



THE BOMBAY GEOGRAPHICAL ASSOCIATION

The Bombay Geographical Association is one of the oldest Geographical Association Registered Under Societies Act XXI of 1860 no. Bom.82/1958 (GBBSD), functioning from C/o Dept. of Geography, University of Mumbai, Lokmanya Bal Gangadhar Tilak Bhavan, Vidyanagari, Santacruz (East), Mumbai 400098. The legacy of BGA is built strongly by its former Presidents and their executive team such as Prin. C.B. Joshi; Shri.Iyer; Dr. C.D. Deshpande; Shri.N.M.Joshi; Shri.Vakil; Prof. B. Arunachalam; Dr. K. Sita; Prof. V.G. Amrite; Dr. V.S. Phadke; Prof.S.Ebenezer; Prof.Savitsmita Vilasrao Chawan and presently Prof.Bharati Unni. The BGA has been conducting various academic programmes for disseminating knowledge in Geography through Conferences, Seminars, Workshops, refresher courses, Orientation program, Diploma Course, field trips, training programmes, Map Exhibition etc. for college and school teachers in association with BOS Geography and Dept. of Geography, University of Mumbai at International, National, State and Regional levels, over the years with kind support from the authorities at University of Mumbai. The BGA has a total of 29 publications in the form of Annual Research Journal namely, 'Bombay Geographical Magazine', occasional papers and Monographs. B.G.A. in association with Dept. of Geography, University of Mumbai and Geography departments in its affiliated colleges has extended activities to *student community through the support of benevolent sponsors by organizing competitions for them such as*: Mrs. Kani Memorial Prize Presentation Competition, Smt. Shantidevi Banerjee Memorial Prize Presentation Competition, Shri Shankar Raghunath Rao Memorial Best Student Award Prize. The BGA is pleased and is grateful to one and all to receive support from various organizations and institutions to disseminate its academic deliberations to academicians, research fraternity and students.



THE S.I.A. COLLEGE OF HIGHER EDUCATION, DOMBIVLI (E)

The S. I. A. College of Higher Education was started in 2010 to cater to the demand for quality education in the vicinity of Dombivli and its suburban residents. The college works with the motto "Knowledge is Power." It offers undergraduate programs viz. B. Com, BBI, BAF, BMS, BMM, B.Sc. IT and two postgraduate courses including M. Com and M. Sc. IT. The institute espouses holistic development through value-based education, skill development and real-time learning. The institution encourages the students and faculty members to adapt to the emerging digital era by training them on the latest technologies and providing hands-on experience to all. All the software that is used in the college is designed by the college incubation cell – the S.I.A. Techlink. In addition, the college also offers various courses to help enhance employability. The college is reaccredited B+ in the second cycle of NAAC. The College under the able guidance of Hon.Chairman Mr.K.V.Ranganathan; Hon Secretary Mr.M.Gopalakrishnan Prin.Padmaja Arvind and its dedicated staff is strengthening the academic growth with laurels in its region.



PERSPECTIVES OF URBAN ENVIRONMENT AND SUSTAINABLE PRACTICES

Chief Editor

Prin. Dr. Padmaja Arvind

Editors

Dr. Ramesh H. Gavit

Dr. Nitinkumar Patil

Dr. Sumant E. Autade

Dr. Dipesh Karmakar



SP
SHETH
PUBLISHERS PVT. LTD.

Unit No.4, Ground Floor, Lalwani Industrial Estate, 14, G.D. Ambekar Marg, Wadala, Mumbai-400 031
Tel.: (022) 6662 4553, 6662 4554. Fax: 6662 4556. e-mail: orders@shethpublishers.com

Follow us:



/shethpublishers



/sheth.publishers

ISBN - 978-93-6268-979-5



Price - ₹ 250.00

SP
SHETH
PUBLISHERS PVT. LTD.

Perspectives of Urban Environment and Sustainable Practices

Chief Editor

Prin. Dr. Padmaja Arvind

Editors

Dr. Ramesh H. Gavitt

Dr. Nitin Kumar Patil

Dr. Sumant E. Autade

Dr. Dipesh Karmarkar

When you care enough to be better than the best


SHETH[®]
PUBLISHERS PVT. LTD.

MUMBAI

GOA ☆ NAGPUR ☆ BHAVNAGAR

Follow us:



/shethpublishers



/sheth.publishers

Price: 250

ISBN - 978-93-6268-979-5

First Edition: October, 2024

No Part of this publication may be reproduced or transmitted by any means, electronic or mechanical, including photocopy, recording or any information storage and retrieval system, without permission in writing from the copyright owners.

DISCLAIMER

The authors are solely responsible for the contents of the chapters in this book. The publishers and editors' do not take any responsibility for the same in any manner. Errors, if any are purely unintentional and readers are requested to communicate such errors with the editors and authors to avoid discrepancies in future.

Published & Printed by:

Sheth Publishers Private Ltd.
Unit No.4, Ground Floor, Lalwani Industrial Estate,
14, G.D.Ambekar Marg, Wadala Mumbai-400 031
Contact: 6662 4553/ 6662 4554 FAX: 6662 4556

Acknowledgement

This book is the result of the dedicated efforts of research scholars and academicians. We would like to express our heartfelt appreciation and gratitude to everyone who contributed to its production and publication.

We are deeply honored and sincerely thank our management: Hon. President Mr. K. V. Ranganathan and Hon. Secretary Mr. Gopalakrishnan of the South Indian Association, Dombivli, for granting us the permission to publish this book.

I also extend my sincere gratitude to Principal Dr. Padmaja Arvind and Vice Principal and IQAC Coordinator Mrs. Booma Halpeth of S. I. A. College of Higher Education, Dombivli (E), for their unwavering support throughout the completion of this book.

I express my sincere gratitude to Mrs. Bharati Unni, President of the Bombay Geographical Association (BGA), C/O Department of Geography, University of Mumbai, Lokmanya Tilak Bhavan, CST Road, Kalina, Santacruz (East), Mumbai. My heartfelt thanks also extend to Prof. Dr. Moshumi Datta, Secretary of BGA and Principal of N.K. College (Autonomous), Malad, Mumbai; Prof. Dr. Sanjukta Sattar, Joint Secretary of BGA and Head of the Department of Geography, University of Mumbai; Prof. Vilasrao Chawan, former Head, Department of Geography, B. K. Birla College, Advisory Member and former Vice President of BGA; Principal Dr. Hemant Pednekar, Advisory Member and former Vice President of BGA; Dr. Ramesh Gavitt, Treasurer of BGA and Associate Professor in the Department of Geography, University of Mumbai.

Additionally, I would like to acknowledge the Governing Body Members of BGA: Dr. Dipesh Karmarkar, Research Guide and Head of the Department of Geography, Smt. CHM College, Ulhasnagar-3, and Shri. Dyaneshwar Bombe, Head of the Department of Geography, Sathaye College, Vile Parle, Mumbai, affiliated with the University of Mumbai. Their association in the publication of this book has been integral to its success.

I owe my sincere and special thanks to Prof. Dr. Savitsmita Vilasrao Chawan, Advisory Member and former President of BGA, and former Head of the Department of Geography, University of Mumbai for her invaluable support and expertise guidance in achieving the outcome of publication of this book.

I am immensely grateful to all the authors for contributing chapters on topics aligned with the theme of this book and for their timely submissions. I also extend special thanks to the editorial board for their diligent efforts in editing the entire manuscript.

Words are inadequate to express my deepest thanks to Shri Kirtibhai Sheth and Shri Deepak Seth, Directors of Sheth Publications Pvt. Ltd., for publishing this book with an ISBN. I also extend my gratitude to the faculty members of S.I.A. College of Higher Education, Dombivli (E), and the entire Governing Body Members of the Bombay Geographical Association for their support and good wishes in the publication of this book.



Dr. Nitinkumar M. Patil
Faculty, the S.I.A. College of Higher
Education,

Perspectives of Urban Environment and Sustainable Practices

Preface

Welcome to "Urban Environment: Need for Sustainable Practices" a comprehensive exploration of the challenges and opportunities facing urban areas in the pursuit of sustainability. In this rapidly evolving world, the way we design, manage, and inhabit our cities has never been more critical. This book explores into various aspects of urban living, offering insights, analyses, and solutions from experts across diverse fields. In the pursuit of a sustainable future, the role of our urban environments cannot be overstated. As cities continue to grow and evolve, the need for innovative and practical solutions to address environmental, social, and economic challenges becomes increasingly significant.

"Urban Environment: Need for Sustainable Practices" is a compilation of insights, strategies, and case studies aimed at guiding this journey towards environmental sustainability. Through the contributions of various experts, this book explores a diverse array of topics, ranging from renewable energy integration to smart city development, from green infrastructure implementation to the social impacts of urbanization. In this book, readers will find a wealth of knowledge and inspiration to inform their understanding of urban sustainability and to catalyse positive change in their own communities. Whether you are a policymaker, urban planner, researcher, or concerned citizen, this book offers a valuable perspectives and approach with practical solutions to help shape a more sustainable future for our cities.

The chapters within this volume span a wide range of topics, reflecting the multidimensional nature of urban sustainability. From the integration of electric vehicles with renewable energy sources to the development of smart cities, each contribution presents innovative approaches to address the complex issues confronting urban environments today.

Authors of the present book given their expertise to bear on topics ranging from sustainable mobility to ethical governance, from green infrastructure development to the social impacts of technology. Through their research, analysis, and case studies, authors have thrown light on the influence of nature of environmental, social, economic, and technological factors shaping urban life. By examining both challenges and successes, they offer valuable

insights that can inform policies, practices, and behaviours aimed at fostering more sustainable urban environments.

The chapters in this book are based on the selected paper presentations made at an Interdisciplinary National Level Conference in Hybrid Mode on ‘Environment, Development and Sustainability An Inclusive Approach for Resilient Future’ held on 17th February 2023 at The S.I.A. College of Higher Education, Dombivli (E) With IQAC Affiliated to University of Mumbai, Dombivli in collaboration with The Bombay Geographical Association housed in the Department of Geography, University of Mumbai. The contributors to this book are from varied disciplines with multidisciplinary approach to the theme of this book.

As editors, we are grateful to the contributors for sharing their knowledge and perspectives in this collective endeavour. It is hoped that this book serves as a catalyst for dialogue, innovation, and action, inspiring readers to engage with the pressing issues facing our urban communities and to contribute to building a more sustainable future.

Join us on this journey as we work together to create urban environments that are not only ecologically sound and socially equitable but also resilient and thriving for generations to come. Together, let us embark on a journey towards not only liveable and vibrant but also resilient and regenerative urban environments.

Dr. Ramesh H. Gavit
Associate Professor
Department of Geography,
University of Mumbai-98

Contents

S.N.	Title	Authors	Page No.
1.	Urbanization and Land Use Land Cover Change: A Case of Thane District	Raj Shaikh and Dipesh Karmarkar	1-9
2.	Electric Vehicles Integrated with Renewable Energy Sources for Sustainable Mobility	Priyanka Patil	10-15
3.	Exploring Sustainable Practices in Mumbai's Housing Societies	Mukul Kulkarni, Sujith Raman and Tarun Sadanand Kuckian,	16-24
4.	Redefining Urban Living Through Smart Cities	Dr. Gayathri N.	25-32
5.	Development of Green Infrastructure in Urban Space: Case of Greater Mumbai	Prin. Prof. Dr. Moushumi Datta	33-42
6.	Impact of Psychological Contract on Job Satisfaction with Reference to Bank Employees in Mumbai Region	Athira M K & Irin Biju	43-51
7.	Smart city application and IIoT-Industrial Internet of Things	Dipti Dharne Mrs. S. Sai Sree	52-58
8.	SWOT Analysis of E-Vehicles in India	Sejal Mahajan	59- 68
9.	Social and Economic Aspects of Unorganized Daily Labour Market Workers in Panvel Municipal Corporation	Pilake & Dr.Deepak Narkhede	69-78
10.	Impact of Social Media on Complaint Redressal: A Case Study of Mumbai City	Mayuri Govindrao Madne	79-89
11.	Ethical Governance and Sustainability: A Focus on Indian Business Landscape	Dr.Preeti Sumant Autade & Dr. Autade Sumant Mr. Aditya Vilankar	90-97
12.	Growth Analysis of Pune City in Maharashtra State	Dr. Rajendra S. Pawar, Dr. Anil A. Landge, Dr. Babasaheb K. Wani Dr. Sudarshan A. Aher	98-103

1. URBANIZATION AND LAND USE LAND COVER CHANGE: A CASE OF THANE DISTRICT

Raj Shaikh¹ and Dipesh Karmarkar²

¹ Assistant Professor, Department of Geography, Smt. CHM College, Ulhasnagar, Thane, Maharashtra, India, Email: rajshaikh.rs2151@gmail.com; Contact: 9960715215

² Associate Professor, Department of Geography, Smt. CHM College, Ulhasnagar, Thane, Maharashtra, India. Research Guide, Dept. of Geography, University of Mumbai.

Email: dipeshgeography@gmail.com; Contact: 7666157636)

Abstract:

The present work intends to understand the land use and land cover (LULC) changes in the Thane District from 2005-06 to 2015-16 through the use of remote sensing data from the Bhuvan National Remote Sensing Center. The data thus obtained is analyzed to find out the decadal LULC changes. Thane District has been divided into nineteen LULC categories. The findings indicate significant changes in the LULC of Thane District, including urban expansion, agricultural shifts, forest cover changes, and alterations in water bodies. These changes demonstrate the intricate interplay of human activity, natural circumstances, and conservation programs that influenced Thane District's dynamics during the study period. The understanding of these changes would facilitate informed decision-making on land management and conservation strategies.

Keywords:

Land use land cover change, urbanization, Thane District

Introduction

Urbanization is the complex process by which rural landscapes are transformed into urban habitats. It is a shift in population dynamics from predominantly agricultural activities to a concentration of people in cities and towns, representing a transition in regional development. The expansion of urban areas is widely regarded as a key indicator of a country's socio-economic progress and overall prosperity. More specifically, urbanization refers to a relative increase in the urban population compared to the total population of a given area. More than half of the world's population currently lives in cities, contributing to the emergence of densely populated metropolitan giants. Urbanization is driven by several factors, including population growth, economic

dynamism, and infrastructure initiatives such as road building and public investment in infrastructure to support development (Khadke and Waghmare, 2017).

Urbanization has a profound impact on land use and land cover (LULC) and changes the natural environment in fundamental ways. As urban areas expand to accommodate the growing population, there is a visible change in LULC dynamics. Modern spatial analysis tools such as Geographic Information Systems (GIS) and Remote Sensing play a central role in monitoring and quantifying these LULC changes and provide valuable insights for informed decision-making in the pursuit of balanced urban development (Ratnaparkhi, et al, 2016). Research into LULC changes is necessary due to their far-reaching implications for environmental sustainability, socio-economic planning, and the overall well-being of communities. Understanding these changes is essential for effective land management as it provides insights into the spatial patterns and drivers of urban expansion. Through a comprehensive study of LULC changes, policymakers and urban planners can predict the environmental impacts of urbanization, including habitat loss, deforestation, and biodiversity change. This knowledge is crucial for formulating sustainable development strategies that balance the needs of urban growth with the preservation of the environment. In addition, monitoring LULC changes enables the identification of potential risks such as increased vulnerability to natural hazards, water scarcity, and the degradation of ecosystem services (Patil and Jamgade, 2019).

Objectives, Study Area, and Methodology

The purpose of this study is to understand the nature of LULC changes in Thane District from 2005-06 to 2015-16. The selection of Thane District as the study is due to its unique geographical and socio-economic characteristics. Located in the western state of Maharashtra, India, Thane District (Fig. 1) covers an area characterized by diverse landscapes and includes coastal areas along the Arabian Sea, hilly terrain, and fertile plains. Strategically located adjacent to Mumbai, the financial capital of India, Thane District has emerged as a major player in the Mumbai Metropolitan Region (MMR) and has undergone profound changes in its socio-economic status over the years. The district has witnessed a significant inflow of people in search of economic opportunities and better living standards, which has contributed to rapid urban expansion. According to the 2011 census, Thane District had a population of 1,10,60,148, of which 25,45,470 were rural and 85,14,678 were

urban (Census, 2011). Thane District has witnessed a transformation marked by industrialization, urbanization, and a growing population in search of livelihood opportunities. The district is a vibrant hub where traditional agricultural communities coexist with fast-growing urban centres, forming a dynamic web of rural, peri-urban, and urban landscapes. Its proximity to Mumbai has spurred infrastructural development and made Thane a focal point for residential, commercial, and industrial activities. This has significantly influenced the LULC patterns in the Thane District.

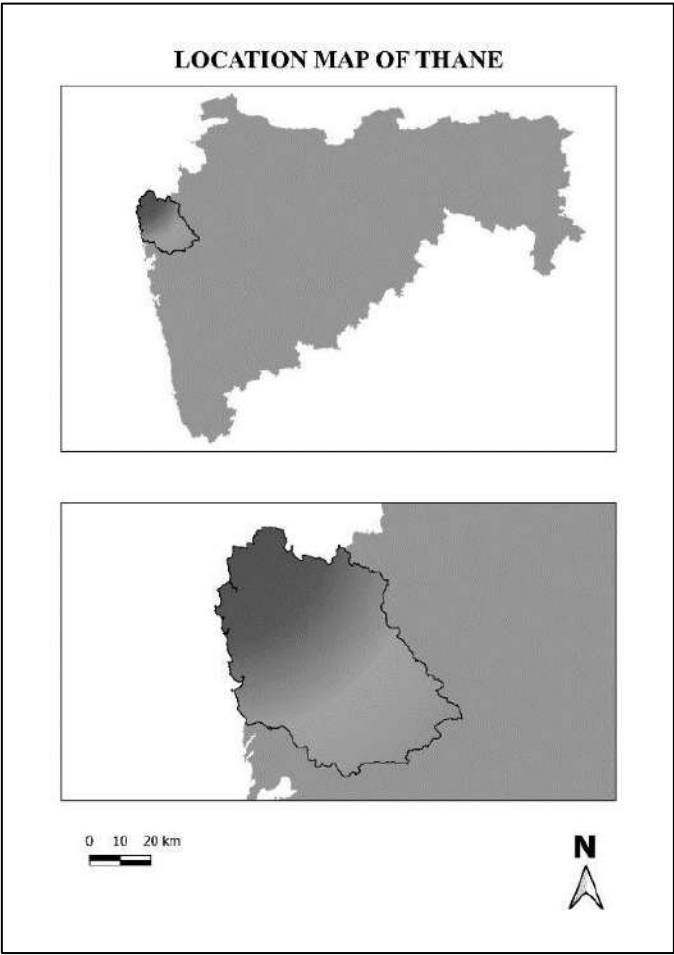


Fig. 1 Location Map of Thane District

The research methodology adopted in this paper is qualitative. It attempts to investigate decadal LULC trends in the Thane District, with a focus on the 2005-06 and 2015-16 years. The image and quantitative data were obtained from the National Remote Sensing Centre’s Bhuvan website. The thematic maps were created using the QGIS 3.24 software. The NRSC’s LULC classification was employed, which divides land into aquatic

(rivers, streams, canals, and lakes), wasteland (wasteland and uncultivable), vegetation (scrub, evergreen, and deciduous), agriculture (arable land and plantations), and built-up land (rural and urban). Finally, LULC changes were identified and interpreted by comparing the categorized datasets for 2005-06 and 2015-16.

Results and Discussion

Table 1 and Figure 2 indicate the patterns of areal change under the defined LULC categories. The findings indicate major changes in Thane District’s LULC, including urban expansion, agricultural shifts, forest cover changes, and water body modifications. These changes are the product of natural processes, human activity, and conservation initiatives.

Table 1. Thane District: Area under LULC Categories (2005-06 to 2015-16)

Sr. No.	LULC Categories	Area (km ²) 2005-06	Area (km ²) 2015-16
1	Agriculture (Cropland)	2720.53	2865.31
2	Forest (Evergreen / Semi-Evergreen)	2144.7	2143.92
3	Barren/Unculturable/Wastelands (Scrub land)	1183.62	1118.54
4	Forest (Deciduous)	426.51	783.06
5	Agriculture (Fallow)	789.68	460.03
6	Agriculture (Plantation)	650.31	444.54
7	Built-up (Urban)	295.18	411.22
8	Forest (Scrub Forest)	437.19	408.85
9	Wetlands/Water Bodies (Coastal/Wetland)	454.83	344.57
10	Wetlands/Water Bodies (River/Stream/Canals)	192.19	188.05
11	Wetlands/Water Bodies (Reservoir/Lakes/Ponds)	9558	139.86
12	Built-up (Rural)	59.09	125.41
13	Forest (Swamp/Mangroves)	10.26	60.42
14	Barren/Unculturable/Wastelands (Salt Affected Land)	52.9	38.88
15	Built up (Mining)	2.2	19.54
16	Barren/Unculturable/Wastelands (Sandy Area)	8.48	4.94
17	Forest (Forest Plantation)	0	0.53
18	Wetlands/Water Bodies (Inland Wetland)	0	0.2
19	Barren/Unculturable/Wastelands (Barren Rocky)	0	0.15

The results show that the built-up area expanded significantly from 356.47 sq. km. in 2005-06 to 556.17 sq. km. in 2015-16, indicating substantial urbanization, industrialization, and rural development (Fig. 3). This expansion is driven by population growth, economic activities, and infrastructure development initiatives. It led to the conversion of rural and natural land into built-up areas to accommodate housing, industries, and associated infrastructure. There was a notable increase in urban area from 295.18 sq. km. in 2005-06 to 411.22 sq. km. in 2015-16. It indicates significant urbanization and infrastructure development. The area under mining activities saw a substantial rise from 2.2 sq. km in 2005-06 to 19.54 sq. km in 2015-16, suggesting increased mining activities in the region. The rural area also experienced growth, expanding from 59.09 sq. km in 2005-06 to 125.41 sq. km in 2015-16, possibly due to agricultural expansion or rural development.

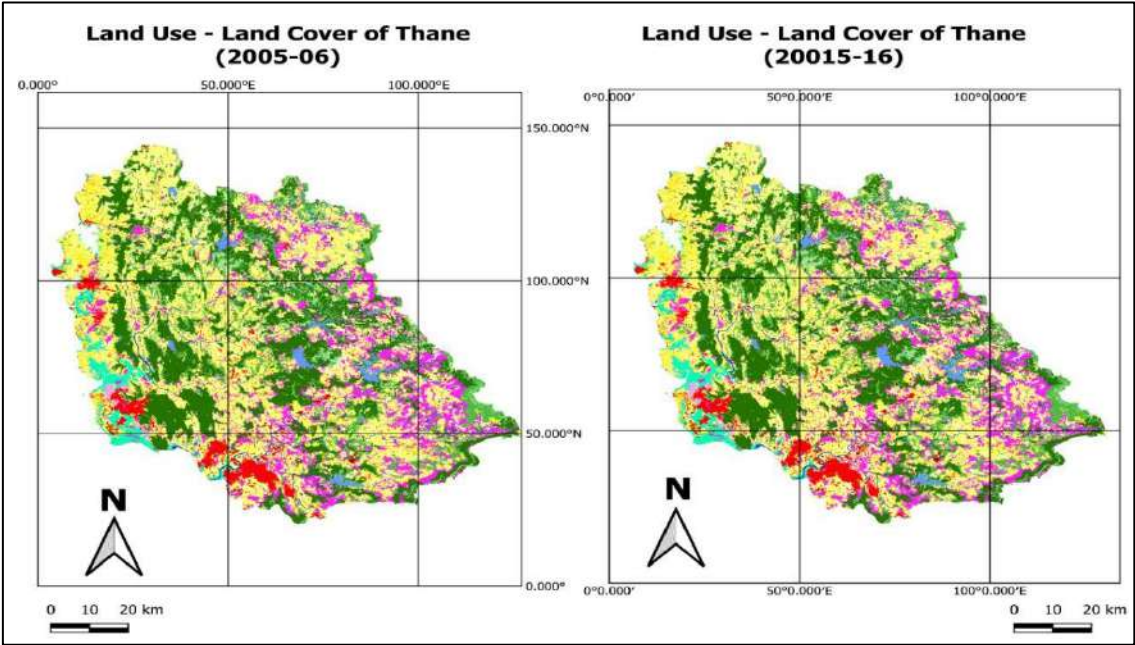


Fig. 2 Thane District: LULC (2005-06 and 2015-16) Based on NRSC Bhuvan Data

Thane District’s agricultural landscape changed significantly, with the overall agricultural area decreasing slightly from 4160.52 sq. km. in 2005-06 to 4179.88 sq. km. in 2015-16. The area under plantation agriculture declined from 650.31 sq. km. in 2005-06 to 444.54 sq. km. in 2015-16, reflecting a shift in agricultural techniques or land use. Are under crops grew marginally, from 2720.53 sq. km. in 2005-06 to 2865.31 sq. km. in 2015-16, indicating continued agricultural activity. Fallow land declined dramatically from

789.68 sq. km in 2005-06 to 460.03 sq. km. in 2015-16, which could mostly indicate land reclamation. This transition reflects changes in agricultural practices and land use trends. While farmland rose marginally, plantation agriculture and fallow land both declined. These shifts could be linked to urbanization, industrialization, changes in agricultural regulations, and climate variability, all of which have an impact on land suitability and farmers’ land use decisions.

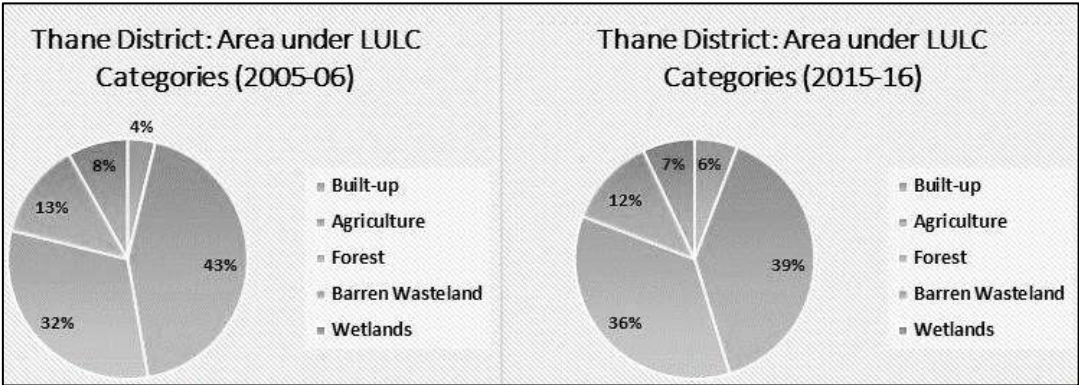


Fig. 3 Thane District: Area under Broad LULC Categories (2005-06 and 2015-16)

The area under evergreen and semi-evergreen forests has remained relatively stable (Fig. 3) due to their resilient nature and possibly conservation efforts. These forests typically withstand disturbances better than deciduous forests and may have benefited from protective measures and conservation programs. On the other hand, the area under deciduous forest experienced a substantial increase from 426.51 sq. km. in 2005-06 to 783.06 sq. km. in 2015-16. This growth could be attributed to reforestation initiatives, afforestation programs, and natural regrowth resulting from reduced deforestation rates and possibly changes in land use policies. Efforts to restore degraded lands, promote sustainable forestry practices, and enhance ecosystem services may have contributed to this positive change. The area under swamp and mangrove forests also saw a significant increase, indicating conservation efforts to protect these ecologically valuable habitats. Restoration projects, stricter regulations, and awareness campaigns may have contributed to this positive change. The area under scrub forest, however, experienced a slight decrease, possibly due to land conversion for agriculture, urbanization, or degradation resulting from unsustainable land use practices. Expansion of agricultural lands, urban sprawl, and infrastructure development may have encroached upon scrub forest areas, leading to habitat

fragmentation and loss of biodiversity. These changes reflect the interplay between human activities, environmental factors, and conservation efforts shaping the forest cover dynamics in Thane District over the study period. Efforts to promote sustainable forest management, protect key habitats, and restore degraded ecosystems are essential for ensuring the long-term ecological integrity and resilience of the region’s forests.

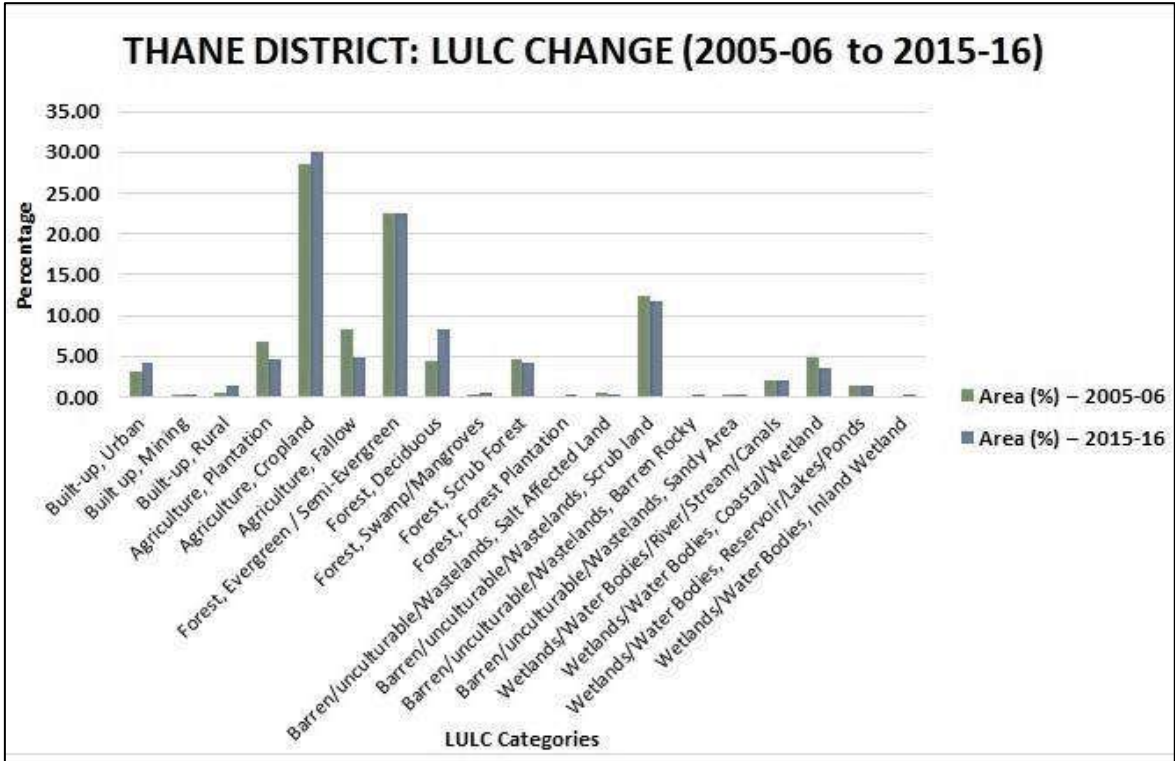


Fig. 4 Thane District: LULC Change (2005-06 to 2015-16)

The area classified as barren wasteland decreased from 1244.1 sq. km. in 2005-06 to 1184.57 sq. km. in 2015-16. The salt-affected land decreased from 52.9 sq. km. in 2005-06 to 38.88 sq. km. in 2015-16, possibly due to land reclamation or mitigation efforts. Scrubland and barren rocky lands experienced minor changes, with scrubland decreasing slightly and barren rocky land appearing in a small area. Sandy area decreased slightly, possibly due to natural processes or land use changes. This decline suggests efforts towards land reclamation, rehabilitation, or natural processes transforming barren areas into more productive or stable landforms. Decreases in salt-affected land, scrubland, and barren rocky land indicate potential improvements in land quality, possibly due to soil conservation measures, afforestation initiatives, or natural regeneration processes.

The land under rivers, streams, and canals saw a slight decrease. It could be attributed to various factors including natural processes like sedimentation, erosion, and changes in hydrological regimes due to human activities such as dam construction, water extraction, and land use changes. The area under coastland and wetlands also experienced a decrease. It indicates habitat loss or degradation due to coastal development, pollution, encroachment, and conversion of wetlands for agricultural or urban purposes. These ecosystems are particularly vulnerable to anthropogenic pressures and climate change impacts. Compared to the above two sub-categories, the land under reservoirs, lakes, and ponds declined significantly. Urbanization and land use changes contribute to the shrinkage of these water bodies through encroachment and pollution. A small increase is observed in the inland wetland category, suggesting conservation efforts or natural regeneration driven by wetland restoration projects, protection measures, and habitat management initiatives.

Conclusion:

The LULC changes observed in Thane District, Maharashtra, from 2005-06 to 2015-16 bring to the fore several environmental and developmental challenges faced by Thane District. The significant expansion of built-up areas highlights the rapid pace of urbanization and industrialization, leading to concerns such as habitat loss, fragmentation, and loss of agricultural land. Unplanned urban growth can also strain resources, aggravate pollution, and increase vulnerability to natural hazards. Changes in agricultural land use patterns raise questions about the sustainability of farming practices, food security, and environmental impacts. Conversion of agricultural land to other uses, alongside shifts in cropping patterns, may affect local livelihoods, biodiversity, and ecosystem services. Declines in forest cover and wetlands underline the threats to biodiversity, ecosystem services, and resilience to climate change. Loss of natural habitats can disrupt ecological processes, decrease water quality, and increase the risk of flooding and other natural disasters. Declines in water bodies such as reservoirs, lakes, and ponds highlight challenges related to water management, including water scarcity, pollution, and altered hydrological regimes. These changes can impact ecosystems, agriculture, and human well-being, necessitating sustainable water resource management strategies. The decline in barren wastelands may suggest efforts towards land reclamation and rehabilitation, but ongoing land degradation processes remain a concern. Soil erosion, desertification, and pollution

can degrade land productivity, compromise ecosystem health, and exacerbate poverty and food insecurity. To address these issues, integrated land management with prioritization of environmental sustainability, social equity, and economic development is recommended. Sustainable land use planning, conservation initiatives, stakeholder engagement, and policy interventions will go a long way in promoting resilient and equitable landscapes in Thane District.

References:

1. Ratnaparkhi, N., Nagne, A. and Gawali, B. (2016): Analysis Of Land Use/Land Cover Changes Using Remote Sensing And GIS Techniques In Parbhani City, Maharashtra, India. *International Journal of Advanced Remote Sensing and GIS*. Vol. 5, Issue 4, pp. 1702-1708,
2. Patil S. and Jamgade, M. (2019): Monitoring Land Use/Cover Change in Navi Mumbai, Maharashtra, India, Using Remote Sensing and Satellite Data. *International Journal of Innovative Technology and Exploring Engineering (IJITEE)*, Vol. 6, Issue 1, pp. 726-737.
3. Khadke. P. and Waghmare, P. (2017): Level Of Urbanisation And Their Disparities In Maharashtra State. *Scholarly Research Journal for Interdisciplinary Studies*, Vol. 4 (35), pp. 5953-5964,
4. <https://www.census2011.co.in/census/district/355-thane.html>

2. ELECTRIC VEHICLES INTEGRATED WITH RENEWABLE ENERGY SOURCES FOR SUSTAINABLE MOBILITY

Priyanka Patil

The S.I.A. College of Higher Education, P-88, MIDC Residential Area, Dombivli ,
Gymkhana Road, Near Balaji Mandir, Dombivli (East), District Thane, Pin 421 203,
Email address: priyankapatil6779@gmail.com, **Contact number:** 9511876564

Abstract

This research looks at how one can make transportation better for the environment by combining electric cars with renewable energy like solar and wind power. Right now, we're trying to find alternatives to using fossil fuels for transportation and using electric cars with renewable energy could be a big part of the solution. An attempt has been made in this paper to understand how technology improves and what problems one might face in joining electric cars with solar, wind, and other renewable energy sources. The present study has started with checking out how many people use electric cars and how much renewable energy we have. Then, it was also found out how connecting electric cars to solar and wind power could help us cut down on pollution, become more independent with our energy and make our power systems more stable. We have also looked at how this might affect money and the rules that we follow. The paper discusses the new ways to store energy, smart technologies for the power system and how one can use electric cars to give energy back to the system when we don't need it. We have also figured out what problems we might face with building new stuff, managing our power systems and getting people to use this new way of doing things.

Keywords: *Electric vehicles (EVs), renewable energy sources (RESs), solar photovoltaic energy, wind energy, eco-friendly.*

Introduction

Electric vehicles (EVs) represent a revolutionary stride towards sustainable transportation, offering a promising solution to the environmental challenges posed by traditional fossil fuel-powered vehicles. The integration of electric vehicles with renewable energy sources stands as a pivotal junction in reshaping the landscape of mobility towards sustainability. This research paper investigates the symbiotic relationship between electric vehicles and renewable energy sources, exploring the synergies, challenges, and potential pathways that the way for a more sustainable and efficient transportation ecosystem. By examining the integration of EVs with renewable energy, this study aims to shed light on the advancements, implications, and prospects of achieving a harmonious convergence of clean energy technologies for fostering sustainable mobility.

Objectives The present paper is aimed at understanding the use of renewable energy resources for electric vehicles.

Methodology

The present paper uses both primary and secondary data. In view of understanding the public opinion and perception of electric vehicles integrated with renewable energy resources, the questionnaire method was adopted. The secondary data was obtained through various publications.

Renewable Energy

Renewable energy is energy that comes from natural sources that won't run out, like the sun, wind, water, and plants. Unlike fossil fuels such as coal or oil, which are used up and take a long time to form, renewable energy sources can be used again and again without getting used up. They're clean and better for the environment because they don't produce as much pollution or greenhouse gases when making electricity or powering things like cars.

Types of Renewable Energy Resources

Solar Energy: This type of energy is generated by capturing sunlight using solar panels or collectors. It can be converted into electricity through photovoltaic cells or used directly for heating and lighting purposes.

Wind Energy: Wind turbines capture the kinetic energy of the wind and convert it into electrical power. They consist of blades that rotate when the wind blows, turning a generator to produce electricity.

Hydroelectric Energy: This renewable energy is produced by harnessing the power of flowing water, typically through dams or flowing rivers. Water flows through turbines, generating electricity.

Geothermal Energy: Geothermal energy is derived from the earth's heat. It involves tapping into the natural heat beneath the Earth's surface to generate electricity or for heating and cooling purposes.

Biomass Energy: Biomass energy is generated from organic materials such as wood, agricultural residues or organic waste. It can be burned directly for heat or converted into biofuels like ethanol and biodiesel.

Tidal Energy: This form of energy captures the kinetic energy from the ebb and flow of tides in coastal areas. It typically involves the use of turbines or other technologies placed underwater to generate electricity. Powering Electrical Vehicles by Renewable Energy

Generation of Renewable Energy: Renewable energy sources are like solar, wind, hydroelectricity. Solar panels capture sunlight, wind turbines harness wind power and hydroelectric plants utilize flowing water to generate electricity. This energy is typically generated in power plants or through distributed systems like solar panels on rooftops.

Integration into the Grid: The electricity generated from renewable sources is fed into the electrical grid. It becomes part of the overall pool of electricity available for consumption. This grid-connected renewable energy is then accessible for various purposes, including charging electric vehicles.

Charging EVs: EV owners can charge their vehicles using electricity from the grid. This electricity could be sourced from renewable energy power plants. When an EV is plugged in for charging, it draws electricity from the grid and if that grid incorporates renewable energy, the EV effectively uses this clean power for its recharge.

Direct Use of Renewable Energy: In some cases, EV owners might directly connect their vehicles to renewable energy sources like solar panels installed at their homes or workplaces. This method ensures that the energy used to charge the EV comes exclusively from renewable sources.

Overview of Government Policies

Renewable Purchase Obligation (RPO): This policy mandates a certain percentage of electricity consumption to be sourced from renewable energy. States like Karnataka and Gujarat in India have implemented RPOs, requiring a specific portion of their electricity to be generated from renewable sources.

Feed-in Tariffs (FiTs): FiTs offer guaranteed payments to renewable energy producers for the electricity they generate and supply to the grid. States like Tamil Nadu have implemented FiTs to encourage solar power generation, providing fixed rates to solar energy producers.

Net Metering: Net metering allows individuals who generate renewable energy (e.g., through solar panels) to sell excess electricity back to the grid and receive credits on their electricity bills. States such as Maharashtra and Kerala have implemented net metering policies to promote rooftop solar installations.

Renewable Energy Certificates (RECs): RECs are tradable certificates given to those generating renewable energy, providing an additional revenue stream. Rajasthan and

Madhya Pradesh are examples of states in India where RECs have been introduced to incentivize renewable energy production.

Green Energy Funds/Incentives: Some states like Telangana and Andhra Pradesh have set up green energy funds or offered financial incentives to promote investments in renewable energy projects, encouraging private sector participation.

Public Survey:

A survey was conducted to collect information from people. In this case, in all 105 individuals were asked about what they thought about electric vehicles using renewable energy. Doing a survey is important because it helps get trustworthy information that one can study and use to figure out what most people think about electric vehicles and renewable energy working together.

Questionnaire:

Q. Are you familiar with the concept of electric vehicles (EVs) integrated with renewable energy sources for sustainable mobility?

Answer: When People were asked if they were familiar with the concept of electric vehicles (EVs) integrated with renewable energy sources for sustainable mobility, 90.9 % of people were familiar with the concept.

Q. How would you rate the importance of integrating renewable energy sources with electric vehicles for sustainable mobility?

Answer: When people were asked importance of integrating renewable energy sources with electric vehicles for sustainable mobility, 54.5% said very important, 27.3% said important, 9.1% said neutral and 9.1% said Not Sure.

Q. According to you, which factors do you consider important when choosing a vehicle?

Answer: When people were asked which factors do you consider important while choosing a vehicle, 23.5% chose cost, 33.6% chose environmental impact, 12.2% chose Range and charging infrastructure, 9.1% chose Government Incentives and 21.6% chose Energy efficiency.

Q. Which renewable energy sources do you believe are most suitable for powering electric vehicles?

Answer: When people were asked Are you aware of any renewable energy options available for charging electric vehicles, 63.1% knew solar power, 11.1% knew wind power 7.1% knew hydroelectric power, 9.1% geothermal power and 9.6% knew tidal power.

Q. What do you perceive as the primary barriers to the widespread adoption of electric vehicles integrated with renewable energy sources?

Answer: When people were asked which factors primarily are barriers to the widespread adoption of electric vehicles integrated with renewable energy sources, 25.5% chose high cost, 22.5% chose limited charging, 14.2% range anxiety, 16.4% chose lack of awareness and 21.4% chose technology limitations.

Q. How likely are you to consider purchasing or using an electric vehicle integrated with renewable energy sources in the next 5 years?

Answer: When people were asked to purchase or use an electric vehicle integrated with renewable energy sources in the next 5 years, 27.3% very likely, 36.4% likely and 36.3% neutral.

Environmental Impact: Integrating EVs with renewable energy sources significantly reduces greenhouse gas emissions. By using electricity generated from renewable sources like solar or wind, EVs contribute to cleaner air and combat climate change compared to traditional gas-powered vehicles.

Energy Independence: Dependence on fossil fuels decreases when EVs are charged with renewable energy. This shift promotes energy independence for countries, reducing reliance on imported oil and enhancing national energy security.

Grid Stability and Load Management: Integrating EVs with renewables requires a well-managed electric grid. However, it also presents opportunities for grid stability and load management. Smart charging systems can optimize EV charging during off-peak hours when renewable energy production is typically higher, reducing strain on the grid.

Cost Savings and Economic Benefits: Over time, using renewable energy to power EVs can lead to cost savings. While initial setup costs might be higher, the long-term operational expenses can be lower due to the decreasing costs of renewable energy production.

Challenges and Barriers: Despite the advantages, challenges exist. The intermittent nature of renewable energy sources poses challenges for consistent EV charging. Storage solutions and technological advancements are crucial to overcoming this barrier.

Infrastructure Development: Integrating EVs with renewable energy requires robust infrastructure. This includes not only charging stations but also grid enhancements to accommodate increased electricity demand.

Policy and Collaboration: Government policies and collaborations between industries are crucial for successful integration. Incentives, subsidies, and regulations play a significant role in accelerating the adoption of renewable energy-integrated EVs.

Consumer Adoption and Education: Awareness and education programs are necessary to encourage consumer adoption of EVs powered by renewable sources. Understanding the benefits and long-term advantages is vital to widespread acceptance.

Future Prospects: Continued research and development in both EV technology and renewable energy are key for further advancements. Innovations in battery technology, more efficient solar panels, and wind turbines can enhance the integration and efficiency of these systems.

Conclusion

In conclusion, the integration of electric vehicles with renewable energy sources presents a promising solution for creating sustainable mobility. By harnessing clean energy from sources like solar, wind and hydroelectric power, electric vehicles can significantly reduce greenhouse gas emissions and reliance on fossil fuels. This combination not only helps in combating climate change but also promotes energy independence and a healthier environment. However, further advancements in technology and infrastructure are necessary to fully realize the potential of this integration. With continued research and development, the synergy between electric vehicles and renewable energy sources holds great promise for a more sustainable future in transportation.

References

1. Chen, X., & Wang, Y. (2018). Technological Advancements in Electric Vehicles Integrated with Renewable Energy Sources. *Renewable Energy*.
2. Green, A., et al. (2022). Environmental and Economic Impacts of Electric Vehicles Integrated with Renewable Energy: A Meta-Analysis. *Journal of Sustainable Transportation*.
3. Jones, R., & Brown, S. (2019). Policy Frameworks for Sustainable Mobility: Integrating Electric Vehicles with Renewable Energy. *Energy Policy*.
4. Smith, T., & Johnson, L. (2020). Infrastructure Development for Electric Vehicles Integrated with Renewable Energy. *Transportation Research Part D: Transport and Environment*.
5. Zhang, Q., et al. (2021). Synergies between Electric Vehicles and Renewable Energy for Sustainable Mobility. *Journal of Clean Energy*.
6. https://powermin.gov.in/sites/default/files/uploads/power_sector_at_glance_Nov_2023.pdf
7. <https://www.energetica-india.net/articles/integration-of-solar-with-electric-vehicles->

3. EXPLORING SUSTAINABLE PRACTICES IN MUMBAI'S HOUSING SOCIETIES

Mukul Kulkarni¹, Sujith Raman² and ✉ Tarun Sadanand Kuckian³

The S.I.A. College of Higher Education, P-88, MIDC Residential Area, Dombivli
Gymkhana Road, Near Balaji Mandir, Dombivli (E), Dist. Thane, 421 203;

✉ Email: tarun.kuckian@thesiacollege.com, Mob.no: 9220985156

Abstract

Sustainable living involves recognizing how our lifestyle choices influence the world. Sustainable practices initiated by housing societies in cities play an important role in maintaining the quality of the urban environment. Mumbai, the most populous city in India faces many environmental problems like waste management, pollution etc. which have to be addressed urgently. In this context, the housing societies in Mumbai have taken initiatives to implement some appropriate sustainable practices to cope with different environmental challenges. Considering this fact, the present paper attempts to study the sustainable practices for the housing societies in the city. The study utilizes both primary and secondary data and concludes that, local government, nongovernment organizations and working committees of the housing societies should adopt an integrated approach to implement sustainable practices effectively.

Keywords: Sustainable Practices, Housing Societies, Mumbai, Environment, City.

Introduction

Sustainable development is an effort to ensure that the activities carried out now will be sustainable in the future and not hurt the environment (Rosen, A. 2017). The ultimate goal of sustainable development can only be achieved through a decision-making process by integrating and recognizing economic, environmental, and social problems (Emas, R. 2015).

There are many benefits of sustainable development to both people and the environment. It is predicated on the knowledge that social, economic, and environmental issues are interconnected and aim to enhance everyone's quality of life. Sustainable practices can, in the long run, lead to a safer, healthier, and more productive workplace. Socially, sustainable practices can enhance living conditions, fortify ties within communities, and inspire hope for a better future. Sustainable

practices can support biodiversity, mitigate the effects of climate change brought on by global warming, and protect natural resources. The benefits from sustainable development, such as social inclusion and sustainability, are intricately related to our actions at personal, family, societal and national level, particularly in the context of residential housing societies in India's major cities. Housing societies in big cities of India also initiate and implement environment friendly practices, as a step taken towards sustainable development. However, sustainable housing practices need to integrate three aspects: environmental, social, and economic (Lopez, C. et al. 2019). The contribution of habitants and members of each of the society varies from city to city. It depends on the size of the dwelling. The size of a dwelling is related to various factors, including location, culture, and costs (Nelson, A. 2018). How much space one person, or a family, occupies also varies across the world (Ellsworth-Krebs, K., 2020). Thus, the contribution of an individual housing society member also varies across the world. Considering these facts, the present paper attempts to study the sustainable practices in the city area, by selecting Mumbai as a case study.

Objective

The objective of the present paper is to study the sustainable practices in housing societies located in the city of Mumbai.

Materials and Methods

The present study is based on both primary and secondary data. The sources of primary data include empirical evidence and discussions held with the residents. Government publications, reports, news articles, research papers and web resources provided the secondary data. The results are presented theoretically.

Results and Discussion

The present study reveals that, as the city dwellers in Mumbai (Fig. 1) have a high literacy rate and above-average per capita income in the country, they are well aware of the hazardous effects of climate change and can implement sustainable practices in their housing societies. The following are the common sustainable practices found, initiated by people in their housing societies in the city of Mumbai.

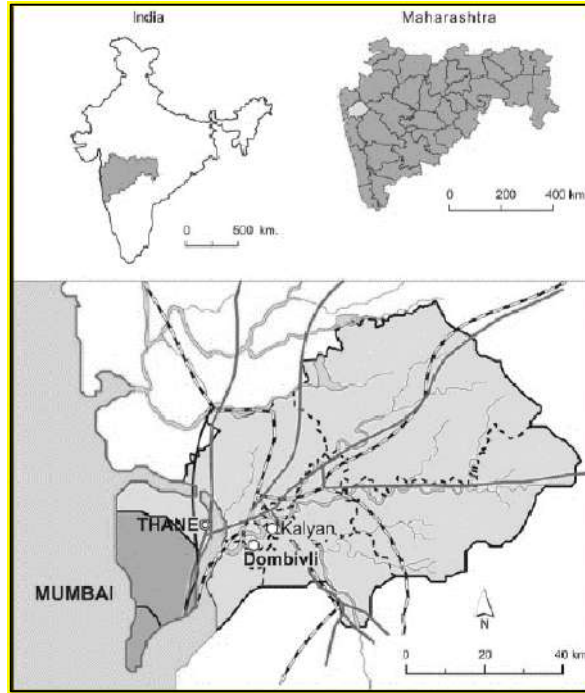


Fig.1 Location Map of Mumbai

Grey-Water Plantation

A significant amount of water from housing societies' kitchens and bathrooms is lost to rivers and the ocean after entering the sewage system. This is referred to as "grey water," which lowers society's overall water demand by being utilized for gardening or toilet flushing with the least amount of filtration. Water collected for gardening purposes can go through a separate pipeline, be graded by filter media, stored in a tank, and then pumped at predetermined intervals. However, separate flushing tanks would need to be installed on the tops of the buildings to flush the toilets. Grey water could then be periodically pumped from the collection tank to the flushing tank for later use. Compared to gardening operations, this would require a slightly more investment and costly installation and upkeep process. The managing body may make decisions based on the resources available to the housing society.

Composting Biodegradable Waste

Every housing society produces a significant amount of waste that decomposes every day. These are gathered and given to the municipal waste trucks via a collection system, where they are disposed of for either incineration or natural degradation in the municipal dumping ground. Furthermore, the housing societies buy fertile topsoil or

manure from the market to fertilize the soil for the benefit of numerous plants, trees, and grassy lawns. This is easily fixed with a little work, which entails producing rich manure for the society by methodically composting the biodegradable wastes on the society's grounds. This would not only be a sustainable and environmentally friendly practice, but it would also ultimately cost less to maintain. There may even be chances for manure to be sold in the market to raise money for the community.

Eliminating Cellular Phones Towers

These days, the market for mobile phone networks is extremely competitive, and the various service providers aim to keep their network strength in every location at least as good as that of their competitors. Because of the intense competition, urban neighbourhoods are crowded with a high density of towers. The cellular companies target housing societies to lower the cost of tower installation; from whom they obtain leases at significantly lower rates than what they would have had to pay to the commercial vendors. But this causes a lot of radiation in the buildings surrounding the towers, particularly in the signal path's neighbouring buildings and the upper floors beneath the towers.

Human health is adversely affected by cellular tower radiation in several well-documented ways. Housing societies in Mumbai ought to deny the cellular companies permission to erect towers on their property. By doing this, the radiation from cellular towers inside the housing society may be significantly reduced.

Management of Plastic Waste

Plastics have been recognized and acknowledged as a primary source of non-biodegradable material that has permeated human daily life. The housing societies should consider implementing the practice of 'reduce, reuse, and recycle' for effective solid waste management disposal. Primarily motivated by the small amount of money that could be made from the waste plastic materials, rag-pickers now handle the recycling and reuse of plastics in most places. Nonetheless, housing societies are now creating policies for managing plastics at the individual and societal levels by teaching people about recycling plastics and cutting back on their usage. Plastics can be segregated on an individual basis and then voluntarily placed in a communal storage facility. They can then be incorporated into appropriate recycling procedures.

Use of Solar Energy Some of the housing societies in Mumbai have taken the initiative to install solar panels on their roofs to get electricity and hot water. Financial assistance

provided by banks, subsidies provided by the government and technical support offered by the solar panel-producing and delivering companies are proven to be helpful to take this step.

Use of Low-Power Consuming Devices

As the use of low-power-consuming devices reduces electricity bills, citizens of the study areas prefer to purchase these devices. Low-energy certified refrigerators, dishwashers, clothes toasters, mixers grinders, ceiling fans and CFL bulbs as well as tubes are some of the common devices they purchase.

Limitations to the Sustainable Practices in Mumbai's Housing Societies

There are several obstacles to sustainable practices in Mumbai's housing societies, main among them being the special difficulties associated with urban living in a city that is densely populated and growing quickly. Several of these restrictions consist of:

- 1. Limited Space:** Mumbai is one of the world's most densely populated cities, so there is a high demand for space. Housing societies often face the challenge of locating sufficient space for the installation of sustainable infrastructure, such as green spaces, rainwater harvesting systems, or solar panels.
- 2. Expensive:** Using sustainable practices and technologies regularly necessitates a large initial outlay of funds. It may be hard for many housing societies, particularly those with limited funds, to afford these technologies, which would make it challenging to put sustainable solutions into practice.
- 3. Lack of Awareness:** Despite increased awareness of environmental issues, many housing society management committees and residents may be still ignorant of the advantages of sustainable practices. It is difficult to gain support for sustainable initiatives without the right knowledge and instruction.
- 4. Infrastructure Difficulties:** Adopting sustainable practices is difficult in Mumbai due to its outdated infrastructure and scarce resources. For example, it can be expensive and logistically challenging to install waste management infrastructure in crowded areas or retrofit old buildings with energy-efficient systems.
- 5. Regulatory Obstacles:** Adoption of sustainable practices may occasionally be impeded by bureaucratic procedures and government regulations. Housing societies may be

dissuaded from pursuing sustainable initiatives by difficult permitting processes, ambiguous guidelines, and contradictory regulations.

6. Social Dynamics: Housing societies are multifaceted groups of people with different interests and goals. It could be difficult to persuade every resident to embrace sustainable practices, particularly if some of them are resistant or indifferent to environmental issues.

7. Maintenance and Management: Constant upkeep and oversight are necessary for sustainable infrastructure. Sustaining sustainable systems can become burdensome in housing societies with inadequate resources or incompetent management structures, which can result in neglect or inefficient operation.

8. Water Scarcity: Mumbai has serious problems with water scarcity, particularly in the dry seasons. Although rainwater harvesting systems can help mitigate this issue, factors like erratic rainfall patterns and inadequate storage capacity may limit their effectiveness.

9. Waste Management Challenges: With insufficient recycling facilities and a shortage of landfill space, waste management is a major problem in Mumbai. Housing societies may find it difficult to put in place efficient recycling and waste segregation programs because of administrative issues and a lack of public support.

10. Dependency on External Factors: Some environmentally friendly solutions, like the production of renewable energy, rely on outside variables like sunlight or wind patterns. These solutions might not work as well in a city like Mumbai where pollution and tall buildings can block sunlight and wind flow.

Notwithstanding these restrictions, housing societies in Mumbai have the chance to overcome obstacles and implement sustainable practices with the help of creative thinking, community involvement, and assistance from governmental and non-governmental groups.

The Future of Sustainable Practices in Mumbai's Housing Societies

Sustainable practices in Mumbai's housing societies have a bright future ahead of them, one that will be crucial in meeting the demands of an expanding urban population while also addressing environmental issues. The following are some possible developments:

1. Green Building Certification: More housing societies may choose to pursue green building certifications such as GRIHA (Green Rating for Integrated Habitat Assessment) or LEED (Leadership in Energy and Environmental Design). The use of waste management, energy efficiency, and sustainable building techniques are promoted by these certifications.

- 2. Integration of Renewable Energy:** As technology advances and costs come down, there might be a rise in the use of renewable energy sources like rooftop solar panels. This can assist in lowering carbon emissions and dependency on grid electricity.
- 3. Water Management:** Flooding and a lack of water are problems Mumbai faces. Rainwater harvesting systems can be installed by housing societies to restore groundwater levels and reduce the risk of flooding. Greywater recycling systems and water-efficient fixtures can also aid in lowering water usage.
- 4. Waste Management:** Good waste management techniques, such as composting organic waste and segregating waste at the source, can lessen the load on landfills and encourage recycling. Housing societies can transform organic waste into valuable compost for gardens by implementing community composting initiatives.
- 5. Green Spaces and Urban Farming:** Including green spaces in housing developments not only improves the aesthetics but also the air quality and gives residents access to recreational areas. Initiatives related to urban farming, like community gardens or rooftop gardens, can foster a connection with nature and increase food security.
- 6. Efficient Transportation:** You can lower carbon emissions and ease traffic congestion by promoting the use of public transportation, carpooling, cycling, and walking. Housing associations can install infrastructure, like bike racks and electric vehicle charging stations, to support sustainable transportation options.
- 7. Community Involvement and Education:** Workshops and awareness campaigns can encourage locals to incorporate sustainable habits into their everyday lives. A sense of ownership and dedication to sustainability goals can be fostered through community initiatives and participation in decision-making processes.
- 8. Technology Integration:** In housing societies, energy-efficient appliances, smart meters, and building automation systems are examples of smart technologies that can optimize resource usage and improve overall energy efficiency.
- 9. Policy Support:** Green technology adoption in housing societies can be further accelerated by government incentives and rules that support sustainable practices. Examples of these include waste management programs and subsidies for renewable energy installations.

All things considered, the future of sustainable practices in Mumbai's housing societies rests on a confluence of policy support, technological innovation, community

involvement, and personal environmental stewardship. Housing societies can help create a more resilient, liveable, and healthy urban environment for present and future generations by embracing sustainability.

Suggestions

The following are some measures that can be implemented by the residential housing societies towards sustainable living.

1. Traditional lights in houses and common spaces should be replaced by energy-efficient or CFL bulbs and tubes.
2. Government guidelines such as the Eco-Niwas Samhita developed by the Bureau of Energy Efficiency, Government of India that aims to improve energy efficiency by setting minimum envelope performance standards for buildings should be adopted.
3. Water Conservation practices, with rainwater harvesting and groundwater recharge should be made mandatory in housing societies.
4. Segregation management practices including segregation of waste, composting of biodegradable waste and recycling of dry waste are some of the waste management practices that should be adopted by housing societies.
5. Green Landscaping on the campus of the housing society should be made compulsory.
6. Housing societies should opt for wind energy wherever possible.
7. Community Gardens should be developed at appropriate places.
8. Green Building Materials should be used for the construction of the buildings.
9. Housing societies should establish Electric Vehicle Charging Stations on their premises.
10. Installation of solar panels on the rooftop should be made mandatory to generate electricity and get hot water.
11. GRIHA (Green Rating for Integrated Habitat Assessment) is a rating mechanism developed by TERI (The Energy and Resources Institute) and endorsed by the Ministry of New and Renewable Energy. It aims to promote sustainable construction practices for buildings that will minimise the cost to environment. Eligible Residential construction projects should adopt sustainable practices in line with GRIHA rating framework. IGBC (Indian Green Building Council) which is a part of the Confederation of Indian Industries and LEED (Leadership in Energy and Environmental Design) are similar such Green Building Rating systems.

Conclusion

The study reveals that, though the citizens of Mumbai are aware of the hazardous effects of climate change, the majority of the housing societies in the city have not yet given priority to sustainable practices. This is because of the absence of willpower, lack of financial support, differences in opinion and dearth of space available. Local government, nongovernment organizations and working committees of the housing societies should adopt an integral approach to take appropriate initiatives to initiate sustainable practices.

Reference:

1. Ellsworth-Krebs, K., (2020). Implications of declining household sizes and expectations of home comfort for domestic energy demand. *Nature Energy*, 5(1): Pp. 20–25.
2. Emas, R. (2015). “The Concept of Sustainable Development: Definition and Defining Principles, Florida International University,” *Br. GSDR* 2015, Pp. 1–3.
3. Jain A.K. GRIHA Rating of Green Buildings. *Environmental Management*. URL: <https://ebooks.inflibnet.ac.in/esp12/chapter/griha-rating-of-green-buildings/>
4. López C. Díaz, M. Carpio, M. Martín-Morales, and M. Zamorano, (2019). “A comparative analysis of sustainable building assessment methods,” *Sustain. Cities Soc.*, vol. 49, no. May, p. 101611, 2019.
5. Nelson, A. (2018). *Small is necessary: shared living on a shared planet*. Pluto Press.
6. Rosen, M. A., (2017). “The Future of Sustainable Development: Welcome to the European Journal of Sustainable Development Research,” *Eur. J. Sustain. Dev. Res.*, vol. 1, no. 1, Pp.1-2

4. REDEFINING URBAN LIVING THROUGH SMART CITIES

Dr. Gayathri N.

MES's The D.G. Ruparel College of Arts, Science and Commerce, Senapati Bapat Marg,
Mahim, Mumbai 400104, Email: gayathri.n@ruparel.edu

Abstract

With the fast-paced growth in India, urbanization is inevitable. This influx has necessitated innovative solutions to address the challenges of urban living, paving the way for the concept of smart cities. As India embraces urbanization, the implementation of smart city initiatives becomes crucial in managing resources, infrastructure, and services efficiently. A smart city is one that seamlessly integrates technology with its distinct socio-cultural framework. Internet of Things (IoT) is essential in streamlining urban processes by tying together systems and gadgets. Beyond the sphere of effective urban services, smart cities have the capacity to completely redefine what it means to live in an urban environment in a country where tradition and modernity coexist. This article deals with the development of smart cities in India - goals, objectives, success and challenges.

Keywords: Digitalization, urban planning, technology, smart transportation, sustainability

Introduction:

The rapid urbanization of recent decades, marked by the migration of millions to cities, presents both opportunities and challenges. 57.4 % of the population of the World and 36.3% of the population of India is urban. This accounts to 518,239,122 people in 2023. The population of Indians residing in urban areas has increased by about eight times since 1950, from 62 million to 482 million, with the overall rate of urbanization rising from 17.3% to 35%. By 2030, 40% of India's population is predicted to live in urban regions, which would also generate 75% of the country's GDP. According to GoI projections, effectively managing India's urban expansion may boost GDP by up to 1.5% a year (Bajpai, 2021). The idea of smart cities is emerging as a key factor influencing the future of urbanization in India, a country at the cusp of a significant urban revolution. The incorporation of Information and Communication Technologies (ICT) has given rise to a

new dimension in the emergence of urban centres in a land where history and present coexist harmoniously.

Smart city in India:

India launched its National Smart Cities Mission (NSCM) in 2015 with the goal of transforming urban areas into more inclusive, sustainable environments. The initiative was designed to meet the requirements of a community that was increasingly urbanizing. In the Indian context, a smart city encapsulates the fusion of technology with the unique socio-cultural fabric; exploring not only the technological facets but also their cultural and historical resonance. It is not merely a confluence of technology but a harmonious blend of the old and the new. The challenges faced by traditional cities, augmented by population growth, congestion, and inadequate infrastructure, provide the impetus for a paradigm shift. It encapsulates the spirit of progress while respecting the cultural ethos that defines each city. A total tendered amount of 1.84 lakh crore has been approved under the project, a total of 100 cities were selected to take part in the NSCM with new developments receiving funding across the country. The three pillars of the SCM —Liveability, Economic-ability, and Sustainability—are aligned with 15 out of the 17 Sustainable Development Goals. (Aijaz, 2021)

Objectives and Goals of Smart City:

The objectives and goals of smart cities aim to seamlessly integrate technology, enhance infrastructure, and improve the quality of life for residents. Effective Urban Services - Improving urban services is a top priority for India's smart city initiatives. This entails using technology to boost the general effectiveness of municipal operations, enhance public service delivery, and streamline governance. A seamless urban experience is the aim, from efficient administrative procedures to attentive public services.

Sustainable Development - The objectives of smart cities reflect India's dedication to sustainable development. The country's larger environmental goals are aided by eco-friendly urban designs, waste minimization, and energy-efficient activities. Smart cities aspire to create urban areas that coexist peacefully with the environment by striking a balance between ecological responsibility and technology growth.

Inclusive Urban Growth - One of India's main objectives for smart cities is inclusivity. In order to guarantee that everyone in society benefits from urban growth, the concept goes beyond technological innovation. Economic prospects, public service accessibility, and the development of public areas that meet the requirements of the inhabitants are all examples of this inclusion.

Citizen Engagement - By encouraging residents to actively participate in governance and decision-making processes, smart cities seek to empower the public. Citizens can express their issues, participate in urban planning, and communicate with local governments through digital channels. The social fabric of metropolitan areas is strengthened and a sense of community ownership is fostered by this participative approach.

Components of Smart City:

The elements that make up smart cities propel metropolitan areas into a world of networked innovation. Modern urban living is shaped by these essential components, which include cutting-edge technologies, sustainable infrastructure and citizen-centric services. The core foundation of smart cities includes the sturdy ICT infrastructure. This comprises communication networks, data centers, and high-speed connectivity that enable real-time data exchange. The foundation for many services and applications related to smart cities is the integration of these technologies (Kozlowski and Suwar, 2021).

Internet of Things (IoT) - The establishment of a networked urban environment is largely dependent on the use of IoT sensors and devices. These gadgets are used in India in a number of industries, including energy management, smart transportation, and healthcare. IoT sensors and devices are positioned strategically in urban environments to gather and send real-time data. This information serves as the cornerstone for well-informed decision-making, empowering local officials to act quickly in response to issues pertaining to energy use, trash management, and traffic control. IoT-driven solutions are transforming transportation, optimizing traffic flow in cities like Mumbai and Delhi. For example, IoT-enabled traffic management systems in Mumbai use sensor data to modify traffic signals, lowering traffic and enhancing mobility overall. Energy management systems contribute to sustainable development, crucial in a nation seeking efficient power solutions.

Smart Infrastructure - Intelligent infrastructure that can adjust to changing urban demands is a key component of smart cities. This includes integrated waste management systems that maximize collection routes, energy-efficient buildings outfitted with sensor-driven technology, and smart transportation systems that monitor traffic in real-time. Tailored waste management systems, using smart sensors, navigate the intricate urban landscapes of cities like Kolkata and Chennai. In Chennai, trash management is made more effective by the use of smart waste bins with sensors that track waste levels and optimize pickup routes.

Initiatives for Environmental Sustainability - Smart cities are designed with sustainable practices in mind. This includes the development of renewable energy sources, the promotion of energy-efficient urban planning, and prioritizing recycling (Soumya, 2018). The incorporation of electric vehicles (EVs) into smart cities is a prime initiative that is transforming urban mobility. Within the context of smart city projects, EVs play a critical role in developing environmentally conscious and sustainable transportation systems, while also helping to reduce carbon emissions and improve air quality.

Sustainable Urban Development - India's smart cities are dedicated to long-term ecologically friendly activities. Green areas, environmentally friendly infrastructure, and renewable energy sources are given top priority in urban development strategies (Venkat Reddy *et al.*, 2017). Cities are attempting to strike a careful balance between urbanization and environmental preservation, as seen in Chandigarh's green programs and Pune's focus on sustainable urban planning. Innovative power consumption solutions, smart grids, and energy-efficient structures are examples of how technology is being incorporated into urban design. For instance, energy-efficient technologies in smart buildings in Jaipur allow them to adjust to the climate there, lowering their overall energy use. In cities like Ahmedabad, smart grids facilitate the efficient distribution of electricity, reducing waste and encouraging the development of a more sustainable energy infrastructure.

E-Government Platforms - In smart cities, digital platforms for government are essential. These systems, which range from e-governance websites to online service delivery, improve administrative efficiency and give citizens easy access to necessary services. E-governance encourages accountability and openness in local government operations.

Platforms for e-governance are revolutionary in promoting public participation and delivering effective public services. Digital platforms are now the link between the public and local government, streamlining procedures and increasing transparency from Delhi to Hyderabad. Online portals that facilitate services like tax payments, permit issuing, and municipal updates enable residents to communicate with the government in an easy and seamless manner. By integrating mobile applications, a more participatory governance model is fostered by ensuring that residents have real-time access to information and services.

Enhancing quality of life in Indian smart cities:

Beyond technical innovations, improving the quality of life for the diverse population residing in these dynamic metropolitan areas is at the core of the transformation of urban living in India's smart cities. These cities are changing urban living by prioritizing the convenience, inclusivity, and well-being of its citizens through creative projects.

Reducing the difficulties related to urban mobility is one of the main goals of smart cities in India. The general mobility experience in Delhi, where clogged roads and traffic jams are frequent occurrences, has been greatly enhanced by smart transportation solutions. When public transportation data is integrated with intelligent traffic management, people may make better decisions, which shortens travel times and improves accessibility. Furthermore, programs that support non-motorized transportation—like bike lanes and pedestrian-friendly zones—help create a more accessible and healthier urban environment. These initiatives support the larger objectives of lowering pollution and encouraging a healthier lifestyle in addition to meeting the urgent transportation needs.

India's "smart cities" acknowledge the critical role that technology plays in improving access to healthcare and education. Smart healthcare projects use wearable technology, data analytics, and telemedicine to improve patient outcomes and medical services in cities like Hyderabad and Pune. These technologies help close the gap that exists between citizens and healthcare practitioners, especially in places where access to high-quality medical facilities is scarce.

Digital learning tools and platforms are made available to students through smart education programs. Many cities like Bengaluru and Chennai are at the forefront of integrating technology into the education industry, from digital classrooms to online instructional resources. This promotes a culture of lifelong learning in addition to raising the standard of education. One of the main goals of India's smart cities is to guarantee the safety and security of its citizens. The efficiency of emergency services and law enforcement is increased when technology is incorporated into public safety initiatives. Smart street lighting, real-time crime mapping, and surveillance systems all help to make cities safer.

Formally, SCM initiatives were divided into two categories - citywide development and area-based development. City-wide initiatives aimed to benefit the whole metropolitan region and frequently included the most cutting-edge ICT applications in the SCM with the most potential to benefit the population as a whole. Conversely, area-based developments—which could be further broken down into three distinct models: retrofitting, redevelopment, and greenfield development—involved significant investment in a relatively small geographic area and were meant to demonstrate smart urban renewal concepts to neighboring municipalities. Best examples for retrofitting, redevelopment and greenfield development are the range of SCM in New Delhi City Centre, East Kidwai Nagar in south-central Delhi and Palava city in Maharashtra respectively.

Addressing Challenges and Concerns in Indian Smart Cities:

While the vision of smart cities in India is ambitious and transformative, it has challenges and concerns. Six key issues that a smart city must address are: establishing an economic foundation; developing effective urban infrastructure; enhancing the environment and quality of life; facilitating social integration; maintaining the natural environment's environmental attributes; and ensuring sound governance (Yigitcanlar and Lee, 2014). Smart cities need to manage concerns about privacy, inclusion, and fair access to technology as urban landscapes change (Anthopoulos, 2017). In order to create a future where technological breakthroughs improve urban living without leaving anyone behind, it is imperative that we acknowledge these problems.

Large volumes of data are produced by the widespread installation of sensors, cameras, and networked devices in smart cities. Although this information is essential for making well-informed decisions, serious privacy and security issues are brought up by it. Cities that struggle with protecting citizen data from potential breaches and exploitation are Bangalore and Hyderabad.

India's smart cities are putting strong cybersecurity safeguards, data encryption procedures, and stringent privacy laws into place to allay these worries. Finding a balance between using data for urban planning and making sure that residents' rights to privacy are maintained and protected is the difficult part. Urban progress is made possible by smart cities, but it is important to make sure that everyone benefits from them. In India, where socioeconomic differences are prominent, attaining inclusion is a major obstacle. To meet the requirements of underserved communities, inclusive smart city development is being actively worked on by cities like Kolkata and Lucknow. In order to close the digital gap, initiatives are being made to ensure that everyone has equal access to digital services, to ensure that urban infrastructure is universally accessible, and to support skill development programs. The difficulty is in developing smart cities that benefit the whole community and ensure that no one is left behind on the path to development (Joshi *et al.*, 2016).

Smart cities' fast urbanization and growth have the potential to widen already-existing social and economic divides. The emergence of tech-centric sectors may boost economic growth in cities like Chennai and Mumbai, but it may also widen the income gap. Enacting laws that lessen these differences and guarantee that the advantages of technological innovation are shared fairly is essential. Smart city planning must include initiatives that support social welfare programs, skill development courses, and affordable housing. Smart cities have the potential to become catalysts for inclusive growth and shared prosperity by tackling social and economic imbalances head-on.

Conclusion:

The main goal of a smart city is to optimize city functions and promote economic growth while also improving the quality of life for citizens by using smart technologies and data analysis. Agendas for smart cities prioritize sustainable development, inclusivity, and a citizen-centric approach. As India looks toward the future, the prospects of AI, 5G, and

resilient infrastructure promise to reshape urban landscapes further. The value lies in how this technology is used rather than simply how much technology is available. When taken as a whole, these technology connections help India achieve its aspirations for smart cities.

References:

1. Aijaz, Rumi (2021). “India’s Smart Cities Mission, 2015-2021: A Stocktaking.” Observer Research Foundation Special Report. No. 155. <https://www.orfonline.org/research/indias-smart-cities-mission-2015-2021-a-stocktaking/>
2. Anthopoulos, L. (2017) The rise of the smart city - Public Administration and Information Technology, in: Understanding Smart Cities: A Tool for Smart Government or an Industrial Trick?, pp. 5-45, Springer. DOI: 10.1007/978-3-319-57015-0_2.
3. Bajpai, N. and Biberman, J. (2021): India's Smart City Program: Challenges and Opportunities, ICT India Working Paper, No. 62, Columbia University, Earth Institute, Center for Sustainable Development (CSD), New York, NY
4. Joshi S., Saksham S., Tanvi G., Shreya (2016). Developing Smart Cities: An Integrated Framework. Procedia Computer Science 93,902 – 909.
5. Kozłowski W. and Suwar K. (2021). Smart City: Definitions, Dimensions, and Initiatives, European Research Studies Journal, vol. 0 (Special 3), 509-520.
6. Smart Cities Mission, India: Localizing Sustainable Development Goals (2023) UN-Habitat <https://unhabitat.org/smart-cities-mission-india-localizing-sustainable-development-goals>
7. Soumya P. and Alok G. (2018). Effective Approach Towards Elegant, Smart and Green City, International Journal of Civil Engineering and Technology (IJCET): 9(11),2164–2169.
8. Venkat Reddy P, Siva Krishna A and Ravi Kumar T (2017) Study on concept of Smart City and its Structural Components. International Journal of Civil Engineering and Technology (IJCET): 8(8), 101–112.
9. Yigitcanlar, T. and Lee, S.H. (2014). Korean ubiquitous-eco-city: A smart-sustainable urban form or a branding hoax? Technological Forecasting & Social Change, 89,100-114.

5. DEVELOPMENT OF GREEN INFRASTRUCTURE IN URBAN SPACE: CASE OF GREATER MUMBAI

Principal Prof. Dr. Moushumi Datta

Nagindas Khandwala College- Empowered Autonomous, Mumbai-64.

Email: moushumi@nkc.ac.in

ABSTRACT

*Green infrastructure refers to a network of natural and semi-natural spaces, features, and systems strategically designed and managed to deliver a multitude of ecological, social, and economic benefits. Unlike traditional, gray infrastructure that relies heavily on concrete and steel, green infrastructure leverages the inherent services provided by ecosystems, fostering a harmonious integration of nature into the built environment. With this background, the **research objectives** are to evaluate the effectiveness of current green infrastructure projects in Greater Mumbai, to investigate the level of community awareness, perception, and engagement with green infrastructure and to suggest measures to improve the gaps. The **research methodology** is a systematic one with collection of secondary data from various online and offline sources and a survey to collect primary data to understand the perception and awareness of people about the topic. The **major findings** indicate that the awareness is low, people realize the importance of green buildings but they do not know the ground reality and therefore, it is an unrealized concept. The **recommendations** include awareness drives, inclusion in school curriculum and affordability of the green buildings. Therefore, it can be **concluded** that green buildings is the immediate need of the hour and unless it's understood it cannot be implemented in full swing.*

Keywords: urban, green building, perception, awareness, education

Introduction

Green infrastructure refers to a network of natural and semi-natural spaces, features, and systems strategically designed and managed to deliver a multitude of ecological, social, and economic benefits. Unlike traditional, gray infrastructure that relies heavily on concrete and

steel, green infrastructure leverages the inherent services provided by ecosystems, fostering a harmonious integration of nature into the built environment. This concept represents a shift towards sustainable and resilient urban planning, acknowledging the vital role that nature plays in enhancing the quality of life for communities while addressing contemporary challenges such as climate change, biodiversity loss, and urbanization. Increasing awareness of the impact humans have on the environment has led to an international movement to renovate urban landscapes. With urban development and population growth, there is an increasing need to correct the mistakes of past planning. By incorporating permeable sidewalks, bioswales, street plantings, green roofs, green walls, restored wetlands, urban forests, parklands, and other vegetation systems into the urban fabric, we can transform impermeable urban infrastructure such as concrete. There is a movement to reduce the impact of materials.

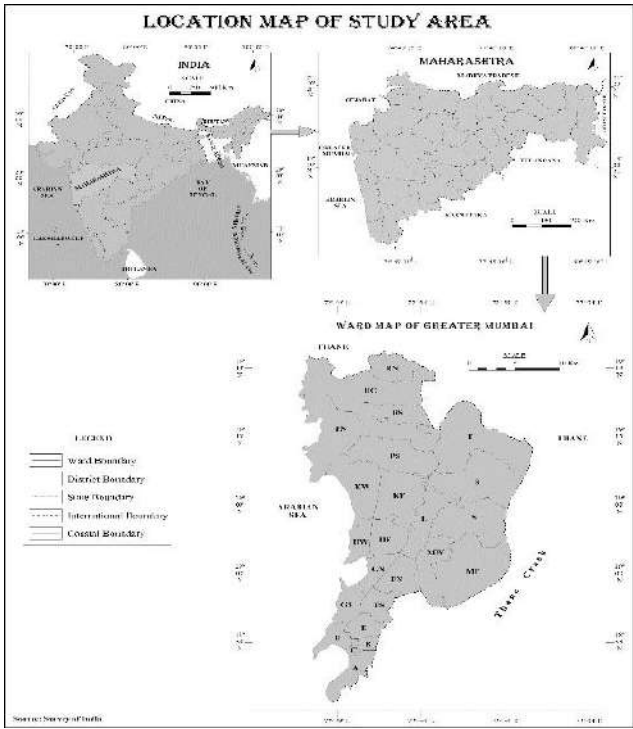


Figure 01: Location of Study Area

Literature Review

Green infrastructure has become increasingly significant on a global scale as cities confront the ecological and societal repercussions of urbanization. Research conducted by Beatley (2011) and Benedict and McMahon (2006) underscore the role of green areas in promoting

urban sustainability, enriching biodiversity, and enhancing overall quality of life. The principles of green infrastructure, as articulated by Ahern (2013) and CIRIA (2015), underscore the importance of multifunctionality, connectivity, and resilience. These principles serve as a guide for integrating green spaces, permeable surfaces, and sustainable drainage systems into urban planning, fostering environmental and social advantages. Examining specific instances such as the High Line in New York (Gartner, 2013) and the Cheonggyecheon Stream Restoration in Seoul (Kim et al., 2012) offers insights into successful green infrastructure projects, highlighting positive environmental and economic outcomes associated with incorporating green spaces into urban settings. In the Indian context, the research conducted by Manasi and Shreedhar (2018) delves into the challenges and prospects of introducing green infrastructure in rapidly urbanizing cities, emphasizing the importance of tailored solutions and community involvement. Recognizing public perceptions of green spaces is crucial in this regard.

Research Objectives

1. To evaluate the effectiveness of current green infrastructure projects in Greater Mumbai.
2. To investigate the level of community awareness, perception, and engagement with green infrastructure.
3. To suggest measures to improve the gaps

Research Hypothesis

(H₀): There is no significant relationship between public awareness campaigns and the level of green infrastructure integration in Mumbai.

(H₁): Public awareness campaigns positively correlate with higher levels of green infrastructure integration in Mumbai.

Research Methodology

- Coverage

The area chosen for the research is Greater Mumbai. Its latitudinal extension is from 18⁰ East to 19⁰ East and longitudinal extension is from 72.82⁰ North to 73.00⁰ North

approximately. There are 24 wards in Greater Mumbai. The area comprises of Mumbai District and Mumbai Suburban District. The Arabian Sea borders it on the south and west, the Ulhas River on the north, and Thane Creek on the east. It serves as both the financial and state capital of Maharashtra. It is a significant industrial centre for the entire country. The area is under the management of Municipal Corporation of Greater Mumbai and is one of the largest (administrative area) municipal corporations of the country. The total area of Greater Mumbai is 437.71 sq. kms.

- Data Collection

To understand people' perception about green buildings, the tool used for collection of data is a close-ended questionnaire prepared using Google Forms for the ease of data collection and storage. The method used is survey method. The total number of respondents is 100. The sampling method is random sampling. The respondents are spread across the city within 24 wards of the city. To analyse the spatial distribution and prevailing conditions of the existing green buildings in the city, secondary data is collected from the official website of green Building Council of India.

- Data Analysis

The data has been analyzed using statistical tools of data analysis with the help of MS-Excel and IBM SPSS 21 software. The same has been represented using figures and charts.

Data Analysis and Discussion

Mumbai, renowned for its lively culture and dynamic urban setting, has embarked on substantial endeavors in recent years to incorporate green infrastructure into its developmental framework. As one of India's most populous and dynamic cities, Mumbai has witnessed the implementation of numerous green infrastructure initiatives aimed at bolstering sustainability, addressing environmental challenges, and enhancing overall quality of life. Noteworthy green infrastructure projects in Mumbai include:

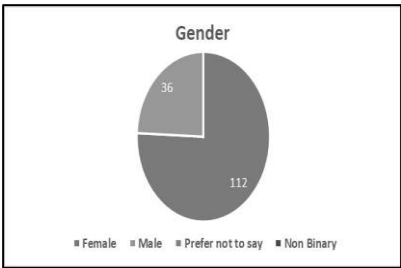
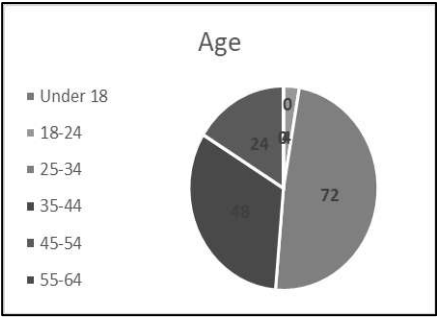
These endeavors, spanning the revitalization of water bodies like Mithi River and Powai Lake to the establishment of urban green spaces like Maharashtra Nature Park, illustrate Mumbai's dedication to promoting environmental sustainability, enriching biodiversity, and

establishing robust urban ecosystems. Through initiatives such as the Versova Beach Clean-Up and the integration of green elements into iconic structures like the Bandra-Worli Sea Link, the city strives to find equilibrium between rapid urbanization and the preservation of its natural heritage. This case study aims to explore the diverse green infrastructure projects in Mumbai, delving into their objectives, implementation strategies, and the manifold benefits they bring to the city's residents.

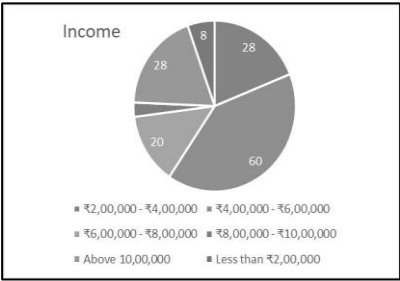
Green building, also known as sustainable or eco-friendly construction, is an innovative and environmentally conscious approach to designing, constructing, and operating buildings. The fundamental goal of green building is to minimize the environmental impact throughout a building's entire lifecycle. This entails using resource-efficient and environmentally friendly materials, optimizing energy and water efficiency, and incorporating design strategies that enhance indoor air quality and occupant well-being. Green buildings often utilize renewable energy sources, implement efficient waste management systems, and integrate landscaping for improved sustainability. The emphasis on reducing carbon footprint, conserving resources, and promoting a healthier living environment makes green building a crucial component in the global efforts towards sustainable and responsible urban development.

The background of respondents explains that maximum respondents fall in the age group of 25 to 34 years which implies that they have understanding of the concept of green building or atleast they may me in the position to answer the questions logically and with some experience. Another age group with higher number of respondents is 35 to 44 years which also means that they are apt for the survey. However, we may say that as age grows, one’s experience and understanding improves and expands to be able to comment on recent and old topics.

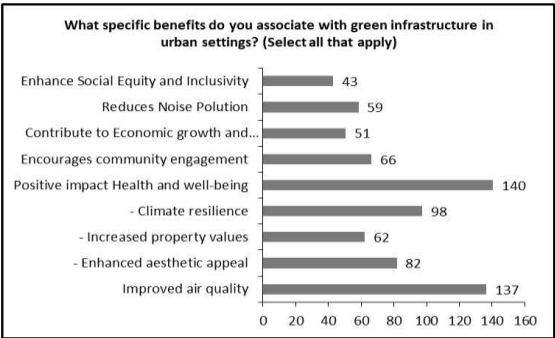
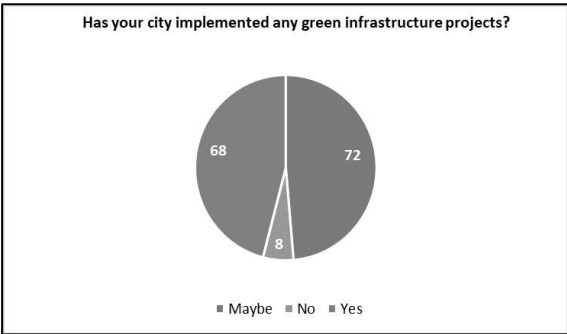
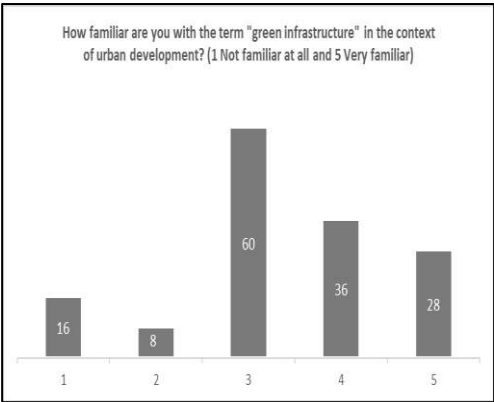
Maximum respondents are females followed by males. This is just a random occurrence. It only indicates that the survey has opinions from a diverse group of samples.



Maximum respondents belong to the income group of 1 lakh to 5 lakh per month followed by 1 lakh to 2 lakh and other groups. The survey is conducted of those people who reside in the green buildings or work there. Since the flats in such buildings are very costly, only those with high monthly income can afford them due to which the income of the respondents is very high.



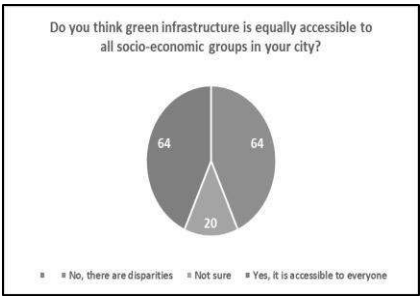
It is observed that maximum respondents are not familiar with the concept of green infrastructure or green building due to which they are neutral and have punched 3, however many are familiar and very familiar which indicates a positive attitude towards the awareness of the concept. This further implies that awareness must be increased through



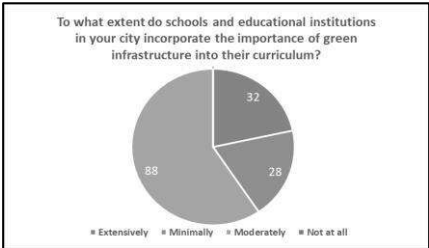
robust measures.

It is observed that maximum respondents are not sure whether their city viz. Greater Mumbai has implemented green infrastructure and green building projects followed by a large number of people knowing that it is implemented. This implies that the level of awareness and interest is very less among the citizens of the study area due to which they are unable to decide on the aspect.

Similarly, when they were asked about the benefits of green infrastructure and green buildings in an urban setting, maximum responded that it has a positive impact on the health and well-being of the people followed by improved air quality, climate resilience and much more. This implies that respondents know the importance of green infrastructure and green buildings but fail to know whether its implemented or not.

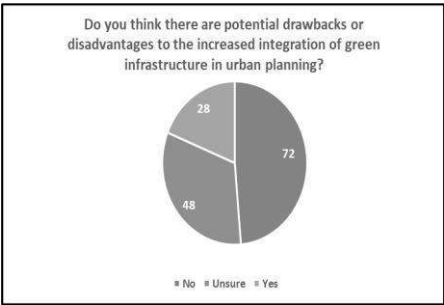


Even if green infrastructure is present everywhere, whether it is accessible to everyone or not is a major issue as it has to be affordable to all income groups. Therefore, equal number of respondents feel that it is accessible as well as inaccessible. This implies that people are aware that such facilities are very costly and cannot be accessed by all, however it should not be the case. For the betterment of the environment, it must be considered priority and should be accessible by all.



Awareness and knowledge of any concept can be imbibed best through formal education in schools which is the foundation of education everywhere.

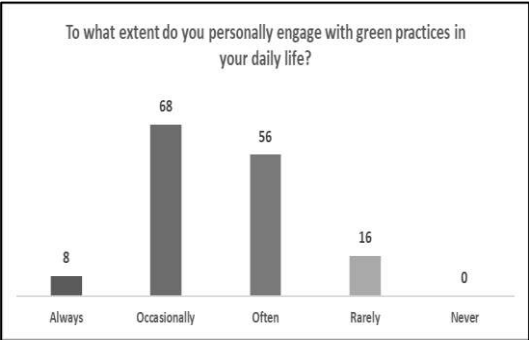
It is observed that maximum respondents have agreed that the schools include the concept of green buildings and infrastructure only moderately in the syllabus while some have agreed that it is extensively incorporated. This implies that the school curriculum must be kept updated and enhanced as per the needs of the day to protect the near future.



Maximum respondents perceive that there are no potential drawbacks or disadvantages to the increased integration of green infrastructure in urban planning while a large number thinks yes and some are unsure. It is likely that the awareness and understanding of the concept is lacking due to which some are unsure and many disagree the importance and

role of green infrastructure in urban planning and preservation and conservation of the environment.

Any change in the environment- negative or positive is an outcome of the ignorance or efforts taken by individuals. However, in this case, it is found that maximum respondents themselves practice eco-friendly habits or gestures only occasionally followed by often. This has to change as when individually efforts will be there then only community level efforts can make a difference.



(H₁): Public awareness campaigns positively correlate with higher levels of green infrastructure integration in Mumbai.

(H₀): Public awareness campaigns do not positively correlate with higher levels of green infrastructure integration in Mumbai.

The value of Karl Pearson’s correlation(r) is 0.78 and the value of p at 99% confidence for 2 degrees of freedom is 0.22 which suggests that the value of r is greater than the p value. This implies that the null hypothesis is rejected with 99% confidence. This further indicates that public awareness campaigns positively correlate with higher levels of green infrastructure integration in Mumbai. Further, the higher the number of campaigns the better will be the integration of green infrastructure.

Recommendations

Green Infrastructure, also known as blue-green infrastructure, constitutes a network that offers the essential elements for addressing urban and climatic challenges through nature-based solutions. It goes beyond merely incorporating green or open spaces; rather, it encompasses sustainable blue infrastructure, such as urban drainage systems, swales, wetlands, riverbanks, and canal areas. The essence of green infrastructure lies in the integration of diverse elements to achieve a sustainable environment, enhanced quality of life, and economic growth.

While individual components of green infrastructure can serve practical purposes independently, the true benefits emerge when these elements are interconnected to form comprehensive green networks. This connectivity extends from neighborhoods and streets to individual houses, resulting in strategic advantages. The transformative potential of green infrastructure is realized through practical strategies that revolve around key components:

1. Biodiversity
2. Sustainable energy production
3. Economy and business
4. Housing and the buildings sector
5. Improved transport
6. Clean water and sanitation
7. Effective solid waste management

Conclusion

Green buildings play a crucial role in addressing contemporary environmental challenges and promoting sustainable development. Their significance lies in their ability to minimize the environmental impact of construction and operation, fostering a more ecologically responsible approach to urban development. Green buildings are designed to optimize energy efficiency, reduce water consumption, and enhance indoor air quality, contributing to a healthier and more sustainable built environment. By incorporating eco-friendly materials, renewable energy sources, and innovative technologies, green buildings strive to lower carbon footprints and decrease overall resource consumption. Beyond environmental benefits, these structures often lead to long-term cost savings for occupants through reduced energy bills and maintenance expenses. Additionally, the emphasis on sustainable design in green buildings aligns with global efforts to mitigate climate change and create resilient, adaptable urban spaces. As awareness of environmental issues continues to grow, the importance of green buildings becomes increasingly evident in shaping a more sustainable and harmonious future for both urban landscapes and the planet as a whole. In conclusion, the comprehensive examination of Mumbai's green infrastructure highlights its critical role in urban sustainability and resilience. By understanding the complexities and

opportunities, we can collectively work towards fostering a greener, healthier, and more vibrant city for the present and future generations.

References

1. Ahern, J (2007) Green Infrastructure for cities: The Spatial Dimension. Proceedings of the 3rd Fábos Landscape Planning and Greenways Symposium, University of Massachusetts. University of Massachusetts, Amherst.
2. Beatley, T (2000) Green Urbanism: Learning from European Cities. Island Press, Washington D.C.
3. Benedict, MA & McMahon, ED (2002) Green Infrastructure: Smart Conservation for the 21st Century. Renewable Resources Journal. Autumn Edition. Pg. 12-17— (2006) Green Infrastructure: linking landscapes and communities. Island Press, Washington.
4. Sridhar K. S. (2021). Mobility, job accessibility and welfare from jobs in Bengaluru, India, Area Development and Policy, 6(1), 106–122. <https://www.tandfonline.com/doi/full/10.1080/23792949.2020.1785319>

6. IMPACT OF PSYCHOLOGICAL CONTRACT ON JOB SATISFACTION WITH REFERENCE TO BANK EMPLOYEES IN MUMBAI REGION

Athira M. K.¹ Irin Biju²

¹ Assistant Professor, Department of BMS/BAF V. K. Krishna Menon College of Commerce and Economics, Bhandup East.

² SYBMS, V. K. Krishna Menon College of Commerce and Economics, Bhandup East

Abstract

The psychological contract represents the unwritten expectations and perceptions employees have regarding their employment relationship with an organization. This dynamic concept has gained considerable attention in the realm of organizational psychology and human resource management. This abstract explores the intricate relationship between the psychological contract and job satisfaction, shedding light on the profound impact these constructs have on each other. The study employs a multi-faceted approach, drawing on existing literature, empirical research and theoretical frameworks to unravel the complexities surrounding the psychological contract and its direct influence on job satisfaction. The analysis delves into the various dimensions of the psychological contract, encompassing implicit and explicit expectations, perceived obligations and the reciprocity between employees and employers. Key findings reveal that a well-managed and positive psychological contract contributes significantly to heightened levels of job satisfaction among employees. When there is alignment between employee expectations and organizational promises, job satisfaction tends to increase, fostering a positive work environment. Conversely, breaches in the psychological contract, such as unmet expectations or perceived injustices, may lead to decreased job satisfaction, increased turnover intentions and overall negative implications for both employees and organizations. Furthermore, the abstract highlights the role of communication, transparency and organizational culture in shaping and maintaining a healthy psychological contract. The study underscores the need for organizations to cultivate a supportive and trust-based environment to enhance the psychological contract and, consequently, bolster job satisfaction. Practical implications of the research are discussed, offering insights for human resource practitioners, organizational leaders and policymakers on strategies to foster a positive psychological contract and, by extension, elevate job satisfaction levels. As organizations navigate an ever-evolving employment

landscape, understanding and managing the psychological contract emerges as a crucial factor in promoting a satisfied and engaged workforce, ultimately contributing to organizational success and sustainability.

Keywords: *Psychological contract, Job satisfaction, Organizational Commitment*

Introduction

The psychological contract refers to the unwritten expectations and perceptions that individuals have about the terms and conditions of their relationship with an organization. Unlike a formal employment contract that outlines specific job duties, responsibilities, and benefits, the psychological contract is more implicit and is based on mutual beliefs, perceptions, and promises between the employer and the employee. Key aspects of the psychological contract include:

Mutual Expectations: The psychological contract involves mutual expectations between the employer and the employee. This includes beliefs about job security, career development opportunities, work-life balance, and the overall employment relationship.

Perceived Promises: Employees form perceptions about what the organization has promised them in terms of support, recognition, and rewards. These promises may not be explicitly stated but are implied through organizational culture, communication, and actions.

Trust and Fairness: Trust is a crucial element in the psychological contract. Employees need to trust that the organization will fulfill its commitments, and they expect fairness in the treatment they receive. Violations of trust or perceived unfairness can lead to a breakdown in the psychological contract.

Dynamic Nature: The psychological contract is dynamic and can evolve over time. Changes in organizational policies, leadership, or external factors may impact employees' perceptions and expectations, leading to adjustments in the psychological contract.

Individual Differences: Different employees may have different psychological contracts based on their personal preferences, values, and experiences. Understanding and managing these individual differences is essential for maintaining a positive employment relationship.

Implicit Nature: While some aspects of the psychological contract may be explicitly communicated, many are implicit and based on the employee's interpretations of the organization's actions and behaviors.

Job satisfaction refers to the extent to which an individual feels content or fulfilled with their job. It is a complex and multifaceted concept that involves various factors influencing an employee's overall perception of their work. Job satisfaction is crucial because it has significant implications for individual well-being, organizational performance, and employee retention.

The key factors that contribute to job satisfaction are:

Work Environment: The physical and social aspects of the workplace, including the office layout, facilities, and the relationships with colleagues and supervisors, can significantly impact job satisfaction.

Job Security: A sense of job security contributes to satisfaction. Employees who feel secure in their positions are likely to be more satisfied and committed to their work.

Compensation and Benefits: Fair and competitive compensation, along with a comprehensive benefits package, is a fundamental factor in job satisfaction. Employees need to feel that they are fairly rewarded for their efforts.

Opportunities for Advancement: The availability of opportunities for career growth and development is essential for job satisfaction. Employees often seek challenges and a clear path for career progression.

Work-Life Balance: The balance between work and personal life is critical for satisfaction. Employees who feel they have the flexibility to manage their time effectively are generally more satisfied.

Recognition and Appreciation: Feeling valued and appreciated for one's contributions is a powerful driver of job satisfaction. Recognition can come in various forms, such as praise, awards, or promotions.

Job Autonomy: Having some degree of control and autonomy over one's work can contribute to satisfaction. Employees who feel trusted to make decisions are likely to be more engaged.

Workplace Relationships: Positive relationships with colleagues and supervisors can enhance job satisfaction. A supportive and collaborative work environment fosters a sense of belonging.

Task Variety and Challenge: Jobs that offer a variety of tasks and challenges can be more satisfying than routine and monotonous roles. Employees often seek opportunities to use their skills and knowledge in meaningful ways.

Alignment with Personal Values: When an employee's values align with the organization's mission and values, job satisfaction tends to be higher. This alignment can create a sense of purpose and meaning in the work.

Monitoring and understanding the factors that contribute to job satisfaction is crucial for organizations seeking to create a positive work environment. Satisfied employees are more likely to be productive, engaged, and committed to the organization, leading to improved overall performance and reduced turnover.

The psychological contract plays a significant role in influencing job satisfaction. As mentioned earlier, the psychological contract refers to the implicit and mutual expectations between an individual and their employer. When these expectations align positively, it can contribute to higher job satisfaction. Here are several ways in which the psychological contract impacts job satisfaction:

Expectation Fulfillment: Job satisfaction often hinges on whether the organization fulfills the expectations employees have regarding their employment. When there is alignment between what employees expect (regarding work conditions, career development, recognition, etc.) and what the organization provides, it fosters a positive psychological contract and, consequently, higher job satisfaction.

Trust and Confidence: A positive psychological contract is built on trust and confidence. Employees need to trust that the organization will honor its commitments and deliver on

promises. When this trust is maintained, employees feel more secure and satisfied in their roles.

Fairness and Equity: The psychological contract includes perceptions of fairness and equity in how employees are treated. If employees perceive that they are being treated fairly in terms of rewards, promotions, and opportunities, it contributes to job satisfaction. Unfair treatment or perceived inequities can lead to dissatisfaction.

Communication and Transparency: Effective communication between employers and employees is crucial for managing the psychological contract. When organizations are transparent about changes, expectations, and future plans, it helps employees understand and accept the evolving nature of the employment relationship, fostering job satisfaction.

Organizational Culture: The psychological contract is closely tied to the organizational culture. When an organization has a positive and supportive culture, it tends to reinforce a positive psychological contract, contributing to higher job satisfaction.

Adaptability to Change: As organizations evolve, the psychological contract may need to adapt to changes in the business environment. Employees who perceive that the organization is considerate of their needs during times of change are more likely to maintain job satisfaction.

Recognition and Appreciation: The psychological contract includes expectations about recognition and appreciation for one's contributions. When organizations acknowledge and appreciate the efforts of their employees, it strengthens the psychological contract and positively influences job satisfaction.

Alignment of Values: When an organization's values align with the values of its employees, it reinforces a positive psychological contract. Employees who feel that their personal values are in sync with the organizational culture are more likely to experience higher job satisfaction.

Theoretical framework

Below are some key theoretical perspectives that contribute to explaining this relationship:

Social Exchange Theory: Social Exchange Theory forms the basis for understanding the reciprocal relationship between individuals and organizations. According to this theory, individuals engage in social exchanges with their employers, contributing their effort, time, and skills in exchange for rewards and favorable treatment. When the organization fulfills its obligations and meets the expectations outlined in the psychological contract, employees are more likely to experience job satisfaction.

Equity Theory: Equity Theory posits that individuals strive for fairness and equity in their social exchanges. When employees perceive a balance between their contributions and rewards compared to their peers or their expectations, they are more satisfied. The psychological contract is closely tied to equity perceptions, as violations or imbalances can lead to dissatisfaction.

Organizational Support Theory: Organizational Support Theory focuses on the belief that employees develop perceptions of how much the organization values their contributions. When the psychological contract is fulfilled, employees feel a sense of support and appreciation, which positively influences job satisfaction. Conversely, breaches in the psychological contract can erode perceived organizational support and reduce satisfaction.

Expectancy Theory: Expectancy Theory suggests that individuals make choices and exhibit behaviors based on their expectations of outcomes. In the context of job satisfaction, employees have expectations regarding the outcomes of their efforts and contributions. When these expectations align with the actual outcomes provided by the organization, job satisfaction is likely to be higher.

Transactional Analysis (TA): TA, developed by Eric Berne, emphasizes the interpersonal transactions between individuals. The psychological contract can be viewed as a series of transactions between employees and the organization. When these transactions are positive, with expectations met and commitments fulfilled, it contributes to a positive emotional state, including job satisfaction.

Attribution Theory: Attribution Theory explores how individuals interpret and explain events. In the context of the psychological contract, employees make attributions about the

organization's actions and behaviors. When the organization fulfills its promises, employees attribute their positive experiences to the organization, enhancing job satisfaction.

Two-Factor Theory (Herzberg's Motivation-Hygiene Theory): Herzberg's Two-Factor Theory distinguishes between factors that contribute to satisfaction (motivators) and factors that prevent dissatisfaction (hygiene factors). Fulfillment of the psychological contract, including factors such as recognition, career development, and fair treatment, aligns with motivators and positively influences job satisfaction.

Objectives of the Study

1. Assess the Relationship between Psychological Contract Fulfillment and Job Satisfaction
2. Explore and identify specific elements within the psychological contract that have a significant impact on employees' overall job satisfaction.
3. Examine the Role of Organizational Communication in Managing the Psychological Contract
4. Explore the impact of psychological contracts on employee performance outcomes.

Research Methodology

The present study is based on primary data collected through a questionnaire survey in the form of google forms circulated among bank employees in the Mumbai region. The sample size for the study was 100. Data Analysis and interpretation were done as per the responses received, using MS Excel.

Findings, Conclusions and Suggestions

Positive Psychological Contract and Job Satisfaction: Studies consistently show that a positive psychological contract, where employees perceive fairness, trust, and fulfillment of promises, is strongly associated with higher levels of job satisfaction.

Employees who believe their organization values their contributions and provides fair rewards are more likely to report greater job satisfaction.

Fulfillment of Expectations: When employees feel that the organization is meeting their expectations regarding career development, recognition, work-life balance, and other factors, it positively influences their job satisfaction. Unmet expectations or perceived breaches in the psychological contract can lead to decreased job satisfaction.

Trust and Communication: Trust is a crucial component of the psychological contract, and studies emphasize that high levels of trust between employees and employers are linked to increased job satisfaction.

Effective communication, transparency, and honesty in managing the psychological contract contribute to higher job satisfaction.

Impact of Psychological Contract Violations: Research indicates that breaches in the psychological contract, where promises are not fulfilled, are negatively correlated with job satisfaction.

Perceived violations can lead to feelings of betrayal, reduced organizational commitment, and lower overall job satisfaction.

Organizational Support and Job Satisfaction: Perceptions of organizational support, including fair treatment, opportunities for development, and supportive leadership, are positively related to job satisfaction.

Employees who feel supported by their organization are more likely to experience higher job satisfaction.

Role of Perceived Fairness: The perception of procedural and distributive fairness in the workplace contributes significantly to job satisfaction.

Fairness in decision-making processes and the equitable distribution of rewards enhance employees' overall satisfaction with their jobs.

Longitudinal Studies: Longitudinal research suggests that changes in the psychological contract over time can impact job satisfaction levels. Organizations that actively manage and adapt the psychological contract to changing circumstances are more likely to maintain higher levels of job satisfaction among their employees.

References:

1. Abbott P, Wallace C, Tyler M. 3rd ed. London (GB): Rutledge; 2005. An introduction to sociology: Feminist perspectives.
2. Brief AP. Vol. 9. Thousand Oaks (CA): Sage; 1998. Attitudes in and around organizations
3. Burke RJ, Davidson M. London (GB): Ashgate; 2004. Women in management worldwide]
4. Cox T, Griffiths A, Leka S. 3rd ed. Oxford (GB): Blackwell Publishing; 2005. Work organization and work-related stress. Occupational hygiene.
5. European Agency for Safety and Health at Work (EU-OSHA) Luxembourg (LU): Office for Official Publications of the European Communities; 2007. Expert forecast on emerging psychosocial risks related to occupational safety and health
6. Fairbrother K, Warn J. Workplace dimensions, stress and job satisfaction. *J Manag Psychol*. 2003;18(1):8–21. doi: 10.1108/02683940310459565.
7. Faragher EB, Cass M, Cooper CL. The relationship between job satisfaction and health: A meta-analysis. *Occup Environ Med*. 2005;62(2):105–112. doi: 10.1136/oem.2002.006734 .
8. Harter JK, Schmidt FL, Keyes CL. Washington DC (USA): American Psychological Association; 2003. Well-being in the workplace and its relationship to business outcomes: A review of the Gallup studies. In: Keyes CL, Haidt J, editors. Flourishing: Positive psychology and the life well-lived; pp. 205–224. doi: 10.1037/10594-009.
9. International Labour Office. Vol. 56. Geneva (CH): International Labour Office; 1986. Psychosocial factors at work: Recognition and control.
10. Locke EA. The nature and causes of job satisfaction in Dunnette. Handbook of industrial and organizational psychology. In: Dunnette MD, editor. Chicago (IL): Rand McNally; 1976.
11. Marmot M, Wilkinson RG. 2nd ed. Denmark (DK): WHO Regional Office; 2006. Social determinants of health: The solid facts.
12. Nadinloyi KB, Sadeghi H, Hajloo N. Relationship between job satisfaction and employees mental health. *Procedia Soc Behav Sci*. 2013;84:293–297. doi: 10.1016/j.sbspro.2013.06.554

7. SMART CITY APPLICATION AND IIOT-INDUSTRIAL INTERNET OF THINGS

Dipti Dharne¹ Mrs. S. Sai Sree²

^{1,2} Department of Information Technology, The S.I.A. College of Higher Education, Dombivli Gymkhana Road, Dombivli (E), Tal. Kalyan, Dist. Thane, PIN 421 203

Abstract

The Industrial Internet of Things is a part or we can say a subset of the Internet of Things, i.e., IIOT comes under IOT, which mainly focuses on industrial applications. The collection of sensors, instruments and independent devices linked to industrial applications via the Internet is known as the Industrial Internet of Things or IIoT. By facilitating data collection, analysis, and production optimization, this network improves manufacturing efficiency and lowers service and manufacturing costs. Industrial applications are entire technological ecosystems that link machinery to people who oversee large-scale distribution, logistics, and assembly line operations.

Keywords: IoT, IIoT, Technology, Application, Machines.

Introduction

The network of physical objects, or "things," that are embedded with sensors, software, and other technologies to connect and exchange data with other devices and systems over the Internet is known as the Internet of Things (IoT). Through the collection of data, analysis, and production optimization made possible by this network, manufacturing and service costs can be decreased and efficiency raised. Industrial applications are entire technological ecosystems that link machinery to people who oversee large-scale distribution, logistics, and assembly line operations. IIoT leverages the data generated by dumb machines that have been in industrial settings for years by utilizing real-time analytics and smart machine capabilities. The underlying principle of IIoT is that intelligent machines are superior to humans not only in real-time data capture and analysis but also in conveying critical information that can expedite and improve the accuracy of business decisions. The manufacturing, transportation, and energy sectors

account for majority of IIoT applications currently in use; global investments in these sectors exceeded \$300 billion in 2019 and are projected to double by 2025. Predictive maintenance systems, warehouse and transport control systems, cobots, and other industrial robots are anticipated to become more common shortly as a result of the IIoT's adoption.

Objectives

The present paper is aimed at understanding the role of IIoT in the Industrial sector and this has been achieved with the help of the following objectives.

1. To understand the characteristics of IIoT.
2. To apprehend various aspects of IIoT.
3. To study the challenges faced in implementing IIoT.

Methodology

The present paper is theoretical and is based on descriptive information regarding the concept.

Implementation of IIoT

The network of devices a business uses to improve manufacturing processes in industrial applications is known as the Industrial Internet of Things or IIoT. IIoT aims to make it possible for businesses to more efficiently monitor and maintain their assets. IIoT offers numerous advantages, but in general, it facilitates system integration for improved task and process automation, improves supply chain and logistics visibility and expedites maintenance procedures for businesses. Moreover, IIoT has emerged as a key force behind two movements:

1. Digital Transformation: IIoT has become indispensable to accomplishing objectives as more industrial enterprises embrace digital technology and rely on big data analytics—advanced analytical techniques on large and diverse data sets.
2. Industry 4.0: Cyber-physical systems (CPS) and advanced communication systems that allow for increased machine autonomy are the main features of this fourth industrial revolution. Correct IIoT implementation can boost an organization's dependability, uptime, and profit margins while supporting Industry 4.0 initiatives.

How IIoT Works

An IIoT ecosystem consists of several parts, each of which contributes differently to the overarching goal of data monitoring, capture, exchange, and analysis:

Connected devices: A physical item that is capable of establishing an Internet connection with other devices and systems is called a connected device. These gadgets provide real-time equipment maintenance data via industrial IoT sensors. IIoT sensors, when combined with machine learning (ML), advance conventional machine-to-machine (M2M) communication by extracting insights from massive volumes of data to enhance efficiency.

Infrastructure for data communications: This part consists of the devices, software, and network connections that send sensor-captured data to IIoT platforms.

Analytics: IIoT platforms feature applications that produce insights or analytics across various devices using sensor-captured data. Analytics can spot patterns and trends, offer targeted recommendations, and identify problems before they worsen or become failures.

Data storage: Maintenance teams must store and retrieve the enormous amounts of data generated by IIoT devices. Some businesses use on-site servers to store this data, while others choose more adaptable cloud storage options.

Machine operators: The ability of machine operators, who normally oversee machines and devices, to make data-driven business decisions based on IIoT insights is essential to a robust IIoT ecosystem.

The use of IIoT technologies by contemporary businesses is starting to enhance predictive maintenance programs, which monitor asset conditions using sensor devices. But IIoT technology is developing quickly, and setting up a productive ecosystem is not without its challenges.

Characteristics of IIOT

IIoT systems function according to a tiered structure:

1. **Electronic gadgets:** The devices, which include machines, sensors, and GPS locators among others, make up the system's visible component.
2. **The network:** The network created by edge computing or cloud storage between these devices and the servers sit above this known as the connectivity layer.

3. Provision of services: These are computer programs that process and analyze data to provide a particular service.

4. Information: This is the device's interface with the human operator, which could be a tablet, PC or even wearable tech like augmented or virtual reality glasses.

Applications of IIoT

The applications of the Internet of Things in industry are varied, but below we review some of the most relevant:

1. Autonomous vehicle use: Autonomous vehicles that can navigate from one side of the factory to the other by detecting obstacles can be used to transport products to the warehouse or components to the plant.

2. Enhancing machine efficiency: A machine that is not in use costs money. In a manufacturing plant, machine utilization time can be optimized with the help of sensors and data processing. Reduction of human errors.

3. Distribution and logistics improvements: Products that are stored have sensors built into them that give real-time information on their location, temperature, and environmental factors. This information will be especially helpful when things like the COVID-19 vaccine are being distributed.

4. A reduction in the number of accidents: Wearable technology, like gloves, bracelets, and goggles, makes it possible to gather data from operators while they are using them. To lower the risk of accidents, examples of this data include their location or proximity to machines, as well as their pulse, temperature, and blood pressure connected to the system to save time and avoid errors.

Benefits of IIoT

IIoT devices used in the manufacturing industry offer the following benefits:

1. Predictive maintenance: Companies can forecast when a machine needs maintenance by

using real-time data produced by IIoT systems. In this manner, the required upkeep can be finished ahead of a failure. This is particularly useful on a production line, where a machine failure could cause a work stoppage and significant expenses. Better operational

efficiency can be attained by an organization by proactively addressing maintenance issues.

2. More efficient field service: By using IIoT technologies, field service technicians can find possible problems in customer equipment before they become serious ones, allowing them to address the issues before they have an impact on customers. Field service technicians can also get information from these technologies about the parts that they need to fix a problem. This guarantees that when on a service call, technicians have the required parts on hand.

3. Asset tracking: Asset management systems allow manufacturers, suppliers, and customers to monitor the location, status, and condition of goods at any point in the supply chain. If the goods are damaged or in danger of being damaged, the system instantly notifies the relevant parties, allowing them to take corrective action either immediately or in advance.

4. Increased customer satisfaction: Product designers and manufacturers can create more customer-focused product roadmaps when they connect their products to the Internet of Things (IoT) and gather and analyze data about how customers use them.

5. Improved facility management: Manufacturing equipment is prone to wear and tear, which certain factory conditions can make worse. Vibrations, temperature, and other elements that can result in less-than-ideal operating conditions can all be monitored by sensors.

The Industrial Internet of Things in Action

To know how IIoT works, it's helpful to explore real-life examples of it in action:

1. HMSHost: HMSHost required a quick, easy, and reliable method of facility maintenance. They were able to maintain a more preventive and safe operation without incurring unnecessary costs or resources thanks to IIoT sensors.

2. Icon Entertainment: In light of COVID-19, large production company Icon Entertainment realized it needed improved work order management and streamlined communication. The company swiftly submitted, tracked, completed, stored, and analyzed work orders using IIoT sensors to improve decision-making and operational efficiency.

3. FMLY: FMLY addressed maintenance problems with inexpensive band-aid fixes. Every time a piece of equipment began malfunctioning, they had to take a wild guess since they

lacked the information necessary to identify the underlying causes. Their technicians could accurately diagnose maintenance issues and solve problems with IIoT sensors.

As you can see, companies across industries with unique challenges, goals, and limitations use IIoT devices to connect their asset and equipment data in a secure place.

Risks and challenges of IIoT

Security is the main risk that comes with using IIoT. Even when they are deployed into production, IIoT devices frequently stick with their default passwords. Likewise, a lot of IIoT devices send data in the form of legible text. An attacker may find it relatively simple to intercept data coming from an IIoT device under these circumstances. In a similar vein, an intruder may hijack an unsecured IIoT device and utilize it as a springboard to assault additional network resources. The management of devices and security present significant obstacles for individuals in charge of an organization's IIoT devices. Adopting an efficient device management strategy becomes more crucial as an organization adds more IIoT devices. More precisely, to stop rogue devices from being used, organizations need to be able to positively identify IIoT devices. For operations like swapping out a malfunctioning device or running a device refresh, establishing a way to identify every device is also essential. Managing patches is an additional difficulty when using IIoT devices. Periodic firmware updates from device manufacturers are becoming more and more common. Companies need to have a reliable method for verifying if devices are running the most recent firmware and updating them as needed. To avoid interfering with operations, such a tool must also follow the organization's set maintenance schedule.

Suggestions

While operational efficiency and reliability are among the most desirable outcomes of an IIoT deployment, it is imperative to give cyber security measures top priority and allocate resources accordingly. By doing this, you can minimize performance issues and maximize the functionality of your IIoT devices. Businesses should follow these four essential best practices to guarantee the security of IIoT technology:

a. Establish secure execution environments: By establishing secure execution environments, maintenance teams can safeguard the confidentiality and integrity of data. This strategy will assist in preventing unauthorized individuals or groups from altering applications and data.

b. Encrypt sensitive data: Organizations must make sure that every system interaction goes through particular cryptology protocols in advance to comply with encryption standards. All sensitive data should be encrypted, especially when exchanging data with other parties.

c. Restrict access to data: Your organization can guard against disruption and destruction from cyberattacks by limiting access to data through the use of encryption and virtual private network (VPN) tunnels.

d. Authenticate sensor data: Analytics systems can detect absent or fraudulent sensors by assigning each sensor a distinct, easily verifiable identity.

When properly secured, an IIoT ecosystem can operate like a well-oiled machine and help your maintenance team make meaningful improvements that streamline broader business operations.

Conclusion:

Operating efficiency and asset visibility are prerequisites for optimizing business equipment. However, antiquated inspection and maintenance protocols, fragmented systems, and almost continual requests via various channels can all impair efficiency and productivity. In this case, IIoT technology can help by allowing you to carry out streamlined operations based on real-time data. IIoT sensors can improve long-term profit margins and dependability.

References

1. [https://www.iberdrola.com/innovation/what-is-iiot#:~:text=The%20Industrial%20Internet%20of%20Things%20\(IIoT\)%20is%20the%20collection%20of,the%20internet%20to%20industrial%20applications](https://www.iberdrola.com/innovation/what-is-iiot#:~:text=The%20Industrial%20Internet%20of%20Things%20(IIoT)%20is%20the%20collection%20of,the%20internet%20to%20industrial%20applications) https://upkeep.com/learning/industrial-internet-of-things-iiot/
2. % 20to%20industrial%20applications https://upkeep.com/learning/industrial-internet-of-things-iiot/
3. <https://www.techtarget.com/iotagenda/definition/Industrial-Internet-of-Things-II>

8. SWOT ANALYSIS OF E-VEHICLES IN INDIA

MISS. SEJAL. S. MAHAJAN

K.C. College of Engineering and Management Studies & Research,
Mithbunder Road, Near Sadguru Gardens, Kopri, Thane (E), Maharashtra PIN 400 603

Abstract

Any vehicle that is propelled by one or more electric motors is considered an electric vehicle. It can run on batteries independently or via a collector system that draws power from sources outside the vehicle. As the use of e-vehicles has many advantages in the field of environment and health, in India, the sale of e-vehicles is rising day by day. Thus, based on the secondary data, the present study attempts to understand the scenario of e-vehicles in India, using the technique of SWOT analysis. The results obtained are presented in textual form.

Keywords: SWOT Analysis, E-Vehicles, India, Renewable, Environment

Introduction:

India is immensely dependent on oil imports. Internal Combustion Engine (ICE) vehicles produce air pollution and greenhouse gases. Encouraging the use of E-Vehicles (EVs) can have numerous benefits for the environment, public health, economy and technological innovation. India has been working to promote the use of electric vehicles through numerous schemes and incentives (GoI, 2023). Henceforth there is an urgent need to examine factors and challenges for the development of sustainable and clean alternatives for transportation systems. Electrified vehicles are one of the promising, clean and sustainable transportation. The current scenario of the road transportation sector can be highlighted as GHG emissions, 1730 million tons of CO₂ equivalent (Gujarathi, P., K, and Shah., V., 2019). Manifold initiatives have been taken by the Government of India to encourage manufacturing as well as the adoption of EVs. This has led to increased penetration of EVs in the Indian market. By 2030, the government aims to make India a 100-percent electric vehicle nation. It has been planned that, two-wheelers below the engine capacity of 150 CC sold in the country after March 31, 2025, and three-wheelers sold after March 31, 2023, should be EVs. (transport policy) FAME (Faster Adoption and Manufacturing of Electric Vehicles in India) India is a part of the National Electric Mobility Mission Plan. The main purpose of FAME is to encourage electric vehicles by providing subsidies. Objectives of FAME Schemes are to Encourage faster adoption of electric and hybrid vehicles by way of offering upfront Incentives on the purchase of Electric vehicles (Mahal, K., Patil P. 2021). The transportation sector is predicted to grow

about tenfold over the next four decades (Global EV Outlook, 2013). Unlike other countries, the vehicle-to-people ratio is very high in India, however, the population is bigger and emissions are high. India stands third with the CO₂ emission of 1.726 billion Mt. (Gujarathi, P. K., Shah V. A., and Lokhande, M. M. 2015). With these facts, the present paper attempts to comprehend the scenario of E-vehicles in India using the technique of SWOT analysis.

Objectives:

1. To know the concept of e-vehicle
2. To comprehend the scenario of e-vehicles in India with the help of SWOT Analysis
3. To give suggestions for popularization of e-vehicles in India

Database and Methodology

The present study is based on both primary and secondary sources of data. Discussions held with e-vehicle users and dealers are the primary data sources. Government reports, publications, research papers and news articles available both in print and electronic form are used as a source of secondary data. The technique of SWOT analysis is used to conclude the study. Findings are presented in textual form.

Results and Discussion

The technique of SWOT analysis was used to understand the present scenario of electric vehicles in India. It is helpful to understand the concept of e-vehicles and provide some solutions to popularize e-vehicles among the masses.

Concept of e-vehicles

An electric vehicle (EV) is a vehicle that runs on one or more electric motors that are fed energy from an energy storage device, such as rechargeable batteries. Since EVs run mostly on electricity rather than fossil fuels like gasoline or diesel, they are both potentially more energy-efficient and environmentally friendly than conventional internal combustion engine vehicles.

Electric vehicles come in various varieties:

1. Battery Electric Vehicles (BEVs):

Rechargeable batteries are the only source of power for these automobiles. They have no internal combustion engine and to refuel their batteries, they need to be plugged into an electric power source.

2. Plug-in Hybrid Electric Vehicles (PHEVs):

These vehicles combine an internal combustion engine and an electric motor. They can be powered by gasoline, electricity that is stored in their batteries, or a combination of the two. PHEVs can be powered up again by connecting to an electrical outlet.

3. Hybrid Electric Vehicles (HEVs):

HEVs combine an electric motor and an internal combustion engine. Although the car cannot be plugged in to recharge the battery, the electric motor helps the engine run more fuel-efficiently. Rather, the internal combustion engine and regenerative braking are used to charge the battery.

4. Fuel Cell Electric Vehicles (FCEVs):

An electric motor is powered by an electric cell powered by hydrogen gas in FCEVs. Since heat and water vapor are the only byproducts of this process, FCEVs are an emission-free vehicle choice.

There are several Strengths and opportunities for e-vehicle use in the country. However, e-vehicles have some weaknesses and threats. By considering this fact, the present study attempts to understand the present scenario of e-vehicles by using the technique of SWOT analysis.

Strengths:

1. Reduced Running Cost

The use of electronic vehicles saves expenditure on fuel because there is no need to buy gasoline or diesel to keep electric vehicles running. When comparing the cost of charging an electric vehicle to that of gasoline or diesel, the difference is significant. By utilizing renewable energy sources like solar power, one can further lower the cost of electricity.

2. Minimal upkeep expenses

Vehicles running on gasoline or diesel need routine maintenance because they have a lot of moving parts. With electric vehicles, this isn't the case because they have fewer moving parts overall. This implies that over time, the maintenance costs of the electric car should be lower.

3. Financial and tax advantages

India has welcomed the use of electric vehicles (EVs) and the government has implemented various policies and incentives to promote the use of e-vehicles. For example, buying an EV will cost less in road tax and registration fees than buying an ICE vehicle.

4. Improved output

Previously, EVs were thought to be unfeasible. With manufacturers now producing attractive and well-designed EVs, that has changed over time. Even the efficiency of electric vehicles has improved. Compared to fuel-powered vehicles, electric vehicles have perfect acceleration and are lighter in weight.

5. No emissions from the exhaust

Electric vehicles (EVs) have zero tailpipe emissions, lowering their carbon footprint. By using renewable energy to charge your electric vehicle, you can further minimize your carbon footprint.

6. Quiet and simple to drive

EVs are simple to drive, thanks to their simple controls and reduced number of moving parts. Additionally, when one needs to charge a vehicle of this type, he or she can plug it into a public or residential charging station. Additionally, they are quiet, which lessens the noise that fuel-powered cars produce.

7. Home charging convenience

It is not necessary to locate the closest gas station to fill up. One can go ahead and charge his or her EV at home. Modern charging technology allows one to quickly charge an electric vehicle (EV) or even use battery swapping services so one can continue driving regardless of the availability of conventional fuel.

8. No fuel, no emissions

The way that EVs affect the environment is among their biggest benefits. Because pure EVs have no tailpipe emissions, air pollution is decreased. The EV's electric motor doesn't release any hazardous gases because it runs on a closed circuit. Fuel and diesel are not needed for pure electric vehicles, which is very good for the environment.

9. Spacious cabin with additional storage

Electric vehicles provide greater cabin room and the possibility to turn these areas into storage because they have fewer moving parts. Since the conventional ICE is no longer present, one can also find storage spaces under the hood. In comparison to vehicles that run on gasoline, electric vehicle motors and batteries occupy less space.

10. They are proof of the future.

Since many nations have committed to progressively lessen their reliance on fossil fuels like gasoline and diesel, EVs are seen as a sustainable substitute.

Weaknesses:

1. A higher cost of purchase

Regular auto vehicles are significantly less expensive than electric vehicles. Auto cars with a gasoline engine cost between three and four lakh rupees. However, one might be surprised to learn that the initial cost of an electric car is only around ten to twelve lakhs. Because it is expensive to purchase, not everyone can use it.

2. Restricted Velocity and Range

Using an electric vehicle for long-distance travel is not feasible. When it comes to speed, electric vehicles are unable to outpace those powered by engines in terms of distance travelled. furthermore, there are severe restrictions on the driving range.

3. Low Resale Price

Even though they are costly to maintain, cars with fuel injection sell for a high price. An electric car can be had for less than three times the price of a conventional car. After driving, an electric car's capacity is much less important, which reduces the car's selling price.

4. The Inconvenience of the Service Station

Electric vehicle usage is still in its infancy. As a result, its serving stations are built similarly and in limited numbers. Even after long-distance driving, there aren't many service stations where vehicles can refuel with electricity.

5. Low Vitality

The largest disadvantage of electric vehicles is unquestionably the need for frequent charging. Furthermore, as these vehicles' weight increases, so does their capacity. Sometimes electric vehicles with limited energy and capacity can be slower than gasoline-powered vehicles.

6. Price of Battery Charger

Electric vehicles are powered by electricity rather than gasoline, but their batteries are incredibly durable. Furthermore, if the battery is not changed within a specific period, the vehicle might sustain damage.

7. Gradual Power Failures

Electric vehicles require multiple hours to fully charge, in contrast to engine-powered vehicles that can be recharged quickly. The charging process for these cars is extremely slow. Why would anyone waste time filling up their car in this fast-paced world?

8. Expensive Recharging Options

If recharging at a charging station is the only option available, electric vehicles can be recharged using the electrical power supply connected to their homes. To recharge, these cars require a high-voltage electric current.

9. Concern for Countries That Make Fuel

As one may already be aware, the fuel that many nations provide makes them relevant. Fuel sales are a major factor in the economies of many nations, including Saudi Arabia, Iran, and Oman. Should there be a sudden decline in the number of vehicles powered by diesel, these nations may face financial difficulties. Thus, countries that produce fuel may face difficulties as electric vehicles become more and more popular.

10. Fewer People

The high cost of electric vehicles means that not everyone can afford them. It's not untrue to say that only the wealthy can afford electric vehicles. One of the main reasons for its high cost is the limited number of electric vehicles, which is a result of limited product availability.

Opportunities:

1. Growing Demand:

As a result of a sharp rise in the price of gasoline and diesel as well as the increased environmental consciousness of the younger generation, there is a growing demand for electric vehicles in India. This is the right moment for domestic manufacturers to increase their market share acquisition because there is a gap in the market for suitable alternatives to conventional vehicles. With the rising costs of gasoline and diesel, there has been significant momentum behind the switch to electric vehicles. Now is the ideal moment for homegrown producers to claim a piece of the EV market. Significant quantities of

reasonably priced, high-quality EVs can be produced by Indian manufacturers.

2. Government Support:

The nation's charging infrastructure has seen significant investment, and buyers of electric vehicles are also eligible for numerous subsidies and a reduction in road taxes. The Central Government is not the only entity providing incentives. The FAME scheme, which aims to significantly increase demand for electric vehicles with a budget outlay of 10,000 crores, is one noteworthy incentive program. The increased demand for electric two- and four-wheelers will be met by this program. This will improve access to reasonably priced and ecologically friendly public transportation by providing incentives for a variety of E-vehicle categories.

3. Low-Cost Manufacturing:

India, one of the world's biggest manufacturers, can use its considerable manufacturing expertise to produce high-quality, reasonably priced electric vehicles. India's easy access to natural resources, which are necessary for the production of electric vehicles, has allowed it to manufacture at a low cost. India is a manufacturing haven due to its large pool of skilled and unskilled labor. Due to these benefits, fewer international companies are choosing to open offices in India. India can become a major player in the EV manufacturing industry by producing EVs and their parts at a substantial discount. Prices for electric vehicles can be reduced even further when economies of scale play a role.

4. Expert Workforce:

By providing additional training in the field of electric vehicle manufacturing, the sizable pool of skilled and unskilled laborers in India can improve the quality of their output. The apparent increase in EV manufacture and sales is expected to increase both skilled and unskilled jobs.

5. Manufacturing of Batteries at the Domestic Level:

One of the main ingredients used to make batteries for electric vehicles is lithium. India, incidentally, is well-positioned to benefit from this recent boom due to its substantial lithium reserves. Additionally, if domestic battery production increases, there will be less need for imported batteries, which will lower the cost of EVs.

Threats:

1. Scarcity of Charging Infrastructure:

The necessary charging network is one of the main obstacles to the scalability of

electric vehicles in India. To make EVs truly accessible, more charging stations must be installed immediately along major thoroughfares, highways, public spaces and even in more isolated areas.

2. High Cost:

Compared to traditional fossil fuel-powered vehicles, electric vehicles are more affordable over time. However, because batteries and other parts are so expensive, an EV requires a significant upfront investment. Because of this, to gain traction in price-sensitive markets, EV adoption will require support in the form of subsidies and other initiatives.

3. Challenges with the Supply Chain:

The manufacturing supply chain for EVs is still in the early stages of development. The cost of EVs may increase as a result of potential delays in sourcing the necessary parts. It will take some time and an established supply chain for EVs to become a proven commodity. Lithium is a necessary component used in the production of EV batteries. India has large reserves of this priceless resource, but it still needs assistance in extracting it effectively and in large enough quantities to support the continuous and widespread production of electric vehicles.

4. Lack of Skilled Workforce:

India has a sizable workforce that can be used for profitable employment. However, the need for more skilled workers is the issue the nation is currently facing.

Suggestions: - Globally, interest in electric vehicles (EVs) as a green and sustainable form of transportation is growing. The use of EVs has the potential to revolutionize transportation in India, a country where pollution and reliance on fossil fuels are major issues. Here are some ideas for encouraging electric vehicles in India:

1. Government Incentives:

The Indian government ought to keep providing grants, tax exemptions and subsidies to both consumers and manufacturers of EVs. This can lower the initial cost of EV purchases and promote adoption.

2. Infrastructure for Charging:

Creating a strong infrastructure for charging electric vehicles is essential to their mass adoption. The construction of charging stations on roads, in rural areas and throughout cities should be funded by the government. Private organizations could be given incentives to install charging stations.

3. Public Awareness Campaigns:

To inform the public about the advantages of electric vehicles (EVs), such as lowered operating costs, less air pollution and a diminished reliance on fossil fuels, awareness campaigns should be started.

4. R&D Investments:

To increase battery efficiency, range and charging speed, promote research and development in EV technology. Innovation in this field can be accelerated through cooperation between public and private research institutes, government agencies and businesses.

5. Fleet Electrification:

Promote the use of electric vehicles in transport, bus and taxi fleets as well as among other commercial fleets. Fleet operators could be given incentives and subsidies to switch to electric vehicles.

6. Regulatory Support:

Put laws into place requiring automakers to sell a specific proportion of EVs. Policies could also be developed to limit the sale of cars that run on fossil fuels in the future.

7. Financial Incentives for Manufacturing:

Offer financial rewards and subsidies to encourage the home production of electric vehicles and parts. Benefits like lower taxes, easier access to affordable loans and assistance with infrastructure could fall under this category.

8. Industry Collaboration:

Encourage industry, government and academic partners to work together to address issues like supply chain management, battery recycling and standardization of charging infrastructure that are preventing more people from adopting electric vehicles.

9. Skill Development:

Fund training initiatives to create a workforce with the necessary skills for the EV sector. This comprises engineers with a focus on battery technology, technicians for EV maintenance and repair and experts in the administration of charging infrastructure.

10. Skill Development:

Fund training initiatives to create a workforce with the necessary skills for the EV

sector. This comprises engineers with a focus on battery technology, technicians for EV maintenance and repair, and experts in the administration of charging infrastructure.

11. Integration with Renewable Energy:

Promote the connection of renewable energy sources, like solar and wind power, with EV charging stations. This can support a more sustainable transportation ecosystem and lessen the carbon footprint of EVs. India can move toward a more sustainable and environmentally friendly future by putting these recommendations into practice and accelerating the adoption of electric vehicles.

Conclusion

In conclusion, despite several challenges, India's supply and production networks for electric vehicles have bright futures. The government must take proactive measures to provide incentives and guarantee a sustainable raw material supply chain if it is to assist India in realizing its full potential in manufacturing e-vehicles and appropriately scaling up.

References

1. Global EV Outlook (2013). Understanding the electric vehicle landscape to 2020.
2. GoI, (2023). Ministry of Heavy Industries Evaluation of Electric Vehicle (EV) Policy Committee on Estimates (2022-23), Twenty-Sixth Report Pp. IV.
3. Gujarathi, P. K., Shah, V. A., and Lokhande, M. M. (2015). Design, Modeling, Simulation and Analysis for Conversion of Conventional Tata Indica Car into Plug-in Hybrid Electric Vehicle. In The 28th International Electric Vehicle Symposium and Exhibition (EVS28), KINTEX, Korea.
4. Gujarathi, P., k, and Shah., V., (2019). Electric Vehicle in India: Market Analysis with Consumer Perspective, Policies and Issues, Journal of Green Engineering 8(1), Pp.17-36
5. Mahal, K., Patil P. (2021). Electric Vehicles and India Recent Trends in the Automobile Sector, International Journal of Research Publication and Reviews Vol (2) Issue (7), Pp. 661-668.

9. SOCIAL AND ECONOMIC ASPECTS OF UNORGANISED DAILY LABOUR MARKET WORKERS IN PANVEL MUNICIPAL CORPORATION

Mr. Pilake V. V. * Dr. Narkhede D. S. **

* Research student, Dept. of Geography University of Mumbai, Maharashtra.
vvspilake@gmail.com,

**Head and Associate Professor, Dept. of Geography, C. K. Thakur ACS College
New Panvel, Maharashtra.
deepaknarkhede176@gmail.com

Abstract

Labour is pivotal for the growth and development of any country. The majority of the labour force in India is in the unorganized sector. The unorganized sector is in existence in rural as well as in urban areas. In rural areas, unorganized labourers are landless farmers, or marginalized farmers, fishermen, woodcutters, labourers in animal husbandry, brick kilns, quarries, mills etc. In urban areas they are construction workers, labourers in small-scale industries, casual labourers, handloom workers, employees in shops and commercial institutes, sweepers and scavengers, they are having uncertainty in their work and earnings. This gives rise to various problems. Though India is a developing country, very little effort has been made for the unorganized sector workers. Labour welfare is on the concurrent list so both central and state governments have worked on some plans for labour welfare according to their needs. But there are many hurdles in the implementation of these welfare schemes such as low literacy rates, lack of information, migrant workers, child labour etc. In the present research paper, an attempt has been made to study some social and economic problems of unorganized workers and problems faced by unorganized labourers in Panvel Municipal Corporation. For the present study, the primary data is collected through methods of observation, interview & discussions with experts, Mukadams and labourers. Secondary data is collected from books, journals, district gazetteers, conference abstracts, reports, websites etc. It is observed that unorganized labourers in Panvel Municipal Corporation face multiple problems like uncertainties in employment, tough competition for employment, decreasing employment with age, low wages, quality of life, debt etc. which are giving rise to future problems as well. This paper will help planning agencies recognize such problems and decide on an agenda to overcome such problems.

Keywords: *Labour, Daily labour market, unorganized sector, unskilled workers, migrant*

Introduction

Labour plays an important role in shaping the growth of a country. The labour force comprises all those who work for gain, whether as employees, employers or self-employed and it includes the unemployed who are seeking work. (Encyclopaedia Britannica) Labour might be skilled or unskilled. But both types of labour are required for the development of the economy. Government focuses on skill development for skilled labourers, through missions like Pradhan Mantri Kaushal Vikas Yojana. On the other hand, still today a major labour force of India earns their living through work in the unorganized segment of the economy. As per a survey carried out by the National Sample Survey Organisation (NSSO) in 2009–10, India has a 46.5 crore workforce out of which 2.8 crore work in the organized sector while the remaining 43.7 crore workers are in the unorganized sector. In the unorganized sector, 24.6 crore workers work in the agricultural sector, 4.4 crore in the construction sector and remaining in the manufacturing and service sector. The unorganized sector is in existence in rural as well as in urban areas. In rural areas, Smaller and marginalized farmers, landless farmers, fishermen, wood cutting, labourers in animal husbandry, brick kilns, quarries, mills etc. fall into unorganized sectors. In urban areas construction workers, labourers in small-scale industry, casual labour, handloom workers, employees in shops and commercial institutes, sweepers and scavengers, and workers in other unprotected labour came into this sector. As A Result of urbanization and industrialisation, there is migration of more population in search of employment in the urban areas. The persons with desired skills in the market got absorbed by the industries and other sectors, but unskilled, semiskilled, illiterate and aged labourers found it difficult to get employment. Some industrial work, construction work, household and other work offer seasonal employment to the labourers; as these activities are seasonal in nature.

As a result of increasing industrialisation in urban areas and constraints on rural employment, there is a rise in the urban workforce. Approximately 30 million workers in India are constantly on the move (migrant labour) and 25.94 million women have been added to the labour market from the year 2000 onwards (NSSO). Though there are various schemes implemented for workers in India like Pension Schemes, Gratuity, Provident

Funds, Leaves, Compensations etc. the major sector of the workforce i.e. unorganized sector does not benefit from the various schemes. All over the world daily labour markets and workers in these markets are studied in different contexts and it is observed that workers here are deprived of their basic needs like security in wages, sanitation facilities, leaves, retirement benefits, compensation and so on. Though the International Labour Organisation (ILO) has insisted on various beneficiary schemes for these workers, other institutes, organizations and various NGOs have worked on that. The Central Government and various state governments have implemented various beneficiary schemes for daily wage workers either sector-wise or as a whole. But there is a gap between those schemes and workers. Hence here an attempt has been made to understand the problem.

Study Area

Daily labour markets are observed all over India. In the present research paper, an attempt has been made to study some social and economic problems faced by unorganized labourers in Panvel Municipal Corporation. Panvel is an upcoming economic growth pole region in Maharashtra. This area lies in the Raigad district of Maharashtra. This area is governed by PMC (Panvel Municipal Corporation) while some areas are by CIDCO (City and Industrial Development Corporation). This area came under the Mumbai Metropolitan Region. It is also part of Navi Mumbai.

Objectives

In the present research paper, an attempt has been made to study some social and economic problems faced by unorganized daily labour market workers in Panvel Municipal Corporation.

Database and Methodology

For the present study, the primary data is collected through methods of observation, interview & discussions with experts, Mukadams and labourers. A sample size of 5% is taken for the study. Secondary data is collected from books, journals, district gazetteers, conference abstracts, reports, websites etc.

Daily Labour Market Workers in Panvel

Panvel lies in Raigad district of Maharashtra which is an upcoming economic growth pole region in Maharashtra. This area is governed by PMC (Panvel Municipal Corporation) while some areas are by CIDCO (City and Industrial Development Corporation). This area came under the Mumbai Metropolitan Region. It is also part of Navi Mumbai. Panvel lies on the entry point of Mumbai having developed infrastructure and industries. So Panvel has migrants from all over Maharashtra and India. The people with skills and expertise got opportunities in various fields but people with low educational attainments and expertise have very few opportunities. So, these people have to move to an unorganized daily labour market. Since there was not any kind of formal set-up to contact labourers for these jobs. Hence various labour markets were immersed in the region. Employees come and discuss with workers about the nature of work, then they discuss the number of days of work available, working place, working hours, number of workers required and other related things. Finally, they negotiate about the wages. Generally, the employees approach workers through the labour contractors, who act as an intermediate between them. They are called Mukadam. Also when individual or fewer workers are required for household or other smaller work then workers are directly connected by employees. Generally, workers prefer to work through contractors in spite of commission due to some kind of assurance of employment since these contractors have connections with various employees.

Findings

Following are some social and economic problems faced by unorganized daily labour market workers in Panvel Municipal Corporation. It is observed that there are three daily labour markets in Panvel which are as follows

1. Kohinoor Naka
2. Ganesh Market New Panvel
3. kalamboli Labour market

Number of Labourers

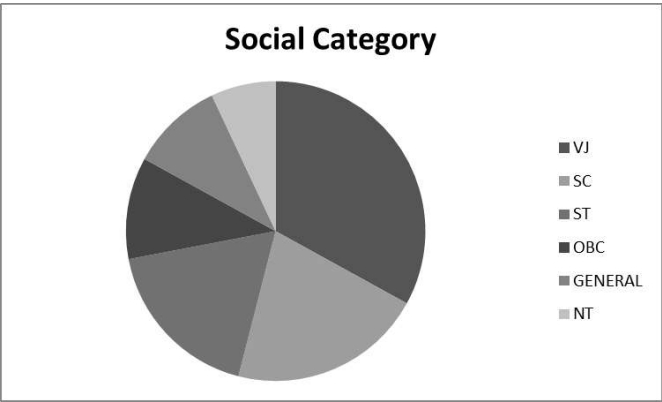
Out of these three markets, Kohinoor Naka is the biggest and oldest labour market in Panvel; the New Panvel market is the second one while the Kalamboli labour market is the smallest of them. Kohinoor labour market approximately has 1053 labourers New Panvel market has around 934 labourers and the Kalamboli labour market has 702 labourers. Males are observed in about 79% of these nakas as this work is labour-intensive. Unskilled females get domestic work easily hence the number is low as compared to males.

Number of old people is less. Some children are also working at the nakas.

Sr. No.	Labour market	No. of workers	males	females
1	Kohinoor Naka	1053	924	129
2	Ganesh Market New Panvel	934	820	114
3	kalamboli Labour market	702	559	143

Social Structure

It is observed that the majority of labourers at this nakas belong to the Banjara community; after that, the Wadar community is observed, they belong to VJ (33%). After that SC (21%), ST (18%), OBC (11%) General (10%) and NT (7%) categories are observed respectively at these knockers a significant amount of Muslim community is also observed at these nakas.



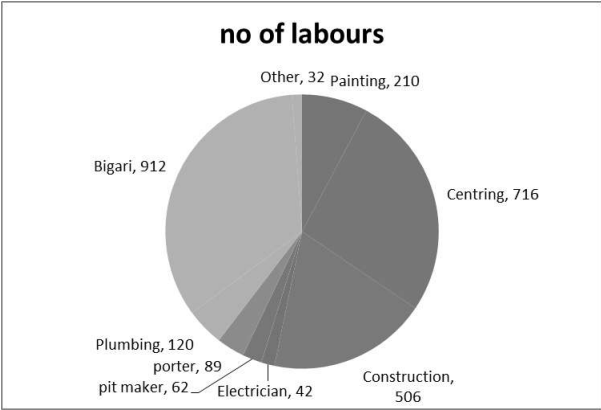
Skill Status

Majority of labourers are unskilled workers while very few workers have some skills which is the major cause behind the low income of these labourers. As these labourers have less education and fewer skills, they don't get much paid whereas skilled labourers face various financial problems. The majority of labourers are doing binary work which is doing odd jobs at the construction sites or digging pits at construction sites or anywhere else. While female labourers are carrying loads of construction material. At New Panvel Naka, we found a major concentration of skilled labourers who are doing electricity work, plumbing work and other household duties while other nakas with very less labourers are engaged in such skill work.

Sr. No.	Labour market	Total Workers	Skilled workers	Percentage
1	Kohinoor Naka	1053	129	12.25
2	Ganesh Market New Panvel	934	241	25.80
3	Kalamboli Labour market	702	103	14.67
	Total	2689	473	17.59

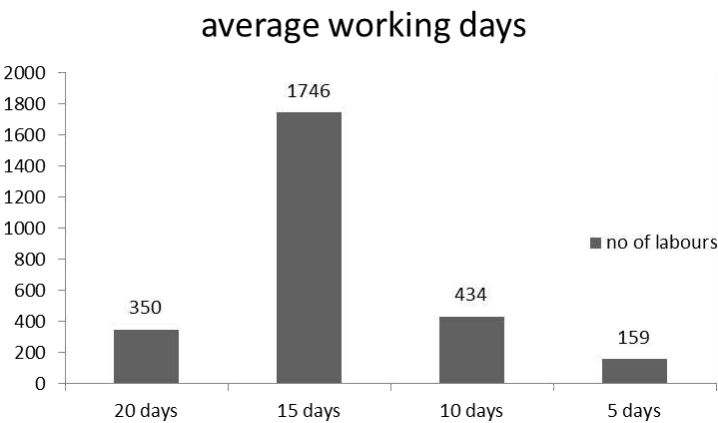
Professional Activities

These workers have less education and uneducated workers are mainly engaged in odd jobs. It is observed that the majority of workers are construction workers which don't require much skill. Diggers or hamals are observed in a majority of this Naka.



Working Days

The majority of builders have direct contact with some supervisors or mukadams so they don't approach nakas. Now since these nakas are overcrowded with immigrants from all over India. It is found that majority of labourer complaining about low working days because of high influx of labours in last few years day by day number of days of getting work is declining.



Daily Income

This work is unskilled work and there are a lot of options available for the selectors. There is no scope for high wages as the work is unskilled and competition is very high. There are also time constraints as time passes in the morning and the wage decreases significantly because they get paid on an hourly basis. Centring work and plumbers get the highest amount of pay which is around 1200 per day after that electrician’s painters gate 1000 to 900 rupees per day while bigari workers get a maximum of 700 rupees depending upon the labour on an average per day this trend is observed for all the three markets. This work is labour intensive so the labourers who are getting old find it difficult to get work. Also, females get low wages as compared to males. On average 300 to 500 rupees is the per day earning of labour over 60 years. While female labourers get 500 to 700 rupees depending upon work.

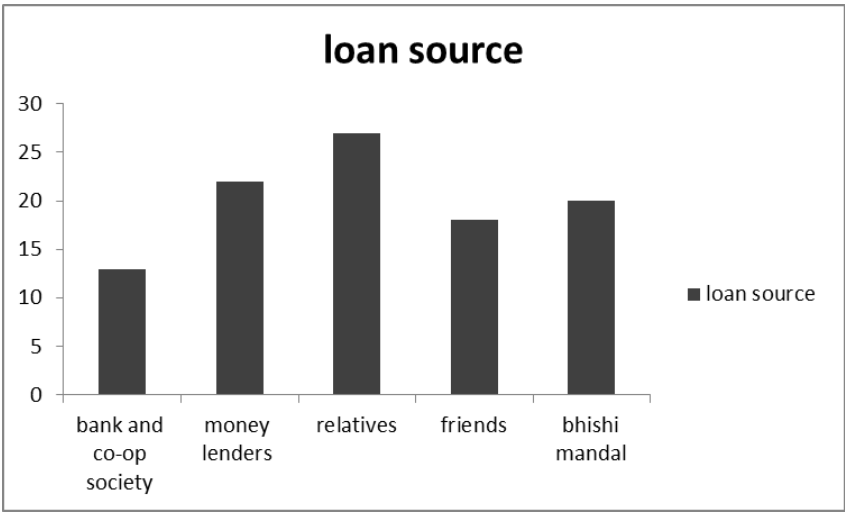
Some have complained that they are denied their pay at the end of work due to various reasons by their employers. Some even complain that the employers have beaten them after asking for the pay. Some employers have not fully paid their wages.

Access to Basic Amenities at Market

The markets are well known but they are unauthorized hence they don't have basic amenities here like shelter, drinking water and restrooms. In the rainy season it is hard for labourers. At Kohinoor Naka, labourers have to stand on the road which has heavy traffic in the morning which makes it dangerous. The labourers have to rely on nearby public restrooms which are inconvenient for them and are not near. It is found that some labour organizations are working with them but fail to give them support.

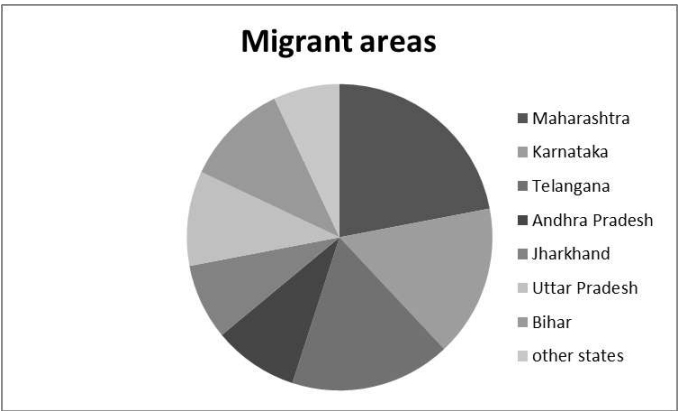
Debt

Since the wages are low and labourers are finding it difficult to get work each day for an average of 10 to 15 days, they get paid so it is observed that the labourers are having financial stress to meet their needs and they are getting debt, the majority of labourers are having debts from their relatives and others because they are migrant to these knockers and don't have proper documents. Also, they get money from bhishi mandals. Some labourers have debt due to their family background such as marriages, child education or agriculture land etc.



Migration

It is observed that the majority of labourers are migrant workers. Kalamboli market has the most number of migrants while Kohinoor Naka has the most number of native workers. It is observed that local people are not working at nakas due to various reasons like they get work at other places. Migrants do not have proper connections and skills also due to a lack of documents they don't get work so they join these nakas as there is no barrier, so it is easy to get entered at these nakas for an initial few day for a migrant. Also, observe that unskilled workers who are having problems at previous jobs enter into this nakas. Some labourers have worked more than 30 to 35 years at these nakas.



Occupational Hazards

This work is labour intensive and sometimes workers are involved in some occupational hazards such as minor and major accidents at construction sites, dog bites, heat stroke etc. due to heavy work and unhygienic conditions, labourers are prone to various diseases.

Recommendation

The government has induced various welfare plans for these labourers but due to various reasons like illiteracy, lack of information, government authority’s concern lack of documentation etc. find it difficult to avail of the facilities provided by the government if these facilities are properly provided some of the problems faced by the labourers will be solved.

References

1. Binoy Joseph, Joseph Injodey & Raju Varghese (2009) Labour Welfare in India, Journal of Workplace Behavioral Health, 24:1-2, 221-242, DOI: [10.1080/15555240902849131](https://doi.org/10.1080/15555240902849131))
2. Chaubey, D. S., & Rawat, B. (2016). Analysis of labour welfare schemes and its impact on job satisfaction: An empirical study. Management Convergence, 7(2), 45-53.
3. *e-SHRAM Portal*. (n.d.). [Https://Eshram.Gov.In](https://eshram.gov.in); Ministry of Labour & Employment. Retrieved April 17, 2022, from <https://eshram.gov.in/e-shram-portal>
4. Employment and Unemployment Situation in India 2009-10(NSS Report No. 537(66/10/1))
5. Fasih, F. (2011). Social Security of Unorganised Workers in India. Available at SSRN 1968206.
6. Rajkuar, B. (2014). A study on labour welfare measures and social security in its industries with reference to Chennai. International Journal of Enterprise Computing and Business Systems, 4(1), 1-10.)
7. <https://labour.gov.in/gazette-notification>
8. www.ilo.org
9. <https://labour.gov.in/gazette-notification>

10. IMPACT OF SOCIAL MEDIA ON COMPLAINT REDRESSAL: A CASE STUDY OF MUMBAI CITY

Mayuri Govindrao Madne* Dr. Prakash Dongre,**

*Research Scholar, Department of Geography, University of Mumbai,

Email: mayuri.ughade11@gmail.com

**Ph.D Guide, Principal, St. Joseph College of Arts and Commerce,
Satpala, Virar, Dist. Palghar

Abstract

Social media has emerged as a powerful tool for citizen engagement and communication with authorities. This study examines the impact of social media on complaint redressal in Mumbai City, India. It adopts a case study approach to analyze how citizens utilize various platforms like Twitter and WhatsApp Chatbot to lodge complaints and seek solutions from government agencies. The research focuses on identifying the types of complaints most frequently addressed through social media, assessing the effectiveness of government response mechanisms, and evaluating citizen engagement in the process. Additionally, it compares the efficiency and reach of social media complaint redressal with traditional methods. The study employs mixed methods of research, including data collection from social media platforms, surveys with citizens and interviews with government officials. The analysis aims to identify trends, patterns, and challenges associated with social media-based complaint redressal in Mumbai. Ultimately, the study seeks to formulate recommendations for improving the use of social media for effective grievance redressal within the city and contribute to the broader understanding of this phenomenon in other urban contexts.

Keywords: Social media, complaint redressal, Mumbai, citizen engagement, government responsiveness.

Introduction

Social media has dramatically changed how we communicate and engage with governance globally. Thus, the present study focuses on understanding how social media influences complaint resolution in Mumbai, India. Citizens now utilize platforms like Twitter and WhatsApp Chatbot to voice concerns and seek solutions from government agencies, reshaping the dynamics of grievance resolution. The city of Mumbai is a sprawling urban center, grapples with diverse challenges, and grievances that span various facets of daily life. The advent of social media has provided an alternative avenue for citizens to express their concerns, transcending the limitations of traditional complaint

redressal methods. Understanding the evolving role of social media in this context is imperative for both policymakers and researchers.

Objectives

1. To Examine the Impact of Social Media on Complaint Redressal in Mumbai City.
2. To Identify Prevalent Types of Complaints Addressed Through Social Media Channels.
3. To Evaluate the Effectiveness of Government Response Mechanisms, assessing the levels of citizen Engagement in the process.
4. To Compare the Efficiency and Reach of Social Media Complaint Resolution with Conventional Methods.

Significance of the Study

The significance of this research lies in its potential to inform policy recommendations and contribute to the broader understanding of the interplay between social media and urban governance. As cities globally grapple with the complexities of modern governance, insights from Mumbai can serve as a valuable reference point for optimizing the utilization of social media in effective grievance redressal. In navigating the complexities of an interconnected and digitally driven society, this study endeavors to offer insights that extend beyond the immediate context of Mumbai, contributing to the evolving discourse on the role of social media in enhancing citizen-government interactions and shaping the dynamics of urban governance.

Methodology

Research Design:

This study employs a comprehensive case study design to investigate the "Impact of Social Media on Complaint Redressal" with a focus on Mumbai City. The case study approach allows for an in-depth exploration of the intricate dynamics involved in the interaction between social media and the complaint redressal mechanisms within the Municipal Corporation of Greater Mumbai (MCGM).

Data Collection

1. Social Media Data: A thorough analysis of social media platforms, including Twitter, Facebook, and Instagram, have been conducted to collect data on citizen grievances. This

involves scrutinizing public posts, comments and messages related to complaints directed at the MCGM. The data have been systematically cataloged and categorized based on complaint types.

2. Report on the status of civic issues in Mumbai by PrajaFoundation (May - 2023)

3. Interactive Complaint Dashboard Data: Data from the Interactive Complaint Dashboard of the BMC have been analyzed to understand the patterns of complaints registered through the dedicated CM helpline chatbot, focusing on solid waste management issues.

4. Surveys and Interviews: Surveys were conducted among Mumbai residents to gauge their experiences and satisfaction levels with social media-based complaint redressal. Additionally, interviews with BMC officers have provided insights into the internal processes, challenges, and success factors associated with this integrated approach.

Sampling

The social media data involved a systematic sampling approach, covering a representative timeframe to capture a diverse range of complaints. The CCRS and Interactive Complaint Dashboard data have been inclusive, encompassing all complaints registered during the study period. Surveys were distributed randomly among residents across different wards and demographics.

Data Analysis

1. Quantitative Analysis: Statistical tools were employed to analyze quantitative data, such as complaint resolution times, escalation trends and demographic patterns obtained from the Interactive Complaint Dashboard, and survey responses.

2. Qualitative Analysis: Thematic analysis has been used to identify recurring themes, sentiments and qualitative insights from social media data. Interviews with BMC officers have been transcribed and analyzed for qualitative patterns.

Ethical Consideration

1. Privacy Protection: All personal information and identities of social media users were anonymized to protect privacy.

2. Informed Consent: For surveys and interviews, participants were provided with clear information about the study's purpose, and their consent was obtained.

Validity and Reliability

The study aims at internal validity by ensuring that the research design and methods accurately represent the impact of social media on complaint redressal in Mumbai City.

Reliability will be enhanced through consistent data collection and rigorous analysis procedures.

Action Taken Report (ATR) and Time Taken to Resolve Complaints

Action Taken Report: The process of generating an Action Taken Report in CCRS (Central Complaint Registration System of the BMC) was initiated in 2017. After a complaint is filed in CCRS, they generate an Action Taken Report (ATR). The ATR is a complaint redressal form that is generated by the CCRS telephone operator with primary details of the complaint including the nature of the complaint, location, etc. After this, the complaint along with the ATR is forwarded to the concerned department to resolve the issue. The ATR is to be filled by the official who attends to the complaint and visits the complaint site. The ATR is required to be filled in detail with information on the type of action taken to resolve the complaint before they can close the complaint in the system.

Escalation Matrix: The CCRS mechanism includes an escalation process for unresolved complaints. These complaints escalate to different levels under the 'escalation matrix' adopted by the BMC. The escalation matrix is a computerized mechanism by which complaints not resolved within a stipulated time (7 days) are automatically shown as being placed before a higher authority within BMC. The escalation matrix was developed to address the problem of complaints remaining stuck at the lower level of the civic administration, with no way to enforce accountability.

Complaint Level	Level 0	Level I	Level II	Level III	Level IV
Escalation Time Frames (in days)	0-2 days	3-9 days	10-16 days (about 2 and a half weeks)	17-23 days (about 3 and a half weeks)	23+ days
Complaint Assigned To	Head of Department	Assistant Municipal Commissioner	DMC	Additional Municipal Commissioner	Municipal Commissioner

Through this system, the higher administration is mandated to take note of and address complaints if they are not solved within a stipulated time. If a complaint is solved at the level at which it is filed, it is treated as being solved at Level 0.

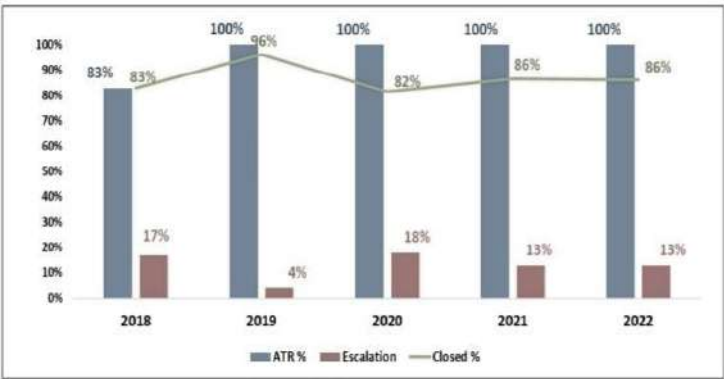


Figure 1: Action Taken Report (ATR) and Time Taken to Resolve Complaints (in %)

Ward	Total complaints received		Closed Complaints				Average days to resolve a complaint	
	2021	2022	2021		2022		2021	2022
			In no.	In (%)	In no.	In (%)		
A	1,764	2,061	1,265	72%	1,567	76%	46	75
B	2,901	3,047	2,600	90%	2,427	80%	40	47
C	2,632	2,826	2,153	82%	2,384	84%	51	61
D	3,191	3,566	2,466	77%	3,555	100%	42	58
E	3,438	3,792	3,375	98%	3,581	94%	17	31
F/N	3,094	3,799	2,886	93%	3,530	93%	32	30
F/S	2,270	3,102	2,194	97%	2,803	90%	22	23
G/N	4,859	5,158	2,825	58%	4,662	90%	110	57
G/S	2,264	2,847	2,203	97%	2,705	95%	21	12
H/E	2,851	3,733	2,798	98%	3,623	97%	19	25
H/W	3,623	4,713	3,224	89%	4,036	86%	38	36
K/E	6,667	7,529	6,172	93%	6,393	85%	35	44
K/W	6,845	8,667	6,217	91%	6,692	77%	47	44
L	6,310	6,575	4,276	68%	5,093	77%	49	40
M/E	3,807	4,023	2,558	67%	3,327	83%	72	54
M/W	4,086	4,027	4,045	99%	3,941	98%	49	16
N	4,045	4,400	3,962	98%	4,354	99%	47	21
P/N	6,177	6,910	4,731	77%	3,190	46%	67	72
P/S	3,133	3,471	2,359	75%	3,216	93%	64	42
R/C	4,641	5,178	4,586	99%	5,173	100%	47	25
R/N	2,017	2,367	1,937	96%	2,360	100%	44	14
R/S	4,064	4,712	3,920	96%	4,707	100%	43	24
S	3,820	5,351	3,491	91%	4,112	77%	78	45
T	1,751	2,214	1,687	96%	2,122	96%	73	30
Total	90,250	1,04,068	77,930	86%	89,553	86%	48	38

Table 1: Ward-wise Comparison of Total Complaints and Complaints Closed in 2021 and 2022

Transformative Dynamics: Social Media, Chatbots, and Responsive Governance in Mumbai City

The integration of social media platforms, such as Twitter, Facebook, Instagram, and innovative technologies like the WhatsApp Chatbot, has transformed communication between Mumbai's Municipal Corporation and its diverse populace. These platforms play a pivotal role by offering real-time updates, sharing crucial information, and fostering transparency, empowering citizens to actively participate in local governance. Notably,

platforms like Twitter and the WhatsApp-based BMC Assist Chatbot have revolutionized complaint redressal mechanisms, providing efficient channels for citizens to submit grievances and receive immediate acknowledgment, contrasting traditional bureaucratic approaches prone to delays. Evaluating the efficiency and satisfaction levels of both methods enables the Municipal Corporation to optimize grievance redressal, aligning with Mumbai's dynamic urban dynamics. The literature review underscores the intricate integration of social media, particularly the WhatsApp Chatbot, into Mumbai's governance fabric, addressing unique challenges with a responsive approach. This technological innovation reflects a commitment to meeting evolving population needs, paving the way for a citizen-centric governance model tailored to Mumbai's dynamic urban environment.

The Role of Chatbots and Social Media in Grievance Redressal in Mumbai City:

In the context of Mumbai City, the integration of chatbots and social media portals/apps in grievance redressal processes is pivotal for enhancing the responsiveness of complaint resolution. This exploration delves into global literature to glean insights into how chatbots and social media are specifically utilized in Mumbai to streamline the complaint redressal process and reduce response times.

Streamlining the Complaint Redressal Process

Chatbots for Immediate Responsiveness

As per the information provided by BMC, The BMC Assist Chatbot. Launched on January 14, 2022, this WhatsApp-based Intelligent Virtual Assistant serves as a two-way communication channel, allowing Mumbaikars to interact with BMC in both Marathi and English. The paper examines the user-friendly IVR structure and the integration of WhatsApp features, such as interactive buttons, lists, and location-sharing, to facilitate information exchange.

Results and Findings: The BMC Assist Chatbot offers a range of services, including Registering an online complaint, providing information about wards, control room numbers, key contacts, BMC services, payment processing, issuance of receipts, certificates, permits, and locating nearby amenities. The 24x7 availability and the option for users to receive updates and provide feedback contribute to an efficient and user-centric experience.

These implications of BMC's technological innovations on the aspirations of Mumbaikars and the broader vision for Mumbai City. It analyzes how such initiatives

aligned with the global trend of delivering citizen services through familiar and convenient channels, catering to the evolving needs of a technologically savvy population.

By Analysis of the Interactive Complaint Dashboard, the Studies highlight the significance of chatbots as immediate responders in Mumbai's complaint redressal landscape. By automating initial interactions, chatbots ensure rapid acknowledgment of user complaints, setting the stage for a responsive and citizen-centric grievance resolution process tailored to Mumbai's dynamic urban environment.

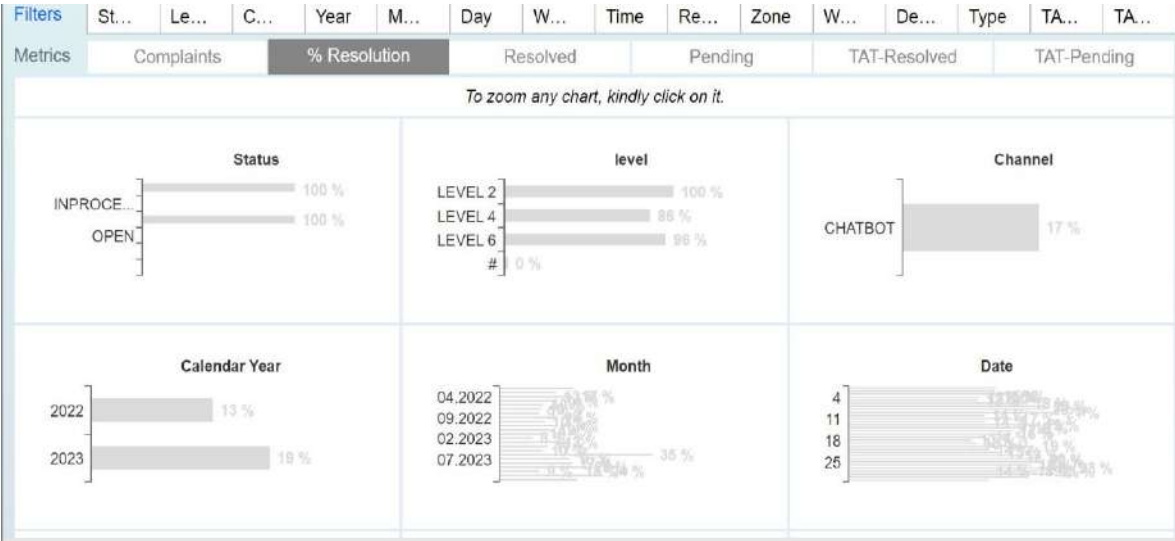


Figure 2: Interactive Complaint Dashboard which shows Escalation Time of WhatsApp Chatbot Complaints

The Impact of BMC's Dedicated CM Helpline Chatbot

The Brihanmumbai Municipal Corporation (BMC) has introduced a helpful CM helpline chatbot specifically dedicated to handling solid waste management complaints. Impressively, over 90% of the complaints received through this system are effectively addressed within just 24 hours. This efficient approach not only demonstrates the BMC's commitment to resolving solid waste issues promptly but also highlights the success of the dedicated chatbot in providing swift solutions to citizens' concerns.

Social Media as a Dynamic Engagement Platform

In the unique context of Mumbai City, social media platforms serve as dynamic spaces for citizen engagement. Organizations leverage these platforms to encourage users

to voice grievances publicly, initiating a transparent and collaborative process that resonates with the city's diverse and active population.

Reducing Response Times

Mumbai-Specific Query Resolution with Chatbots

Localized findings highlight chatbots' ability to provide instant resolutions to Mumbai-specific queries, reducing response times and enhancing complaint resolution efficiency in the city's fast-paced environment.

Real-Time Mumbai-centric Communication via Social Media

Social media platforms offer real-time communication tailored to Mumbai's needs, with organizations responding promptly to public grievances, demonstrating a commitment to addressing Mumbai-specific issues swiftly.

Prioritization through Mumbai-centric Social Media Visibility: Social media visibility aids in prioritizing urgent cases specific to Mumbai, leveraging public platforms to address critical issues promptly within the city's unique context.

Efficiency Enhancement in Mumbai: Chatbots and social media platforms in Mumbai are scalable, handling the city's volume of interactions efficiently, particularly during peak complaint periods. Continuous learning from Mumbai-specific interactions improves efficiency over time, addressing the evolving needs of residents and enhancing user engagement and satisfaction.

Demographics

A survey of 300 Mumbai residents revealed a male majority (206 males, 94 females) with age distribution as follows: 35% aged 18-24, 25% aged 25-34, 15% aged 35-44, 10% aged 45-54, and 15% aged 55 and above. Regarding education, 45% held a bachelor's degree or higher, 30% had a diploma or associate degree, and 25% had a high school diploma or GED. Occupationally, 35% worked in the private sector, 20% in the public sector, 20% were students, 15% self-employed, and 10% unemployed. The majority of social media users preferred WhatsApp (44.9%), followed by Twitter (26.1%), Instagram (12.4%), Facebook (7.8%), and YouTube (2.1%). Other channels accounted for 6.7% of respondents. Primary social media usage included information sharing (60.1%), contacting family and friends (55.1%), obtaining items (53%), registering complaints (25.4%), and accessing assistance (22.3%).

How you use social media during disaster?

283 responses

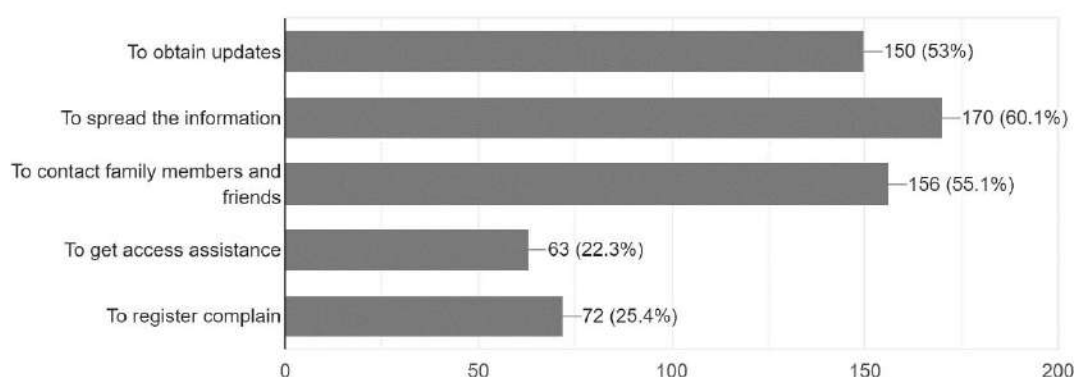


Figure 3: Purpose of Social Media Platform Users in Mumbai City by Social Media Platforms
(According to a Survey conducted by the author)

Social Media Usage Patterns

The survey unveils a robust social media culture, with over 80% of respondents actively engaging. Daily usage is prevalent, with 51.6% using social media daily and 27.6% doing so very often. WhatsApp emerges as the undisputed leader, claiming 41.7% of respondents, followed by Facebook (25.4%), Instagram (12.4%), Twitter (8.1%), and YouTube (3.2%).

For daily users, a significant 42.1% dedicate more than two hours to social media. The average rating of 3.7 for the impact of social media on respondents' lives underscores a predominantly positive perception.

Survey Insights: Social Media Use in Mumbai

Survey findings reveal widespread social media use in Mumbai, with Twitter for information and WhatsApp dominating. Implications for businesses, government, and organizations highlight social media's power for engagement and communication.

Key Takeaways: Mumbai Social Media Survey

Over 50% of respondents use social media daily, with WhatsApp as the top platform. The diverse purposes include connectivity, entertainment, and information gathering. Further research is needed to understand the detailed impact.

Harnessing Social Media for Mumbai's Future

Businesses, governments, and organizations can utilize social media for positive impact. Addressing social media addiction requires platform interventions and educational guidance for responsible use.

Challenges

Exploring social media's impact on complaint redressal in Mumbai reveals opportunities and challenges. The vast volume of information poses challenges in identifying relevant complaints, while the digital divide excludes certain demographics. Anonymity allows for misuse, linguistic diversity complicates resolution, and privacy concerns arise. Technical barriers and algorithmic bias further complicate the process. Rapid response expectations strain resources, while heightened visibility exposes authorities to scrutiny. Integrating social media with traditional systems poses organizational challenges. Addressing these challenges is vital for developing inclusive governance strategies leveraging social media's potential

Opportunities

Social media enables prompt complaint resolution, boosting citizen satisfaction and trust. It fosters citizen engagement, transparency, and proactive problem-solving through diverse complaint analysis. Social media data-driven decision-making aligns policies with citizen needs, empowering direct citizen participation. Efficient resource allocation and global best practices adoption further enhance complaint resolution efficacy, fostering cultural understanding and governance transparency in Mumbai.

Conclusion

This study sheds light on how social media significantly influences governance and complaint redressal in Mumbai through the Municipal Corporation of Greater Mumbai (MCGM). Platforms like Twitter, Facebook, and Instagram redefine communication, making governance more responsive and transparent. Real-time updates enable the Municipal Corporation to address city-specific issues promptly, showcasing adaptability in managing this vast metropolis. Social media transforms citizen engagement, providing residents with direct channels to voice concerns to municipal authorities, and fostering collaboration. The evolving complaint redressal mechanisms, driven by platforms like Twitter, offer efficient channels for citizens to submit grievances and gain immediate

visibility, enhancing satisfaction. The study emphasizes the need for an adaptable approach, recognizing the value of social media-driven methods. It advocates for continued exploration of social media's evolving role in governance, citizen engagement, and complaint resolution, offering a roadmap for effective urban governance in the digital age in Mumbai.

Reference

1. BMC Annual Report. (2023). "CM Helpline Chatbot: A Case Study in Technological Solutions for Efficient Complaint Resolution." Brihanmumbai Municipal Corporation.
2. Central Complaint Registration System (CCRS) of the BMC and the Interactive Complaint Dashboard of the BMC
3. Jones, M., & Kumar, A. (2020). "Platforms like Twitter and Facebook as Crucial Mediums for Citizen Participation in Civic Discourse." *Urban Studies Journal*, 18(2), 145-163.
4. Interview with BMC Officers.
5. Lee, J., & Kim, Y. (2017). "Timely and Transparent Responses in Building Trust between Citizens and Authorities." *Public Governance & Management Review*, 32(4), 210-228.
6. Patel, A. (2018). "The Role of Social Media in Cultural Preservation: A Case Study of Mumbai." *International Journal of Cultural Studies*, 22(3), 321-340.
7. Patel, R., & Gupta, S. (2019). "Influence of Social Media on Complaint Redressal Mechanisms in Urban Settings." *Public Administration Review*, 24(1), 78-94.
8. Report on the status of civic issues in Mumbai by PrajaFoundation (May - 2023)
9. Smith, A., et al. (2018). "The Immediacy and Reach of Social Media in Disseminating Citizen Grievances." *Journal of Civic Engagement*, 12(3), 45-62.

11. ETHICAL GOVERNANCE AND SUSTAINABILITY: A FOCUS ON INDIAN BUSINESS LANDSCAPE

Dr. Preeti Sumant Autade¹, Dr. Sumant Eknath Autade² Mr. Aditya Vilankar³

¹ Assistant Professor in Commerce, Swami Vivekanand Night College, Dombivli (E)

² Assistant Professor in Geography, Swami Vivekanand Night College, Dombivli (E)

³ TYBCOM, Swami Vivekanand Night College, Dombivli (E)

Abstract

This article deals with the multifaceted landscape of business ethics in India, examining the pivotal role played by cultural, legal, and societal influences. With India's rich cultural diversity and spiritual traditions, ethical considerations are shaped by religious beliefs, moral values, and cultural practices. The principles of duty, action and consequence, and non-violence from Hindu philosophy underscore the importance of societal welfare in business. The legal framework, highlighted by the Companies Act of 2013 and corporate governance practices, mandates ethical conduct, transparency, and accountability in business operations. Regulatory bodies like SEBI ensure fair practices in securities transactions, addressing issues such as insider trading. The Prevention of Corruption Act, 1988, aims to combat corruption in various sectors, including business, with institutions like the CVC and CBI playing key roles. Corporate Social Responsibility (CSR) has gained traction in India, with the Companies Act, 2013, mandating companies to allocate a percentage of profits to CSR activities. Businesses voluntarily engage in socially responsible initiatives, contributing to sustainable development and social welfare. The article also explores the ethical dimensions related to labour standards and employee welfare, emphasizing laws such as the Factories Act, Minimum Wages Act, and measures to address workplace harassment. The piece stresses that business ethics in India is not only a legal obligation but a moral imperative. The collaboration between the government, regulatory bodies, and businesses is aimed at promoting responsible and sustainable business practices. Upholding ethical standards not only benefits the businesses themselves but also contributes to societal development. The article emphasizes the importance of continually assessing and improving ethical practices to create a positive work environment that values and respects employees, thereby fostering India's sustainable growth and development.

Key Words: *Business Ethics in India, Cultural Influences, Legal Framework, Corporate Social Responsibility (CSR), Labour Standards and Employee Welfare.*

Introduction

Business ethics plays a pivotal role in shaping the Indian business landscape. As a diverse nation with a rich cultural heritage, India's approach to ethical behavior in business is influenced by various factors, including religious beliefs, legal frameworks, corporate

governance practices, and societal expectations. In recent years, there has been an increasing emphasis on corporate social responsibility, transparency, and sustainability. This article explores the key dimensions of business ethics in India, examining the cultural, legal, and societal influences that shape ethical decision-making and practices.

Background

In recent years, India has grappled with various ethical issues in business. One prominent concern is corruption, exemplified by high-profile cases like the 2G spectrum scam and the Satyam scandal. Bribery remains pervasive, hindering fair competition. Labor exploitation is another pressing matter, with instances of substandard working conditions and child labor emerging in industries. Environmental negligence is evident, as seen in controversies surrounding industrial pollution. Unethical marketing practices, such as misleading advertisements, also persist. These issues underscore the imperative for India to address systemic ethical lapses, fostering a business environment rooted in integrity, transparency, and social responsibility.

Statement of problem

This research aims to examine the effectiveness of government measures in addressing ethical issues within Indian businesses. Focusing on governance and sustainability, the study seeks to assess the impact of regulatory interventions on promoting ethical practices. By analyzing the measures taken by the government, the research aims to provide insights into how these initiatives contribute to fostering ethical governance and sustainability in the Indian business landscape.

Objectives

1. To examine the effectiveness of government measures in addressing ethical issues within Indian businesses.
2. To provide insights into how these initiatives contribute to fostering ethical governance and sustainability in the Indian business landscape.

Methodology

- Employ a qualitative research methodology relying solely on secondary data analysis.
- Utilize a comprehensive review of existing literature, government reports, industry publications, and academic research to analyze the effectiveness of government measures in addressing ethical issues and promoting sustainability in Indian businesses.

Findings

The study reveals how government efforts impact ethical behavior and sustainability in Indian businesses, shedding light on their effectiveness and implications.

1. Cultural Influences on Business Ethics in India

India's cultural diversity and spiritual traditions significantly impact business ethics. With a multitude of religions coexisting, including Hinduism, Islam, Christianity, Sikhism, Buddhism, and others, ethical considerations are shaped by religious beliefs, moral values, and cultural practices. Hindu philosophy, for example, incorporates concepts such as dharma (duty), karma (action and consequence), and ahimsa (non-violence), which have implications for ethical decision-making in business. The principles of "lokasangraha" (welfare of society) and "vasudhaiva kutumbakam" (the world is one family) underline the importance of considering collective welfare, fairness, and social justice in business practices. Business leaders and organizations in India often embrace these principles and aim to balance profit-making with societal well-being, thus fostering sustainable and inclusive growth.

2. Legal Framework and Corporate Governance

India has a robust legal framework and corporate governance practices to promote ethical behavior in business. The Companies Act, of 2013, serves as a comprehensive legislation governing the functioning of companies. It mandates ethical conduct, transparency, and accountability in business operations. The Act outlines the composition and responsibilities of the board of directors, protection of shareholder rights, and disclosure requirements for companies. Securities and Exchange Board of India (SEBI), the regulatory body for Indian capital markets, plays a crucial role in ensuring fair and ethical practices in securities transactions. SEBI's guidelines focus on issues like insider trading, fraudulent and unfair trade practices, and corporate disclosures. The introduction of corporate governance codes, such as the Kotak Committee recommendations, further strengthens governance practices in Indian companies.

3. Combating Corruption and Bribery

Corruption poses a significant ethical challenge in the Indian business environment, impacting fair competition, economic growth, and social development. To address this issue, India has enacted the Prevention of Corruption Act, 1988, which provides a legal framework to tackle corruption in various sectors, including business. This act criminalizes

bribery, embezzlement, and other corrupt practices. To combat corruption, India has established institutions such as the Central Vigilance Commission (CVC) and the Central Bureau of Investigation (CBI) to investigate and prevent corrupt practices. The introduction of digital governance initiatives, such as the use of technology in public procurement processes, has aimed to increase transparency and reduce opportunities for bribery.

4. Corporate Social Responsibility (CSR)

India has witnessed a growing recognition of the importance of corporate social responsibility (CSR). The Companies Act, 2013, mandates certain companies to spend a percentage of their profits on CSR activities. This initiative aims to promote sustainable development, inclusivity, and social welfare. CSR activities in India encompass a wide range of initiatives, including education, healthcare, rural development, environmental sustainability, and empowerment of marginalized communities. Many companies go beyond legal requirements and voluntarily engage in socially responsible activities, contributing positively to society. Additionally, collaborations between businesses, civil society organizations, and government bodies further drive CSR efforts. The Company's Act 2013 has encouraged businesses to integrate social and environmental considerations into their core strategies, fostering a sense of responsibility beyond mere profit-making. In the context of environmental sustainability, companies are expected to implement eco-friendly practices, reduce their carbon footprint, and contribute to environmental conservation efforts. This aligns with global goals for sustainable development and reflects a growing awareness of the impact of business operations on the environment. Overall, the Companies Act 2013 has played a pivotal role in promoting corporate responsibility in India, urging businesses to be socially and environmentally conscious, and making a positive impact on the communities they operate in.

5. Labour Standards and Employee Welfare

Ethical considerations in the Indian business context extend to the fair treatment of employees, adherence to labour laws, and ensuring their welfare. India has enacted several laws and regulations to safeguard the rights and well-being of workers. The Factories Act, 1948, serves as a key legislation that sets standards for employment practices and working conditions in factories. It covers aspects such as working hours, leave entitlements, health and safety measures, and welfare provisions for workers. This act ensures that businesses prioritize the physical and mental well-being of their employees.

The Minimum Wages Act, 1948, mandates that employers pay workers at least the minimum wage determined by the government. This legislation aims to prevent exploitation and ensure that workers receive fair compensation for their labour. The Employees' Provident Funds and Miscellaneous Provisions Act (1952), establishes a provident fund scheme to provide financial security and retirement benefits to employees. Employers are required to contribute a certain percentage of their employees' wages to the provident fund. Additionally, the Payment of Bonus Act (1965), ensures that employees receive bonuses based on their performance and the company's profitability. This act encourages fairness in rewarding employees for their contributions to the organization's success.

Businesses in India are also expected to adhere to the Sexual Harassment of Women at Workplace (Prevention, Prohibition, and Redressal) Act, 2013. This legislation mandates the establishment of Internal Complaints Committees (ICCs) to address and redress complaints of workplace harassment. Businesses must create a safe and respectful working environment that protects the dignity and rights of all employees. Furthermore, ethical considerations in labour standards encompass the promotion of diversity and inclusion. Businesses are encouraged to provide equal employment opportunities, irrespective of gender, caste, religion, or other discriminatory factors. Promoting diversity and ensuring fair treatment contribute to a more inclusive and ethical work environment.

In recent years, employee welfare has gained prominence in the Indian business landscape. Organizations are investing in initiatives to enhance the overall well-being of their employees. This includes programs and policies focused on employee health and wellness, work-life balance, skill development, and career progression. Companies are increasingly recognizing that a satisfied and motivated workforce leads to higher productivity and business success.

6. Whistleblower Protection

The Whistleblower Protection Act, 2014, aims to safeguard whistleblowers who expose corruption and unethical practices within organizations. It provides mechanisms for the protection of whistleblowers from victimization and retaliation, fostering a culture of transparency and accountability.

7. National Corporate Social Responsibility (CSR) Policy

The government has formulated a National CSR Policy to provide guidance and direction to companies in fulfilling their CSR obligations effectively. This policy outlines priority areas for CSR activities, encourages collaboration between companies and government agencies, and promotes innovative approaches to address social and environmental challenges.

8. National Voluntary Guidelines on Social, Environmental, and Economic Responsibilities of Business : The Ministry of Corporate Affairs introduced the National Voluntary Guidelines (NVGs) to encourage businesses to adopt responsible and sustainable practices voluntarily. These guidelines provide a framework for integrating social, environmental, and economic considerations into business strategies, emphasizing stakeholder engagement and disclosure of non-financial performance.

9. Enhanced Transparency and Disclosure Requirements

The Companies Act, 2013, mandates increased transparency and disclosure requirements for companies, ensuring stakeholders have access to accurate and timely information. Companies are required to disclose information related to CSR activities, environmental impact, corporate governance practices, and remuneration policies, enhancing accountability and trust.

10. Ethics Training and Capacity Building

The government collaborates with industry associations, academic institutions, and civil society organizations to provide ethics training and capacity building programs for business leaders, managers, and employees. These initiatives aim to raise awareness about ethical issues, impart knowledge about relevant laws and regulations, and equip stakeholders with the skills to make ethical decisions in the workplace.

11. Specialized Regulatory Bodies

The government has established specialized regulatory bodies to oversee and regulate specific sectors, ensuring compliance with ethical standards and industry best practices. For example, the Reserve Bank of India (RBI) regulates the banking and financial sector, while the Insurance Regulatory and Development Authority of India

(IRDAI) oversees the insurance industry, each enforcing ethical conduct within its respective domain.

12. Public-Private Partnerships (PPPs) for Ethical Initiatives

The government promotes public-private partnerships to undertake ethical initiatives and address social and environmental challenges collaboratively. PPPs facilitate the pooling of resources, expertise, and networks from both the public and private sectors to implement projects that have a positive impact on society and the environment.

13. Incentives and Recognition for Ethical Practices

The government offers incentives, awards, and recognition schemes to incentivize and reward companies that demonstrate exemplary ethical practices and CSR initiatives. These incentives may include tax benefits, preferential treatment in government procurement, and participation in prestigious awards programs, encouraging companies to integrate ethics into their business models.

14. Strengthening Enforcement Mechanisms

The government continuously reviews and strengthens enforcement mechanisms to ensure compliance with ethical standards and legal requirements. This includes enhancing the capacity and resources of regulatory agencies, streamlining investigation processes, and imposing stringent penalties for violations of ethical norms.

15. Promotion of Ethical Leadership and Corporate Governance

The government promotes ethical leadership and corporate governance practices through initiatives such as the National Corporate Governance Policy. This policy encourages companies to adopt principles of transparency, accountability, and fairness in their decision-making processes, fostering a culture of integrity and trust.

16. International Collaboration on Ethical Standards

The government collaborates with international organizations, regulatory bodies, and foreign governments to align ethical standards with global best practices. Participation in forums such as the United Nations Global Compact and engagement with international conventions and treaties help harmonize ethical norms and promote responsible business conduct on a global scale.

17. Promotion of Digital Ethics

With the rapid digitization of the economy, the government emphasizes the importance of digital ethics and data privacy in business operations. Initiatives such as the

Personal Data Protection Bill aim to safeguard the privacy and confidentiality of personal information, mitigating risks associated with data breaches and cybercrimes.

Conclusion

Business ethics in India encompasses a wide range of considerations, including cultural influences, legal frameworks, and societal expectations. Upholding ethical standards in business practices is not only a legal requirement but also a moral imperative. The Indian government, regulatory bodies, and businesses are working together to promote responsible and sustainable business conduct. By embracing business ethics, Indian companies can build trust, enhance their reputation, and foster long-term relationships with stakeholders. Ethical behaviour not only benefits the business itself but also contributes to the overall development and well-being of society. In a dynamic and evolving business landscape, it is crucial for organizations to continually assess and improve their ethical practices. By prioritizing labour standards, employee welfare, and adhering to laws and regulations, businesses can create a positive work environment that values and respects its employees. When businesses prioritize ethical conduct, they become agents of positive change, contributing to India's sustainable growth and development.

References

1. A Moyeen, B (2014). Promoting CSR to foster sustainable development: Attitudes and Perceptions of managers in developing countries. *West - Asia-Pacific Journal of Business Administration*, Vol 6 (2). 97 -115.
2. Adda, G., Azigwe, J. B., & Awuni, A. R. (2016). Business ethics and corporate social responsibility for business success and growth. *European Journal of Business and Innovation Research*, 4(6), 26-42.
3. <https://economictimes.indiatimes.com/jobs/c-suite/ethical-leadership-fostering-a-culture-of-responsibility-in-organizations/articleshow/104644391.cms>

12. GROWTH ANALYSIS OF PUNE CITY IN MAHARASHTRA STATE

Dr. Rajendra S. Pawar¹, Dr. Anil A. Landge², Dr. Babasaheb K. Wani³ Dr. Sudarshan A. Aher⁴

^{1,2,3} Padmashri Vikhe Patil College of Arts, Science and Commerce, Pravaranagar, A/P Loni Kd., Tal. Rahata, Dist. Ahmednagar, M.S.

⁴M.V.P. Samaj's Janata College, Igatpuri, Dist. Nashik, M.S.

Abstract

Urban growth is one of the major causes of environmental degradation across the globe. Rapidly growing population in many cities, particularly in developing countries like India is responsible for air, water, noise and soil pollution resulting into the degradation of environmental quality. Pune, an industrial city and an educational hub is also suffering from the problem of environmental degradation. Congestion of traffic is one of the major problems of this city. With this background, the growth analysis of Pune City is carried out in the present study. Based on both primary and secondary data the present study concludes that, the application of advanced techniques viz. Remote Sensing and Geographical Information System provides a realistic picture of the growth of Pune city.

Keywords: Growth Analysis, Pune, GIS, FCC, SOI.

Introduction

It is fact that urban growth is affecting on Environment. Because of urbanization we face number of problems in future also. So, we should give more attention on environment awareness. The urban areas in the developing world are under constant pressure of a growing population. Indian cities are experiencing an accelerated pace of growth since independence. Cities are now emerging as centers of domestic & international investments in an era of economic reforms, liberalization and globalization. Because of push form villages and capital investment made in urban area large number of people migrate from villages to cities. Cities find it difficult to accommodate all the economic activities and population. The core of cities became more important. Due to population pressure, concentration of commercial activities, traffic congestion, pollution, crime etc. it is important to plan core of the city with advanced techniques like remote sensing and GIS.

Pune (Maharashtra) is one of the many cities in India, growing at a very fast rate. In the patronage of kings and rulers, it has acquired a complex urban structure over the years.

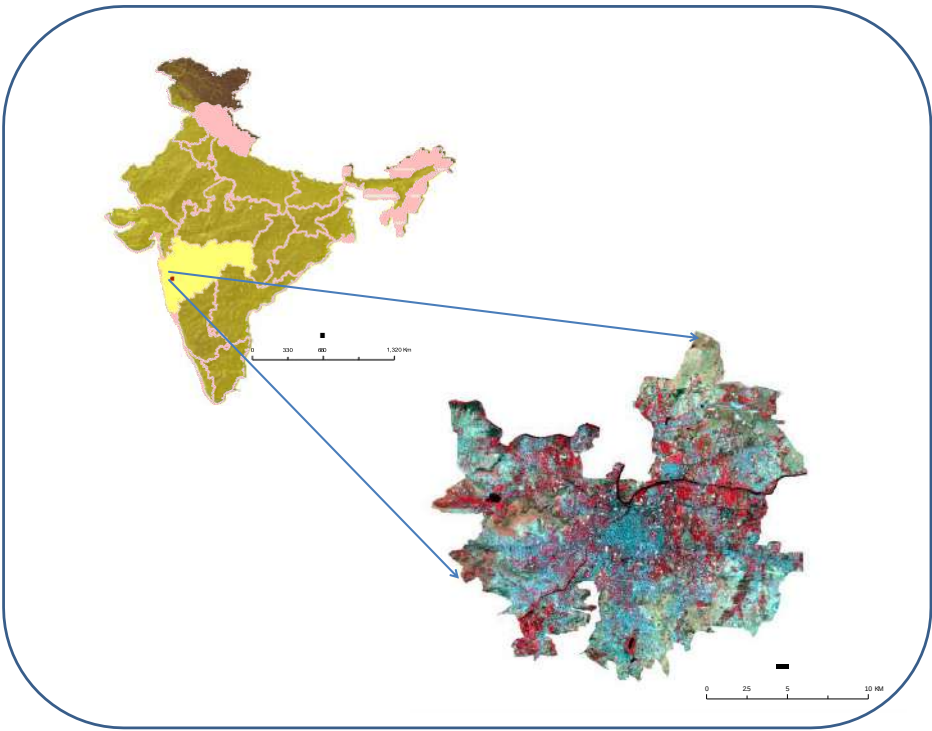
The city has gone through unusual changes from last 40 years in terms of economic, social and physical transformations.

An attempt is made to prepare a Development Plan in duration of three years on a Geographic Information System (GIS) platform ensuring the connectivity and integration of core area with the rest of the city using spatial information obtained through remotely sensed data, city maps and Survey of India (SOI) topographical sheets.

Study Area

Pune city situated on the 18⁰ 31’ North latitude and 73⁰ 51’ East longitude and cover an area of 243.96 sq.km. It has a strategic position in the valleys of Mula and Mutha, which join each other in the Pune city. In Pune city total 177 census wards are there where, more than 600000 households and more than 3.2 million people (according to Pune Municipal Corporation 2006). Pune is one of fast developing urban agglomerations in Asia and ranks eight at national level (Census 2001).

It has grown quite haphazardly. The present growth is due to various factors such as industrialization, location of various Central and state Government establishments.



Need of Study

Usually, researches use technique and satellite data to see the changes of the growth of a city. In present work I am conducted the research with searching ground truth with the help of extensive fieldwork. To see the change occurred in economical activities of Pune city in last 30 years and how Pune city transform from small hamlet with only 15 huts in 613 A.D. to 1.3 million in 1981 and in 2001 the population has reached 3.5 million. City dwellers economically transform from fisherman to IT professionals. How spatial change occurred in different phases of Pune city and surrounding area with the help if people participation in the research.

Database

1. Collateral data: temporal population data from the government agencies, cadastral data from land records department and topographical sheets from Survey of India on 1:25000 scale 47 F/14.
2. IRS – 1C/ID, LISS- III - For 1997 and recent one. Remote sensing data from National Remote Sensing Agency, Hyderabad.
3. Data related to Population of city, workers participation in different activities, Housing is obtained from the Census of India.
4. Random Sample Survey

Methodology

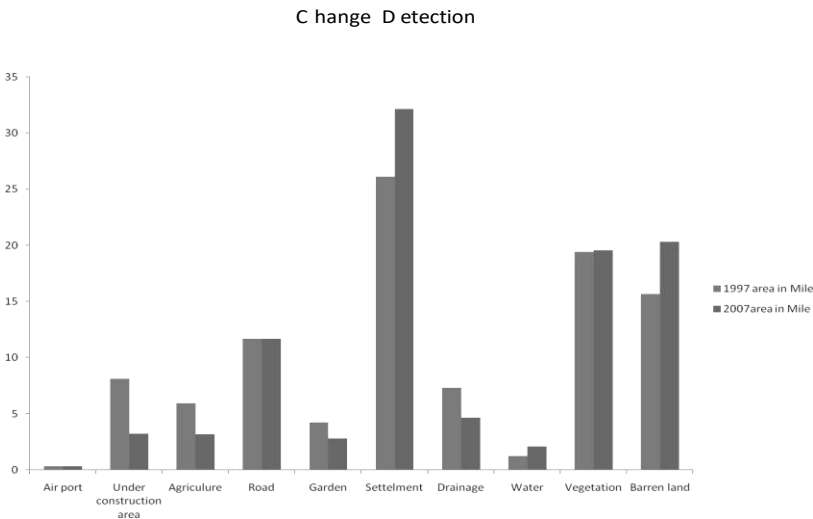
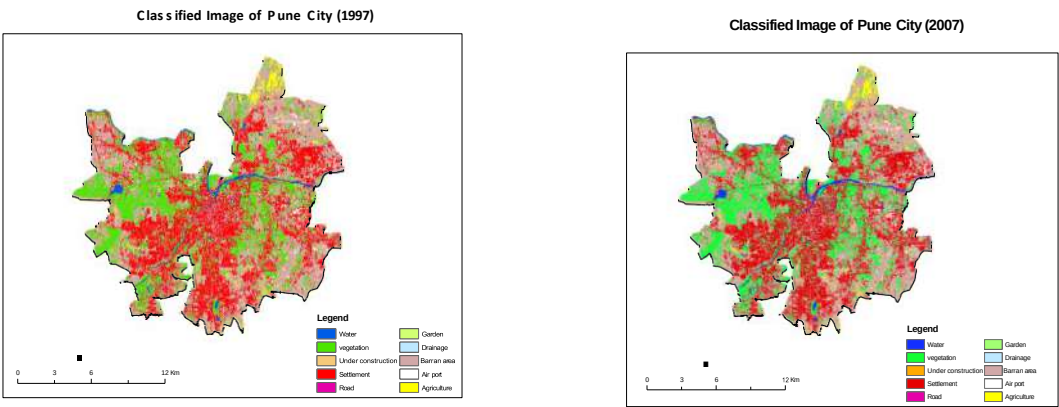
The digital remote sensing data was processed and geo-referenced in Erdas software. Initially the toposheets were scanned and geo-referenced and used as base for image registration. The geo-referenced FCC image was further enhanced by using necessary enhancement techniques. After that visual interpretation of image was done to identify the major land use classes. The enhanced image was classified on the basis of sample collected from different classes. Maximum likelihood classifier of supervised classification in Erdas was used to classify the image into major classes and again they remerged into two main classes as built-up and non built-up area.

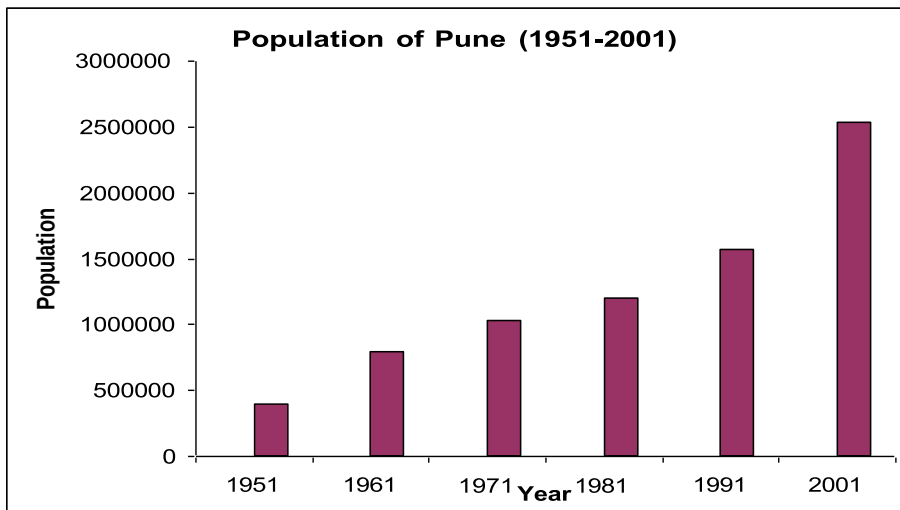
Hence, considering the built-up area as a potential and fairly accurate parameter of urban growth gives better knowledge for understanding the behavior of such growths.

Therefore the classified image and the merged toposheets were brought into Arc View 3.2 environment and the toposheets and the area under built-up was calculated for further analysis.

Urban Growth Analysis

Urban growth over the period of 1970 to 2001, almost a period of three decades was determined by computing the area of all the settlements from the digitized toposheets and comparing it with the area obtained from the classified IRS ID image





Population of Pune

Between 1976 and 1981, the population of Pune city grew by 16.7%, and from 1981 to 1991 it grew by 30.2%. Between 1991 and 2001, the growth has doubled to 62.17%. In comparison, Pune district has a growth rate of 30.58%, while the state is experiencing the growth rate of 22.5%. These trends are likely to persist in future. This shows that the larger urban agglomerations are getting overcrowded and fast growing in a haphazard and unplanned manner. Therefore, it is necessary to assess the past and present growth trends of these rapidly growing cities, for effective urban management and sustainable development.

Results and Conclusion

- Remote sensing and GIS are time and again proving that they are highly capable in urban studies particularly in urban management and planning. With these modern tools it is quite possible to analyze the spatial pattern of urban growth over different time periods and it can be systematically mapped, monitored and accurately assessed from remotely sensed data along with conventional ground data.
- Pune is experiencing high rate of population growth. Between 1976 and 1981, the population of Pune city grew by 16.7% and from 1981 to 1991 it grew by 30.2%. Between 1991 and 2001, the growth was more than two times i.e., 62.17%, where as Pune district has the growth rate of 30.58% and the state experienced the growth rate of 22.5%.
- This shows that the increasing population of Pune city exercise lot of pressure on available land in the city and city's limit had been pushed towards the adjacent villages.

- This will show how much pressure has been given to the available land. Recently, 23 villages had been added to the old municipal limit and the total area of Pune city has increased from 145.92 sq.km. to 243.96 sq.km.
- The municipal corporation has also prepared the development plan for these villages. Our present study does not have any aim to analyze the development plan of fringe village. But to help the planners to identify the villages which have to be given more priority and where exactly the growth takes place and to understand the degree and intensity of such growth of better management.
- As the urban phenomena (residential, industrial, commercial, public and semi public uses... etc) has uniform reflectance throughout electromagnetic spectrum, it is not possible to identify delineate urban land use classes using digital analysis techniques as these techniques employ spectral characteristics of the objects for the classification.
- This study shows that the city of Pune is experiencing a leapfrog pattern of urban growth due to the hills, and ribbon growth along the highways.
- With the integration of remote sensing and GIS, it is easy to implement in the study of Pune city and quite sure that the results will be definitely useful for implementing and managing the development plan of Pune.

References

1. "Techniques for mapping suburban sprawl", Photogrammetric Engineering and Remote Sensing, Vol. 63(9): pp 913 – 918.
2. Burrough P. A. (1986). "Principles of Geographic Information Systems for Land Resources Assessment", Clarendon Press, Oxford Epstein, J., Payne, K., and Kramer, E., (2002).
3. Hussain. M. (2003). Urban Geography, Anmol Publications Pvt. Ltd., New Delhi Li, X. and Yeh, A.G.O. (2001).
4. *Photogramm. Engg. & Remote Sensing*, Vol. 67(4): 471-477. -43 Pathan, S. K., Jothimani, P., Pendharkar, S. P. and Sampat Kumar, D. (1989).
5. Urban land use mapping zoning of Bombay Metropolitan Region using Remote Sensing data. *J. Indian Soc. Remote Sensing*, 17(3): 11-22
6. Zoning land for Agricultural protection by the integration of Remote Sensing, GIS, and Cellular Automata.

EDITORS



Prin. Dr. Padmaja Arvind, Ph.D. in History, is currently working as a principal at the S.I.A. College of Higher Education, Dombivli (E), which is affiliated with the University of Mumbai. She has over thirty years of experience teaching at the undergraduate level and fifteen years of experience at post graduate level. Her interest in teaching is in Research Methodology, Mass Media, Sociology and History.

The college has completed two NAAC cycles under her able guidance. She has twenty research publications to her credit, both nationally and internationally. In addition to completing the UGC-HRDC and University organized training programs and presenting research papers both at national and international platforms, Dr. Padmaja is the author of one book. She has organized six state and national level conferences, seminars and workshops in addition to giving invited presentations under variety of titles. Dr. Padmaja was appointed as a Vice Chancellor's nominee for BoS in BMM for Mumbai-based prestigious institutions and has worked as a subject expert on Local Inquiry Committees (LIC). She has also worked as a member of screening committee constituted for the appointment and promotion of college teachers under the Career Advancement Scheme (CAS).



Dr. Ramesh H. Gavit, Ph. D., NET in Geography, is working as an associate professor in the Department of Geography, University of Mumbai, Mumbai. His teaching experience at undergraduate and postgraduate level is of eighteen years. Dr. Gavit is a research guide.

With 20 national and international publications to his credit, presently two research students are doing Ph. D. under his guidance. In all 25 post graduate students have completed their dissertations under the able supervision of Dr. Gavit. He has published two research articles in edited volumes and delivered nine invited talks.

Dr. Gavit has one patent design to his credit titled 'Device to Analyze and Generate Hotel Planning'. He is a member of BoS in Geography at the University of Mumbai and S. P. College, Pune, and also worked as a convener of NEP 2020 Geography syllabus framing. Dr. Gavit is a treasurer of the Bombay Geographical Association (BGA) and Secretary of All India Adivasi Employees Federation, Branch University of Mumbai (AIAEF) from 2022. Dr. Gavit is a recipient of Best Geography Teacher Award 2023 given by the Deccan Geographical Society of India.



Dr. Nitinkumar M. Patil, Ph. D. in Geography (Climatology), with more than thirty years' experience of teaching at both undergraduate and post graduate level is presently working as a faculty at the S.I.A. College of Higher Education, Dombivli (E), affiliated to the University of Mumbai. His areas of interest are Environmental Management, Agricultural science, Agro-climatology Population Studies, Settlement Geography and Tourism.

There are fifty-four national and international level research publications to his Credit. Dr. Patil has authored four books of geography and environmental science, completed twenty-two UGC-HRDC, PMMMNMTT and University organized training programs, presented thirty-three research papers on various national and international platforms, delivered more than twenty-five invited talks and organized seven conferences, seminars and workshops at state and national level. He has worked as a head, department of geography, member of the College Development Committee, Students' Welfare Officer, NSS Coordinator, member of the NAAC steering committee and subject expert in the university level committees constituted for the selection of assistant professor to be appointed in the colleges and committees constituted for the promotion of college teacher under Career Advancement Scheme (CAS). Dr. Patil has completed two minor research projects funded by UGC, New Delhi and Soliton NetLink Pvt. Ltd. Dombivli. He is a recipient of the 'Shikshak Ratna Award' given at national level by Samta Sahitya Academy at Goa in May 2017 and has also obtained the 'Best Oral Presentation Award' in the international conference organized by BASE-Biology association, Agriculture SciTech and Agricultural association in collaboration with college of medicine, University of Hail, Saudi Arabia in June 2021. Dr. Patil is a life member of The Deccan Geographical Society, India, Maharashtra Bhoogolshastra Parishad, Pune and Bombay Geographical Association, Mumbai.



Dr. Sumant E. Autade is presently working as Associate Professor in Geography at Swami Vivekanand Night College in Dombivli, affiliated to University of Mumbai. He has teaching experience of 18 years at under-graduate and 4 years teaching experience at post graduate level. His research interests are in application of remotely sensed data in natural hazard assessment, particularly landslides. He has published his research work in various national and international journals. To his credit, Dr. Autade has 24 research papers published in reputed National and International journals, 2 newspaper articles, 2 articles in "*Marathi Bhasha Vishwakosh*", 7 book chapters in edited books and 2 general articles in magazines. Dr. Autade, to his credit has 325 citations, H-index - 4 and i-10 index 3 (Google scholar). Dr. Autade has participated and presented papers in several national and international conferences. He has delivered over 20 talks as guest speaker in different academic conventions at various institutions. He has completed 3 minor and 1 major research projects funded by University of Mumbai and ICSSR. He has successfully participated in two certificate courses on Remote Sensing and GIS at Indian Institute of Remote Sensing, Dehradun. He has also completed 12-week online certificate course on Geographical Information System organized by IIT Chennai.



Dipesh Karmarkar, Ph.D. in Historical Geography, is an Associate Professor and Head of the Department of Geography at Smt. C. H. M. College (Ulhasnagar), University of Mumbai. He ranked among the top 10% of teachers globally in the International Teachers' Olympiad in 2023. He has published three books, twenty papers in journals, proceedings, edited books, nineteen textbooks, and more than twenty Marathi articles in periodicals.

His recent article "Mahim Before Bombay: The Story of a Lost Port" published in the volume "Gateways to the Sea: Historic Ports and Docks of Mumbai Region" has received appreciation from the academicians. This volume has been compiled by the Maritime Mumbai Museum Society and published by the Government of India. He has contributed geographical entries to the Marathi Vishwakosh and academic blogs. He is a Ph.D. Research Guide, a Member of the Board of Studies in Geography at the University of Mumbai and a Governing Body Member of the Bombay Geographical Association.

THE BOMBAY GEOGRAPHICAL ASSOCIATION

Governing Body Members 2023 onwards

President : Smt. Bharti Unni

Vice Presidents: Prin.M.T.Telang; Shri.Prakash G.Shinde; Shri..Vilasrao R. Chawan;
Shri.B.D.Patil; Smt.Premalata Singhi; Prin.Dr.Debajit Sarkar;
Shri.Suresh Shetkar; Prin.Dr.Prakash Dongre.

Secretary : Prin.Dr.Moushumi Datta;

Jt. Secretary: Dr.Sanjuktta Sattar; **Asst.Secretary:** Shri.Dhyaneshwar Bombe

Treasurer : Dr. Ramesh Gavit; **Asst.Treasurer:** Shri. Sachidanand Honna

Executive Members: Dr.Dipesh Karmarkar; Dr.Pandurang Choudhari; Dr.Minal Parab;
Dr. Ravindra Gawade; Prin.Dr.Anita Awati; Prin.Dr.Priti Mahajan;
Dr.Baban Singare; Dr.Deepali Bhide; Dr.Shweta Ranade;
Dr.Sanjyot Pritam Deuskar; Mr.Nikhil Gawai; Ms.Aastha Smarth Kapur;
Shri.Bhagwan Gangawane; Dr.Sheetal Zalte; Dr.Jayeeta Datta;
Dr.Samruddhi Chawan; Dr.Neetu Sharma; Dr.Amrita Agrawal

Advisory Committee: Shri.S.Ebeneezer;

Dr.Savitsmita Vilasrao Chawan;

Prin.Dr.H.M.Pednekar

Auditor: C.A.Manoj Pal

We are blessed with the rich legacy of BGA built strongly by well-known geographers, academicians, administrators, and philanthropists who have been the founder pillars as Presidents during their tenure in sequence as Prin.C.B.Joshi; Shri.Iyer; Dr.C.D.Deshpande; Shri.N.M.Joshi; Shri.Vakil; Prof. B. Arunachalam; Prof.Dr.K.Sita; Prof.Dr.V.S.Phadke; Shri.V.G.Amrite; Shri.S.Ebeneezer; and Prof.Dr.Savitsmita V. Chawan.



THE BOMBAY GEOGRAPHICAL ASSOCIATION

The Bombay Geographical Association is one of the oldest Geographical Association Registered Under Societies Act XXI of 1860 no. Bom.82/1958 (GBBSD), functioning from C/o Dept. of Geography, University of Mumbai, Lokmanya Bal Gangadhar Tilak Bhavan, Vidyanagari, Santacruz (East), Mumbai 400098. The legacy of BGA is built strongly by its former Presidents and their executive team such as Prin. C.B. Joshi; Shri.Iyer; Dr. C.D. Deshpande; Shri.N.M.Joshi; Shri.Vakil; Prof. B. Arunachalam; Dr. K. Sita; Prof. V.G. Amrite; Dr. V.S. Phadke; Prof.S.Ebenezer; Prof.Savitsmita Vilasrao Chawan and presently Prof.Bharati Unni. The BGA has been conducting various academic programmes for disseminating knowledge in Geography through Conferences, Seminars, Workshops, refresher courses, Orientation program, Diploma Course, field trips, training programmes, Map Exhibition etc. for college and school teachers in association with BOS Geography and Dept. of Geography, University of Mumbai at International, National, State and Regional levels, over the years with kind support from the authorities at University of Mumbai. The BGA has a total of 29 publications in the form of Annual Research Journal namely, 'Bombay Geographical Magazine', occasional papers and Monographs. B.G.A. in association with Dept. of Geography, University of Mumbai and Geography departments in its affiliated colleges has extended activities to *student community through the support of benevolent sponsors by organizing competitions for them such as*: Mrs. Kani Memorial Prize Presentation Competition, Smt. Shantidevi Banerjee Memorial Prize Presentation Competition, Shri Shankar Raghunath Rao Memorial Best Student Award Prize. The BGA is pleased and is grateful to one and all to receive support from various organizations and institutions to disseminate its academic deliberations to academicians, research fraternity and students.



THE S.I.A. COLLEGE OF HIGHER EDUCATION, DOMBIVLI (E)

The S. I. A. College of Higher Education was started in 2010 to cater to the demand for quality education in the vicinity of Dombivli and its suburban residents. The college works with the motto "Knowledge is Power." It offers undergraduate programs viz. B. Com, BBI, BAF, BMS, BMM, B.Sc. IT and two postgraduate courses including M. Com and M. Sc. IT. The institute espouses holistic development through value-based education, skill development and real-time learning. The institution encourages the students and faculty members to adapt to the emerging digital era by training them on the latest technologies and providing hands-on experience to all. All the software that is used in the college is designed by the college incubation cell – the S.I.A. Techlink. In addition, the college also offers various courses to help enhance employability. The college is reaccredited B+ in the second cycle of NAAC. The College under the able guidance of Hon.Chairman Mr.K.V.Ranganathan; Hon Secretary Mr.M.Gopalakrishnan Prin.Padmaja Arvind and its dedicated staff is strengthening the academic growth with laurels in its region.



Unit No.4, Ground Floor, Lalwani Industrial Estate, 14, G.D. Ambekar Marg, Wadala, Mumbai-400 031
Tel.: (022) 6662 4553, 6662 4554. Fax: 6662 4556. e-mail: orders@shethpublishers.com

Follow us:  /shethpublishers  /sheth.publishers

ISBN - 978-93-6268-286-4



Price - ₹ 250.00

TOWARDS A GREENER FUTURE: ENVIRONMENTAL PERSPECTIVES AND PRACTICES

Chief editor
Smt. Bharati Unni

Editors:

DR. SUMANT AUTADE

DR. NITINKUMAR PATIL

DR. RAMESH H. GAVIT

MR. DNYANESHWAR BOMBE



Towards a Greener Future: Environmental Perspectives and Practices

Chief Editor

Smt. Bharati Unni

Editors

Dr. Sumant E. Autade

Dr. Nitinkumar Patil

Dr. Ramesh H. Gavit

Mr. Dnyaneshwar D. Bombe

When you care enough to be better than the best


SHETH[®]
PUBLISHERS PVT. LTD.

MUMBAI

GOA ☆ NAGPUR ☆ BHAVNAGAR

Follow us:



/shethpublishers



/sheth.publishers

Price: 250

ISBN - 978-93-6268-286-4

First Edition: October 2024

No Part of this publication may be reproduced or transmitted by any means, electronic or mechanical, including photocopy, recording or any information storage and retrieval system, without permission in writing from the copyright owners.

DISCLAIMER

The authors are solely responsible for the contents of the chapters in this book. The publishers and editors' do not take any responsibility for the same in any manner. Errors, if any are purely unintentional and readers are requested to communicate such errors with the editors and authors to avoid discrepancies in future.

Published & Printed by:

Sheth Publishers Private Ltd.
Unit No.4, Ground Floor, Lalwani Industrial Estate,
14, G.D.Ambekar Marg, Wadala Mumbai-400 031
Contact: 6662 4553/ 6662 4554 FAX: 6662 4556

Acknowledgement

This book is the result of the dedicated efforts of research scholars and academicians. We would like to express our heartfelt appreciation and gratitude to everyone who contributed to its production and publication.

We are deeply honored and sincerely thank our management: Hon. President Mr. K. V. Ranganathan and Hon. Secretary Mr. Gopalakrishnan of the South Indian Association, Dombivli, for granting us the permission to publish this book.

I also extend my sincere gratitude to Principal Dr. Padmaja Arvind and Vice Principal and IQAC Coordinator Mrs. Booma Halpeth of S. I. A. College of Higher Education, Dombivli (E), for their unwavering support throughout the completion of this book.

I express my sincere gratitude to Mrs. Bharati Unni, President of the Bombay Geographical Association (BGA), C/O Department of Geography, University of Mumbai, Lokmanya Tilak Bhavan, CST Road, Kalina, Santacruz (East), Mumbai. My heartfelt thanks also extend to Prof. Dr. Moshumi Datta, Secretary of BGA and Principal of N.K. College (Autonomous), Malad, Mumbai; Prof. Dr. Sanjukta Sattar, Joint Secretary of BGA and Head of the Department of Geography, University of Mumbai; Prof. Vilasrao Chawan, former Head, Department of Geography, B. K. Birla College, Advisory Member and former Vice President of BGA; Principal Dr. Hemant Pednekar, Advisory Member and former Vice President of BGA; Dr. Ramesh Gavit, Treasurer of BGA and Associate Professor in the Department of Geography, University of Mumbai.

Additionally, I would like to acknowledge the Governing Body Members of BGA: Dr. Dipesh Karmarkar, Research Guide and Head of the Department of Geography, Smt. CHM College, Ulhasnagar-3, and Shri. Dyaneshwar Bombe, Head of the Department of Geography, Sathaye College, Vile Parle, Mumbai, affiliated with the University of Mumbai. Their association in the publication of this book has been integral to its success.

I owe my sincere and special thanks to Prof. Dr. Savitsmita Vilasrao Chawan, Advisory Member and former President of BGA, and former Head of the Department of Geography, University of Mumbai for her invaluable support and expertise guidance in achieving the outcome of publication of this book.

I am immensely grateful to all the authors for contributing chapters on topics aligned with the theme of this book and for their timely submissions. I also extend special thanks to the editorial board for their diligent efforts in editing the entire manuscript.

Words are inadequate to express my deepest thanks to Shri Kirtibhai Sheth and Shri Deepak Seth, Directors of Sheth Publications Pvt. Ltd., for publishing this book with an ISBN. I also extend my gratitude to the faculty members of S.I.A. College of Higher Education, Dombivli (E), and the entire Governing Body Members of the Bombay Geographical Association for their support and good wishes in the publication of this book.



Dr. Nitinkumar M. Patil Faculty, the S.I.A. College of Higher Education

“Towards a Greener Future: Perspectives and Practices”

Preface

In an era of unprecedented environmental challenges, the imperative for rigorous action to safeguard our planet has never been more pressing. The accelerating pace of climate change, driven by anthropogenic activities, leads to biodiversity loss. This threatens the equilibrium of ecosystems causing disruptions in the foundations of life on Earth. Rising global temperatures, erratic weather patterns, and the intensification of extreme weather events are stark reminders of the urgent need for proactive measures to mitigate and adapt to the impacts of climate change. Additionally, biodiversity loss is driven by habitat destruction, pollution, overexploitation, and depletion of natural resources. Further, exploding populations and unsustainable consumption patterns aggravate the strain on finite ecosystems. It therefore calls for a lifestyle focussed on greener consumption as an imperative towards a greener future. It needs to be highlighted with increasing awareness as the urgent need for mitigating the increasing frequency and intensity of environmental challenges facing our planet. Exploring diverse environmental perspectives and practices towards a greener future becomes particularly significant in this context.

Against this backdrop, the present book “Towards a Greener Future: Perspectives and Practices” offers diverse insights and perspectives on the complex interactions between environmental conservation, sustainable development, and societal well-being. From exploring the role of media and social media in environmental conservation to examining the impact of climate change on agriculture and ports, the authors provide valuable research contributions to the discourse on sustainability. The interdisciplinary nature of the chapters reflects the complex nature of environmental challenges, underlining the need for collaborative efforts across various fields and disciplines.

Chapters 1 to 4 signify the role of media towards a greener future for our earth. The chapter “Use of Social Media for Environment Conservation” explores the innovative ways in which social media platforms can be leveraged to promote environmental conservation efforts. Chapter on “Role of Media for Environmental Conservation”, examines the crucial role of traditional and digital media in raising awareness and advocating for environmental conservation. “Role of Media in Water Conservation: A Case Study of the Paani Foundation” chapter focuses on a specific case study of an NGO and explores how media initiatives can be instrumental in mobilising communities and promoting water conservation practices. The chapter on “The Media’s Role in Environmental Conservation: A Catalyst for Change” explains the transformative potential of media as a catalyst for driving environmental conservation, emphasising its capacity to inspire collective action.

Chapters 5 to 12 provide multifaceted perspectives of environmental significance covering agriculture, tourism, rural development, demography, women empowerment and sustainability of ports. For instance, the chapter “Banana Cultivation in Jalgaon District of Maharashtra, India: A SWOT Analysis” evaluates the strengths, weaknesses, opportunities, and threats associated with banana cultivation, and offers valuable insights into sustainable agricultural practices. “Tourism in India: A SWOT Analysis” provides a SWOT analysis approach to examine the tourism industry in India. The chapter on “Rendezvous with the Carpet Industry for Rural Development: A Study in Malgaon Village, Uttar Dinajpur, India” examines the role

of the carpet industry in promoting rural development and livelihood enhancement. “A Consolidated Study of Demographic Differentials of SC Population in Punjab” examines demographic differentials among the Scheduled Caste population. “Employment Status of Women in Rural Kolhapur” sheds light on the employment status of rural women and highlights the challenges and opportunities for their economic empowerment. “Government Schemes in India for Empowerment of Women Through Education” provides an overview of government schemes in India aimed at empowering women through education. The chapter “Climate Resilience in Agriculture: Investigating the Role of Millets in Promoting Sustainable Development Goals” investigates the potential of millets in enhancing climate resilience in agriculture and offers insights into sustainable farming practices that contribute to achieving the UN Sustainable Development Goals. The chapter “Climate Change and Sustainability of Ports: A Case of Mumbai” focuses on the Mumbai and the JNPT ports and explores the impact of climate change on port sustainability, highlighting the need for adaptive measures to mitigate environmental risks and ensure the resilience of port infrastructure.

The chapters in this book are based on the selected paper presentations made at an Interdisciplinary National Level Conference in Hybrid Mode on ‘Environment, Development and Sustainability An Inclusive Approach for Resilient Future’ held on 17th February 2023 at The S.I.A. College of Higher Education, Dombivli (E) With IQAC Affiliated to University of Mumbai, Dombivli in collaboration with The Bombay Geographical Association housed in the Department of Geography, University of Mumbai. The contributors to this book are from varied disciplines with multidisciplinary approach to the theme of this book.

These chapters thus offer multi-spectral investigations with diverse themes related to environmental conservation, sustainable development, and societal well-being. We extend our heartfelt gratitude to all the contributors for enriching this volume. Their dedication and expertise have made this publication an effort towards the feasibility of a positive step toward a greener future. We are sure that scholars, researchers, policymakers, practitioners and society from diverse backgrounds will find this book a valuable resource for gaining insights into the pressing environmental issues of our time and investing individual efforts towards conservation of our mother earth. As editors, we sincerely hope this book will initiate further research, dialogue, and action towards achieving a more sustainable and resilient future for generations to come.

Dr. Sumant E. Autade

Associate Professor,
Department of Geography,
Rashtriya Shikshan Sanstha's
Swami Vivekanand Night College of Arts and Commerce
Dombivli East, Maharashtra – 421201.
May, 2024.

“ Towards a Greener Future: Environmental Perspectives and Practices”

S.N .	Title	Author	Page No.
1	Use of social media for Environment Conservation	Ashutosh Saxena	1-5
2	Role of Media for Environmental Conservation	Ms. Meenakshi S. Lokam	6-10
3	Role of Media in water Conservation: A Case Study of the Paani Foundation	Medha V.Dhapre	11-20
4	The Media's Role in Environmental Conservation: A Catalyst for Change	Jitendra Pol	21-28
5	Banana Cultivation in Jalgaon District of Maharashtra, India: A SWOT Analysis	Dr. Nitinkuma M. Patil Mr.Rooshike Jade	29-37
6	Rendezvous with the Carpet Industry for Rural Development: A Study in Malgaon Village, Uttar Dinajpur, India	<i>Dr. Tapas Pal</i> Dr. Deep Narayan Pandey	38-49
7	Climate Resilience in Agriculture: Investigating the Role of Millets in Promoting Sustainable Development Goals	Rukmani Kumari Sachin Deore	50-56
8	Employment Status of Women in Rural Kolhapur	Shri Sanjay N. Patil, Dr. Deepak S. Narkhede	57-63
9	A Consolidated Study of Demographic Differentials of SC Population in Punjab	Dr.Preeti Chauhan	64-78
10	Government Schemes in India for Empowerment of Women Through Education	Prof. Narayan Mohan Lad	79-86
11	Climate Change and Sustainability of Ports: A Case of Mumbai	Dr. Dipesh Karmarkar	87-96
12	Tourism in India: A SWOT Analysis	Mrs. Shilpa Nimbre Mrs. Bhavna Dhande	97-104
13	Tribal Cultivators in Nashik District, Maharashtra	Ekanath Sitaram Nirmal	105-111
14	Poverty Alleviation Through Financial Inclusion in India	Mrs.Megha Vignesh Mrs.kavitha Nadan	112-118

1. USE OF SOCIAL MEDIA FOR ENVIRONMENT CONSERVATION

Ashutosh Saxena

Assistant Professor, Department of Commerce, Jai Hind College, A Road, Churchgate,
Mumbai 400 020

Abstract

Social media through its various forms like Twitter, Instagram, Facebook, etc. has been of immense support in improving the base for developing the overall consciousness among youth to maintain effective environment conservation. The different social media channels have been especially effective in making today's well-informed and well-connected youth take a lot of non-personal and non-time initiatives which can be mega initiatives for the future. One of the recent initiatives is by Mama Earth wherein they are planting a sapling for every product which is purchased by the user. One such initiative is also the use of bicycles in place of fuel-based vehicles, which can be a big revolution in public transport in the future, wherein every youth would be willing to switch to eco-friendly and pocket-friendly vehicles as compared to high-tech vehicles for transportation purposes in the future.

Keywords: *Environment Conservation, Public Transport, Replenishment, Pocket-Friendly Vehicles.*

Introduction

The use of social media is necessary to maintain a better ecological balance. It is further a connecting tool that is well connecting the modern youth. In the context of empowering the youth to take up the challenge of managing the environment on priority, one of the fastest and the impactful impacts is truly made by social media. On average one can realize the immense impact on conservation and replenishment of the environment, which is provided very effectively at least for the awareness through social media. The researcher finds that there is truly very limited or no significant impact of social media, which is useful in managing the required conservation of the environment.

Objectives

In the present research paper, the researcher emphasizes how social media can be an effective tool to increase broader awareness to enhance environmentally responsible citizens of the future via the youth section of society-

1. Increasing environmental cause viewership; there is certainly more

2. Better and ideal customer retention: There is a need to retain better customer satisfaction for the given business, which is very necessary not just for improving the business, but also to ensure improved business participation by the employees.

3. Increasing better work performance there is a direct focus of the business to ensure a more responsible and better idea for making a better and more focused stage of the business growth. This leads to managing the requirements of the business in the long term.

Review of Literature

1. W. Pearce (2019) in his paper viz. 'The Social Media Life of Climate Change' has provided insight into how there is a transformation in the climate and the relative impact of social media in handling climatic change and making strategies to increase the climatic changes in a given business.

2. T. Toivonen (2019), in his paper on 'Social Media data on conservation science' has given the basics of developing the strong dimensions of conserving nature. There is a strong need to ensure that business and social integration take place simultaneously in the business, due to which it is necessary to maintain proper use of social media for inculcating positive consumption habits.

3. E. N. Spotswood (2021), in the paper on "Nature inequity and higher covid 19 case rates in less green neighbourhoods in the United States' has provided a strong base for integrating social media with business needs. This is further very useful in helping the existing business processes, which is a strong factor leading to favourable business returns.

4. M. I. Espinoza (2021) in the paper on 'big data for climate action or climate action for big data 'has provided inputs for making a positive climate change, which is a pathbreaking effort to manage the climate change and at the same time spreading timely awareness among students to use eco-friendly habits.

5. A. Ghermandi (2019) In the research paper titled, 'Passive Crowdfunding of Social Media in Environmental Research gives a basic and clear idea of how crowdfunding can be an effective tool to ensure a more and accurate base for realizing business objectives and making them synchronized with advertising objectives.

Hypotheses of Research

The researcher presents the following hypotheses in the present research,

Null Hypotheses

‘Social media is not effective for Environment Conservation’

Alternative Hypotheses

‘Social Media is effective and impactful for Environment Conservation’

Assumptions

The following are the assumptions of the present research:

1. Social media not only has a strong Global impact but also influences the consumption patterns of consumers.
2. There is an increasing contribution of the eco-friendly base of consumers.
3. The consumers are keener about minimizing the ecological impact of consumption.
4. Social media supports increasing discipline in consumers in terms of spending.
5. The youth consumers give equal importance to using products and ensuring their efficient disposal.

Research Methodology

1. In the present research the researcher has given importance to a combination of primary data and secondary data for making better decisions.
2. The sample size referred by the researcher in the given research is 200 respondents.
3. The researcher has been particular about using random data to remove the sample bias, further researcher is focused on enhancing the quality of research by interviewing youth and understanding their perceptions.
4. The researcher has a preferred degree of freedom.
5. In the present research the researcher has focused on increasing data on how the references and choices of youth are changing towards green consumption.

Data Analysis of Research

1. The researcher has referred to the impact of various social media used by youth for doing the research, not just this he has identified how they contribute to increasing environmental consciousness.
2. According to the random samples collected by the researcher about 78% of the respondents are already sensitized to the concept of environment awareness.
3. Not just this, many respondents wish to actively contribute to the cause of a green environment but they are not able to do the same regularly.
4. About 12% of the respondents regularly share updates on the environment and are very supportive of making proper use of social media to make the mass awareness campaign a grand success for mobilizing youth for the cause of ecology.
5. There is also a small initiative suggested by researchers of sending regular podcast messages to like-minded people to further take up the cause of natural conservation.

Problems/Limitations of Existing Research

1. In the present research there is more orientation only on youth who may not always be influenced by social media.
2. It would be too early to comment on how there is better integration of the environment and youth consumption habits.
3. The youth are often found to be casual in their approach and do not support environment conservation.
4. Times youth do not take the right steps to enhance environmental quality which leads to unexpected repercussions for the next generation.
5. It requires more focus and discipline for youth to increase the environmental quality and decrease the side effects of overconsumption.

Suggestions

1. The researcher hereby submits that it requires regular and focused efforts to ensure better and more integrated environmental solutions from youth.

2. In addition, the researcher further adds that unless and until there is a better strategy from youth to improve the environment quality, there cannot be a certain future.
3. The researcher therefore identifies that there is a need to ensure more stronger base of qualitative environment research which can help in satisfying the objectives of a sustainable environment.
4. The researcher further investigates how there can be a more dynamic and better base to coordinate the given research to easily achieve the objectives.
5. There is a focus on youth to develop better credibility and ensure clarity of satisfying environment conservation objectives for a cleaner society in the future.

Conclusion

The researcher thus strongly advocates that it is through constructive and positive thinking by youth, that there can be right steps that can lead to balancing the need for a better environment along with increasing consumption of resources. It further needs a better and more integrated use of resources, which are crucial for given businesses to ensure that there is participation of youth and thus leads to improving benefits and returns for the next generation in terms of a cleaner environment and better-quality ecological balance.

References

1. Alan Barakat. et. al, (2023)' Social Media's Role on Sustainable Fashion Education A quantitative study of social media in promoting sustainable Fashion Education for consumers and companies in the Fashion Industry'. DOI .10.13140/RG.2.230566.80963 April 2023
2. Brenda Scholtz. et al. (2017) Evaluating student's social media use of extracurricular education. Journal of Applied Research in Higher Education.
3. www.economicandpoliticalweekly.com
4. www.economictimes.com
5. www.nationalgeographic.com

2. ROLE OF MEDIA FOR ENVIRONMENTAL CONSERVATION

Ms. Meenakshi S. Lokam (M. Com, SET)

Assistant Professor, Department of Accountancy, Patkar -Varde College, Goregaon (W),
Mumbai 400062. Email: meenakshilokamofficial014@gmail.com

Abstract

Environmental conservation is an important factor in long-term sustainability. The main purpose of this paper is to explore more about the environment in which we are living and to understand the importance of conversation about the environment. At the same time, this study also focuses on the role of different media in environmental protection or conservation. This study analyses the media's contribution to the safeguarding of the environment. The data used in this study is secondary data, which is derived from reviews of related research papers, articles, news, and books. Whichever data is used in the paper is mentioned at the end of the paper. This study will help to understand how various media are contributing towards solving environmental issues and also find out the role of media in creating awareness about them among a large audience.

Keywords: *Environment, Environmental conservation, media, Environmental issues, Environmental awareness.*

Introduction

There has been life on the Earth for over a thousand million years. Humans are the most evolved animals on earth. Only humans have developed thinking and reasoning abilities. As humans' brains started to develop, they learned to use natural resources like wood, water, soil, animals, oils, etc. to satisfy their needs. But as the human population increased, their demand also increased, which led to the exploitation of the earth. For example, cutting down trees to get wood or to use land for cultivation leads to deforestation. Deforestation results in the extinction of many valuable plants and animals. Apart from this, in earlier days, humans were killing animals only for meat, milk, skin, etc., but soon they started to kill animals for sports or pleasure. In the current scenario, luckily, humans have started to realize the importance of the environment and have taken the initiative to protect and sustain it. Examples: Chipko movement, Narmada Bachao Andolan, Bishnoi movement, etc.

Now we will talk about the role of media in environmental awareness and conservation. Traditionally, there have been media tools such as television, radio, journals, magazines, and newspapers that play an important role in spreading awareness

among people about the environment. In the modern world, people are now using new media tools like Facebook, Twitter, Instagram, WhatsApp, YouTube, Google, etc. for collecting information and entertainment. In this paper, we will discuss how all this media is contributing to spreading information and motivating people to protect and sustain our environment.

Objectives

1. To understand the importance of conservation of natural resources.
2. To explore the role of media in the protection, awareness and conservation of the Environment.
3. To find out the use of media to aware youths of Environmental Conservation.

Methodology

This paper is based on secondary data collected from authentic websites and their standard articles. The data collection process involved reviewing more than 15 research papers and a few books. At the end of the paper, a few references are mentioned.

Literature review

In the paper (Role of Media in Conserving the Environment, Saneh, December 2018), the author talks about environmental awareness more than environmental conservation. This is because people will give their contribution towards environmental conservation when they are aware of environmental issues. The author explained how newspapers, television, radio, social media, etc. play an important role in environmental awareness. At the end of the study, the author concluded that media, especially digital media, play an important role in environmental awareness. (Role of media in enhancement of environmental awareness, Anil Kumar Jharotia) In this paper, the author explains the contribution of various media in creating awareness about environmental issues. To convey his point, he has enlightened many initiatives taken by various media, like print media, broadcast media, social media, etc. He also talks about the various initiatives taken by the government to make people aware of pollution-related issues. According to the author, print media like newspapers, magazines, journals, etc. are traditional but evergreen forms of communication and play an important role in awakening people to their responsibility for the environment. The second most important media, as per the author, is social media, because of its rapid growth.

Results and Discussion

The present study attempts to understand the role of Media in environmental conservation. Based on the secondary data, the study reveals the following aspects.

Environmental Conservation

The term environmental conservation can refer to anything we do to protect our environment and conserve its natural resources. In simpler terms, we can explain environmental conservation as the management of natural resources, in a way, to retain diversity and balance in nature, but the point is that humans will conserve the environment only when they realize how they are harming it and why they should not harm it. To make them understand, it is necessary to convey information about environmental issues to them. This need is fulfilled by the media.

Contribution of Media to Environmental Awareness and Environmental Conservation

Print media

Print media includes tools like newspapers, magazines, journals, etc. The print media, especially newspapers, play an important role in making people aware of what is going on around them. The various articles about the environment, news related to issues facing the environment, news related to the movement that has been started to conserve the environment, etc. play a crucial role in making people aware of and motivating them to give their contribution to environmental conservation movements. Dainik Bhaskar has started the “Ek Ped Ek Jindgi” campaign in the last few years. This campaign aimed to awaken people before it's too late.

Television

Television has auditory and visual features; hence, it does not require any literary knowledge to understand the message. It is ageless media, which means it is watched by everyone, whether children or adults. Its audio and visual effects attract the viewer most. People can be educated, aware, and motivated by environmental conservation by watching films, serials, and advertising about environmental issues. Some of the films that raise environmental issues are Robot 2.0, Kadvi Haava (2017), and Bhopal Express (1999). Apart from this, news channels like ABP MAZA, Aaj Tak, India Today, etc. also bring environmental issues to the world's attention. The nation's leading TV channel group, NDTV, launched a Toyota green campaign in 2008. This constant 24-hour

program has been started, and many stars and celebrities have participated in it. It was an effort to raise people's awareness about environmental issues.



Radio

Radio is a traditional and effective medium of communication. In earlier days, when social media was not as active as today, the radio played a very important role in communication. Although radio is still heard today, its popularity has declined since social media like YouTube, Instagram, and Twitter have become popular. Traditionally, government channels in the radio medium do a better job of promoting social and environmental issues, but this medium is disappearing now, or we can say it is being replaced by social media tools.

Digital media

Digital media includes all those media that are created and consumed through digital technology, like websites, blogs, podcasts, online videos, etc. Some websites that help in learning about environmental conservation are TreeHugger.com, Oceana.org, WorldWildLife.org, etc.

Social media

The modern tools of media are social media like WhatsApp, Twitter, YouTube, Instagram, etc. Although it is part of digital media, it plays an important role in making people aware of environmental conservation; hence, it is explained separately. A recent national survey in India indicates that 60% of youngsters aged 9–17 spend more than 3 hours daily on social media. With the help of social media, organizations or individuals can share information about environmental issues with a large audience. For example, if people are aware of the impact of plastic on the environment, they may be more likely to

use reusable bags and containers.

On the other hand, speeches about environmental protection are also helpful in raising public awareness about environmental issues. Social media can be used to share speeches by environmental experts and policymakers. These speeches can inspire people to take action and make a positive change in their communities.

Conclusion

From this study, we can conclude that environmental awareness is a first step in environmental conservation, and the government and various institutions are taking the initiative to educate people about environmental conservation. Media such as print media, television, radio, social media, and digital media are the mediums through which governments and other institutions can convey their messages to the public. By using these media correctly, governments or institutions can also motivate people to engage in environmental conversations. All of this media, print media and social media play an important role in attracting the world's attention to environmental issues.

Reference

1. ROLE OF MEDIA IN CONSERVING- Saneh, Assistant Professor in Geography, C.R.M.Jat College Hisar (HR)
2. Environmental studies, author Benny Joseph Environmental studies and Ethics – Gouri Suresh https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4674890
3. https://scholar.google.com/scholar?start=10&q=research+paper+on+environmental+conservation+&hl=en&as_sdt=0,5#d=gs_qabs&t=1706846560025&u=%23p%3DOsBH1aoVhz8J
4. https://scholar.google.com/scholar?start=20&q=research+paper+on+environmental+conservation+&hl=en&as_sdt=0,5#d=gs_qabs&t=1706846693197&u=%23p%3Dl6m3y0vQbaIJ
5. <https://www.dainikbhaskargroup.com/social-initiatives>.
6. <https://www.google.com/amp/s/www.indiatoday.in>
7. https://www.researchgate.net/publication/311899164_Environmental_preservation_A_path_towards_sustainability_and_economic_sustenance
8. https://www.researchgate.net/publication/323751233_Role_of_Media_in_Enhancement_of_Environmental_Awareness
9. https://www.researchgate.net/publication/323751233_Role_of_Media_in_Enhancement_of_Environmental_Awareness
10. https://www.researchgate.net/publication/353164121_ENVIRONMENTAL_CONSERVATION_AND_MANAGEMENT

3. ROLE OF MEDIA IN WATER CONSERVATION – A CASE STUDY OF THE PAANI FOUNDATION

Medha V. Dhapre

Head, Department of Political Science,
DES's Kirti M Doongursee College, (Autonomous), Dadar, Mumbai
Email: dhapremedha16@gmail.com

Abstract

Water is the most precious natural resource because the water available for human consumption is less than 1%. Rising global population, increasing urbanization, and industrialization are adding to the water woes. It is predicted that the non-availability and inadequacies of pure water will lead to serious conflicts among nations. To meet the challenges of the 21st century, water management is the need of the hour. Similarly, awareness of water conservation must be emphasized. The state and central governments are focussing on water conservation through its laws, policies, and programs, but the expected results are not achieved. This requires an approach of participatory governance, which implies stakeholders' participation in the government's efforts to make those effective and widespread. This can be ensured with the initiatives of the civil society. The endeavours of government and civil society can be influential if the media gives exposure to them. The traditional media include print, broadcast, and support media; and the modern media is the digital media, which involves the use of the internet. The youth are swayed by the social media platforms like Facebook, and YouTube. The government and civil society-National and International- reach communities through the extensive utilization of digital media.

Keywords - Water scarcity, Participatory governance, civil society, and Digital media.

Introduction

Water resources are vital for maintaining ecosystem health, promoting economic activity, and preparing for climate change. Effective resource management and protection are essential for the welfare of present and future generations. Water is necessary for all life, including that of humans, animals, and plants. It is essential for staying hydrated, preserving biological processes, and protecting ecosystems. Human survival is not possible without water. It is evident from history that all civilizations are on the river banks and human evolution is along the side of the water. The earth has 70% of water and 30% of the land. The mass of water may seem more than the landmass but the available freshwater is only 3% and the rest of 97% is saline water in oceans and seas. Out of that 3% freshwater available for human consumption, for animals, birds, and plants, 79% is in the form of glaciers, groundwater is 20% and accessible surface water is only 1%. (USGS, 2019).

The rate at which the supplies are running low is alarming. Due to both the competing demands of economic expansion on natural resources and the world's rapidly expanding population, there is an increasing shortage of safe water to consume. Consequently, increased demand accelerates the rate at which the population experiences water stress by increasing pollution, loss of natural ecosystems, and groundwater depletion.

Not only is the population growing, but there is also the intriguing and attention-grabbing premise that per-person consumption is also on the verge of increasing. The reasons for this are industrialization, urbanization, and globalization. The changing lifestyle is one of the root causes of the water scarcity. “More than 2 billion people live in countries experiencing high water stress. The situation will likely worsen as populations and the demand for water grow, and as the effects of climate change intensify.” (UN Water, 2021). So almost one-fourth of the global population is deprived of life's fundamental requirements. Any other resource cannot replace water. Since the amount of water scarcity in the world is growing daily, water conservation is imperative. Depletion of groundwater and climate change causing unpredictable floods and droughts constitute highly sensitive issues. The policies and programs implemented by the government alone are not producing the desired outcomes. It will take a paradigm shift from a state-centric to a people-centric approach to ensure that people are aware of and participate in initiatives to preserve the environment.

Large-scale public participation will ignite a movement that will significantly contribute to environmental conservation and preservation. Since times immemorial mass media has been instrumental in generating awareness and educating people about environmental concerns. By creating awareness through a range of means, including news coverage, educational information, sharing success stories, documentaries, projection, and data dissemination, the mass media can significantly impact the adoption of water conservation practices.

Objectives

1. To understand the water crisis and methods to overcome scarcity.
2. To explain the need for enhanced public responsiveness and participation for water governance.

3. To know different types of media and its use by Government and Non-Governmental organizations (NGOs).
4. To examine the contribution of media in generating awareness about environment and water conservation.
5. To understand the limitations of the media's contribution to the conservation and protection of the environment.
6. To analyze the role of traditional media vis-à-vis modern media.

Methodology – A case study method was adopted for the research. A mixed method of Qualitative research was adopted, by referring to the articles and websites.

Result and Discussion

Media: 'Man is a social animal' said the famous political thinker Aristotle and with the urge to communicate with others and to share information the concept of media had emerged. Media is a method of communicating, sharing information, and entertainment to a large population in a short time.

Types of media: Print media- News reports and articles in periodicals are the earliest sources of communication. Books are a good source of education and information. It is the publishing of data and research-derived information. Investigative journalism is focused on how regulatory and legal violations lead to environmental deterioration, water pollution, and contamination incidents.

Broadcast media –A significant portion of the literate and semiliterate populace, may easily access and enjoy a broad range of media via radio, television, and films. It can rise above a language barrier and can be an effective method for communicating with many people. Support media – Posters, banners, signs, and hoardings can become pictorial and eye-catching. It being constant and stationary, can generate awareness among large people which may be rural and semi-literate.

Digital media- Every kind of media that can be executed, examined, stored, and disseminated by electronic digital gadgets is considered digital media. The term digital media refers to content and marketing that are made available via digital platforms, such as computers, smartphones, podcasts, and applications, including electronic media. Websites, blogs, social media, podcasts, online news, mobile apps, streaming services, e-books, and

so on. With a variety of methods, digital media is reaching a big chunk of the young and vibrant population. Print, broadcast, and support media are the traditional media. Young people are enthusiastic users of digital media, which is a modern and contemporary form of media. The intended paradigm shift can be accomplished and involvement can truly become participatory if future generations become conscious of the necessity to conserve and manage natural resources.

Methods of Media Outreach: The media plays a crucial role in environmental conservation across various dimensions like education, raising awareness, advocacy, promotion of conservation initiatives, and dissemination of facts and information. The government and civil society extensively utilize these methods. Among civil society, various International Non-governmental organizations (IGOs) and non-governmental organizations (NGOs) use print and digital media widely. In the **Government**, the water departments at the central and state levels, the autonomous institutes, and regulatory authorities spread awareness and information through print and digital media.

The **Jalshakti Mantralaya** (Department of Water Resources, River Development, and Ganga Rejuvenation) has its website to generate awareness and disseminate information about available water resources and their management.

Central Water Commission through the website, the commission disseminates information about the nation's hydrology, water available in reservoirs and rivers, construction of dams, and status of irrigation in India.

Maharashtra Water Resources Regulatory Authority (MWRRA) was established in 2005, its website provides information about the water policies, legislations, and water resources data in the state.

Governmental schemes and policies- For water management and optimum utilization of this natural resource, the central and state governments have floated different schemes and policies. The government uses print, broadcast, and digital media to popularise and sensitize masses about the water conservation schemes like Jalyukta Shivar, Har Ghar Jal, More Crop per Drop, and Mission Paani.

International Non- Governmental Organizations (IGOs) namely **UN Water** play a significant role in the sharing of water facts and success stories of water conservation adopted throughout the globe.

In India, Non- Governmental Organizations (NGOs) have a vast network and are influencing and moulding public opinion for water conservation and management. Mention a few are -**South Asia Network on Dams, Rivers, and People (SANDRP)**, is a non-official network that focuses on issues about rivers, communities, and large-scale water infrastructure, such as dams: their performance, the effects they have on the environment and society, and governance concerns. It does this by publishing blogs on its website.

Watershed Organization Trust (WOTR), is a think tank that works with diverse stakeholders from a range of industries to collaborate at the nexus of practice, knowledge, and policy at different scales. Water and food availability, livelihoods, and income security are all priorities for WOTR to support the sustainable growth and well-being of marginalized and vulnerable populations in rural India.

The India Water Portal is an online resource that fosters community development and knowledge sharing regarding water and related matters in India. The Portal has developed into a useful repository for information on water, including working papers, reports, data, articles, news, events, opportunities, and conversations. It's now a location to talk to water experts, exchange experiences and solutions, and find out about what other people are doing in India to manage water sustainably.

Case Study - Paani Foundation: '*Satyamev Jayate*' (2012-14) was a popular talk show on Indian National Television '*Star Plus*' based on the prevalent social issues like child abuse, and female foeticide. It was hosted by Mr. Aamir Khan, an eminent and renowned film celebrity. One of the episodes was about increasing conflicts arising out of water scarcity.

Based on the experiences of these social problems, Mr. Amir Khan, Mr. Satyajit Bhatkal, Dr. Avinash Pol established Paani Foundation in 2016, to tackle the water scarcity in Maharashtra and to make villages water sufficient. Novel method of people's participation was adopted, and that was the competition among villages for water conservation and sustainable agricultural practices.

The following competitions are organized –

Satyamev Jayate Water Cup (2016 – 2019) -It was an annual 45-day competition to improve soil quality and increase water storage in the villages. The two primary components of this competition were training and *Shramadaan*, or voluntary manual labour. Through a four-day comprehensive residential training session, the villagers received training in the fundamentals of managing watersheds, inspiration for battling drought, and several freely available tools to assist them along their path.

The villagers received training in watershed management. After acquiring instructions in watershed management, the participating villages, the villagers with other ‘*Shramadan*’ volunteers with a lot of enthusiasm built the water-saving structures and gathered funds for machine work, and soil testing.

Through the Water Cup platform, citizens can deal with the issue of water shortage collectively, end the cycle of dependence on the government, and feel the pride of creating an ample water supply in their village on their own.

For *Shramadan* the volunteers participated from urban, peri-urban, and semi-urban areas. The registration was carried out through the online forms. A huge mass gathering for this competition could be achieved with the media coverage on the ABP Maza program titled ‘*Toofan Aalaya*’. (Strom has arrived).

Satyamev Jayate Samruddha Goan Spardha (Prosperous Village Competition) (2020 onwards) - This competition aimed to get villages to focus on water management and environmental restoration rather than just water conservation. The villagers persevered and worked hard despite all the challenges that COVID-19 presented. Among their many accomplishments were planting more than 2 lakh seedlings, organizing a large-scale well water monitoring program for more than 7,000 wells, and establishing nearly 600 protected grasslands. During the COVID-19 period, training and webinars were carried out on digital platforms in collaboration with the Vedantu and Zoom meetings reaching 861 villages and training 1,762 villagers. (Paani Foundation website).

Satyamev Jayate Farmers’ Cup (2022 onwards) : In contemporary times of climate change, farmers are among the most vulnerable and adversely affected groups of people. Their livelihoods are still severely impacted by unpredictable monsoons, high temperatures,

declining soil health, and other issues. Incorporate the difficulties brought on by unstable markets, insufficient financial stability, and restricted availability of scientific farming expertise.

The lone farmer cannot overcome these obstacles on his or her own. Nevertheless, effective case studies have demonstrated that when farmers band together, they may increase their resources, strengthen their negotiating position, and provide mutual support during difficult times. Farmers are given the platform to achieve precisely that through the Farmer Cup. It gives people the ability to band together, acquire scientific farming methods for free, and get the tools they need to tackle the problems brought on by climate change.

Soon after the pandemic subsided in 2022, the competition started, and it is still going strong today. By cooperating and cutting labour and input expenses, the top-performing farmer groups in the first year (2022–2023) were able to save a total of 1.4 crore rupees. Additionally, they saw an astounding 108% increase in profit per acre. (Paani foundation website).

Online resources- the Paani Foundation has a large chunk of free online resources on its website, which is accessible. These sources are audio-visual also animated with the characters Chaturrao and Chaturatai, thus making them very popular among villagers.

Watershed management – There are 45 short films about the development of watersheds. These include different topics like how to construct the CCTs (Continuous Contour Trenches), how to dig a soak pit, make a hydro-marker. These films are in Marathi to reach a vast audience and also have English subtitles.

Sustainable agriculture - There are 45 short films about soil testing, preparation of manure, and vermicompost. These are in Marathi so those are impacting the minds of the masses.

Digital Farming Schools (*Sheti shalas*) –In collaboration with the best agricultural colleges in Maharashtra, we hold digital farming schools, or "sheti shalas," during the cropping season. Farmers can get free education on around thirty different crops' optimum production techniques. They also gain access to a platform that allows them to communicate directly with top experts and obtain real-time answers to their questions. It was an online interactive program.

Toofan Aalaya- TV show (from 2016 till date)

ABP -Majha and other channels telecast the success stories of the Water Cup and the Farmers' Cup in the show titled *Toofan Aalaya*. The previous shows are now available

on YouTube. This acts as a motivating factor for those who are willing to put in their efforts.

Paani Foundation has a wide cover of the media. The publicity given to the water cup competition and participation of urban and peri-urban populations through *shramadan*, reached some 1,75,000 persons per day for 45 days in 2019.

Satyamev Jayate Water Cup (2016 – 2019)

Year	Participations of districts	Participation of talukas	Participation of villages	Training is given to no. of persons	No. of Participants in Shramdan (daily for 45 days)	Water storage capacity (in crores of litres)
2016	3	3	116	850	10,000	1,368
2017	13	30	1321	6,000	65,000	8,261
2018	24	75	4025	20,000+	150,000	22,269
2019	24	76	4706	25,000	175,000	23,213

Source: journals.sagepub.com/doi/10.1177/09728201231191349 (Mody,2023)

During the Water Cup, a total of 55,000 Crore Litres of water storage capacity was created and the market value of this water is 11,020 crores. (Paani Foundation Website).

Social media presence – The Paani Foundation is very active, vigorous, and effective on social media like Facebook, and Instagram. The following table elaborates it further.

Social Media Sites	Facebook	LinkedIn	Twitter	Instagram	YouTube
No. of Followers	261,000	3,000	151,000	54,000	351,000

Limitations of media

- Accessibility of mass media is limited due to the ‘digital divide’.
- Few members of society are interested in information about environmental issues and are willing to take any action about the protection and conservation of the environment.
- For print and broadcast media knowledge of language is very fundamental, and so becomes a hurdle in effective communication.
- Limited coverage by the print and broadcast media. The national news channels have coverage of environmental issues is 2%, which includes environmental

accidents leading to environmental hazards, increasing carbon footprints, high levels of the Air Quality Index, and depletion of natural resources like fossil fuels, and groundwater.

- Media coverage is given only when any disaster occurs causing pollution and contamination of the natural resources. Else on days of international importance like Water Day on 22nd March, Environment Day on 5th June, and Earth Day on 22nd April the stories projecting doomsday are published

Way forward

- Green journalism should be developed and encouraged instead of yellow journalism. Need for eco-journalists in print and digital media to take up the specialized issues and future threats of environmental hazards.
- Regular features and articles should appear in print and broadcast media to motivate conservation by giving wide publicity to the success stories of participatory conservation. It should focus on mass participation through the tiny steps at the individual, and family levels, and educational institutes should felicitate students as *Urja-Mitra* or *Jal-Sakhi*. These brand ambassadors of environmental conservation should be publicized by the local media.
- The impact of celebrities from media like film and TV actors, and social influencers is high among youth. These celebrities should project a sustainable lifestyle – like clothes, and food habits. So young minds will be involved in the conservation and management of water and other natural resources.

Conclusion

The study reveals that, the media plays an important role in the implementation of water conservation program. The movement of water conservation under Paani Foundation has reached up to the common man through media. Broadcasting of success stories through media however, should effectively put forth the process of water conservation, so that, the youth of the nation should get involved in this movement.

References

1. journals.sagepub.com/doi/10.1177/09728201231191349 (accessed on 10-2-24)
2. Mody, Pallavi. Srivastava, Sushmita. '*Paani Foundation: A Gamified Approach to Water Crisis in Rural India*', Sage Journals, September 21, 2023.
3. National Journal of Multi-Disciplinary Research, January 2017
4. Paani Foundation <https://www.paanifoundation.in/> (accessed on 11-2-24)
5. Saikia, Ruksana. *Role of Media in Environmental Awareness*
6. UN-Water, 2021: Summary Progress Update 2021 – SDG 6 – water and sanitation for all. Version: July 2021. Geneva, Switzerland
7. Water Science School. '*The distribution of water on, in, and above the Earth*'
8. <https://www.usgs.gov/media/images/distribution-water-and-above-earth#:~:text=About%2071%20percent%20of%20the,percent%20of%20all%20Earth's%20water.> (accessed on 10-2-24)

4. THE MEDIA'S ROLE IN ENVIRONMENTAL CONSERVATION: A CATALYST FOR CHANGE

Mr. Pol Jitendra Bharat - Research Scholar - Department of Geography, University of Mumbai,

Abstract:

This paper explores the pivotal role of the media in environmental conservation efforts, serving as a catalyst for change. In today's digitally connected world, media platforms wield significant influence in shaping public perceptions, attitudes, and behaviors towards environmental issues. Through various mediums such as television, newspapers, social media, and documentaries, the media has the power to raise awareness, foster environmental literacy, mobilize communities, and hold stakeholders accountable. This paper discusses the ways in which the media can effectively communicate environmental challenges, showcase success stories, and inspire collective action. Furthermore, it examines the potential pitfalls and biases inherent in media coverage of environmental issues, highlighting the importance of balanced and accurate reporting. Drawing on case studies and empirical evidence, this paper underscores the need for collaboration between media professionals, environmentalists, policymakers, and the public to leverage the full potential of media in advancing environmental conservation goals. Ultimately, it argues that the media has a responsibility to not only inform but also to empower individuals and communities to become stewards of the environment.

Keywords: Media, Environmental Conservation, Awareness, Advocacy, Public Perception.

Introduction:

The unique challenges created by the global environmental catastrophe call for swift and coordinated action. The scope and complexity of environmental concerns, which range from pollution and deforestation to climate change and biodiversity loss, necessitate creative solutions and broad participation. In this situation, the media shows itself to be a potent partner in the battle for environmental preservation. The media is vital in creating awareness, rallying support, and influencing policy change because of its capacity to spread information, create narratives, and impact public conversation. This essay explores the

media's capacity to act as a catalyst for good change as it looks at its varied role in environmental conservation initiatives.

The media's broad impact on society attitudes, behaviour, and perceptions has made the contemporary era's unparalleled degree of interconnection possible. With environmental issues like pollution, biodiversity loss, and climate change becoming more pressing, the media's role in promoting environmental protection is becoming more and more important. The media, from conventional mass media to the quickly changing world of social media and digital platforms, is a potent tool for spreading knowledge, inspiring people to take action, and bringing about revolutionary change.

This paper discusses the complex dynamics surrounding the media's contribution to environmental preservation, outlining its wide-ranging effects and examining the potential and difficulties it raises. We want to explore how the media can be a constructive force for change in the sustainability space by looking at the ways that it affects environmental advocacy, awareness, and action. Additionally, we examine the moral dilemmas and hazards related to media coverage of environmental concerns, highlighting the significance of media literacy and responsible journalism in navigating the information world.

As we handle this conversation, we do so across an extensive variety of media platforms and communication tactics, from more established channels like radio, newspapers, and television to the rapidly expanding fields of digital media and social media. By using both theoretical frameworks and empirical observations, our goal is to emphasise how important the media is in bringing people together to fight for sustainable development and environmental conservation.

We also study the narrative framing and storytelling's transformational potential in influencing public opinion and encouraging empathy for environmental issues. We illustrate the potential of media as a medium for amplifying voices, promoting solidarity, and enacting change in behaviour by explaining the power of engaging tales and visual images in rallying individuals and communities.

Whereas the media has the ability to be a positive force in the world, we must also be aware of the dangers of false information, greenwashing, and sensationalism that are present in the conversation on environmental concerns. We shed light on the necessity of media literacy and discernment in negotiating the challenging landscape of environmental communication through critical analysis and case studies.

Objectives of the study:

- To study the concept of environment.
- To know awareness about environmental issues.
- To evaluate how the media shapes the environment Activist

Meaning of environment:

The surroundings or conditions in which an organism, person, or system functions or lives are referred to as the "environment". It includes all of the natural environments—soil, water, air, and temperature—as well as the biological, social, and cultural elements that affect the species that live there. The term "environment" refers to a wide range of factors, including interactions between man-made and natural components. It is essential in determining how organisms behave and evolve, as well as how effectively ecosystems function. Natural resources and ecosystems, as well as human activity, pollution, urbanisation, and climate change, are examples of environmental influences. The sustainability and health of ecosystems, as well as the standard of living for people and other living things, depend on our ability to understand and manage the environment.

The Media as a Platform for Environmental Awareness:

As a way to prevent degradation of habitat, species extinction, and resource depletion, among other urgent environmental challenges, the media is essential to environmental conservation. The media promotes environmental literacy among the general public by educating them through news reporting, feature pieces, and investigative journalism. Additionally, it humanises environmental stories by elevating the voices of those impacted by degradation, sharing their experiences, and inspiring empathy in viewers.

Many environmental concerns are covered by media sources, including pollution, deforestation, climate change, and endangered species. A few examples of documentaries and films that graphically represent environmental challenges and their effects include "An Inconvenient Truth" and "Our Planet." People and organisations may exchange news, information, and firsthand accounts of environmental events on social media sites such as Facebook, Instagram, and Twitter.

Opinion articles and editorials in newspapers, journals, and online media critique environmental policy, advocate for conservation measures, and inspire public action.

Viewers are taught the value of preserving the environment and leading a sustainable lifestyle through educational programmes and podcasts on radio stations, television networks, and internet platforms. Advertising and marketing efforts promote eco-friendly products, activities, and behaviors, encouraging customers to adopt ecologically responsible choices.

Public awareness campaigns sponsored by media outlets partner with governments, NGOs, and grassroots groups to inform, motivate, and organise citizens to take action and support environmental conservation initiatives. All things considered, the media is a potent tool for raising environmental awareness and enticing people to save the environment.

Case Study: The Role of Documentaries in Environmental Awareness

Documentaries are becoming a potent tool for bringing environmental concerns to people's attention and motivating them to take action. With millions of viewers worldwide, films like "An Inconvenient Truth" and "Our Planet" have sparked discussions on sustainability, biodiversity, and climate change. These documentaries inspire viewers to take action for environmental protection by fusing scientific data with gripping narrative to elicit strong emotional responses from viewers. Furthermore, as demonstrated by the film "Blackfish," which raised awareness of the moral dilemmas associated with the captivity of killer whales and heightened scrutiny of marine parks, documentaries have the power to sway public opinion and governmental choices.

The Media as an Advocate for Environmental Sustainability:

As raising awareness, inspiring conversation, and bringing about good change at the individual, community, and societal levels, the media is essential in the advocacy for environmental sustainability. Through articles, features, and segments, it may advance sustainable practices in industries including building, energy, transportation, and agriculture. Exposes and investigative reporting expose misconduct and make governments, businesses, and other stakeholders answerable for their environmental policies.

The media also uses social media movements, campaigns, and petitions to enlist the public's support for environmental concerns. The media gives communities the tools, resources, and forums for discussion they need to act as a group on environmental

concerns. Social media and other media platforms may encourage public action and participation in environmental concerns by utilising hashtags, online petitions, and virtual events.

Through exposés and investigative journalism, the media may inspire corporate responsibility and hold companies accountable for their environmental effect. Putting an emphasis on environmental sustainability in projects, enterprises, and startups is one way to highlight green innovation and entrepreneurship. Public service announcements, instructional programmes, and documentaries may inform and motivate viewers to make more environmentally friendly decisions in their everyday lives.

To sum up, the media can be extremely helpful in promoting environmental sustainability by creating awareness, encouraging discussion, and bringing about beneficial changes in people's lives, communities, and society as a whole.

Case Study: The Role of Social Media in Environmental Activism

Social media platforms have developed into vital instruments for environmental activism, facilitating worldwide connections, cooperation, and mobilisation for people and groups. Millions of young people have been inspired by campaigns like Fridays For Future and Climate Strike to demand that world leaders take action on climate change. They have used social media to plan rallies, disseminate information, and increase awareness of the gravity of the climate situation. Furthermore, social media platforms have made environmental activism more democratic by strengthening grassroots movements and giving voice to underrepresented groups that are frequently ignored by mainstream media.

Challenges and Opportunities:

While the media has the potential to drive positive change in environmental conservation, it also faces numerous challenges and limitations. Sensationalism, misinformation, and bias can distort public perceptions and undermine efforts to address environmental issues. Moreover, the consolidation of media ownership and the rise of clickbait culture have led to a prioritization of entertainment over substantive reporting, relegating environmental stories to the sidelines. Additionally, the polarization of public discourse and the spread of disinformation pose significant obstacles to effective environmental communication.

Challenges:

- **Misinformation and Greenwashing:** The dissemination of false information and greenwashing by special interests is a serious problem. Sensationalism may take precedence over fact in some media outlets, which might result in the spread of inaccurate or misleading information regarding environmental problems and remedies.
- **Restricted attention:** Compared to other subjects like politics and entertainment, environmental concerns frequently receive less attention. The public's knowledge and comprehension of important environmental issues and possible solutions may be hampered by this scant coverage.
- **Political and Economic factors:** The way media outlets report environmental concerns may be influenced by political and economic factors. The storyline and the scope of reporting on environmental conservation initiatives can occasionally be shaped by corporate interests, advertising, and governmental objectives.
- **Complexity of Environmental Topics:** Environmental concerns can have several facets and are intricate, encompassing social, political, scientific, and economic aspects. It may be difficult for media organisations to convey this complexity in an understandable and compelling way, which might result in oversimplification or misunderstanding of the problems.
- **Audience Apathy and Fatigue:** Even with extensive media coverage, some audiences may grow weary or indifferent to environmental issues, particularly if they think the issues are unimportant or overwhelming. Media outlets may find it difficult to maintain public interest and involvement in the long run as a result.

Opportunities:

- **Educational Role:** Citizens can be informed and educated by the media on scientific advancements, sustainable practices, and environmental conservation initiatives. Media outlets may enable people to make educated decisions and take action to safeguard the environment by delivering factual, in-depth coverage.
- **Advocacy and Awareness:** By increasing public awareness, highlighting the perspectives of environmental experts and activists, and holding businesses and governments responsible for their environmental effects, media outlets may function as advocates for environmental conservation.

- **Storytelling Innovation:** New developments in digital media and storytelling methods present chances for creative approaches to environmental journalism. The comprehension of environmental challenges by audiences can be improved by the use of immersive narrative, virtual reality, interactive visuals, and multimedia platforms.
- **Partnerships and Cooperation:** To create stories and campaigns that have an impact, media outlets can work with scientists, environmental organisations, community organisations, and legislators. Through these collaborations, difficult environmental concerns may be addressed more successfully by utilising a variety of resources and skills.
- **Inspiring Solutions and Positive Stories:** The media may help to promote solutions and encouraging tales of environmental restoration and conservation in addition to bringing attention to environmental issues. Through exhibiting prosperous endeavours and encouraging people and societies, the media has the power to spur others to action and foster constructive transformation.
- To properly navigate these obstacles and capitalise on possibilities, one must be dedicated to upholding journalistic ethics, truth, and the public interest. The media may, in fact, act as a catalyst for progress in environmental conservation initiatives when it plays its role appropriately.

Conclusion:

The media contributes to environmental conservation because it advocates for sustainability, raises public awareness, and mobilises support. It has the capacity to mould opinions, sway actions, and propel legislative action. Nonetheless, cooperation, responsibility, and a dedication to truth and integrity are necessary for journalism to reach its full potential. Together, media experts, environmentalists, legislators, and the general public may use the media's power to create a future that is more robust and sustainable for future generations.

Investigative journalism, factual reporting, and creative narrative are some of the ways the media may educate the public about the complexity and severity of environmental issues. Through elevating the perspectives of environmental specialists, activists, and affected communities, media platforms may promote legislative modifications, corporate accountability, and individual initiatives.

The media may provide effective coverage and initiatives by collaborating and forming relationships with stakeholders from all sectors. This allows the media to encourage narratives that focus on solutions and build a greater awareness of environmental concerns. Digital media innovations provide new channels for audience engagement and the encouragement of environmental action. Essentially, the media's contribution to environmental conservation goes beyond simple issue reporting; it also involves inspiring revolutionary change that will result in a world that is more resilient and sustainable.

References:

1. Boykoff, M. T. (2011). *Who Speaks for the Climate? Making Sense of Media Reporting on Climate Change*. Cambridge University Press.
2. Carvalho, A. (2007). Ideological cultures and media discourses on scientific knowledge: re-reading news on climate change. *Public Understanding of Science*, 16(2), 223–243.
3. Hansen, A. (2011). Towards a typology of climate change skepticism: differences in evaluations and attitudes towards science and scientists. *Wiley Interdisciplinary Reviews: Climate Change*, 2(1), 113–128.
4. Leiserowitz, A., Maibach, E., Roser-Renouf, C., Feinberg, G., & Howe, P. (2012). *Climate change in the American mind: Americans' global warming beliefs and attitudes in May 2012*. Yale University and George Mason University. New Haven, CT: Yale Project on Climate Change Communication.
5. O'Neill, S. J., & Boykoff, M. T. (2010). Climate denier, skeptic, or contrarian? *Proceedings of the National Academy of Sciences*, 107(39), E151.
6. Schäfer, M. S. (2012). Sources, characteristics and effects of mass media communication on science: a review of the literature, current trends and areas for future research. *Sociology Compass*, 6(2), 89–103.
7. Shearer, C., & Burggraf, C. (2017). *News Use Across Social Media Platforms 2017*. Pew Research Center.
8. Tandoc Jr, E. C., & Lee, K. (2016). The fortunes of digital news. *Digital Journalism*, 4(6), 700–714.
- 9.

5. BANANA CULTIVATION IN JALGAON DISTRICT OF MAHARASHTRA, INDIA: A SWOT ANALYSIS

Dr. Nitinkumar M. Patil¹ Mr. Rooshikesh Jade²

^{1,2}The S.I.A. College of Higher Education, Affiliated to the University of Mumbai, P-88, MIDC Residential Area, Dombivli Gymkhana Road, Near Balaji Mandir, Dombivli (E), Dist. Thane, 421 203, **Corresponding Author:** Dr. Nitinkumar M. Patil, nitinkumar.pati1970@gmail.com

Abstract

Bananas are one of the most popular fruit crops in the world. It is of the genus Musa, of the family Musaceae. In India, particularly in the tropical zone of the country, the agroclimatic conditions are suitable for banana cultivation. Jalgaon district of Maharashtra state is one of the major banana-producing districts in India. Farmers of this district sell their bananas in domestic as well as international markets. Consequently, banana production plays an important role in the economy of Jalgaon District. Considering this fact an attempt has been made in this study to understand the details of banana cultivation. Based on both primary and secondary data, the present study analyses Strengths, Weaknesses, Opportunities and threats to banana cultivation in the study area and suggests measures to enhance banana.

Keywords: Banana cultivation, SWOT, Food processing, Diseases.

Introduction

Bananas and plantains are popular globally not only due to their nutritional value but also for their economic importance, especially, to small and marginal farmers in developing countries. Bananas are grown in over 130 countries across the world, in an area of 10.1 million ha. producing 121.85 million tonnes (FAO, 2009). Banana, a vegetatively propagated fruit crop, has a high demand because of its unique flavour, all-year-round harvest, and nutritional values. The banana industry is highly fragmented; its international trade is largely controlled by multinational companies such as Chiquita, Dole and Del Monte, followed by medium- and large-scale commercial plantations, then smallholder farmers (FAO 2014). Although the industry is an important and widely traded business, banana plantations are plagued by various issues, especially disease outbreaks (Zulperi and Sijam 2014; Teng et al. 2016). These problems are prevalent, particularly among smallholders who are resource-poor, unorganized, have limited access to information and lack awareness of technologies and appropriate plantation management practices (Kayat et al. 2016). India produces about 30 million tonnes of bananas from an area of 0.83 million ha (NHB, 2011). The district of Jalgaon, located in Maharashtra State of India is one of the

leading producers of bananas in the country. Considering these facts, an attempt has been made in this study to understand the status of banana cultivation in Jalgaon District.

Objectives

The present paper is aimed at understanding the status of banana cultivation in the Jalgaon District of Maharashtra. This has been achieved with the help of the following objectives.

- 1. To comprehend the soil and climatic conditions required for banana cultivation.
- 2. To know about the details of banana cultivation with the help of a SWOT analysis.
- 3. To suggest measures for the enhancement of banana production in the study area.

Methodology

The present study is based on both primary and secondary sources of data. Government reports, research papers, news articles and private publications are referred to as secondary sources while discussions and empirical evidence are used as primary sources of data for the present study. SWOT analysis, a strategic planning tool used to identify and understand the strengths, Weaknesses, Opportunities and Threats related to banana cultivation in Jalgaon District (Fig. 1) is carried out to conclude the study. Results are presented in Textual form.

	Helpful	Harmful
I n t e r n a l	Strengths	Weaknesses
E x t e r n a l	Opportunities	Threats

Fig.1: SWOT Matrix

Study Area

The Jalgaon district (Fig. 2) lies between 20°15' N latitude and 21°15' N latitude and 74° 55' E longitude to 76° 28' E longitude. The Jalgaon District experiences 10° to 48° C temperatures and 690 mm of rainfall on average. The climate of the study area is quite

varied. Summertime brings extremely high temperatures (up to 45° C) and dry conditions. Approximately 700 mm of rain falls in the Jalgaon district during the monsoon season followed by pleasant winter weather. The Tapi River is the main natural feature of the district. The districts of Buldhana to the northeast, Dhule to the west, Aurangabad to the south and Nashik to the southwest encircle the district of Jalgaon. The state of Madhya Pradesh borders the district to the north. The district occupies 11,765 square kilometers in terms of area. The district's fifteen tehsils are Jalgaon, Jamner, Chalisgaon, Dharangaon, Bhusawal, Bodwad, Yawal, Raver, Muktainagar, Amalner, Chopda, Parola, Pachora, Bhadgaon, and Erandol.

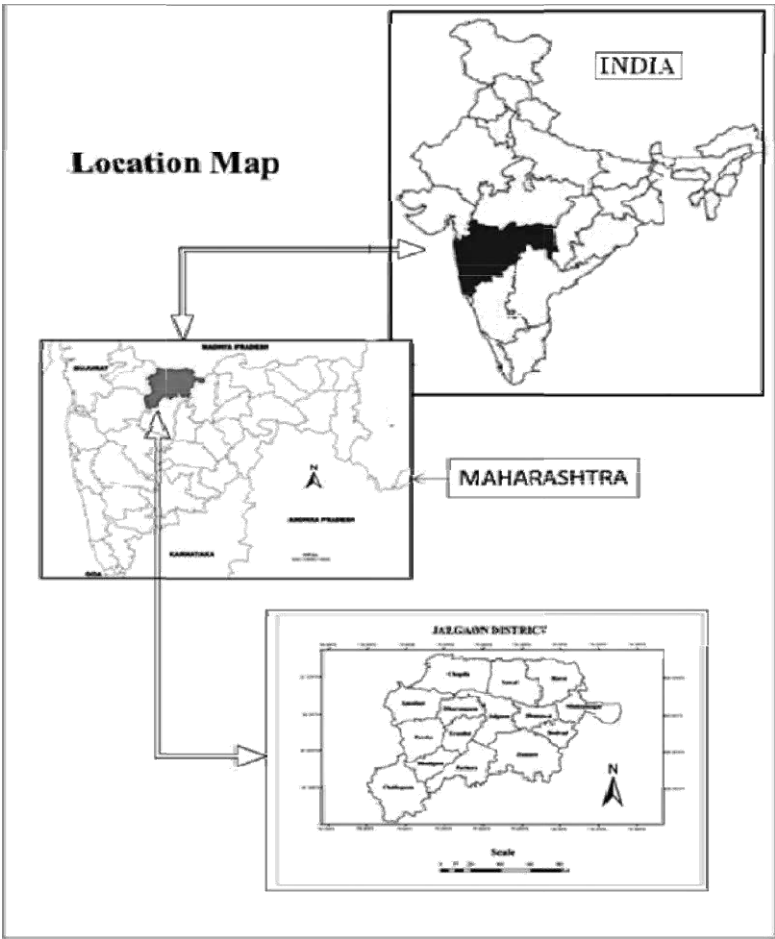


Fig.2. Location Map of Jalgaon District

Geographical Conditions Required for Banana Cultivation

Since bananas are heavy feeders, soil fertility is crucial for the successful cultivation of this crop. One of the few fruits with a limited root zone is bananas. The two most crucial factors to take into account when choosing soil for banana plants are, therefore depth and drainage. A 0.5 to 1 m depth, rich, well-drained, fertile, moisture-retentive soil

with an abundance of organic matter are the ideal conditions for banana cultivation. The pH of the soil should be ranged from 6.5 to 7.5. The best soil types for growing bananas are those that are alluvial and volcanic. Bananas are tropical plants that need warm and humid weather. It can, however, be grown from sea level to an elevation below 1200 meters. It can be grown in a variety of temperatures between 10°C and 40°C with high humidity, but growth is slowed at 20°C and higher at more than 35°C. When temperatures stay above 24°C for an extended amount of time, yields increase. The crop takes a longer period to mature in colder climates. During their active growth stage, plants that are exposed to low temperatures and humidity exhibit decreased growth and yields. The leaves get shredded and dried out by hot, strong winds in the summer. For it to grow satisfactorily, it needs 1,700 mm of rainfall spread out over the course of the year. Stagnation of water is injurious and may cause diseases like Panama wilt.

Results and Discussion:

The present study reveals that there are many strengths and opportunities, while there are some weaknesses and threats to banana cultivation in the study area. Strengths, Weaknesses, Opportunities and Threats (SWOT) to banana cultivation in the study area are discussed below.

SWOT Analysis:

Strengths

a. Favorable Natural Conditions

Jalgaon district is located in the Tapi River basin where the topography of the region is almost flat. The fertile alluvial and medium black soils with tropical climatic conditions are favorable for banana cultivation.

b. Demand from Domestic and International Market

There is always a demand for banana fruits and fruit products in the domestic as well as international markets particularly in Middle Eastern countries.

c. Availability of Labor

As Jalgaon is one of the densely populated districts of the country. Thus, there is enough labor supply from local areas. Both skilled and unskilled workers required for banana cultivation are available in the study area.

d. Loan Facility

Banana cultivators in the district are provided with essential loan facilities. The Jalgaon District Credit Cooperative bank and farmers' credit societies working at the village level provide loans at minimum interest rates. The loan waiver schemes of state government during various natural calamities help banana growers boost their economic conditions.

e. Connectivity by Rail and Road

The study area is well connected with the different parts of the country by rail and roadways. Central Railway and National Highway no. 6 passing through the district play a crucial role in the transportation of bananas up to the markets located in different states of the country, while air and waterways are being used for the supply of bananas to the countries abroad.

f. Central Location

The district of Jalgaon is situated in the inland area of India and its geographical location is almost in the central region of the country. The four major markets of the country located in the cities of Mumbai, Delhi, Chennai and Kolkata are within reach of 36 hours by train from the study area.

g. Durability of Fruits

Green bananas slowly ripen over a week. This weeklong period can be used for the transportation of the fruits. Thus, most bunches of bananas are sold in varying stages of ripeness.

h. Awareness of Farmers

Banana-growing farmers in the district are aware of the variety, cultivation practices, market prices and ripening methods. They have adopted advanced techniques like the use of a drip irrigation system with liquid fertilizers. Banana seedlings propagated by biotech companies using tissue culture techniques are being used by banana growers of the district.

i. Research and innovation

Krishi Vigyan Kendras, Colleges, research institutes and private companies in the district are involved in the preparation of seedlings using tissue culture, developing new crop varieties and methods of disease control. The city of Jalgaon is well-known for the production of drip irrigation sets being used for banana cultivation in the district.

j. Use of Drip irrigation

The drip irrigation system being used for banana cultivators in the study area is useful in saving water during irrigation, controlling weeds and applying liquid fertilizers. It is fully safeguarded from breakages caused by falling leaves or destruction. The use of drip irrigation allows banana growers to work on the plantation without getting wet, even when the water is on.

k. Advancement in packaging

Careful handling of bananas, padding of the bunch with banana leaves, fungicidal treatment and packaging bananas in corrugated boxes with perforated polythene lines are some of the advanced packaging techniques available to extend the shelf life of bananas.

Weaknesses

a. Dearth of Food Processing Industry

Banana flour, banana chips, banana juice, banana wine, banana ice cream, banana stem fiber, banana stem plates etc. are the banana products that can add value. However, the lack of professional attitude among banana cultivators and entrepreneurs in the district limits the development of the food processing industry here.

b. Lack of technology use

Farmers in Jalgaon district are not well acquainted with the advanced technology. Illiteracy, poverty and ignorance in the rural parts of the district are the basic reasons behind the lack of technology use.

c. Shortage of water for irrigation in summer

It is because of the high rate of evapotranspiration; that the water requirement of banana plants is also high. It needs regular irrigation. However, in the summer season, the area experiences a shortage of water for irrigation.

d. High rate of evaporation

In Jalgaon District, the maximum temperature of the day reaches up to 47⁰ C in the month of May, leading to a high rate of evaporation.

Opportunities

a. Rising Demand for banana fruits

The increasing global population needs a large and consistent supply of nutritious food material. Thus, there is a rising demand for banana.

b. High nutritional value

Banana fruits have high nutritional value. They consist of calories, water, proteins, carbs, sugar, fibers and a negligible amount of fats. Banana fruits consist of carbohydrates, vitamins and minerals including vitamin B6, vitamin C, potassium etc.

c. Export opportunities

Banana cultivation is concentrated in the tropical part of the world where there is an enough availability for water for irrigation. The countries located in temperate and polar regions as well as those which are located in the arid and semiarid part of the tropical region are lacking in banana production. Thus, being located in tropical region, where there is an availability of water for irrigation, the district of Jalgaon enjoys export opportunities. Farmers of the district export their bananas mainly to the middle east countries.

d. Employment Generation

Banana cultivation, packaging of fruits, their transportation, processing and marketing need a continuous labor force. Thus, banana production employs the local people. Women get employment opportunities in agro-processing industries. Thus, it helps women's empowerment and rural development.

e. Ratooning

Ratooning is the agricultural practice of harvesting a monocot crop by cutting most of the above-ground portion by leaving the roots and the growing shoot apices intact to allow the plants to recover and produce a fresh crop in the next season. Taking a ratoon crop is possible in case of banana cultivation which helps in cost cutting.

Threats

a. Diseases

Banana saplings developed using tissue culture normally fall prey to various diseases including Cucumber Mosaic Virus (CMV) Infection. Banana plants in Raver, Yaval and Muktainagar tehsils normally suffer from this type of infection.

b. Competition from Other Fruit Crops

Banana is one of the important fruit crops in India. Its year-round availability, affordability, varietal range, taste, nutritive and medicinal value make it the favorite fruit for all classes of people. However, this crop has to compete with other fruit crops available in the market including mango, orange, sapota, guava, watermelon, sweet lemon etc.

c. Exploitation by Middlemen

The process of banana marketing in India includes middlemen at different stages. The exploitation of banana cultivators by middlemen in the district is a common problem.

d. Price Fluctuation

Irregular supply of banana fruits to the market, competition with other fruit crops and unstable transportation charges lead to fluctuations in banana prices.

e. High Input Cost

The high cost of banana saplings, fertilizers, wages, pesticides and drip irrigation systems increases the input cost of banana cultivation.

Suggestions

1. Banana processing factories should be established and developed in the study area.
2. Grading, packaging and handling of bananas should be done properly.
3. Quick and cheap transportation facilities should be made available.
4. Banana production should be at par with international standards.
5. Per hectare productivity of bananas should be increased.
6. Cheap and advanced storage facilities should be made available.

Conclusion:

Banana cultivation in Jalgaon district is characterized by a combination of traditional practices and modern agricultural techniques, with farmers adapting to local conditions and market dynamics to sustainably produce this important crop. It is because of the favorable environmental conditions, that Jalgaon district is well known as one of the major banana-producing districts of India. However, there is a need to establish and develop various banana-based food processing industries and inculcate entrepreneurial attitudes among banana-growing farmers of the district. Banana production should be at par with international standards and productivity of this crop should be at par international average.

References

1. FAO. (2009). Food and Agriculture Statistical Databases (FAOSTAT). In: <http://faostat.fao.org>
2. FAO (2014). The Changing Face of Global Banana Trade. <http://www.fao.org/news/story/en/item/224807/icode/>
3. Kayat, F., A. Mohammad Amizi, A.A. Idris (2016). “Study of the Intention of Banana Growers in Improving the Production in Jeli, Kelantan.” Paper presented at the Second Asia Pacific Conference on Advanced Research (APCAR), Melbourne, Australia, Pp.27–28.
4. NHB (2011). Horticultural Data Base, National Hort. Board, Gurgaon, India
5. Teng, S.K., N.A. Abd Aziz, M. Mustafa, R. Laboh, I.S. Ismail, S.R. Sulaiman, A.A. Azizan, S. Devi. (2016). “The Occurrence of Blood Disease of Banana in Selangor, Malaysia.” *International Journal of Agriculture & Biology* 18, Pp.92–97.
6. Zulperi, D., and K. Sijam. (2014.) “First Report of *Ralstonia solanacearum* Race 2 Biovar 1 Causing Moko Disease of Banana in Malaysia.” *Plant Diseases* 98, Pp.275.

6. RENDEZVOUS WITH THE CARPET INDUSTRY FOR RURAL DEVELOPMENT: A STUDY IN MALGAON VILLAGE, UTTAR DINAJPUR, INDIA

Dr. Tapas Pal¹ Dr. Deep Narayan Pandey²

¹Assistant Professor (Stage II) of Geography, Raiganj University

²Assistant Professor, Special Center for Disaster Research, Jawaharlal Nehru University

Abstract:

India is ranked first in the handmade carpet industry¹ and carpet weaving was introduced by Sultan Zain-ul-Abadin during the fifteenth century in Kashmir.² India is currently the world's 2nd largest exporter of handwoven carpets by a large margin, having exported over 336 million dollars in 2021.³ India is providing carpet weavers with opportunities such as Bharat tex2024, Domotex International Trade Fair, Kallen lebel, and CEPC.⁴ Carpets can be a carrier for rural, unemployed artists. It is used in daily life for decorating rooms and luxury hotels. Folk artists in the small carpet industry often come from rural areas because around 20 lakh craftsmen, particularly women, are connected with it.⁵ Again, modern electronic room heaters are now used to keep the house warm in winter, so the use of traditional carpet on the floor of the house is decreasing day by day. Most of the carpet industries in the village have been shut down for the last two years due to lockdown. Lack of awareness and knowledge to avail government schemes or bank loans is great limitation of these rural folk to run its traditional carpet weaving industry. In addition, as a result of globalization, the market has been flooded with various synthetic, polyester, and plastic products instead of jute, wool, silk, or cotton carpets. So the demand for carpets is declining in global markets. As a result, the handicraft and handloom industries are closing down, and the carpet industry is being merged with other occupations. This study is based on the carpet industry of Malgaon village under the Kaliyaganj block of Uttar Dinajpur district, which was started in 1981.

Key words: Handwoven, Bharat tex2024, Domotex International Trade Fair, Kallen Lebel, CEPC.

Introduction:

The carpet, or 'carpite' (comes from an old French word), 'carpita' (an Old Italian word), or "carpire" (meaning picking), and carpet weaving had begun long ago in the 16th century of the Mughal period.⁶ In time, the weaver became an artist who incorporated unusually magical colors into Indian carpets. Based on the ability of each individual weaver, there is a touch of color and beauty on the carpets. The carpet industry is also a part of the handicraft industry, which is one of the traditional industries in India. About 80 percent of the carpet is produced in India and exported.⁷ India is famous all over the world with its excellent design, especially Paisley design.⁸ This industry provides about 2.5 million livelihoods for artisans and earns significantly more foreign currency.⁹ Hand knot wool carpets, embroidered woollen carpets, chain sewing tapes, pure silk carpets, synthetic carpets, and handmade woollen rugs are some of the most sought-after products in the European and American markets.¹⁰ Currently, Rajasthan, Kashmir, Punjab, Uttar Pradesh, West Bengal, Andhra Pradesh, and Himachal Pradesh are the major provinces where the carpet industry is booming.¹¹ Helping to innovate and technological development, the Ministry of Textiles and the Government of India established the Indian Institute of Carpet Technology in Bhadohi, Uttar Pradesh, in 2001.¹²

Rational and Statement of the Problem: In the rural economy, carpet, terracotta, pottery, weaving, etc. are of great importance. In the current era of globalization and profit maximization, the rural handicraft industries are closing down. At present, people are moving away from primary and secondary economic activities and engaging in tertiary work. As a result, small industries like handloom, handicraft, and terracotta are closing down day by day. The government is not taking sufficient steps to improve these handicraft industries. If these rural handicap industries can be kept alive, then the historical, folk, and traditional cultures can be kept alive. Under such circumstances, the collapse in the employment sector creates a major problem, and it is clear that a sound solution seems to be improving and making the domestic traditional cottage industry more prosperous. So, the researchers have decided to do a study on it.

Objective: To highlight the location, impact, and issues of the carpet industry in Malgaon village in Uttar Dinajpur district.

Research questions: Researchers used specific open- and closed-ended questions related to the name and address of the weavers, nature of carpet products, family

involvement, main earning source of the family, problem of raw materials, manpower, product receiver, percentage of profit, form of business, location in selling goods, substitute products of carpet, reason behind the shortage of products, etc.

Delimitation: Families whose livelihoods are dependent on the carpet industry in Malgaon village have been considered in this research.

About the study area: Malgaon is a village in Kaliyaganj block in the district of Uttar Dinajpur in West Bengal, India, located at 25.5893° N, 88.2276° E.¹³ It has almost a flat topography and slopes gently from north to south, with an area of 4.1635 sq. km. Its elevation is approximately 37 meters above sea level. Malgaon has a humid subtropical climate.¹⁴ Here, the average annual temperature is 24.9°C. On average, 1400 mm of rain falls per year, with most of it falling in the wet season months of June through September. As per the 2011 Census, Malgaon village has a total population of 6048, with 3139 (51%) males and 2909 (48%) females.

Methodology and Data Sources: The mixed research method was taken into consideration to complete this research. For this purpose, both quantitative and qualitative techniques are used. All the people who are involved in the carpet industry in Malgaon village are part of the population here. During field surveys, interview techniques have also been used through questionnaires to gather the primary data. A geo-tagged photography technique was used to record the data. To prepare the location map, ArcGIS Pro software was used. To arrange and analyze the data, MS Excel was used. To observe the real-life theme of the carpet industry, researchers used a video-based observation technique (YouTube-Soma Chakroborty, etc.) for a qualitative study. **To collect the data, researchers visited the village three times: on January 25, May 31, and June 11, 2023.** The study was based on primary data taken from a field survey in Malgaon village. Here, the industry-to-industry survey and a face-to-face interview with specific valid questionnaires were used. The simple random sampling technique was used to collect the primary data through face-to-face interviews, photography, videos, and the observation method. To complete this research work, different books, articles, newspapers, various social media platforms, several web-based secondary sources, onefivenine.com, village info.in, etc. were used. Descriptive statistics and various cartographic diagrams were used in this project.

Data Analysis and Interpretation: The main raw materials of the carpet industry are wool, yarn, cotton, paint equipment, etc.; those are imported from Banaras and Bhadohi in

Uttar Pradesh and Kolkata to Malgaon. In the first step, the weavers dye the yarns by dipping them in the desired mixture of different colors of water, then collect the colored yarns, dry them well in the sun, meld the yarn into different designs, and then make carpets of different designs. After the weaving process is completed, the carpets are stored in the warehouse and packaged for marketing. Then carpets are marketed by the contractors. Malgaon sells their products at various locations in Banijjo Mela, Hastosilpo Mela, Sabari Mela, Biswabangla Mela, and various government agencies such as Biswa Bangla, Tantuj, and Manjusha.



P1



P2



P3



P4



P5



P6



P11



P10



P9



P8



P12



P13



P14



P16



P17



P18

Note: Here ‘P’ means **p**lates. P1: Raw materials for making carpets. P2: Instrument of color mixing where wools are dyed. P3: Persian catalog or carpet catalog. P4: Khadi and Dari carpet are being weaved in Abu Taher’s house. P5: This is the frame for making tufted carpets, where the design is done with tufted guns. P6: factory-made carpets are stored. P7: thick traditional dari or dhurrie carpet. P8: Tufted carpets, which are made from stretched wool, are arranged neatly in a frame, and then the design is made with a tufted gun. P9: Knotted Carpet, which is popular and made from quality wool. P10: Khadi carpet’s yarns are completely woven by hand and are made of cotton and silk. P11: Tenpatti carpet is mainly made by women. P12: The machine is used for making the knotted carpet, but at the present time it is useless. P13: Spinning wheel where the yarn of the carpet industry is cut. P14: Imported raw materials have been wasted in the last two years due to lockdown. P15: Machine of Dari Carpet, which is out of order due to a work stoppage. P16: “Chora” is used for cutting wool. P17: “Panja” is used to maintain the density of the carpet. **P18:** Babul Mohammad’s carpet industry is completely closed today, and it is now used as a place to keep food for cattle.

Map 1: Locations of Carpet Industries in Malgaon Village.

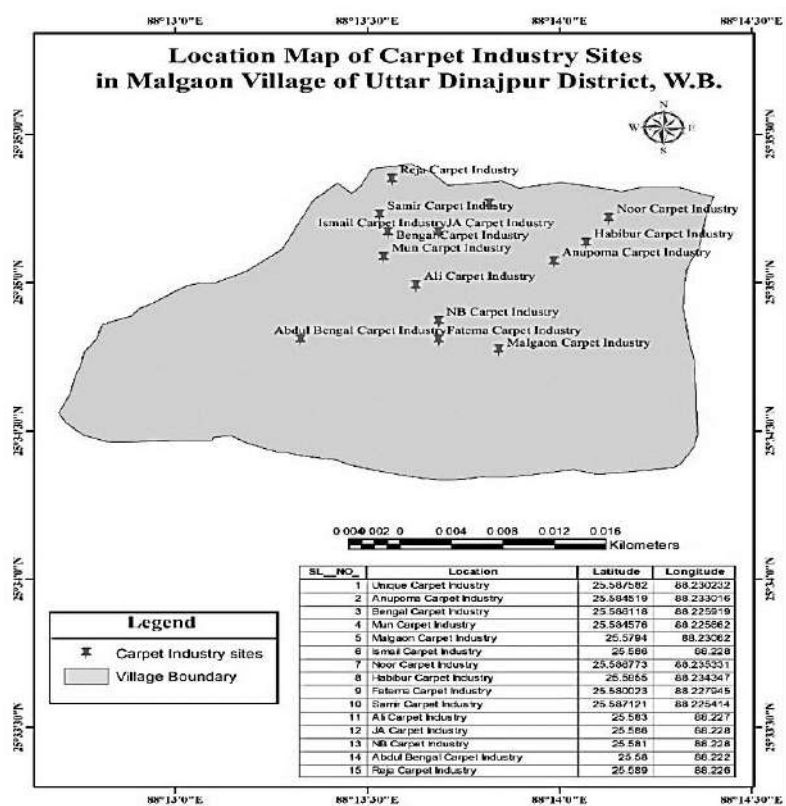


Table 1: Producing items and their trading scenarios.

Collection from	Varanasi and Bhadohi in Uttar Pradesh		
Ingredients used	Wool, Different colours, Cotton		
Types of carpet	Production Cost (Rs.)	Selling Price (Rs.)	Profit (Rs.)
Dari Carpet	300	650	350
Tufted Carpet	2050	3350	1300
Knotted Carpet	200	350	150
Khadi Carpet	50	130	80
Tinpatti Carpet	2100	4500	2400

Source: Field Visit, 2023.

Table 2: Yearly sale of carpets by individual owners and monthly income of carpet weavers in Malgaon village.

Industry Name	Estd.	Owner	Yearly sale (in lakh)	Name of the weaver	Age	Total member of the family	Monthly income in rupees
				Workers of carpet industries			
AT Carpet Industry	1981	Abu Taher	20	Tarikh Aziz	30	5	12000
Bengal Carpet Industry	2000	Sahadad Hussain	15	Habibul Mursalin	32	3	10000
JB Carpet Industry	2017	Jabed Asif	10-15	Aualur Badsar	18	4	10000
Abdul Bengal Industry	2010	Abdul Hasid	10-12	Babul Muhammad	45	3	8000
Reja Carpet	2016	Ahmed Reja	12	Jamsed Ali	30	3	9000
Indian Carpet	2019	Basir Ali	7-8	Rupsena Khatun	25	4	7500
Noor Carpet Industry	2012	Noor Mohammad	7-8	Rafikul Islam	32	5	15000
Habibur Carpet Industry	2012	Habibur Rahaman	8-12	MD. Kabil	40	4	8000
Fatema Carpet Industry	2014	Firoj Mahammad	6-9	Marufa Khatun	29	3	6000
Unique Carpet Industry	2007	Samim Riaz	5-7	Najmir Begam	23	4	5000
Anupoma Carpet Industry	2005	Saidul Islam	9-10	MD. Mohosin	27	3	9000
Mun Carpet Industry	2010	Sahajahan Ali	8	Arif Muhammad	22	5	13000
Malgaon Carpet Industry	2001	Sahayesta Abedin	5-6	Fajlur Rahaman	45	3	12000

Ismail Carpet Industry	2014	Ismail Sarkar	7-8	Abdul Salam	50	4	7000
JA Carpet Industry	2008	Jasbir Alam	12	Manibul Haque	35	6	8000
NB Carpet Industry	2008	Md. Najrul	6	Najrul Islam	45	4	7000
Samir Carpet and Handloom Industry	2011	Samir Ali	7-9	Rubel Rana	23	5	11000
Ali Carpet Industry	2005	Mansur Ali	10-11	Jafar Alam	25	3	11000
Jayeda woolen Carpet Industry	2005	Zid Rahaman	8-10	Hussain Ali	32	6	13000
MR Carpet	2003	Matiur Rahaman	12-13	MD. Faruk	29	5	16000

Source: Field visit 2023.

Findings:

In Malgaon, the first carpet factory was set up by the 'Malgaon Handloom Development Society'. Abu Taher is the secretary of this society, and this factory was built in 2009 on the initiative of the Malgaon Hand Loom Clustered Development Society. A total of 22 families have their own carpet industry in Malgaon village. The Tantis make a living by exporting their products. But at present, the workers associated with this industry are facing various economic problems. The income from the carpet industry maintains the livelihood of the weavers. Abu Taher, secretary of the Malgaon Handloom Cluster Development Society, said that depending on the carpet industry, the weavers associated with the industry export carpets worth 1-1.5 crore rupees every year. Although carpet weaving is mainly done by men, now women have joined the industry and become self-reliant, which is one of the main reasons for the development of Malgaon village. It is known from Abu Taher, the Pradhan of Malgaon village, that the first AT Carpet Industry was established in this village in 1981. At present, there are 22 carpet industries in their village. In 2018, the "Malgaon-Kunore Mega Weaver Carpet Co-operative Society" was established in the village for the overall development of the carpet industry, and Abu Taher is currently the secretary of this society. Samim Riaz, a provider of the Unique Carpet Industry gets sales of Rs. 5 to 7 lakh from this industry every year. But over the past two years, he has suffered a loss of 4 to 5 lakh rupees due to the Corona pandemic situation in 2020–2022. He also applied for a loan of Rs 1.5 lakh from PMGP for his carpet industry in 2014, and the loan was sanctioned, but later he did not get any response. Tariq Aziz, a carpet weaver

has family with four members, and they all depend on the carpet industry for their livelihood. The government runs the Integrated Child Development Services project to provide nutritious food to children under the age of six.¹⁶ Apart from Raghunathpur FP School, Malgaon Junior Basic School, and nearby Malancha Nimno Buniyadi Vidyalay, students of classes V to VIII of Malgaon village get the benefit of the midday meal. The houses of those who are economically strong in Malgaon village are mainly pucca and semi-pucca, etc. Mud and tin houses are also noticed here. A minimum number of tube wells have been installed in Malgaon by the initiative of the local administration. Here, water tanks were installed in 2013 at the initiative Public Health Engineering Department¹⁷ with a capacity of 55,000 gallons of water. Almost every household in the village now has tube wells and small pump machines, which are the main source of water collection. The toilet in the house of Tariq Aziz was built at his own expense. Sahodad Hussain, a provider of the Bengal Carpet Industry, said that at present, the prices of raw materials required for their carpet industry have increased day by day. They mainly import raw materials for the carpet industry from Benaros and Bhadohi in Uttar Pradesh. This also increases the cost of transporting raw materials from faraway Uttar Pradesh. In addition, the quality of imported raw materials is often poor. Abdul Salam, a 50-year-old carpet worker, said he had been involved in the business for the last 25 years. The total number of members in their family is five, and all depend on this carpet industry. But in the last two years, the carpet industry has lost jobs due to lockdowns. He is currently making a living by driving a tractor and farming. Javed Asif, a provider of J.B. Carpet Industry, said that he is currently facing problems in this industry. The number of his family members is six. He has suffered a loss of 7 to 8 lakh rupees for the last two years due to the lockdown and is unable to sell products caused by the closure of fairs such as Banijjo Mela, Hastosilpo Mela, Sabola Mela, and Biswabangla Mela organized by various government initiatives. Fazlur Rahman, a worker in the carpet industry, said he has been involved in the industry for 10 years and has a family of five members. Currently, there are few employment opportunities in the carpet industry, so he has joined the profession of mason. Rupsana Khatun, a 25-year-old female worker, said she had three family members, and she and her husband have been involved in the carpet industry for the past seven years. Currently, her husband has gone to work outside of the Malgaon carpet industry as he does not have much income. Malgaon carpet industry provider Shayesta Abedin has been involved in this profession for five

years. He sells carpets worth Rs 10 to 15 lakh at various fairs and companies every year. But for the past two years, he and his family have suffered financial losses due to the closure of his carpet business. Mobinul Haque, a 34-year-old worker, was involved in the carpet industry for five years. But now he lost his job and drove the truck. Habibur Rahman has been associated with this industry since 2012. It is known from him that the equipment and raw materials for this industry were brought from Uttar Pradesh. As a result, they often run out of raw materials and equipment. Habibul Mursalin, a local resident, was involved in the industry for two years. He is currently involved in a clothing store in a market near Malgaon. It is known from him that most of the carpet workers in this village have gone to Delhi, Uttar Pradesh, Kolkata, Maharashtra, etc. in search of jobs as they could not find work here after the lockdown. Researchers talked with Matiur Rahaman, a provider of the MR Carpet Industry, to collect information about the problems related to this industry and from where they collect the necessary raw materials and equipment. The traditional industry carries a good economic status for the village as well as the families associated with it. Wool is the main raw material in the carpet industry. But at present, there is a considerable shortage of supply. This essential raw material for the carpet industry is not commonly found in North Bengal. The main hub for this raw material is Uttar Pradesh. The weavers have to face enough problems to import raw materials from there. The problems are the increase in price, scarcity of raw materials, low quality of the product, and differences in quality. Most of the time, the small weavers associated with the carpet cannot afford the sophisticated equipment required for their industry due to a lack of capital, and they are forced to use old equipment. As a result, the productivity and sales of their carpets are constantly declining. From 2020 to 2022, all trades across the country and the world were shut down due to the lockdown caused by the Covid-19 situation. Malgaon's carpet industry is no exception. As a result, weavers are forced to join other jobs to earn money. The main problem for the weavers associated with this industry is that the carpet industry needs necessary raw materials and sophisticated equipment, and those are coming from Uttar Pradesh. Today, transportation costs have increased, and there is often a shortage of raw materials here. 44.28 percent of carpet weavers in Malgaon have toilets in their houses under the scheme of "Mission Nirmal Bangla," and the remaining 56.72 percent of toilets are constructed by them at their own cost. Talking to local carpet industry workers, it is learned that older weavers are still working in the carpet industry, but now the

new generation has shown reluctance in this industry. Currently, women workers in the industry receive a monthly stipend under the West Bengal Government's scheme of 'Lakshi Bhandar'. In addition, through the Centre for Cultural Resources and Training project of the Central Government, students from families involved in the carpet handicraft industry receive scholarships from fifth grade to graduation, which is very helpful for them. Men, as well as women, have easily become self-reliant by associating themselves with the industry. The education of most of the workers associated with the carpet industry in Malgaon is very low. As a result, they have a significant lack of technical skills. Abu Taher, secretary of the Malgaon-Kunor Mega Wafer Carpet Co-operative Society, said that they have approximately 35 carpet industries in Malgaon village, but in reality, no such information has been found during the field survey. But workers associated with the carpet industry in the village of Malgaon still make carpets with old handicrafts.

Recommendations: This industry will develop only when the necessary infrastructure is available. The carpet industry in Malgaon village was once a traditional industry there. But due to a lack of proper care and practice, the industry is almost extinct today. If the government provides subsidies for the workers, then they will be more interested in carpet-making. As there is no developed health center or hospital in Malgaon village, they have to go to Kunore Gramin Hospital for health-related problems, so a health center is needed in Malgaon. Skilled carpet workers are leaving the country to support their families. The panchayat members of Malgaon village should keep an eye on this and arrange employment for the workers. The weavers do not receive adequate remuneration. The carpet industry in the village of Malgaon is constantly facing problems shipping goods to different places. However, if the transport system in Malgaon village can be improved with the help of government initiatives and local administration, then they will be able to export their products easily. In this case, the Prime Minister's statement is very significant: 'Sabka Sath Sabka Vikas Sabka Vishwas'.¹⁹

Conclusion: The rural industries of a country that is lagging behind in development, that is to say, the overall development of the country, are possible only if they can be kept alive and developed. Today is the age of science and technology, but even today, the carpenters of Malgao village are involved in carpet weaving with their old hand-operated machines.

As a result, their productivity is much lower than that of the mechanical industries, and they are lagging behind in carpet exports to the world market. Government and private enterprises can solve this problem and develop the industry at their best. It goes without saying that implementing policies will require highly skilled and committed staff. Since the artisans are in the hands of stereotypical machinery, it may be necessary that the entire program for development be marshaled through various government institutions.

References:

1. Indian Trade Port (2014). Carpet industry and export in India. Ministry of Commerce and Industry under Carpet export promotion council from <https://www.indiantradeportal.in/vs.jsp?lang=0&id=0,31,24100,24103>
- 2,3. September 26, 2022. All you need to know about the Indian carpet industry? Kohan Textile Journal From <https://kohantextilejournal.com/all-you-need-to-know-about-the-indian-carpet-industry/>
4. Carpet Export Promotion Council (2017). Carpets in India from <http://cepc.co.in/>
5. Apr 26, 2021. What is Carpet Industry? Different career options in the industry. India Today Web Desk. New Delhi. Living India Pvt Mt. from <https://www.indiatoday.in/education-today/jobs-and-careers/story/what-is-carpet-industry-different-career-options-in-the-industry-1795060-2021-04-26>
6. Walker, Daniel (1997). Flowers Underfoot: Indian Carpets of the Mughal Era. New York: The Metropolitan Museum of Art. ISBN 0810965100. OCLC 893698548.
7. Sinha Sanjay. (Nov. 27, 1982). Economic and Political Weekly. India and the International Market in Handknotted Carpet. Vol. 17, No. 48 Economic and Political Weekly
8. "Paisley: The story of a classic bohemian print". Archived from the original on 27 May 2018. Retrieved 31 May 2018.
9. Das Chittaranjan. (30/11/2017). Growth and prospect of Carpet Industry: A study. International Journal Of Research Culture Society. ISSN: 2456-6683 Volume - 1, Issue - 09, Nov – 2017.
10. Badri Narayanan G. et al. July 02, 2018. The Existence of Carpet Industry in Bhadohi, India. Crimson Publishers. From <https://crimsonpublishers.com/tteft/fulltext/TTEFT.000563.php>

11. Carpet Industry and Exports 2022. The exports of carpets from India stood at US\$ 1.36 billion in FY23. India Brand Equity Foundation. Ministry of Commerce and industry. GoI. From <https://www.ibef.org/exports/carpet-industry-in-india>
12. Indian Institute of Carpet Technology Bhadohi. Agresearch. Newzealand. UGC-AICTE-DEC joint course. IGNOU. From <https://www.iict.ac.in/IDLP%20Prospectus.pdf>
13. Malgaon. Onefivenine explore India (2021) from <http://www.onefivenine.com/india/villages/Dinajpur-Uttar/Kaliaganj/Malgaon>
14. Malgaon Village. Registrar General & Census Commissioner, Ministry of Home Affairs, Government of India, 2015 (censusindia.gov.in). Open Government Data Platform India. Published under National Data Sharing and Accessibility Policy (NDSAP). From <https://vill.co.in/west-bengal/uttar-dinajpur/kaliaganj-330021980/malgaon-021983100940/>
15. Kaliaganj Block - Uttar Dinajpur 2022 Population Census Data from <https://www.census2011.co.in/data/subdistrict/2198-kaliaganj-uttar-dinajpur-west-bengal.html>
16. Integrated Child Development Services (ICDS) Scheme. Last Updated: 17 Aug 2015. Ministry of Women and Child Development, GOI

7. LIMATE RESILIENCE IN AGRICULTURE: INVESTIGATING THE ROLE OF MILLETS INPROMOTING SUSTAINABLE DEVELOPMENT GOALS

Rukmani Kumari¹, Sachin Deore²

^{1, 2} Department of Geography, SNDT Women's University, Pune Campus

Abstract:

Millets are coarse grains, which have been one of the traditional crops and can be grown in adverse weather conditions with less need for irrigation or special soil. After being grown for its grain to support emerging civilizations, millet was first grown in Asia and Africa and then spread throughout the globe as a cereal crop for evolving civilizations. But at present, climate change is a significant threat to the increasing global population and global food security. Therefore, there is a need for sustainable agriculture to make agricultural systems flexible and sustainable. The main objective of this research is to determine the role of millet in enhancing climate resilience in agriculture and contributing to the achievement of the Sustainable Development Goals (SDGs). This study uses a systematic literature review (SLR) methodology to analysed secondary data sources and publication trends from numerous papers. Primary sources include Google Scholar and Publish or Perish databases, as well as various departments of the Indian government and organizations. Millets, characterized by adaptability to different climatic conditions, nutritional value, and resource efficiency, have the potential to address the challenges posed by climate change while aligning with the SDGs related to food security, health, poverty alleviation, and environmental sustainability.

Keywords: *climate resilience in agriculture, millets, SDGs, adaptability, and food security.*

Millets and SDG: An Introduction to Climate Resilience in Agriculture

Millet is a form of small, seeded grass that is grown widely all over the world as food for humans, fodder for animals, and for cereal crops. Millets are rich in nutritious elements, including high levels of protein, iron, Fiber, antioxidants, and macronutrients, as well as unique agronomic qualities (Laishram et al., 2023). According to Kumar (2018), there are two types of millets that grow in India. Major millet crop and minor millet crop. Major millets crop includes sorghum, pearl millet, and finger millet, and minor millets crop includes foxtail, small millet, kodo, proso, and barnyard millet. The United Nations Food and Agriculture Organization has proclaimed 2023 as the global year of millets (Rao et al., 2021). The world is becoming more aware of the importance of millet for health and ecological benefits, but on the other hand, global food crops are also in danger due to climate change as it affects agricultural productivity and systems (Porter et al., 2015). Millet is a small-seeded grass that requires less water for production and is also highly resilient to climate variability. Millets are also contributing to making the Sustainable Development Goals successful (Zougmore et al., 2021). Millet has a unique agronomic

quality that can tackle climate change. (Kumar et al., 2018). Millets work well with agro-ecological techniques such as mixed cropping, intercropping, and organic farming to support traditional farming practices and improve soil health and ecosystem resilience (Muthamilarasan & Prasad, 2021). Present-day researcher Examining the Function of Millets in Supporting the SLR Method's Sustainable Development Goals: Towards Climate Resilience in Agriculture. To close this gap, a thorough literature review on the relevant subject of the Millets mission is undertaken in this paper. The primary goal of this study is to explore how millet can improve agricultural climate resilience and help achieve the Sustainable Development Goals (SDGs). Additionally, it is recommended to research millet varieties appropriate for various climates, support climate-resilient agriculture, and investigate the socioeconomic effects of millet-based agriculture. Millets are essential for attaining the Sustainable Development Goals (SDGs) because they increase agricultural resilience to climate change. According to Bandyopadhyay and Muthamilarasan (2017), millets are a valuable tool for creating a resilient and sustainable food system because of their high nutritional content, adaptability to changing climate conditions, water efficiency, ability to preserve biodiversity, and compatibility with sustainable farming systems.

The CRA, millets, SDGs, and AFS's theoretical underpinnings

Climate Resilience in Agriculture: Increasing global population and climate change are posing a significant threat to global food security as they disrupt agricultural productivity and affect other aspects of the agricultural system (Porter et al., 2015).

Understanding the Role of Millets in SDGs: Millets contain high amounts of important micronutrients, fiber, and proteins. As a valuable tool in the fight against malnutrition and food insecurity, millets contribute to the Sustainable Development Goals (SDGs) by ensuring nutritional security (Dhankher & Foyer, 2018).

Adaptability and Food Security: In the modern world, food security and adaptability are vital issues. To guarantee food security for all, agricultural systems must be flexible due to the quick changes in climatic patterns, population expansion, and globalization (Crane et al., 2011).

Purpose of investigation in this study

The primary goal in this study is to investigate.

1. To Millets promote Sustainable Production
2. To Enhance Food and Nutrition Security and Support small scale farmers.

Exploration of Data and Methodology

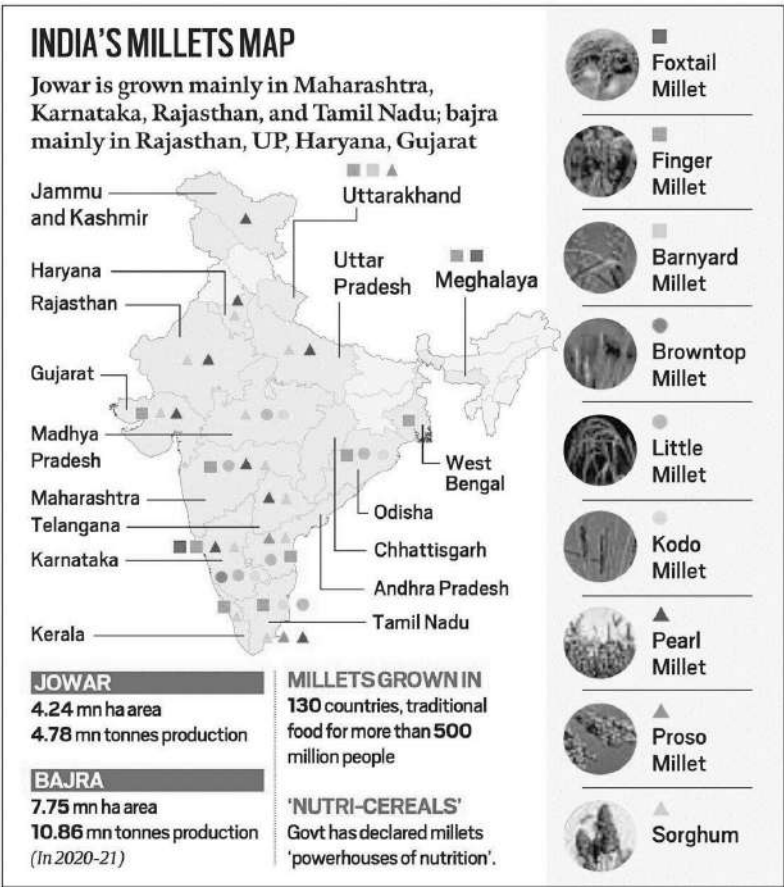
The current investigation material is based on the study of secondary data sources and combines publication trends from numerous papers. We use the systematic literature review (SLR) methodology. The search results from Google Scholar and the Publish or Perish databases were used as the primary sources for the literature used in this investigation.

Which are derived from different sources including the internet or literature related to published by various authors as well as departments of Agriculture and Processed Food Products Export Development Authority (APEDA), Ministry of Commerce and Industry, Government of India, Millets India, Indian Institute of Millets Research (IIMR), International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), and United Nations Department of Economic and Social Affairs Sustainable Development.

Understanding the Role of Millets in Promoting SDGs

Millets play a crucial role in promoting sustainable development goals. SDG (Goal No. 1, Zero Poverty) Millets are a product not only for food or fodder but also for expanding value-added processing and various millet production, which may help generate income in rural regions (Stanislaus et al., 2022). “Goal No. 2 is zero hunger.” The objective of this goal is to end hunger, improve nutrition, and promote sustainable agriculture without harming the environment (UN General Assembly, 2015). Millet’s cultivation could also promote SDG (Goal No. 3) Good health and well-being) in this modern crop do not provide essential nutrients (Pradhan et al., 2021). SDG (Goal No. 8, Decent Work, and Economic Growth): Millet provides income opportunities for rural areas. Millet’s cultivation also promotes various processing and marketing activities related to agriculture, which add value for livelihood opportunities and support the rural economy (Pradeep et al., 2023). SDG (Goal No. 11, Sustainable Cities and Communities) Millets might contribute to sustainable urban development. It can be integrated into urban food systems, agriculture farmers markets, and community resilience (Pradeep et al., 2023). SDG (Goal No. 12, Responsible Consumption and Production) Millets are an environmentally friendly and small cereal crop that promotes asustainable diet and reduces the strain on natural resources (Pradeep et al., 2023). SDG (Goal No. 13, Climate Action) targets and indicators aim to promote mechanisms for enhancing agriculture's productivity; that’s why we implement climate change-related planning and management in developing countries (UN General Assembly, 2015). SDG 13 promotes milletcultivation in two ways. In the first way, millets might help to improve food production and overcome the adverse effects on agricultural productivity caused by global warming and climate change; on the other hand, based on millets, agriculture could help to reduce synthetic fertilizer and pesticide production and help to reduce adverse effects on the environment (Ladha et al., 2020). Nowadays, hardly any agricultural produce is without fertilizer and pesticides, but millets are an exception. It generally grows with less input fertilizer, pesticides,and rain (Devkota et al., 2016). The aim is to achieve (Goal No. 15: Life on Land) sustainable maintenance of biodiversity and ecosystems suitable for specific agroclimatic conditions. Millets promote partnerships between farmers, government agencies, research institutions, andcivil society organizations (Pradeep et al., 2023).

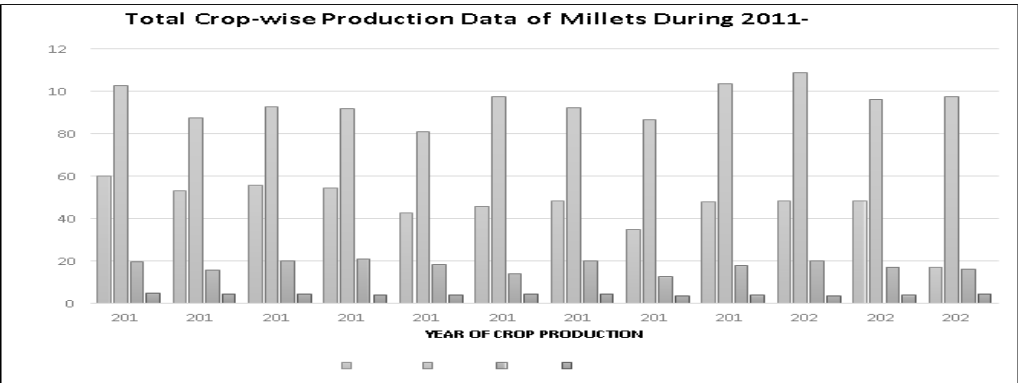
Millets Cultivation in India



Source: Agricultural and Processed Food Products Export Development Authority (APEDA, 2022) Ministry of commerce & Industry, Gov. of India. URL- <https://apeda.gov.in/milletportal>

A					B	
Total Crop-wise Production Data of Millets During 2011-2022					Various types of Millets	
Year	JAWAR	BAJRA	RAGI	SMALL MILLETS		
2011	59.79	102.79	19.29	4.52		
2012	52.81	87.42	15.74	4.36		
2013	55.42	92.5	19.83	4.3		
2014	54.45	91.84	20.61	3.86		
2015	42.38	80.67	18.22	3.91		
2016	45.68	97.3	13.87	4.42		
2017	48.03	92.09	19.87	4.39		
2018	34.75	86.64	12.39	3.33		
2019	47.72	103.63	17.55	3.71		
2020	48.12	108.63	19.98	3.47		
2021	48.12	96.24	16.96	3.75		
2022	16.9	97.5	16	4.2		

Total Crop-wise Production Data of Millets During 2011-2022



Source: Chart (A): Show Total Crop-wise Production Data of Millets During 2011-2022. Fig. (B): Show Various Types of Millets. Fig. (C): Show Total Crop-wise Production Data of Millets Graph. Agricultural and Processed Food Products Export Development Authority (APEDA ,2022) Ministry of commerce & Industry, Gov. of India.URL- <https://apeda.gov.in/milletportal>

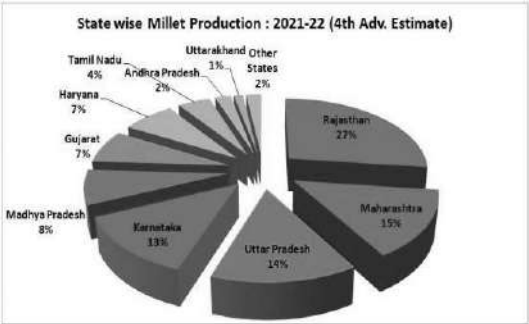
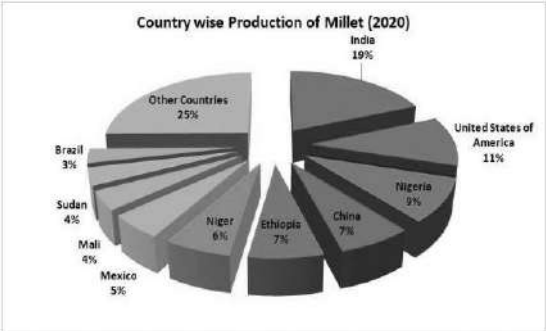
Millets Production Data Country or State Wise

This diagram illustrates the production of millet by country: India accounts for 19%, the United States for 11%, Nigeria for 9%, China for 7%, Ethiopia for 7%, Niger for 6%, Mexico for 5%,Mali for 4%, Sudan for 4%, Brazil for 3%, and other countries for 25%.

Source: Fig.: Show country wise production of Millet (2020), Agricultural and Processed Food Products Export Development Authority (APEDA ,2022) Ministry of commerce & Industry, Gov. of India.

State-wise millets production (2021–22) is depicted in the diagram, with Rajasthan accounting for 27%, Maharashtra for 15%, Uttar Pradesh for 14%, Karnataka for 13%, Madhya Pradesh for 8%, Gujrat for 7%, Haryana for 7%, Tamil Nadu for 4%, Andhra Pradesh for 2%, Uttarakhand for 1%

Source: Fig.: Show State wise Millet Production (2021-22), Agricultural and Processed Food Products Export Development Authority (APEDA ,2022) Ministry of commerce & Industry, Gov. of India.



Benefits of Millets for Health

Nutrient Content of Millets per 100gm					
crop/Nutrient	Protein	Fiber	Minerals	Iron	Calcium
Sorghum	10	4	1.6	2.6	54
Pearl millet	10.6	1.3	2.3	16.9	38
Finger millet	7.3	3.6	2.7	3.9	344
Foxtail millet	12.3	8	3.3	2.8	31
Proso millet	12.5	2.2	1.9	0.8	14
Kodo millet	8.3	9	2.6	0.5	27
Small millet	7.7	7.6	1.5	9.3	17
Rice	6.8	0.2	0.6	0.7	10
Wheat	11.8	1.2	1.5	5.3	41

1. Superior nutritious crop
2. Prevention of Diabetes
3. Gluten free and reduction of weight, High Blood Pressure
4. Dual Purposes for food as well as fodder
5. Reduce the Carbon Footprint

Millets Promoting Climate-Resilient Crops

By encouraging millets to be cultivated, we can take advantage of their natural qualities, such as water efficiency, resistance to extreme weather events, and adaptability to a variety of agroclimatic conditions, to improve climate resilience in agriculture (Ashoka et al., 2020). By encouraging climate resilience in agriculture, millets can significantly contribute to the achievement of the SDGs (Bandyopadhyay & Muthamilarasan, 2017). According to Lenka et al. (2020), they provide a climate-smart and sustainable approach to food production that ensures food security, lessens sensitivity to climate shocks, reduces greenhouse gas emissions, and eases the strain on natural resources. In general, millets play a critical role in agriculture's ability to meet the SDGs and adapt to climate change. They provide several advantages, including climate-smart solutions, sustainable farming methods, and biodiversity conservation. Millets are major kharif crops. The ideal growing conditions are a temperature between 27 and 32 °C, precipitation ranging from 50 to 100 cm, and poor alluvial or loamy soil.

Conclusion

Encourage climate resilience in agriculture; millets are essential to achieving the SDGs. Millets are a valuable tool in creating a resilient and sustainable food system because of their high nutritional content, adaptability to changing climate conditions, water efficiency, ability to preserve biodiversity, and compatibility with sustainable farming practices. Thus, encouraging millets to be grown and consumed is crucial to addressing food security, reducing the effects of climate change, and accomplishing the Sustainable Development

Goals. In the modern world, we will need to try to put food in the mouths of newborns. When grown by environmentally conscious and astute farmers, millet has enormous potential for improving nutrition and ensuring food security.

Reference

1. Ashoka, P., Gangaiah, B., & Sunitha, N. (2020). Millets-foods of twenty first century. *Int. J. Curr. Microbiol. Appl. Sci*, 9, 2404-2410.
2. Brouziyne, Y., Abouabdillah, A., Hirich, A., Bouabid, R., Zaaboul, R., & Benaabidate, L. (2018). Modeling sustainable adaptation strategies toward a climate-smart agriculture in a Mediterranean watershed under projected climate change scenarios. *Agricultural Systems*, 162, 154-163.
3. Crane, T. A., Roncoli, C., & Hoogenboom, G. (2011). Adaptation to climate change and climate variability: The importance of understanding agriculture as performance. *NJAS: Wageningen Journal of Life Sciences*, 57(3-4), 179-185.
4. Das, U., & Ansari, M. A. (2021). The nexus of climate change, sustainable agriculture and farm livelihood: contextualizing climate smart agriculture. *Climate Research*, 84, 23-40.
5. De Pinto, A., & Ulimwengu, J. M. (Eds.). (2017). A thriving agricultural sector in a changing climate: Meeting Malabo Declaration goals through climate-smart agriculture (Vol. 2016). Intl Food Policy Res Inst.
6. Dhankher, O. P., & Foyer, C. H. (2018). Climate resilient crops for improving global food security and safety. *Plant, Cell & Environment*, 41(5), 877-884.
7. Glazebrook, T., Noll, S., & Opoku, E. (2020). Gender matters: Climate change, gender bias, and women's farming in the global South and No
8. Haussmann, B. I., Fred Rattunde, H., Weltzien-Rattunde, E., Traoré, P. S., Vom Brocke, K., & Parzies, H. K. (2012). Breeding strategies for adaptation of pearl millet and sorghum to climate variability and change in West Africa. *Journal of Agronomy and Crop Science*, 198(5), 327-339.

8. EMPLOYMENT STATUS OF WOMEN IN RURAL KOLHAPUR

Shri Sanjay N. Patil¹, Dr. Deepak S. Narkhede²

¹Asst. Professor, Dept. of Geography, Karmaveer Hire College Gargoti, Dist. Kolhapur

²Associate Professor and Head, Dept. of Geography, Changu Kana Thakur Arts, Commerce and Science College New Panvel, Dist Raigad

Abstract

Women naturally constitute half of the population of the society. Means they have equal rights and opportunities in every field in society. The population of women is not equal to men population in age group. Also, with the population size women have not equal to social status with compared to men. There is discrimination in domestic and social life. Women contribute their work to build family, society and nation. Their hidden and unpaid work is not count in income. Agriculture and related activities provide employment to people. These primary activities have been related to mostly in the rural area. Agriculture in India is substantial and traditional occupation. So women work participation rate (WPR) is higher in agriculture sector. Mechanization is increasing in agriculture on a largest scale in rural area. New machines and methods have come in agriculture. The work done by women is being replaced by machines and new techniques. The literacy rate of women has increased in last two decade. Educated women are declining from primary occupation. Sometimes women appear to be literate but do not have higher education and professional education. As a result, employment status remains low. This study focus on female work participation rate in workforce and their Employmental status in rural Kolhapur with area and time.

Keywords: WPR, Rural, Primary Activities, Mechanization

Introduction

Women occupies half population of a society. Means they have equal rights and opportunities in every field in society. But the population of women is not equal to men population in age group. Along with the population size women have not equal to social status with compared to men. There is discrimination in domestic and social life. Women played an important role in society. Their contribution has been remarkable since long ago. Women and their whole life is an integral part of human life. Nature gives us diversity in our life but humankind make discrimination in it.

Rural area is small size area of human settlement. It is a countryside area of the urban center. It has been production activity related to mostly primary occupations. Most of the population in rural areas is engaged mainly in agriculture and agriculture-based occupations. Most occupations are related to natural conditions in rural areas. Women in rural area have been closely related to geographical condition with their all activity. She

participates in domestic, social and economic activities. She actively gives her contribution for improvement of family and economic status. But gender discrimination occurs more in rural area than urban due to illiteracy, less opportunities in employment, patriarchal system and oppressed traditions in society. Her role is important in society like as child rear, caretaker, and house maker. There is need to assess their educational and employment status in society and need to suggestions and remedies for improvement in it.

Objectives

1. To study the role of women in economic activity in rural area.
2. To understand the problems faced by working women in rural area.
3. To identify the employment status of women in playing their role in development of rural area.

Data and Methodology

In this paper, data includes tahsil wise male and female work participation rates. The data for this study is collected from census of India in 1991, 2001 and 2011. It is secondary data. This study is mainly analytical with the help of area and time. With this in view the method of using secondary data consisting of census of India, reports, books, journals, libraries, etc. have been used. The relevant material is collected from secondary sources. For the purpose of research work, the primary data is collected by questionnaire, interview and observation techniques from sample villages. Women's work participation and their problems in work have been understood in the rural area of Kolhapur district. Data table, graph and maps are included for presentation of female work participation in Kolhapur district.

Rural Women and Economic Activities

India is a country where agriculture is a major occupation. The economy of the India is based on agriculture. 66% of the population engaged in agriculture and allied activities. The geographical condition and monsoon climate help sustainable agriculture from long ago. Maharashtra is a third largest state in India and seemed largest in terms of population. 55% part of the population lived in rural area in Maharashtra in 2010-11. As per the National Sample Survey, the total employment in various sectors was 432 lakhs in Maharashtra. The maximum employment was observed in agriculture and allied activities (56%). Agriculture provides employment to a sizeable population.

Agriculture and related activities provide employment to people. These primary activities have been related mostly in the rural area. Agriculture in India is substantial and traditional occupation. So, women work participation rate (WPR) is higher in agriculture sector. Rural women contribute their work to build family, society and nation. Their hidden and unpaid work is not count in income.

Female Work Participation in Rural Kolhapur

Kolhapur district is a southern district of Maharashtra. The physical features of the district are varied topography, consisting of plains, plateaus and hill ranges. Kolhapur has rich source of water to agriculture due to existence of different rivers. The main occupations of people are agriculture, milk production, textile, sugar industry and small-scale industry. For purpose of administration, Kolhapur district is divided into 1197 villages and 12 talukas. The population of Kolhapur district was 38.74 lakhs in 2011 and 957 sex ratios. More than 68 percent population was living in rural area in 2011. And 47.89 percent of the population were engaged in agriculture.

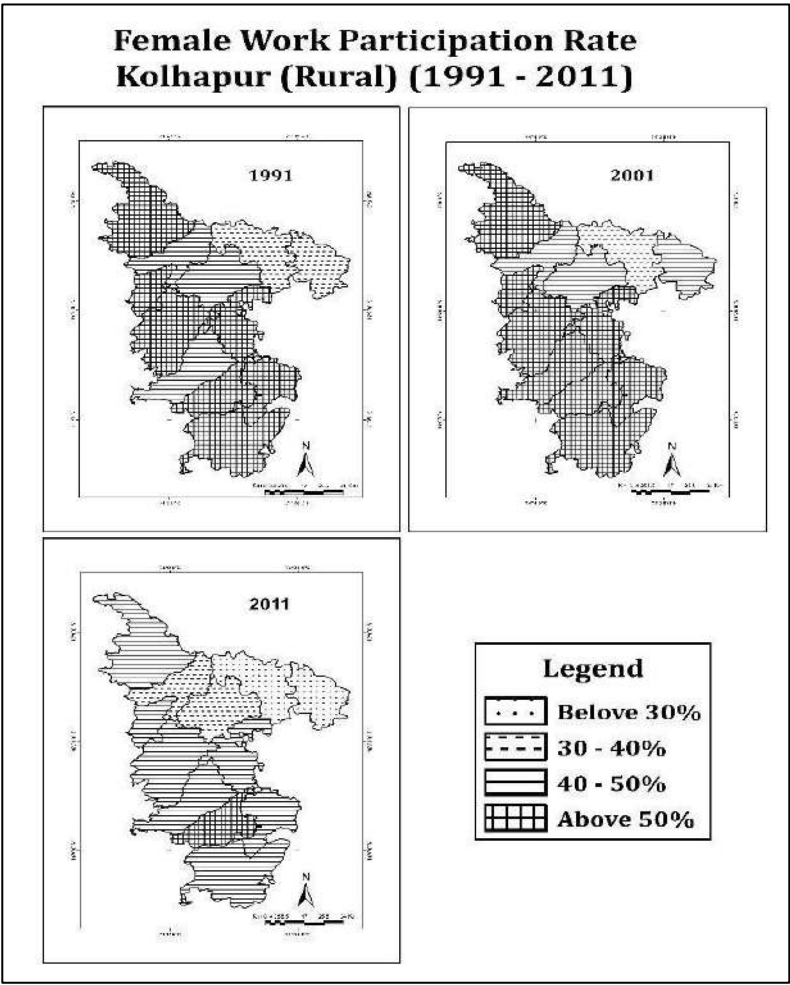
**Work Participation Rates in Kolhapur District (Rural)
(1991 to 2011)**

No.	Tahsil	1991			2001			2011		
		Total	Male	Female	Total	Male	Female	Total	Male	Female
1	Shahuwadi	54.87	53.85	55.80	52.53	54.23	50.92	52.17	56.79	47.65
2	Panhala	51.45	55.39	47.30	53.80	58.04	49.22	47.47	56.42	37.67
3	Hatkanangle	45.88	56.60	34.30	45.53	56.95	33.17	39.78	57.62	20.72
4	Shirol	44.40	57.14	30.67	51.54	60.44	42.05	41.41	58.10	23.83
5	Karvir	49.02	55.11	42.41	52.24	59.75	43.94	46.45	57.92	33.86
6	Bavda	57.32	58.83	55.79	55.56	58.23	52.80	49.40	56.27	42.06
7	Radhanagari	53.46	54.63	52.26	56.19	59.13	53.08	53.29	58.32	47.91
8	Kagal	55.17	55.85	54.47	56.49	59.36	53.47	51.75	58.47	44.67
9	Bhudargad	51.26	52.63	49.92	55.21	58.02	52.38	51.83	57.10	46.47
10	Ajra	51.12	50.03	52.08	54.17	55.14	53.29	55.25	58.16	52.66
11	Gadhinglaj	52.66	54.97	50.42	55.99	59.54	52.53	51.54	58.09	45.26
12	Chandgad	59.20	60.18	58.26	53.68	56.61	50.83	54.18	58.90	49.56
	Kolhapur	50.88	55.57	46.10	52.73	58.27	46.97	47.89	57.77	37.62

(Source: Census of India)

The work participation rate of female population has been low than the male population. In last decade, the female work participation in rural area had decreased by 9.35% and consequently the female rate of non-worker is increased.

Mechanization is increasing in agriculture on a largest scale in rural areas. New machines and methods have come in agriculture. The work done by women is being replaced by machines and new techniques. The literacy rate of women has increased in this decade. Educated women are declining from primary occupation.



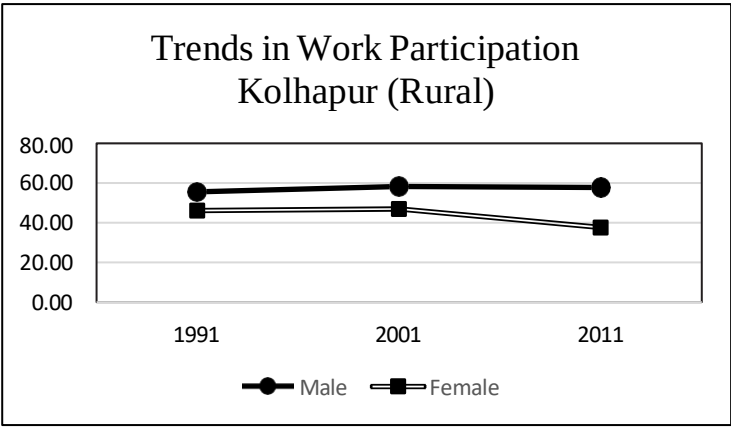
In Kolhapur district, 81.89% women were working in agricultural sector out of total worker. Agriculture is a major occupation which give the employment to people. Women work participation rate in rural area is decreased in five talukas in 1991 to 2001 mainly Shahu wadi, Hatkanangle, Bavada, Kagal and Chandgad. The remaining seven talukas have increased slightly. So no more have change in average rate in this decade. But in the decade

of 2001 to 2011, there is big change. WPR decreased in all 12 talukas with an average of 9.35%.

The taluka of Hatkanangle and Shirol has below 30% WPR in rural areas. These are the developed talukas by a large number of industries and new farming systems. Shahuwadi, Bavda, Radhanagari, Bhudargad and Chandgad have located in hilly region of Western Ghat, where large size number of women are working in agriculture sector.

Employment Status of Women in Rural Area

Employment is important to the reduction and removal of poverty. Generation of employment is connected with development of women. It is important objective of planning in India. Employment enables the person to endow the person with purchasing power, self-respect, and social identification. So, it is one of the most important indicators of development. Employment status refers to the rights and protections the employees are entitled to at work. Employment status determines the responsibilities that an employer give to the employee with their work. Whenever an employer hires new personnel, it is up to them to decide what type of employment status they are hiring for it.



Female Work Participation in Different Sectors (2011)

Female Workers in Different Sectors	Main Workers (77.96%)	Marginal Workers (22.04%)
Cultivators	57.4	43.12
Agricultural Labours	25.3	35.93
Household Industry Workers	2.63	5.15
Other Workers	14.67	15.8
Total	100	100

Women WPR play significant role in reducing gender inequality. About 82.7% women were in main workers in agriculture sector i.e. cultivator and agriculture labors. More female population were engaged in agricultural sector. The participation of primary sector is indicating the low status of women than men. Women have low employment in rural area because of low literacy. Sometimes women appear to be literate but do not have higher education and professional education. As a result, employment status remains low. The level of economy and occupations and diversification effects on women WPR in rural area

Problems of women employment in rural area.

The rate of women work participation in rural Kolhapur (37.62%) is low than the urban area (15.18%) in 2011. There are a few challenges and problems that rural women employment faces like family background, balance of time between family and work, education and work experience etc.. In rural Kolhapur, literacy among women (69.73%) is low compared to men (86.75%). Mostly women are illiterate and less educated in rural area due to lack quality of education. In this regard women do not adopt new technology, new methods of manufacturing and farming, shortage of finance, social and cultural barriers, social attitudes, lack of technology awareness, absence of motivation are the major problems for women empowerment.

Conclusion

Agriculture is a primary occupation in rural area that is very close to environmental resources. Majority of the women population is working agriculture sector. Women must become organizer for sustainable development in rural area. Women work participation rate is decreased in last decade than previous decade. Hatkanangle and Shirol are the developed talukas in agriculture and industry compared to other talukas, where the female WPR low. New techniques and new farming methods decline participation rate in primary sector. But WPR are not more increased in non-agricultural sector.

There is need for women empowerment in all field of society. Decision making process need to be given to women as a part of women empowerment. It means providing equal opportunities for growth and development in society and eliminating the gender bias. The work participation rate of female is decreased in decade 2001 to 2011. This is disapproving the participation of women in productive work. There is need to strengthen the place of women in society and need to facilitate institutions for work towards the

progress and development of women in society. It is essential to create an environment for women where they have access to healthcare, education and employment etc.

References

1. Afrin Sharmina (2008), A Multivariate Model of Micro Credit and Rural Women Entrepreneurship Development in Bangladesh, International Journal of Business and Management, Vol 3, No.8
2. Borooah Vani and Iyer Sriya (2005), 'Religion, Literacy and the Female-to-male Ratio.' Economical and Political Weekly, Vol. XL No. 5, pp. 419-427
3. Chandana R.C. (1994), A Geography of Population, Kalyani Publishers, Ludhiana.
4. Census of India 1991, 2001, 2011
5. Husain, M. (2002), Human Geography, Rawat Publications Jaipur.
6. Jaiswal, R. P. (1993), Professional Status of women, Rawat Publications Jaipur.
7. Jilha samajik v arthik samalochan (2013), Maharashtra shasan, Arth v sankhyiki sanchanalay, Kolhapur
8. Maharashtra Human Development Report (2012), Yashwantrao Chavan Academy of Development Administration, Sage Publication Pune.

9. A CONSOLIDATED STUDY OF DEMOGRAPHIC DIFFERENTIALS OF SC POPULATION IN PUNJAB

Dr. Preeti

Assistant Professor, Geography Department, Goswami Ganesh Dutta Sanatan Dharma College, Sector-32, Chandigarh, E-mail: rituchauhanjan@gmail.com

Abstract

In this paper, an attempt has been made to present a consolidated picture of inter-caste differentials in select demographic characteristics of the scheduled caste population in Punjab. Here, an attempt to present a consolidated picture taking three important parameters, including literacy rate, degree of urbanization and rural non-farm employment. All three parameters are intertwined, representing awareness and awakening, residential mobility, and occupational transformation among SC castes in rural areas, respectively. In other words, these parameters indicate socio-economic transformation taking place among different SC castes. As a geographer, we preferred to examine all these parameters from a spatial perspective. Unfortunately, however, the Census of India stopped the publication of industrial classification of SC workers by individual castes at the district level after the 1981 Census. Caste-wise, such data are now published at the state level. Since district-wise data on the industrial classification of SC workers are not available for 2011, we have calculated data in literacy rates and degree of urbanization also by individual SC castes at the state level. Hence, a limitation has been imposed on examining inter-castes differentials in the socio-economic transformation of the SC population in Punjab at the district level.

Keywords: *Inter-caste differentials, Ad Dharmi, Kabirpanthi, Balmiki, Socio-Economic transformation*

Introduction

Statement of Research Problem

The differentials in socio-economic and demographic characteristics of the SC population are confined not only to the regional or state level but there are glaring intra-regional differentials also. Punjab, one of the developed states of the Indian Union having the highest proportional share of SC population in its total population in the country, there are wide inter-district as well as inter-caste differentials in socioeconomic and demographic characteristics of SC population. Moreover, Punjab lags behind several other states in terms of the socio-economic and demographic development of SC population. For example, SC population in Tamil Nadu (29.9 per cent) is more urbanized than that of Punjab (24.3 per cent), and literacy and work

participation rates among SC population are much higher in the neighboring state of Himachal Pradesh (70.3 per cent, 48.9 per cent) than in Punjab (56.2 per cent, 37.0 per cent, respectively).

At 2011 Census, SC population accounted for 8.86 million persons or about 32.0 per cent in total population of Punjab state. It ranged from a high to 9.23 lakh persons in Ludhiana district to a low of only 1.80 lakh persons in Rupnagar district, giving a range difference of more than five times. Less than one-third of the twenty districts in state, in combine, have more than one- half or 51.3 per cent of total SC population in the state. Though, there were 37 scheduled castes at 2001 Census in the state, four castes namely the Mazhabi, the Chamar, the Ad Dharmi and the Balmiki, in combine, constitute 83.8 per cent of the total SC population in the state. The Mazhabi, with the largest share of 31.6 per cent in total SC population in the state, constituted the first ranking caste in seven of the then 17 districts in the state. The Chamar caste made the first ranking caste in another five districts. In another words, in more than the two-thirds of the districts in the state either the Mahzabis or the Chamars make the top-ranking SC caste (see fig.1). In combine, they make roughly six out of each ten scheduled castes in the state. Such kind of dominance in distribution is bound to play a significant role in social and political mobilization of such castes in the state.



Fig. 1

Literacy and education, which play a vital role in creation of awareness and occupational and social mobility, varied widely among different SC castes in Punjab. The literacy rate ranged from a high of 69.3 per cent among the Darains to a low of only 5.1 per cent among the Sapelas. The state average for SC population being 47.5 per cent, only 14 of the 37 castes had this share higher than the state average. Interestingly, the Mazhabi, the largest SC caste in the state, fared far below the state average. Their literacy rate was only 35.1 per cent. Against this, the Ad Dharmis and the Chamars fared above the state average. While, the large majority of Mazhabis are engaged as agricultural labourers in the state, the Ad Dharmis and the Chamars are more in manufacturing activities and white-color jobs (Judge and Bal, 2009). The Bauris, whose numerical strength is substantial in the state, have literacy rate of less than 25.0 per cent.

Though, there are studies on SC population in the state as will be revealed in the review of literature in the following, there is hardly any study analyzing the inter-caste differentials in socio-economic and demographic characteristics of the SC population during the entire post- Green Revolution phase; and the state taking the present politico-administrative shape, popularly known as Punjabi suba (Punjabi language speaking state). The study proposes to cover the five census decades, from 1971 to 2011.

Significance of the Study

The present study, which purports to cover five census decades Further, there are though 39 SC castes in the state as per the 2011 Census, but top ranking five or six castes steal the overwhelming share in total SC population in the state. It would be interesting and academically rewarding to study how large size and Sikhism in a relative developed state of India Union has helped the SCs and different castes within them in their socio-economic and demographic transformation.

Objectives

It is evidently clear from the preceding discussions and the review of literature that there is inadequate literature on the present research theme in geography. Finding a research gap, the present study accepts the challenge. The study purports to

investigate inter-caste differentials in select demographic characteristics of the scheduled caste population in Punjab in the light of the following research objective: -

To analyse inter-caste differentials in population caste dominance, degree of urbanization, literacy and educational level, and occupational transformation within the SC population in Punjab from the temporal perspective.

Research Questions

In light of above-stated objectives, the present study frames the following research questions for their answers with the help of data mapping and analysis.

1. What is the spatial pattern of caste dominance within the SC population in the state?
2. Which of the castes among the SCs are more urbanized than others and how has it changed in time and space between 1971 and 2011.
3. What has been the degree of education among the SC population in the state and how it differ at the caste (inter-caste) level and what are its causes and consequences?
4. What has been the degree of occupational transformation among the SC population in the state.

Data sources and methodology

The study was mainly based on secondary sources of data. The Census of India has been collecting and publishing data on various demographic and socio-economic attributes of the SC population in India. The Special Tables on Scheduled Castes, published from Census 28 Urbanisation among Scheduled Castes in Punjab: A Study of Inter-Caste Differentials Commissioner and Registrar General of India, New Delhi following each Census decade provide a variety of demographic data on the SC population. The data available from the General Population Tables and the Special Tables on Scheduled Castes pertaining to rural-urban composition have been pressed into service for conducting the present study. For studying differentials in SC Weighted index method has been used to prepare indices for individual parameters as well as the composite picture of the socio-economic transformation of each of the eleven SC castes. An index value of 100 has been assigned to the caste having the

highest score of any of the parameters. The index value for the rest of the castes has been calculated in relation to this value. For example, with a 71.3 per cent share the Dhanak was the most urbanized among all the eleven castes in 2011. So, the Dhanak caste has been assigned a weightage of 100. The next ranking caste in the degree of urbanization is the Kabirpanthi, having 68.5 percent urbanization. If 71.3 per cent is given the weightage of 100, then 68.5 per cent will have an index value of 96 ($100 \times 68.5 / 71.3 = 96.07$ rounded to 96). The same procedure has been repeated for all castes for all three parameters.

Results and Discussion

Eleven SC castes, each having 1.0 per cent or more in the total SC population of Punjab in 2011 have been picked up for the purpose here. Data has been calculated for two census decades, 1971 and 2011, to study current patterns as well as the change taking place during the last four decades between 1971 and 2011. The two new castes, the Mahatam/Rai Sikh and the Mochi, notified in the SC list after the conduct of 2001 Census and enumerated for the first time in 2011, have been kept out here in the present study.

Our focus will be basically on the composite index of socio-economic transformation and inter-caste differentials therein. There are wide inter-caste differentials in their socio-economic transformation. In 2011, with an overall index value of 96 Kabirpanthi caste was the most transformed and with only 28 index value the Bauria caste the least transformed SC among the eleven major castes in Punjab (Table 1). All the whole, the three castes, namely, Kabirpanthi, Ad Dharmi, and Dumna, having composite index value of more than 70, have been classified as the castes having high degree of socio-economic transformation among the major eleven castes in Punjab. While, Kabirpanthi ranked high on all three parameters, Ad Dharmis and Dumnas only on the two parameters, namely, literacy rate and rural economic diversification. Ad Dharmis and Dumnas fared quite low on the parameter of urbanization. In other words, both these castes were though predominantly rural but having high degree of rural occupational diversification and high literacy level. This was particularly true of Ad Dharmis, who were the most literate among all the major SC castes in Punjab. Ad Dharmis, who are mainly concentrated in Jalandhar, SBS

Nagar, Hoshiarpur and Kapurthala districts of Bist doab, are quite awakened and traditionally engaged in shoe-making and sports industry. Many young educated and skilled persons have emigrated to the Middle-East, Canada, England and Australia. Dumnas, who makes a first ranking caste in Gurdaspur districts, are traditionally engaged in non-farm occupations, even in the rural areas and their new generation is paying attention to literacy and education.

Another six districts, having index value ranging between 70 and 54, are categories in medium category of socio-economic transformation. Such castes included the Chamar, the Dhanak, the Balmiki, the Megh, the Sansi, and the Bazigar. In this group of castes, Dhanaks are the most urbanized and the Bizigar, the least. The Meghs, in this category, have the least occupational diversification. Except for the Dhanaks and the Meghs, all other castes in this category are traditionally engaged in non-farm occupations even in rural areas. For example, Bazigars, traditionally nomads and acrobats, were engaged in non-farm activities. Their main concentration is found in Patiala, Firozpur, Sangrur and Bathinda districts of Malwa region. Their literacy level is mainly responsible for placing them in the moderate category of socio-economic transformation.

The remaining two castes, having index value of less than 50, are classified as low transformed SC castes in Punjab. These castes included the Mazhabi (index score being 47) and the Bauria (index score being only 28). In other words, these two castes are predominantly rural by residence and agricultural by occupation.

Change during 2001-2011

In 2001, when the composite index value ranged from a high of 93 for Kabirpanthis to a low of only 26 for Burias, inter-caste differentials were quite sharp but not much different from 2011 (Table 2). In 2011, the range difference between the highest and the lowest index value was 68 points, in 2001 this difference was 67 points. Evidently, there has not been any noticeable change in inter-caste differentials in socio-economic transformation among eleven major SC castes in Punjab during 2001-2011. Three SC castes, namely the Kabirpanthi, Ad Dharmi and the Dumna, which had index score value of more than 70 in 2011 and hence were classified as high transformed SC castes, fall in the same category in 2001 also. Ad Dharmi caste

Table 1: Punjab: Top 11 castes on levels of socio-economic transformation, 2011									
Sr. No.	SC name	Urban	Index	Literate	Index	Rural non-farm	Index	Total of Index	Index score
0	All SC	21.4		56.5		51.2			
1	Kabirpanthi	68.5	96	71.4	98	73.7	94	288	96
2	Ad Dharmi	21.4	30	73.0	100	78.6	100	230	77
3	Dumna	33.4	47	64.7	89	72.1	92	227	76
4	Chamar	30.2	42	64.4	88	63.2	80	211	70
5	Dhanak	71.3	100	46.7	64	36.7	47	211	70
6	Balmiki	39.9	56	57.4	79	59.7	76	210	70
7	Megh	43.5	61	61.2	84	32.3	41	186	62
8	Sansi	27.0	38	42.4	58	53.8	68	164	55
9	Bazigar	21.1	30	48.3	66	51.5	66	161	54
10	Mazhabi	18.3	26	47.0	64	38.9	49	140	47
11	Bauria	10.8	15	36.8	50	15.1	19	85	28
Source: Calculated from (i) Census of India (2011), Primary Census Abstract Data downloaded from Internet (http://www.censusindia.gov.in/2011census/population_enumeration.html)									

could fall in the high category of castes mainly because of its highest position among all the eleven major SC castes both in literacy rate and rural occupational transformation, otherwise fared very poorly in rural-urban mobility. Kabirpanthis were at the top both in 2001 and 2011 for having a high score on all the three parameters. On the other side of the scale, the number of castes under the low socio-economic transformation category was three in 2001, against two in 2011. Low transformation castes are those having an index score of less than 50. In 2001, such castes included Sansi, Mazhabi and Bauria. By 2011, Sansi caste had moved to the moderate category, mainly for its upward movement in urban mobility and rapid increase in literacy rate. For example, its literacy rate of 31.7 per cent in 2001 rose to 42.4 per cent in 2011 and its urban share moved to 27.0 per cent in 2011 from about 19.0 in 2001. Evidently, the movement of the Sansi caste from the low to the moderate category of caste in Socio-economic transformation between 2001 and 2011 was the most noticeable change taking place during the period.

Change during 1991-2001

In 1991, when index score value ranged from a high of 86 for Kabirpanthi caste to a long of only 18 for Bauri caste, the range difference was 68 points (Table 3). Evidently, the range difference in inter-caste socio-economic transformation has remained almost the same during 1991-2001 and 2001-2011. However, the number of castes falling under high category in 1991 was only two, having index score value of more than 70. These two castes in 1991 included the Kabirpanthi and the Ad Dharmi. Both in 2001 and 2011, the Dumna caste was also included in the high transformation category. On the other side of the scale, there were as many as four castes included in the low transformation category.

The number of such castes was only the two in 2011 and the three in 2001. The four castes finding their place in the low transformation category in 1991 included Bazigar, Sansi, Mazhabi and Bauria. In 2001, the Bazigar caste formed a part of the

Table 2: Punjab: Top 11 castes on levels of socio-economic transformation, 2001									
Sr. No.	SC name	Urban	Index	Literate	Index	Rural non-farm	Index	Total of Index	Index score
0	All SC	19.9		47.5		51.4			
1	Kabirpanthi	58.6	85	63.6	96	72.4	99	280	93
2	Ad Dharmi	19.9	29	66.5	100	73.2	100	229	76
3	Dumna	29.0	42	54.2	81	67.6	92	216	72
4	Dhanak	68.8	100	35.7	54	35.3	48	202	67
5	Chamar	25.1	36	54.5	82	59.7	82	200	67
6	Balmiki	35.0	51	47.4	71	55.2	75	198	66
7	Megh	47.6	69	52.4	79	35.6	49	197	66
8	Bazigar	19.6	28	36.2	54	50.8	69	152	51
9	Sansi	18.9	27	31.7	48	52.2	71	146	49
10	Mazhabi	16.0	23	35.1	53	36.3	50	126	42
11	Bauria	8.5	12	25.0	38	19.5	27	77	26
Source: Calculated from (i) Census of India (2001), Social and Cultural Tables, Part II-C (i), Registrar General and Census Commissioner of India, New Delhi.									

moderate transformation category, and in 2011, both the Bazigar and the Sansi were included in the moderate category. Further, the number of castes included in the moderate category was five each in 1991 and 2001, but six in 2011. Obviously, with improvement in literacy level, rural occupational diversification and urban mobility, the more number of SC castes were moving to moderate and high categories of socio-

economic transformation, but their intro-category raking are changing fast due to differential progress made by different castes on the three parameters included in measurement of socio-economic transformation. The notable examples are of the Megh and Dhank castes, which were sliding down the scale over the census decades; while the reverse was true of the Chamar, and the Sansi castes, which are moving upward the ladder. This is mainly due to the differential progress made by the eleven major SC castes in Punjab made on the three parameters of urban mobility, rural occupational transformation and the progress in literacy rates.

Table 3 : Punjab: Top 11 castes on levels of socio-economic transformation, 1991									
Sr. No.	SC name	Urban	Index	Literacy	Index	Rural non-farm	Index	Total of Index	Index score
0	All SC	15.4		33.4		24.8			
1	Kabirpanthi	46.8	70	46.2	89	43.9	100	259	86
2	Ad Dharmi	15.4	23	51.9	100	39.5	90	213	71
3	Megh	50.4	75	37.8	73	23.2	53	201	67
4	Dhanak	67.1	100	20.7	40	23.2	53	193	64
5	Dumna	26.9	40	38.2	74	29.4	67	180	60
6	Chamar	19.8	30	39.3	76	31.5	72	177	59
7	Balmiki	31.8	47	32.4	63	24.9	57	166	55
8	Bazigar	15.9	24	20.3	39	23.3	53	116	39
9	Sansi etc.	17.0	25	19.8	38	20.6	47	110	37
10	Mazhabi	12.4	18	21.1	41	13.2	30	89	30
11	Bauria	8.1	12	12.9	25	7.5	17	54	18
Source: Calculated from (i) Census of India (1991), Social and Cultural Tables, Part II-C (i), Registrar General and Census Commissioner of India, New Delhi.									

Change during 1981-1991

In 1981, index score ranged from a high of 84 for Kabirpanthi caste to only 14 for Bauria caste, with a range difference being 70. During 1991-2001, the range difference was 68 (Table 4). Relatively higher range difference during 1981-1991 indicates to wider inter-caste differentials in transformation than the decades of 1991-2001 and 2001-2011. Further, there was only one caste, Kabirpanthi, in whose case index value was higher than 70. In other words, Kabirpanthi is the only caste

qualifying for a high category of socio-economic transformation. Other four castes, namely the Megh, Ad Dharmi, Dhanak, and Dumna were in the moderate category, having range between 50 and 70. Of the four castes included in moderate category in 1991, the two, the Ad Dharmi and the Dumna, were in high category both in 2001 and 2011. On the other side of the scale, the Megh caste that was placed next only to Kabirpanthi from the top in 1981 was placed on the seventh position among eleven SC castes both in 2001 and 2011. This indicates the relative progress on three parameters of socio-economic transformation over the census decades. Some castes registered a big jump and some other downward trend over the period.

The castes included in the low category of transformation, having index score value less than 50, six or more than one-half of the eleven major castes. The number of such castes was only two in 2011, three in 2001 and four in 1991. Evidently, the majority of SC castes in Punjab performed better over the period on different parameters representing socio-economic transformation. Individual efforts and the government programmes oriented towards the welfare of such castes in the state have been, individually and unison, responsible for such an achievement. Governments in India, the union and the state, have been making efforts as per the constitutional provisions to help such castes to improve their wellbeing. For example, Punjab identified educationally backward SC castes to improve their literacy level under a special drive.

Dhanak caste, that performed the highest on urban mobility but performed poorly both on literacy rate and rural occupational transformation, was ranked fourth among eleven major SC castes in 1981. Against this, Ad Dharmi caste that performed the highest among all the castes in literacy rate and in rural occupational transformation, but performed poorly on account of urban mobility was ranked third after Kabirpanthi and Megh castes. Sansi, Bazigar, Mazhabi and Bauria castes, performing poor on all the three parameters. Bauria caste consistently maintained the bottom position and Kabirpanthi the top position in all the Census decades from 1981 to 2011.

Change during 1971-1981

In the 1971 census, index value ranged from a high of 86 for the Kabirpanthi to only 13 for the Bauri caste, the range difference being 73. This is the highest value for

range differential, indicating the widest inter-caste differential, in other words, inter-caste differentials in socio-economic transformation SC castes in Punjab, were still very wide but narrowed down over the census decades during 1971-2011.

Table 4: Punjab: Top 11 castes on levels of socio-economic transformation, 1981									
Sr. No.	SC name	Urban	Index	Literate	Index	Rural non-farm	Index	Total of Index	Index score
0	All SC	15.0		23.9		22.8			
1	Kabirpanthi	40.9	56	39.3	97	54.2	100	253	84
2	Megh	49.7	68	30.9	76	32.6	60	205	68
3	Ad Dharmi	15.0	21	40.4	100	35.9	66	187	62
4	Dhanak	72.9	100	13.5	33	26.1	48	182	61
5	Dumna etc.	25.1	34	28.4	70	31.5	58	163	54
6	Chamar etc.	16.6	23	28.7	71	28.4	53	146	49
7	Balmiki etc.	30.7	42	22.1	55	20.8	38	135	45
8	Sansi etc.	11.7	16	14.8	37	24.0	44	97	32
9	Bazigar	14.2	20	12.4	31	17.4	32	82	27
10	Mazhabi	10.7	15	12.9	32	12.5	23	70	23
11	Bauria etc.	6.0	8	8.3	21	7.1	13	42	14
<i>Source: Calculated from (i) Census of India (1981), Social and Cultural Tables, Part II-C (i), Registrar General and Census Commissioner of India, New Delhi.</i>									

In 1971, Kabirpanthi and Megh were the two castes falling under the high transformation category, index value being higher than 70. In 1981, it was only one caste, Kabirpanthi, having score value higher than 70. On the other side of the scale, there were as many as the six or more than one of the major SC castes falling under the low category of socio-economic transformation, index value being less than 50 (Table 5). In 1981 also, there were the same number of castes falling under the low category. Kabirpanthi caste topped the list for its highest score both in literacy rate and rural occupational transformation. Megh caste had a relatively high score on all three parameters to find the second ranking next only to the Kabirpanthi caste. On the other side of the scale, Balimiki, Sansi, Bazigar, Mazhabi and Bauria castes performed low on all three parameters. Further, it is to be noted that the Megh and the Dhanak castes, which performed quite well both in 1971 and 1981, started coming down the ladder from 1991 onward, mainly due to their poor performance on literacy rate and rural occupational diversification.

Change during 1971-2011

In the following, an attempt has been made to summarize the overall picture of the transformational change taken place during the last four census decades (1971 to 2011) over the 40 years among the eleven major SC castes in Punjab. Table 6, where has been presented the summarized picture of decadal change among the eleven major castes on the basis of three parameters of socio-economic transformation, provides a highly revealing picture. The 1991 decade makes a water divide in this transformation story. It was in 1991 that Ad Dharmi caste moved to the higher category pushing down the Megh caste to third rank from the second in 1981.

Table 5 : Punjab: Top 11 castes on levels of socio-economic transformation, 1971									
Sr. No.	SC name	Urban	Index	Literate	Index	Rural non-farm	Index	Total of Index	Index score
0	All SC	12.9		16.1		23.0			
1	Kabirpanthi	35.9	57	29.6	100	57.3	100	257	86
2	Megh	50.5	80	23.5	79	38.1	66	226	75
3	Ad Dharmi	12.9	20	27.3	92	36.7	64	176	59
4	Dhanak	63.1	100	11.0	37	20.6	36	173	58
5	Dumna etc.	23.0	36	17.5	59	34.9	61	156	52
6	Chamar etc.	12.3	20	19.8	67	27.5	48	134	45
7	Balmiki etc.	27.1	43	13.8	47	20.2	35	125	42
8	Sansi etc.	9.1	14	11.0	37	26.8	47	98	33
9	Bazigar	11.3	18	6.6	22	17.8	31	71	24
10	Mazhabi	7.9	13	8.3	28	13.0	23	63	21
11	Bauria etc.	2.8	4	6.0	20	8.8	15	40	13
<i>Source: Calculated from (i) Census of India (1971), Social and Cultural Tables, Part II-C (i), Registrar General and Census Commissioner of India, New Delhi.</i>									

Secondly, the Chamar and the Balmiki castes moved to the moderate category from the low category in 1981. Thereafter, in 2001 Dumna caste moved to the high category from the moderate category in 1981, for its rapid progress in literacy rate and rural occupational diversification. Coming to the latest census decade of 2011, while there was no change in high category between 2001 and 2011 there have a noticeable change in moderate category. The number of castes in moderate increased from five to six during 2001 and 2011, and at the same time Chamar caste pushed the Dhanak caste to fifth rank from the fourth in 2001. The Sansi caste moved from ninth rank to eighth rank during the same period. By 2011, the number of castes in the low transformation category was reduced to only two from six both in 1971 and 1981. Moreover, inter-caste differentials socio-economic transformation also got narrowed down over the

period. While, inter-caste differentials were the maximum in 1971, these were the minimum in 2001. However, there has been an increase in differentials after 2001, but only a marginal one.

Table 6: Punjab: Change in socio-economic transformation of major SC castes, 1971-2011					
Transformation Level	Census decade				
	1971	1981	1991	2001	2011
High	Kabirpanthi	Kabirpanthi	Kabirpanthi	Kabirpanthi	Kabirpanthi
	Megh		Ad Dharmi	Ad Dharmi	Ad Dharmi
				Dumna	Dumna
Moderate	Ad Dharmi	Megh	Megh	Dhanak	Chamar
	Dhanak	Ad Dharmi	Dhanak	Chamar	Dhanak
	Dumna	Dhanak	Dumna	Balmiki	Balmiki
		Dumna	Chamar	Megh	Megh
			Balmiki	Bazigar	Sansi
					Bazigar
Low	Chamar	Chamar	Bazigar	Sansi etc.	Mazhabhi
	Balmiki	Balmiki	Sansi etc.	Mazhabhi	Bauria
	Sansi etc.	Sansi etc.	Mazhabhi	Bauria etc.	
	Bazigar	Bazigar	Bauria etc.		
	Mazhabhi	Mazhabhi			
	Bauria etc.	Bauria etc.			
Source: Calculated from (i) Census of India (1971), Social and Cultural Tables, Part II-C (i), Registrar General and Census Commissioner of India, New Delhi. And Socio and Cultural tables for 1981, 1991, 2001 census(ii) Census of India (2011), High level = Index value more than 70 Moderate level = Index value 50 to 70 Low level = Index value less than 50 Chamar; Name of SC caste					

Main Highlights:

1. Based on the three parameters of urban mobility, literacy rate, and rural occupational diversification, the analysis reveals that among the eleven major SC castes in Punjab, the Kabirpanthi caste is social-economically the most transformed, and the reverse is true for the Bauria caste. The same situation continued to hold true for the last four Census decades between 1971 and 2011.
2. However, there have been changes in the relative positions of different castes over the census decades, mainly because of differential progress made by different castes

on the three parameters used to measure socio-economic transformation among the major SC castes in the state. The castes such as the Megh and the Dhanak made a downward trend especially after 1991, against these castes such as Ad Dharmi, Dumna, Chamar, and Sansi moved upward to take higher ranks in socio-economic transformation over the census decades.

3. The 1991 census decade formed a water divide in the transformation story of major SC castes in the state. There has been more or less a status quo in ranking on a composite index of socio-economic transformation up to 1981 census decade. It was in 1991 Census decade, Ad Dharmi caste, which performed very well both in literacy level and rural occupational diversification between 1981-1991, moved up to high category of transformation from moderate category by pushing down the Megh caste, that did not perform well especially in rural occupational diversification, to third position and moderate category of socio-economic category. Furthermore, the Chamar and the Balmiki castes, for their better performance on different parameters of transformation, moved from the low category to moderate category of castes. The same trend continued further in 2001 and 2011 Census decades too.
4. There are wide inter-caste differentials in the socio-economic transformation of SC castes in Punjab. As revealed by the range difference in the composite index of socio-economic transformation differential was very wide during the 1971 and 1981 census decades. However, differentials started declining since 1991 decade and were considerably reduced in 2001 to rise again in 2011 but marginally only. The decline in inter-caste differentials is a combined effect of the personal efforts made at the household level and the government-sponsored programs and schemes oriented to the socio-economic upliftment of these castes. For example, the Government of Punjab identified educationally backward scheduled castes to boost their educational level through a special drive.

References :

1. Bharti, N. (2010). Social Justice and Scheduled Castes in India. Dynamics of Public Administration, Department of Public Administration, Univ. of Lucknow, 27(1) pp. 1-7.
2. D'Souza, V.S. (1975). Scheduled Castes and Urbanization in Punjab: An Explanation. Sociological Bulletin , 24(1) pp. 1-12.
3. Gist, N. (1954). Caste Differentials in South India. American Sociological Review, American Sociological Association Publication. , 19(2), pp. 126-137.

4. Gosal, R.P.S. (2003). The Process of urbanization and the Economic and Social Status of Scheduled Caste in India. *Research Journal Social Science (A Tri-annual Research Journal)*, 2, pp. 125-141.
5. Jodhka, S. (2000). Prejudice without Pollution Scheduled Castes in Contemporary Punjab *Journal of Indian School of Political Economy*. special issue on Scheduled Castes edited by Andre Beteille, XII (3 and 4), pp 381-402.
6. Jodhka, S. (2009). The Ravidasis of Punjab: Global Contours of Caste and Religious Strife. *Economic & Political Weekly* , 44(24), pp. 79-85.
7. Kant, Surya (2001). Socio-economic transformation of scheduled castes in independent India.
8. *Population Geography*, 23 (1&2), pp.15-28.
9. Krishan, G. and Madhav Shyam. (1978). Urban- Rural Differentials in Literacy in India. *The Journal of Developing Areas* , 13, pp. 15.
10. Kundu, A. and Rao, J.M. (1985). Inequity in educational development in India: Issues in measurement, changing structure and its socio-economic correlates with special reference to India. In Moonis Raza ed. *Educational Planning-A Long Term Perspective*, NIEPA, New Delhi.
11. Premsagar (1990). Spatial Pattern of Literacy Differentials in India: 1981. A Ph.D thesis, Submitted to Department of Geography, Panjab University, Chandigarh .
12. Puri, H. K. (2003). Scheduled Castes in Sikh Community: A Historical Perspective. *Economic and Political Weekly* , 38 (26), pp. 2693-2701.
13. Surinder S. Jodhka and Avinash Kumar. (2007). Internal Classification of Scheduled Castes: The Punjab Story. *Economic and Political Weekly* , 42 (43), pp. 20-23.
14. Singh, D. (2009). Development of scheduled castes in India: a review. *Journal of Rural Development*, NIRD, Hyderabad, 28 (4), pp.529-542.
15. Sopher, David E. (1974). A measure of disparity. *Professional Geographer*, 26(4), pp.389- 392.
16. Stroope, S. (2011). Caste, class and urbanisation: the shaping of religious community in contemporary India. Springer Science+Business Media B.V., published online, pp.499 -510.
17. Ramaswamy, Uma (1974). Scheduled castes in Andhra: some aspects of social change. *Economic and Political Weekly*, 9(29), pp.1153 -1158.

10. GOVERNMENT SCHEMES IN INDIA FOR EMPOWERMENT OF WOMEN THROUGH EDUCATION

Prof. Narayan Mohan Lad

Coordinator, Department of Management Studies, Saket College of Arts, Science, and

Commerce Kalyan East. Email: naraya27.lad@gmail.com

Abstract

Women's Empowerment is crucial for building stronger economies, reaching development goals, and improving the quality of life for everyone. It involves uplifting their economic, social, and political status in society. Unfortunately, women often suffer due to discrimination, victimization, and the prevalence of gender norms that favor men. The current paper describes the importance and challenges of women's empowerment and the various government policy initiatives towards this end. The paper also suggests policy recommendations to improve the current situation of women's empowerment through education in India. This study is based on secondary data such as government reports, articles, and research papers. However, despite the importance placed on women's empowerment, it's still a challenge in reality. The study concludes that while providing basic facilities and implementing programs for education and employment are essential, achieving true empowerment depends largely on people's attitudes toward gender equality.

Keywords: Women empowerment, Government schemes, Awareness, Welfare Schemes, Education.

"If you educate a man, you educate an individual. But if you educate a woman, you educate a nation."

Introduction

In many parts of the world, women make up about half of the population, but they often face challenges in getting basic support for important aspects of life. The health and nutrition levels of women are poor as compared to men and they are more at risk of physical violence and mistreatment. They don't always have the same opportunities for education and career growth. In workplaces, women often encounter obstacles, and they may find it hard to actively participate in political life. The unfair social and political situations lead to women having fewer opportunities and capabilities. Historically, the major obstacles to women's empowerment have been discrimination and dominance by the

masculine gender. Women face suppression from family and society for various reasons and are subjected to violence and discrimination by male family members. Historical practices like dowry, sati, nagar vadhu, sexual violence, female infanticide, parda pratha, child marriage, child labor, devadasi pratha, and contemporary social evils like domestic violence and sexual harassment, etc. stem from a traditionally patriarchal system. Empowering women requires eliminating these harmful practices and providing opportunities to women in the areas of education, and economics. Gender discrimination results in cultural, social, economic, and educational disparities which hinder national progress. Prioritizing gender equality, as outlined in the Indian Constitution, is crucial for women's empowerment. The nation must uplift women in all aspects, recognizing it as a top priority. Addressing inequalities between genders is essential for the nation's success, and women should be granted equal value in society. Women must be aware of their rights. The concept of women's empowerment has evolved from a welfare-oriented approach to an equity-focused one over the past five decades. The government has implemented various schemes to empower women, but there is an ongoing struggle to fully achieve women's empowerment. In India, despite efforts by Government, civil society, and social workers, women are generally less empowered than men.

Objectives

1. To understand why women's empowerment is important.
2. To Examine the government programs supporting Women's Empowerment.
3. To provide useful suggestions for the development of social balance.

Methodology

This study relies on information gathered from existing sources, such as books, journals, and the Internet. It is a descriptive paper that aims to study women's empowerment in India. The data used comes entirely from these sources to meet the study's requirements. The information includes details about women's empowerment schemes in India.

Literature Review

[1] Doepke M. Tertilt M (2011) explores whether Female Empowerment contributes to economic development. The study suggests that money in the hands of

mothers benefits children, and it develops models to understand the frictions leading to this observed relationship.

[2] **Duflo E** (2011) examines the relationship between Women's Empowerment and Economic Development, arguing that the links between empowerment and development may require continuous policy commitment to achieve equality between men and women.

[3] **H Subrahmanyam** (2011) compares women's education in present-day India with the past, noting progress in the overall enrollment of girls in schools. The term "empower" means granting lawful power or authority to act, representing the process of women gaining control over various aspects of their lives.

[4] **M Bhavani Sankara Rao** (2011) highlights the positive impact of health discussions within Self-Help Groups (SHGs) on the well-being of women members. These groups contribute to improved health outcomes by sharing information about health-related problems and government provisions.

[5] **Venkata Ravi and Venkatraman** (2005) focus on the impact of SHGs on women's participation and decision-making control in family and group activities. "Employment and Educational Status:Challenges of Women Empowerment in India", A Peer-Reviewed Indexed International Journal of Humanities & Social Science.

[6] **Wentling** (2003) points out that Women often face tension and conflict due to their dual roles in society. In her study on working women in Delhi, she emphasizes that the traditional authoritarian setup of the Hindu social structure remains dominant, leading to role conflicts. She suggests that changes in attitudes among men and women can help resolve these conflicts.

Need for Women Empowerment in India

Women face suppression, discrimination, and reduced access to opportunities and resources due to various reasons. Harmful traditions and customs have developed over time that seek to restrict the role of women to domestic responsibilities, despite the existence of customs and rituals honoring and worshipping women in Indian society. However, mere respect is not enough for the country's development; the entire female population needs empowerment in all aspects of life. India, known for its diversity, has people of various religious beliefs. Empowering women can transform the country into one of equal opportunities and a thriving economy. Empowering women benefits the entire family

effortlessly. As women are often considered responsible for everything in the family, their empowerment can effectively address various social issues. Women's empowerment is not just a solution to individual problems; it contributes to overall societal, economic, and environmental well-being.

In recent years, the positive impacts of women's empowerment are evident. Women are becoming more conscious of their health, education, careers, and responsibilities toward family, society, and the country. Their increased participation across various fields is a result of their rights being recognized after years of struggle. The Government of India has implemented numerous schemes to empower women, emphasizing that it is a multi-dimensional process allowing women to realize their full potential in all aspects of life. Empowerment happens when groups of women work together to become more self-reliant. They have the right to make their own decisions in life and aim to have control and access to resources. Empowerment is a process that helps people take charge of their lives by becoming more aware, taking action, and working towards having more control. This often includes gaining confidence in their abilities.

Women's Education in Modern India:

Women's education in modern India can be traced back to the years following Indian Independence. Several commissions and policies, such as the University Education Commission (1948-49), Modular Commission (1952-53), Kothari Commission (1964-66), National Policy in Education (1968), and National Policy for Education (1986), have emphasized the importance of women's education. In recent times, the government of India has taken steps to ensure education for all Indian women, leading to an apparent increase in the women's literacy rate. Today, women's education is a priority, and female literacy rates have surpassed male literacy rates. The Constitution of India ensures free primary school education for both boys and girls up to the age of 14. Since gaining independence, various initiatives have been implemented to enhance women's education in the country.

The literacy rate in India has shown improvement over the years, as seen from the data for the years 1901-2011.

Sl. No.	Census Year	Persons	Males	Females	Male-Female gap in literacy rate
1.	1901	5.35	9.83	0.60	9.23
2.	1911	5.92	10.56	1.05	9.51
3.	1921	7.16	12.21	1.81	10.40
4.	1931	9.50	15.59	2.93	12.66
5.	1941	16.10	24.90	7.30	17.60
6.	1951	18.33	27.16	8.86	18.30
7.	1961	28.30	40.40	15.35	25.05
8.	1971	34.45	45.96	21.97	23.99
9.	1981	43.57	56.38	29.76	26.62
10.	1991	52.21	64.13	39.29	24.84
11.	2001	64.83	75.26	53.67	21.59
12.	2011	74.04	82.14	65.46	16.68

Source: Census of India

Government Schemes in India for Empowerment of Women

1. **Beti Bachao, Beti Padhao:** The government came up with a really important plan for the education of girl children. The scheme aimed to address the declining child sex ratio. The aBeti Bachao Beti Padhao (BBBP) Scheme was started by the Prime Minister on January 22, 2015, in Haryana. The goal is to change people's attitudes towards the birth and rights of girls. Over the past six years, there has been an increase in awareness about gender bias, and the community has played a role in addressing it. The Sex Ratio at Birth has improved from 918 in 2014-15 to 934 in 2019-20. More girls are now enrolling in secondary schools, with the Gross Enrolment Ratio increasing from 77.45 to 81.32. The scheme has successfully brought attention to the issue of declining Child Sex Ratio in India and has become a topic of public discussion.
2. **Sukanya Samriddhi Account:** Launched in January 2015, this plan is an extension of the Sukanya Samriddhi Yojana. The government is encouraging parents to start saving early for their daughters' future. Instead of prioritizing getting them married, the focus is on providing better economic opportunities and education for girls. Under this scheme, parents or guardians can open a special account for their daughter with any bank or post office, starting with a minimum amount. They can make multiple deposits each year until the girl turns 14. The deposited money will mature after 21 years. The savings can be claimed as a deduction under Income Tax Section 80C, and the interest earned, currently at 8.4% per year, is also tax-free.
3. **Kasturba Gandhi Balika Vidyalayas (KGBVs)** were initially established as residential schools for girls in upper primary levels, targeting those from disadvantaged

groups like SC, ST, OBC, minorities, and Poverty Line families. The Girls Hostel Component of Rashtriya Madhyamik Shiksha Abhiyan (RMSA), which operated until 2017-18, provided hostel facilities for girls aged 14-18 in classes IX to XII, belonging to SC, ST, OBC, Minority communities, and BPL families.

4. **Udaan:** CBSE has introduced a program called "Udaan" to offer free online resources to female students in Class XI and Class XII. This is to help them prepare for admission tests at top engineering colleges in the country. The scheme focuses on increasing the enrollment of girls in prestigious institutions by providing special incentives and support. The goal is to empower girls to pursue higher education, take on leadership roles in the future, and improve their learning of Science and Mathematics at senior secondary levels. The program aims to benefit 1000 selected disadvantaged girls each year. The Udaan program, initiated by the Central Board of Secondary Education (CBSE), aims to tackle the low enrollment of female students in esteemed engineering institutions.
5. **All-India Council for Technical Education (AICTE)** has introduced a program to support and encourage more girls to participate in technical education. This initiative aims to provide opportunities for young women to enhance their education and prepare for a successful future through technical training. The scheme plans to offer 4000 scholarships annually, covering tuition fees up to Rs. 30,000 or the actual amount, whichever is lower. Additionally, students will receive Rs. 2000 per month for 10 months as incidental expenses each year.
6. **The National Scheme of Incentives to Girls for Secondary Education (NSIGSE)** provides Rs. 3000, which is deposited in the name of eligible unmarried girls below 16 years as a fixed deposit. They can withdraw this amount along with the interest when they reach 18 years of age and after passing class X. The goal of the scheme is to create a supportive environment, reduce dropouts, and encourage the enrollment of girls in secondary schools. The scheme includes all girls from SC/ST communities who pass class 8 and girls who pass class 8 from KGBVs and enroll in class IX in Government, Government-aided, and Local Body Schools. The funds are not allocated state-wise but are sanctioned based on proposals from the State Government and the availability of funds during the financial year.
7. **Sarva Shiksha Abhiyan (SSA):** To ensure more girls attend primary school, the

'Sarva Shiksha Abhiyan (SSA)' has specific measures in place. These include setting up schools closer to girls' homes, hiring extra teachers (especially women), providing free textbooks and uniforms, building separate toilets for girls, conducting teacher awareness programs to encourage girls' participation, and using teaching materials that are sensitive to gender. The '**Rashtriya Madhyamik Shiksha Abhiyan (RMSA)**' aims to improve the quality of education by ensuring that there is a secondary school reasonably close to every community. The focus is on enhancing the quality of education at the secondary level and removing barriers related to gender, socio-economic status, and disabilities. Under this program, various actions are taken, such as building new secondary schools, adding toilet blocks in existing schools with separate facilities for girls, constructing housing for teachers, establishing girls' hostels in Educationally Backward Blocks (EBBs), providing special teaching for improved learning, offering self-defense training, guidance, and counseling facilities, conducting adolescent education programs, and organizing empowerment and awareness camps.

8. **One Stop Center Scheme:** We often see women facing different types of problems like exploitation, torture, and violence. This violence can be physical, sexual, mental, economic, or psychological. It is the government's responsibility to create a safe and fair environment for everyone. To help women in distress, the One Stop Center Scheme started in April 2015. These One Stop Centers are there to provide immediate help, emergency assistance, medical support, and legal and psychological aid to women and girls, even those below 18 years old.

Suggestions

1. The primary focus should be on women's education, addressing the fundamental issue at its roots. Therefore, special emphasis must be placed on educating women.
2. Conducting awareness programs becomes crucial to enlighten women, particularly those from marginalized sections, about their rights.
3. Enabling women to work in a safe and supportive environment is essential. Offering fair wages.
4. There should be rigorous enforcement of programs and laws to eliminate the prevailing malpractices in society.

5. Making sure that girls and women can go to school for anything they're interested in.
6. Letting women have more say in important decisions.

Conclusion

From our study, we've found that the current situation for Indian women isn't as good as it should be. There's a need to take steps to ensure women's rights and basic needs are met. The most important thing right now is to change how society views women. The saying, "When women move forward, the family, village, and nation move," highlights the crucial role women play in the development of a good family, society, and nation. Empowering women is a significant concern not only in India but globally in the 21st century. For society to progress, both men and women should have equal opportunities. The government has introduced several beneficial schemes for Women and Child Welfare. However, more than schemes and laws, we need social discussions, debates, promotion, and awareness to address these issues. In conclusion, Indian women, with their persistent efforts and the support of legal provisions and government welfare schemes, have shifted the concept of women empowerment from a focus on welfare to one of equity. However, government initiatives alone won't be enough. Strict implementation of schemes and policies is essential to achieve the goal of women's empowerment.

References

1. Doepke M. Tertilt M (2011). "Does Female Empowerment Promote Economic Development?"CEPR Discussion Paper 8441.
2. Duflo E (2011) This is a research paper about how empowering women contributes to the economic development of a country. It was done by the National Bureau of Economic Research in Cambridge. 2011 ,17702
3. H Subrahmanyam (2011) Women Education in India Facts and Factors, (Asian Entrepreneur, 2011, pages 61-71
4. M Bhavani Sankara Rao (2011) Impact of SHG on Family Welfare Programme, AsianEntrepreneur,2011; 20-30
5. Venkata Ravi and Venkatraman (2005) Empowerment of Women through Self-Help Groups: A Mero Level Study SEDME (Small Enterprises Development, Management & Extension Journal):Volume 32, Issue 1
6. Wentling, R.M. (2003) - Mary Wentling, R. (2003), "The career development and aspirations of women in middle management – revisited", Women in Management Review, Vol. 18 No. 6, pp. 311-324.
7. <https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1691725>
8. <https://static.pib.gov.in/WriteReadData/specificdocs/documents/2022/jan/doc20221207101.pdf>

11. CLIMATE CHANGE AND SUSTAINABILITY OF PORTS: A CASE OF MUMBAI

Dipesh Karmarkar

Associate Professor, Department of Geography, Smt. CHM College, Ulhasnagar,
Email: dipeshgeography@gmail.com

Abstract:

This research paper addresses the urgent need to understand and mitigate the impact of climate change on seaports, with a particular focus on the Port of Mumbai and the Jawaharlal Nehru Port Trust (JNPT) on the Arabian Sea. The study is necessitated by the increasing vulnerability of these key maritime infrastructures to a spectrum of risks caused by climate change, including sea level rise, extreme weather events, and environmental degradation. The main objective is to assess the current and potential future vulnerability of Mumbai Port and JNPT Port to climate change and provide actionable recommendations to improve their sustainability and resilience. The study is based on a comprehensive methodology that includes interviews with maritime experts, analysis of port statistics, reports, academic research, and environmental assessments to provide a nuanced understanding of the multi-layered challenges faced by these ports. The findings highlight the immediate need for strategic interventions, including the restoration of natural tidal circulation, protection of mangroves, and rigorous anti-pollution measures. In addition, the study advocates the integration of climate change considerations into port policies, the development of long-term plans, and the introduction of effective regulatory instruments for sustainable and resilient port development. The paper concludes by emphasizing the critical role of continued stakeholder engagement and proactive action in addressing the complex and universal challenges that climate change poses to seaports.

Keywords: *Climate Change Impact, Seaports, Sustainability, Arabian Sea, Mumbai 2*

Introduction:

Climate change is the consequence of ongoing changes in long-term temperatures and weather patterns caused by human activities. It is a global challenge with comprehensive consequences. In particular, ocean warming, characterized by increased sea surface temperatures, is impacting marine ecosystems, while sea level rise poses a threat to coastal areas and critical port infrastructure. Ocean acidification, due to increased uptake of carbon

dioxide, further complicates the impact of climate change on the marine environment. The intensification of extreme weather events increases vulnerability in various sectors such as health, food security, water supply, infrastructure resilience, and livelihood sustainability. Beyond environmental concerns, climate change also has profound implications for international cooperation, security dynamics, migration patterns, and human rights issues. These impacts transcend geographical boundaries and require urgent and collaborative action by stakeholders.

The pervasive influence of climate change extends to the core of the maritime environment and has a profound impact on the operational landscape of ports, which are important hubs of the global economy. Ports play a central role in global trade and development, handling about 80% of international trade volume and 70% of its value (Notteboom, Pallis, and Rodrigue, 2022). In India, where ports are the main channels for trade, an impressive 95% of the country's trade volume and 68% of its value is handled through these key hubs (Ministry of Ports, Shipping, and Waterways, Government of India [GoI], 2020). However, as ports are at the center of economic activities, they are both contributors and victims of climate change. Ports are closely linked to the maritime environment and face various challenges, from sea level rise and extreme weather events to ocean warming and acidification. As a result, the concept of a sustainable port has become one of the focal points in the climate change discourse. A sustainable port is one that effectively harmonizes its operational activities with ecological equilibrium, ensuring minimal adverse impacts on the surrounding environment. This entails not only the mitigation of climate change-induced stressors but also the prudent management of resources, waste, and energy, with a view towards long-term environmental stewardship. Sustainable port practices align with global initiatives aimed at fostering environmental responsibility. Against the backdrop of climate change, port sustainability becomes a cornerstone for ensuring the enduring relevance and resilience of ports within the evolving dynamics of global trade and environmental consciousness. The sustainability of ports is in line with the United Nations Sustainable Development Goals (SDGs). This connection is particularly evident in the overlap of port sustainability with SDG numbers 8, 9, 11, 12, 13, 14, and 17 (Caliskan, 2022). Against

this backdrop, the present paper attempts to assess the current and potential future vulnerability of Mumbai Port and JNPT Port to climate change and provide actionable recommendations to improve their sustainability and resilience.

Objectives, Study Area, and Methodology

This paper represents a preliminary and exploratory analysis reflecting the early stages of ongoing research. It is expected that as the study progresses, further insights and nuances will emerge that will contribute to a more comprehensive understanding of the topic. The objective of this work is to study the impact of climate change on the Mumbai Port and the JNPT Port. The aim is to identify the nature and extent of these impacts on the port infrastructures. Primary data was collected through in-depth interviews with experts in the maritime field who have specialized knowledge of seas, oceans, ships, and port operations. The qualitative insights gained from these interviews were used to develop a nuanced understanding of direct experiences and perceptions of the impact of climate change on ports. Secondary data was drawn from a variety of sources including port statistics, official reports, academic research articles, newspapers, journals, and relevant websites. The methodology of triangulation is applied by contrasting the insights gained from the primary interviews with the information obtained from the secondary sources. Conclusions were drawn by combining qualitative and quantitative elements to understand the challenges faced by Mumbai Port and JNPT Port in the face of climate change.

A case study approach is employed for this study. The port of Mumbai and the port of JNPT were chosen as sites for the case study (Fig. 1) because of their central role in India's maritime landscape. The Mumbai Port, with its historical significance, large trade volume, and naval presence, offers insights into the long-term impact of climate change on established port infrastructure. The port of JNPT, a large container port developed more recently, provides a contemporary perspective that allows the exploration of strategies to address climate change in modern port development. This two-case approach ensures a comprehensive analysis that encompasses both the historical legacy and current challenges in the face of climate change. Mumbai Port (18°56'27.96" N. and 72°50'29.91" E.) is situated along the Arabian Sea, and stands as a pivotal maritime gateway, boasting a prominent status in India's port hierarchy. Notably, it holds the 5th rank in terms of container traffic, signifying its significant role in facilitating the movement of goods through its terminals. In the fiscal year 2022-23, Mumbai

Port handled an impressive 42 TEUs (Twenty Foot Equivalent Units), solidifying its stature as a key player in containerized cargo traffic. Additionally, Mumbai Port holds the 4th rank in terms of overall cargo handled, recording a noteworthy 63.61 million tonnes in the same fiscal year. This figure represents a 6.21% increase from the previous year, underscoring the port's sustained growth and operational efficiency (Mumbai Port Authority [MbPA], 2023).

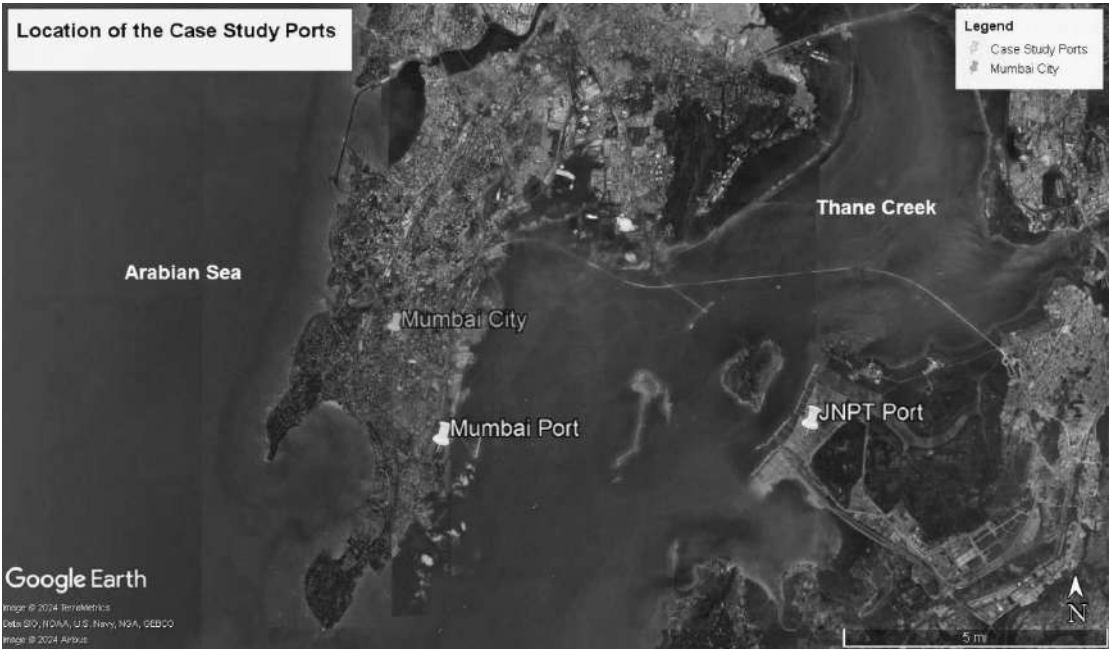


Fig. 1. Map showing the case study locations

Jawaharlal Nehru Port Trust or JNPT Port (18°56'43.68" N. and 72°56'55.19" E.) is positioned along the western coast of India and has emerged as a maritime powerhouse and a vital contributor to the nation's trade dynamics (Anil et al., 2003). As the second-largest container port in India, JNPT plays a pivotal role in containerized cargo movements. Notably, it secures the top rank in terms of container traffic, with an impressive handling of 4833,000 TEUs in the fiscal year 2022-23. This numerical prominence signifies JNPT's central role in facilitating the movement of containers, reflecting its strategic importance in the national trade network. Furthermore, JNPT holds the 3rd rank in terms of overall cargo handled, registering a substantial 83.86 million tonnes during the same fiscal year (Jawaharlal Nehru Port Trust, 2023, <https://www.jnport.gov.in>). This figure represents a commendable 10.35% increase from the previous year, attesting to the port's robust

operational capabilities and consistent growth trajectory. These statistical indicators underscore the critical role of Mumbai Port and JNPT in shaping the maritime landscape along the Arabian Sea. Their strategic rankings and operational

volumes highlight the significance of these ports in facilitating trade, emphasizing the need for a nuanced examination of their vulnerability and resilience in the face of climate change impacts.

Results and Discussion

Climate change has affected the Arabian Sea in many ways. In recent years, the Arabian Sea has experienced remarkable fluctuations in subsurface warming, which affects the intense activity of tropical cyclones (Albert, et al., 2023). Climate change has disrupted the natural decadal cycle of sea surface temperature (SST) in the Arabian Sea (Kumar, et al., 2009). A pronounced regional climate shift has been observed in the Arabian Sea, characterized by a five-fold increase in the frequency of intense cyclones. This increased cyclonic activity poses a direct threat to coastal regions, including the ports of Mumbai and JNPT. These ports are also within 50 km of tropical cyclones such as Nisarga in June 2020 and Tauktae in May 2021 (Becker, 2012). The impacts extend beyond the immediate coastal areas and influence weather patterns, precipitation regimes, and overall climatic stability. Since 1995, the Arabian Sea region has seen a notable decrease in decadal monsoon rainfall, accompanied by a decrease in vegetation cover and an increase in hot spells (Kumar, et al., 2009). These climatic changes have a profound impact on the water resources available to the ports of Mumbai and JNPT, affecting navigability, sedimentation rates, and overall port operations. These observations are confirmed by the results of the interviews. 66.7% of experts indicated that both ports in the case study are vulnerable to the effects of climate change.

The work of Bajaj and Youdon (2022) also supports this fact. The impact of climate change on the seaward and port-side infrastructure and operations of the Port of Mumbai was assessed using the Climate Change Risk Scale. The scale ranges from 1 to 5, with 1 being no risk and 5 being extreme risk. Mumbai Port is exposed to a spectrum of risk levels ranging from moderate to extreme (Bajaj and Youdon, 2022) due to the increased frequency and intensity of cyclonic and extremely severe cyclonic storms in the Arabian Sea. The impact of cyclones and extremely severe cyclones extends to critical maritime areas that include the approach channels, anchorages, navigation support infrastructure, and

berths (Bajaj and Youdon, 2022). These assets are highly exposed to the disruptive forces associated with hurricanes, requiring continuous monitoring and adaptation measures to ensure operational resilience.

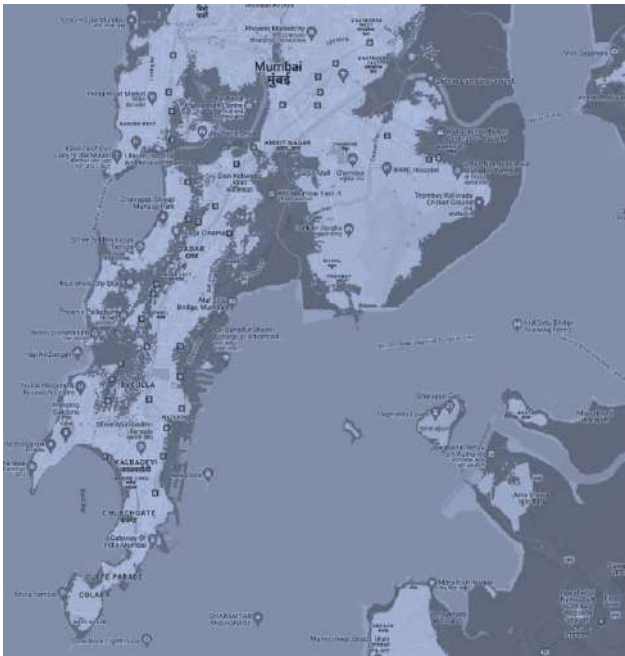


Fig. 2. Map depicting SLR projection for the year 2030 around the case study ports (Source: Climate Central – Coastal Risk Screening Tool, <https://coastal.climatecentral.org>.)

The effects of sea level rise and associated flooding on Mumbai are also significant (Jennath and Paul, 2024). Figure 2 shows the projection of sea level rise for the year 2030 under the current trajectory (“SSP3- 7.0”) around the case study ports. The areas marked in red correspond to the areas projected to be below the limit based on the CoastalDEM v.2.1 elevation data (Coastal Climate Central, 2024). The expected sea level rise (SLR) of 1.24 meters in the Representative Concentration Pathway (RCP) 8.5 scenario poses a significant threat to low-lying areas bordering Harbor Bay and Thane Creek near the Port of Mumbai (Chakraborty, Kambekar, and Sarma, 2021). These areas, characterized by their proximity to the port and Thane Creek, are particularly vulnerable to sea level rise, increasing the risks associated with coastal flooding and inundation. The Port's SLR-induced climate change risk ranges from moderate to extreme (Bajaj and Youdon, 2022). The seafront and portside facilities, including the sluice gates, berths, and crude oil jetties, are particularly vulnerable to water ingress. Sea level rise has a direct impact on critical facilities such as lock gates and berths in the Port of Mumbai (Bajaj and Youdon, 2022). These facilities,

which are essential for the operational efficiency of the port, face the dual challenge of adapting to rising sea levels and managing the associated risks. Mumbai Port also faces a range of risk levels, from moderate to high (Bajaj and Youdon, 2022), attributed to the combined impact of extreme precipitation and cyclonic storms. The heightened frequency and intensity of these climatic events contribute to the vulnerability of portside assets. Portside assets such as crude oil jetties, break bulk jetties, cargo transit areas, and ship repair facilities are susceptible to the risks posed by extreme precipitation and cyclonic storms (Bajaj and Youdon, 2022). During the interview, half of the experts acknowledged the impact of the 2005 Mumbai deluge on both the Mumbai Port and the JNPT Port. The heightened risk levels, ranging from high to extreme, are attributed to the potential impact of extremely severe cyclonic storms on Mumbai Port's portside assets (Bajaj and Youdon, 2022).

Located on the east coast of Mumbai island, the port of Mumbai enjoys a relatively safe location that offers protection from cyclones. The interviews with the experts also corroborated this fact. In contrast, the JNPT Port is a little more vulnerable due to its relatively open location. For example, Cyclone Tauktae in 2021 had a significant impact on the JNPT port (Chaliawala, 2021). The impact included the abrupt cessation of berthing operations, which caused a significant disruption to overall port activities. The resulting service disruption caused significant delays to shipping lines, congestion at the port, and severe disruptions in the supply chains associated with JNPT. During the interviews, participants indicated that the JNPT Port experienced more pronounced effects from the Tauktae cyclone compared to the Mumbai Port. Even in 2020, the JNPT port was hit by heavy rains and strong winds, indicating the evolving climate dynamics. The climatic event led to the collapse of heavy-duty cranes, a critical component of JNPT's operational infrastructure, which brought port activities to a standstill (Bajaj and Youdon, 2021). This incident highlights the port's vulnerability to extreme weather events related to climate change. These cases of climatic disruptions in JNPT highlight the complex challenges posed by climate change, particularly the increasing intensity of supercyclones.

During the interviews, experts were asked to rate the efficacy of climate change in influencing the Mumbai Port and JNPT Port on a scale of 1 to 5, where 1 indicates the least influence and 5 indicates the most impact. In both ports, experts assigned remarkably high ratings (5) to factors such as marine pollution and extreme weather events, including

cyclones. Moreover, they gave a high rating (4) to the impacts of sea level rise, ocean acidification, and the presence of marine biofouling organisms and invasive species. The interviews highlighted specific vulnerabilities of the case study ports. Experts particularly identified the shallowing of Thane Creek as the most dominant factor making the Mumbai Port more susceptible to climate change impacts. Marine pollution, on the other hand, emerged as a major contributor to the 8 vulnerability of the JNPT Port. Loss of mangrove cover and subsequent coastal erosion were also identified as vital factors contributing to the vulnerability of both ports. The potential impacts of climate change on the case study ports were also noted, indicating potential damage to port infrastructure, including terminals, berths, warehouses, quay walls, pilings, oil, and container jetties. Both ports are expected to experience operational downtimes, including issues in berthing times, and disruptions in supply chains. The interviews further suggested that the JNPT Port might face a slightly higher risk of flooding compared to the Mumbai Port, while the latter may specifically suffer damage to naval defense infrastructure and related facilities.

Conclusions and Recommendations

The Arabian Sea is currently struggling with the tangible effects of climate change which poses major challenges for the ports located on its shores. This dilemma takes on added implications when one considers the significant volume and value of trade handled by the ports of Mumbai and JNPT. The overarching issue of climate change is proving to be a formidable challenge for both ports, weaving vulnerability into the fabric of their operations. JNPT Port and Mumbai Port's geographic locations have a big impact on how vulnerable they are to possible climate change effects. Mumbai Port, which is located on the city's eastern shore, benefits from relative protection against cyclones. Due to its slightly more exposed location, JNPT Port exhibits a comparatively higher susceptibility to the escalating impact of extreme weather events. Both ports equally suffer due to the loss of mangrove cover and coastal erosion due to their location on either bank of the Thane Creek. These results highlight the significance of taking the regional context into account when developing focused strategies for maritime infrastructure adaptation and mitigation of climate change. Given the critical role these ports play in both domestic and global trade, it is imperative to recognize and mitigate their climate change vulnerability to promote the resilient and sustainable growth of ports.

In response to the multiple challenges of climate change, a comprehensive set of recommendations is proposed to strengthen the resilience and sustainability of the ports of Mumbai and JNPT. These recommendations are based on the primary and secondary data as well as the author's observations. The immediate need is to prioritize the restoration of natural tidal circulation to mitigate siltation while protecting critical ecosystems such as mangroves and mudflats and implementing measures to curb marine pollution. Climate change considerations must be seamlessly integrated into port policy and reflect a strategic approach to mitigate and adapt to its impacts. A robust, and dynamic action plan is essential to promote the sustainability and resilience of port operations. A forward-looking, long-term plan for 20-25 years is essential, aimed at enhancing capabilities to attract shipping and associated businesses. In addition, a detailed climate change mitigation plan is recommended, taking into account 1 and 2-meter sea level rise scenarios and requiring the allocation of resources for effective implementation. The importance of conducting an internal climate change assessment followed by an independent green audit to evaluate and improve environmental practices is emphasized. To support monitoring efforts, the establishment of effective data collection mechanisms for sustainability and resilience indicators is key. Transparency and accountability should be improved through comprehensive reporting on environmental and social impact indicators. A paradigm shift from merely measuring environmental indicators to proactive measures within the port is advocated (UNESCAP, 2021). The continuous and meaningful involvement of stakeholders is emphasized, as they play a crucial role in effectively adapting to and mitigating climate change. Finally, the development of appropriate regulatory instruments with clear guidelines for sustainable and resilient port development is crucial to ensure compliance with best practices and standards. These comprehensive recommendations serve as a strategic plan for both ports, enabling them to address the complex challenges of climate change and act as role models for sustainable and resilient port development.

References

1. Albert, J., Gulakaram, V., Vissa, N., Bhaskaran, P., and Dash, M. (2023). Recent warming trends in the Arabian Sea: causative factors and physical mechanisms. *Climate*, 11(2).
2. Anil, A.C., Clarke, C., Hayes, T., Hilliard, R.C., Joshi, G., Krishnamurthy, V., Polglaze, J., Sawant, S.S., and Raaymakers, S. (2003). *Ballast Water Risk Assessment, Ports of Mumbai and Jawaharlal Nehru, India, October 2003: Final Report*. GloBallast Monograph Series No. 11.

3. Bajaj, P. and Youdon, C. (2021). Towards a comprehensive climate adaptation framework for India's port infrastructure and operations: lessons from global best practices. *Environmental Science and Sustainable Development*, 6(2), 48-59.
4. Bajaj, P., and Youdon, C. (2022). *Assessing climate change risks to and resilience of India's seaport infrastructure and operations*. New Delhi: National Maritime Foundation.
5. Becker, A. (2012). Climate change and ports: Qualitative analysis of consequences, plans, and requirements. Presentation in the International Conference on Adaptation of Transport Networks to Climate Change. UNECE Greece. June 25-26.
6. Becker, A., Inoue, S., Fischer, M., and Schwegler, B. (2012). Climate change impacts on international seaports: knowledge, perceptions, and planning efforts among port administrators. *Climatic Change*, 110(1-2), 5-29.
7. Caliskan, A. (2022). Seaports' participation in enhancing the sustainable development goals. *Journal of Cleaner Production*, 379(2).
8. Chakraborty, S., Kambekar, A., and Sarma, A. (2021). Impact of Climate Change on Sea Level Rise along the Coastline of Mumbai City, India. *International Journal of Marine and Environmental Sciences*, 15(6), 164-170.
9. Chaliawala, N. (May 15, 2021). Cyclone Tauktae: JNPT stops berthing at Nhava Sheva port. *The Economic Times*. Retrieved February 11, 2024,
10. Jennath, A., and Paul, S. (2024). A multi-risk approach for projecting climate change-associated coastal flood applied to India. *Natural Hazards*. Springer.
11. Kumar, S. P., Roshin, R., Narvekar, J., Kumar, P., and Vivekanandan, E. (2009). Response of the Arabian Sea to global warming and associated regional climate shift. *Marine Environmental Research*, 68(2009), 217-222.
12. MbPA. (2023). 144th Administration Report 2022-23. Mumbai Port Authority. Retrieved February 14, 2024, from www.mumbaiport.gov.in
13. MCAP. (2022). Climate and air pollution risks and vulnerability assessment for Mumbai, India. Mumbai Climate Action Plan. Retrieved February 14, 2024,
14. Notteboom, T., Pallis, A., Rodrigue, J. (2022). *Port Economics, Management and Policy*. New York: Routledge.
15. Poulouse, J., Rao, A., and Dube, S. (2020). Mapping of cyclone-induced extreme water levels along Gujarat and Maharashtra coasts: a climate change perspective. *Climate Dynamics*. Springer,
16. Pramanik, M. K. (2017). Impacts of predicted sea level rise on land use/land cover categories of the adjacent coastal areas of Mumbai megacity, India. *Environment, Development, and Sustainability*, 19, 1343-1366.

12. TOURISM IN INDIA: A SWOT ANALYSIS

Mrs. Shilpa Nimbre¹ Mrs. Bhavna Dhande²

The S.I.A. College of Higher Education, Affiliated to the University of Mumbai, P-88,
MIDC Residential Area, Dombivli Gymkhana Road, Near Balaji Mandir, Dombivli (E),
Dist. Thane, 421 203, Corresponding Author: Mrs. Shilpa Nimbre, E-Mail:
nimbre.shilpa@gmail.com

Abstract

India is a country of diversity. It has remarkable tourist destinations that offer a plethora of experiences to tourists. However, the tourist potential of India is not utilized fully. The in-depth study of India's tourism sector may offer some suggestions for the same. With this view in mind, the present study attempts to conduct a SWOT analysis. The study concludes that there is an urgent need for framing suitable policies with their effective implementation. The Public Private Partnership will be of great help in this context. The results of this study are presented theoretically.

Keywords: Strengths, Weaknesses, Opportunities, Threats, Tourism.

Introduction

“Tourism” is a French word rooted in “Tour”. Tour means rotational motion, travel, trip, and circulation (Baghaili, M. and Norouzi O. 2006). As per the Encyclopaedia Britannica, “tourism is the act and process of spending time away from home in pursuit of recreation, relaxation and pleasure while making use of the commercial provision of services.” India stands unique in South Asia for its tourism. With its rich heritage and a multitude of attractions, the country offers several activities for tourists from all over the world. Bestowed with a distinct geographical entity India has several natural as well as artificial marvels that attract a good number of tourists (Ginwal, R. and Kumar, D. 2022). The effort to develop and promote the tourism industry among developing countries has become one of the vital growth mechanisms of many local destinations (Thetsane, R. 2019). Tourism development provides numerous economic, social, environmental, and cultural changes in the host destination, particularly in the host community's life (Stylidis et al., 2014). India has a dazzling future in the area of tourism and has a kaleidoscope of tourist attractions and products to offer to visitors. Realizing this, the Government of India is giving intense attention to building up facilities to attract tourists from the world over. Generally, tourism growth has been concentrated and accumulated in only some areas (Singh 2002). However, India has long been trying to attract more tourists and it has to go a long way in this sector. With this background, the present study is an attempt to understand

the present scenario of Indian tourism by using the technique of SWOT analysis which is a structured planning method used to assess the Strengths, Weaknesses, Opportunities, and Threats involved. A SWOT identifies the internal and external factors that are favourable and unfavourable for achieving the objective (Agrawal, V. 2016). The present paper implies a technique of SWOT analysis, a tool for strategic planning that helps determine and assess Strengths, Weaknesses, Opportunities and Threats to tourism. Strengths refer to the internal qualities and assets that provide tourism with a competitive edge. Examples include a reputable destination, cutting-edge transportation and accommodation or services, a skilled workforce, copious infrastructure etc. Weaknesses deal with the internal issues that might prevent tourism activity from reaching its goals including a lack of funding, poor management, inadequate infrastructure etc. Opportunities take into account external elements that tourism could take advantage of, Possibilities could result from modifications in tourists' preferences, new partnerships or alliances, technological advancements, or upgradation in technology and services. Threats refer to the external factors that could be harmful to the development of tourism including fierce competition, downturns in the economy, changes in the law, disruptions from technology, or modifications in consumer behavior.

Objective

The objective of the present study is to comprehend the present scenario of tourism in India using the technique of SWOT analysis.

Materials and Methods

This study is based on secondary sources of data. It utilizes the secondary data available on the official websites of several tourism-related authorities and the government of India. Government reports, books, research papers and news articles are also referred to as sources of secondary data while empirical evidences are also taken into consideration in the form of primary sources of information. The results are presented in descriptive form.

Results and Discussion

Strengths

1. There is a variation in the topographical features in India. The topography of the country is an attractive combination of mountains, beaches, deserts, and forests.
2. Indian culture is diverse in its nature. It is an amalgamation of a variety of cultural practices like food habits, languages spoken, fairs and festivals, customs and traditions.

3. There is an abundance of historical sites in India including forts, palaces, battlefields etc. For instance, the states of Rajasthan and Maharashtra are popular for their forts and palaces.
4. Indian monuments and history are well-known to foreign travelers.
5. The government of India has a separate ministry, called the Ministry of Tourism which handles tourism-related support matters.
6. India is a nation with a rich past, old civilization and rich in diversity and depth.
7. There are many sites in India where prehistoric people lived and settled hundreds of years ago.
8. India is a land of Unity in Diversity. It reflects the coexistence of diverse populations belonging to different races, religions, casts, colours, creeds, physical traits etc. within a single nation.
9. India is among the world's fastest-growing economies.
10. The literacy rate of the domestic population in India is increasing considerably.
11. In India, there is a rapid improvement in infrastructural facilities and their quality.
12. India has developed and maintained positive and amicable relations with many nations in the world which makes it easier for citizens of those nations to obtain travel permits to India.

Weaknesses

1. The infrastructure required for tourism development is inadequate and not copious in India.
2. There is an ineffective promotion of India's travel industry abroad.
3. The uncontrolled tourism in some places in India has resulted in the loss of environmental quality and local culture.
4. The rising fuel prices have increased air, train and bus fares in India.
5. There are lapses in security and safety measures, including instances where tourists are harassed and flaunted in some locations.
6. There is a wide gap between the demand and supply of skilled and unskilled laborers required for the development of tourism Industry.
7. Lack of high-quality hotels at most of the tourist destinations creates a problem with lodging for tourists.

8. The traditional practice of open defecation in some parts of the country has created undesirable environmental conditions for tourists.
9. Poor health conditions, deficiency in hygiene and inadequate sanitation, particularly in rural parts of the country create unfavorable environmental conditions for tourism.
10. There are occurrences where locals in various regions of the country harass and torture tourists, particularly those from abroad.

Opportunities

1. There is an involvement of the Indian government in the formulation of tourism policies.
2. In India, there is permission for more international businesses to enter the nation, which gives the country a global reputation.
3. One of the elements contributing to the expansion of the tourism sector of the country is the growth of domestic travel.
4. The innovative projects being launched by the Tourism Ministry, the Government of India assist in realizing the full potential of India's tourism industry.
5. A nationwide campaign designed to raise awareness of tourism among important stakeholders via an orientation and training process in place.
6. Sports events being organized in the country fetch tourists from India and also from other countries.
7. India gained recognition as a "sporting nation" capable of hosting major athletic events and gained a permanent spot on the global map.
8. There is scope to develop more adventure activities, spiritual tourism, and medical tourism
9. Rural areas has to focus on product packaging and marketing for their locally developed products as per standards.

Threats

1. Tourism in India is affected by foreign political unrest and financial hardships.
2. India's tourism industry is impacted by other nations' aggressive tourism promotion tactics, such as those used by Singapore, Switzerland and some Middle east countries.
3. Frequently ignored, deceived and impolitely treated tourists damages the reputation of the country.
4. Terrorist attacks affect the mental health of tourists. The number of foreign visitors to India is significantly decreased by these incidents.
5. The growing Naxalite activities and ongoing Maoist attacks create unrest in the country and pose an unfavorable environment for the tourism sector.
6. The nation's crime rates are rising with minor thefts to major homicides.
7. Outbreaks of diseases like dengue, chikungunya, swine flu and the pandemic of COVID-19 are discouraging travelers from visiting different regions of the country.
8. There is growing competition from far-flung nations such as Hong Kong, Singapore, etc.
9. The tourists are plagued by food problems.
10. The absence of basic tourist accommodations and infrastructure in the rural areas of the country.

Suggestions

India is a big, diverse nation with a lot of room to grow its tourism industry. Here are some ideas to improve Indian tourism:

- 1. Infrastructure Development:** To increase accessibility to tourist destinations, invest in infrastructure like highways, airports, and trains. Travelers will find it simpler to visit various regions of the nation as a result.
- 2. Promotion of lesser-known locations:** Although well-known locations like Goa and the Taj Mahal draw large numbers of visitors, many unexplored hidden gems in India are still unrecognized. Encourage travel to these lesser-known locations to broaden the traveler base and ease congestion at popular locations.
- 3. Cultural Experiences:** Travelers are primarily drawn to India because of its rich cultural legacy. Promote traditional art forms, heritage walks, and cultural festivals to provide tourists with a more comprehensive understanding of Indian culture.
- 4. Adventure Tourism:** Encourage the growth of adventure tourism through the promotion of pursuits like wildlife safaris, river rafting, trekking, and mountaineering. India's varied topography presents a wealth of chances for those who enjoy adventure.
- 5. Eco-Tourism:** To protect the environment and uplift local communities, emphasize eco-friendly tourism practices. Promote conservation efforts, responsible wildlife tourism, and eco-friendly lodging.
- 6. Digital Marketing:** Promote India as a travel destination throughout the world by utilizing digital channels. Make use of social media, travel blogs, and virtual tours to highlight the nation's sights and distinctive experiences.
- 7. Hospitality Training:** Train hotel employees, tour guides, and other tourism professionals to enhance the caliber of hospitality services. Providing top-notch customer service will improve visitors' experiences in general.
- 8. Safety and Security:** Give tourists' safety and security top priority by putting in place safeguards like emergency response systems, trained police officers, and helplines for travelers.
- 9. Personalized Travel Packages:** Provide personalized travel packages that accommodate varying interests and financial constraints. This will draw tourists from a broader spectrum, such as adventure seekers, lone travelers, and families.

10. Public-private partnerships: Encourage cooperation between the public and private sectors as well as local communities to promote the sustainable growth of the tourism industry. This can include undertakings like infrastructure development, community-based tourism, and heritage conservation projects.

By putting these recommendations into practice, India can take advantage of its enormous tourism potential, provide tourists with life-changing experiences, foster economic growth, and assist local communities.

Future of Tourism in India

India's tourism industry has a bright future, thanks to several factors:

1. Domestic Tourism: India's domestic tourism industry is predicted to grow dramatically due to the country's expanding middle class and rising disposable income. The tourism industry is expanding as a result of Indians traveling more and more within their nation.

2. Digital Transformation: Travelers now plan and book their trips in a completely different way thanks to the widespread use of smartphones and internet connectivity. Travel decisions are significantly influenced by social media platforms, travel apps, and online travel agencies. Digital innovations in the tourism industry will continue to be driven by India's tech-savvy populace.

3. Sustainable Tourism: The significance of sustainable tourism practices in protecting the environment and assisting local communities is becoming more widely recognized. Genuine experiences that reduce their environmental effect and boost local economies are what tourists are looking for. India provides a wealth of opportunities for sustainable tourism initiatives due to its rich biodiversity and cultural heritage.

4. Medical Tourism: Patients from all over the world looking for excellent healthcare at reasonable costs are drawn to India, which is quickly becoming a top medical tourism destination. Modern medical facilities and highly qualified healthcare workers make India a prime destination for medical tourists.

5. Adventure and Wildlife Tourism: India's varied topography, which includes the Western Ghats' tropical forests and the Himalayas, provides a wealth of options for these types of travel. A growing number of domestic and foreign tourists are interested in trekking, mountaineering, wildlife safaris, and water sports.

6. Cultural Experiences: Travelers from all over the world are still captivated by India's rich cultural legacy, which includes its historic sites, celebrations, food, and traditional art forms. It is anticipated that cultural tourism will grow as travelers look for genuine encounters and connections with local people.

7. Infrastructure Development: To support the expansion of tourism in India, investments in infrastructure, such as lodging, transportation, and tourist amenities, are crucial. Better roads, increased connectivity, and contemporary amenities will all contribute to a more enjoyable travel experience and increased visitor numbers.

8. Government Initiatives: The growth of the tourism sector will be further aided by the Indian government's focus on promoting travel through programs like "Incredible India" campaigns, e-visa facilities, and policies that are friendly to travelers. Investments in the industry will be driven by public-private partnerships and incentives for the development of tourism.

While India's tourism industry has a bright future, sustainable growth that benefits all parties while protecting the nation's natural and cultural heritage will need coordinated efforts from the public and private sectors as well as local communities.

Conclusion:

Tourism is a clean service industry with a higher economic multiplier. As a result of this, the growth of tourism-related infrastructure and leisure activities has traditionally been seen as having a positive impact on the country's economic growth. Furthermore, it appears that the tourism sector is more successful than other sectors at creating jobs and revenue. The destination nation's economy benefits from the same. Similar to other export-oriented sectors, this influx generates employment, household income, government profits and business turnover. Being a country with diversity in physical and cultural aspects, India has a lot of potential for the development of the tourist sector. However, there are some weaknesses and threats to the country's tourism sector. Framing appropriate policies and their effective implementation with the Public Private Partnership will serve the purpose. Today, a tourism goldmine awaits India, as global visitor arrivals are predicted to rise due to the expectation that foreign visitor arrivals in emerging economies will grow more quickly than in advanced economies.

References

1. Agrawal, V. (2016). A Review of Indian Tourism Industry with SWOT Analysis, *Journal of Tourism & Hospitality*, Vol. 5, Iss. 1, Pp.2-4.
2. Baghail, M. and Norouzi, O. (2006). "Rural tourism as a Source of Income for the Village", Dehyari Publications.
3. Ginwal R. and Kumar D. (2022). SWOT Analysis of Rural Tourism in India, *International Journal of Innovative Science and Research Technology*, Vol. 7, Iss. 3, Pp. 580-583.
4. Singh, R.B. (2002). Tourism Development and Environmental Implications for the Indian Frontier Region: A Study of Himachal Himalaya. In: Shaul Krakover and Yehuda Gradus (eds.), *Tourism in Frontier Areas*, Lexington Books, Lanham, Maryland. Pp. 177-194.
5. Styliadis, D., Biran, A., Sit, J. and Szivas, E.M. (2014). Residents' Support for Tourism Development: The Role of Residents' Place Image and Perceived Tourism Impacts. *Tourism Management*, 45, Pp. 260-274. <https://doi.org/10.1016/j.tourman.2014.05.006>
6. Thetsane, R.M. (2019) Local Community Participation in Tourism Development: The Case of Katse Villages in Lesotho. *Athens Journal of Tourism*, 6, Pp. 123-140. <https://doi.org/10.30958/ajt.6-2-4>

13. TRIBAL CULTIVATORS IN NASHIK DISTRICT, MAHARASHTRA

Ekanath Sitaram Nirmal

Department of Political Science, Arts, Science and Commerce College, Satral
Tal. Rahuri, Dist. Ahmednagar

Abstract

There has been no conceptual change in defining the workers between the 1981 and 1991 censuses. At the 1991 census, there was mainly a three-fold classification of population namely main workers, marginal workers and non-workers which was adopted for 1981 also. In addition to this, the main workers of 1991 are distributed in nine industrial categories of economic activities but in the earlier census of 1981, this presentation was up to four industrial categories only. A person was considered working as a cultivator if he or she was engaged either as an employer, single worker or family worker in the cultivation of land owned or held by the Government or from a private person or institution for payment in money, or in kind or based on sharing of crops. Cultivation also included supervision or direction of cultivation. A person who had given out his/her land to another person or persons for cultivation for money, kind or share of the crop and who did not even supervise or direct the cultivation of land, was not treated as a cultivator. Similarly, a person working on another person's land for wages, either in cash or in kind or a combination of both, (an agricultural laborer) was not treated as a cultivator.

Keywords: Tribal, Agricultural, Cultivators, Occupation, Work

Introduction

The study of occupational structure provides background for formulating future development plans. The term 'work' is used in special sense in Census, 1991 as below. The work is defined as participation in economically productive activity. This participation is physical and mental in nature. However, a person doing any economically productive activity is considered a worker. Thus, work involves actual work, effective supervision and direction of work. The distribution of population in different types of occupations is referred to as occupational structure. It can be categorized into two types, namely, main workers and marginal workers. Main workers can be sub-categorized as farmers (Cultivators), agricultural labourers, domestic workers and other workers. Main workers are those who work at least six months in one year preceding. The marginal workers are those who work sometimes but not for a period of more than six months in one year preceding. The occupational structure of society is a product of a variety of intimately related factors. The nature and variety of physical resource bases lay down a basic foundation for the availability of land for agriculture, fishing, forestry and mining (Chandana, 1986). Therefore, the study of

occupational structure is essential to understand the activities carried out by scheduled tribe, their distribution and their participation in different economic activities. If more people are engaged in primary activity implies that the region is undeveloped, if more people are engaged in secondary activity means that the country is in the process of development and if more people are engaged in tertiary activity means the field is farming.

Rational of the study

A study of tribal agricultural cultivators provides the groundwork for social and economic development for policymakers and planners. This paper has attempted to assess the agricultural cultivators of the tribal population in the Nashik district. The data pertaining scheduled tribe population was obtained at the Tahsil level from the District Census Handbook Nashik District in 1981 and 2011. These data were then converted into a percent and represented by the choropleth method.

Study Area

The district came into being in 1869 when Britishers re-arranged districts of Maharashtra state. Nashik district is located in northwest Maharashtra state. This district extends from $19^{\circ} 33''$ to $20^{\circ} 52''$ north latitudes and $73^{\circ} 16''$ to $74^{\circ} 56''$ east longitudes. The study region spreads over 15530 square kilometers and ranks fifth in Maharashtra state accounting for 5.04 percent area. Nashik is the 4th most populous district out of the total 35 districts in Maharashtra and it is 11th most Populous district in India.

Objective

The objective of this study is to assess the Distribution of Tribal Cultivators in Nashik District of Maharashtra State.

Data Sources

The present study is primarily based on both secondary and primary data. The secondary data have been obtained from the Nashik District Census Handbook, Statistical Handbooks, Socioeconomic Abstract of Nashik District, Tribal Development Department Nashik and Census of India from 1981 to 2011.

Tribal Main Workers in Nashik District

It is observed that among the tribal population, there were 45.90 percent cultivators in 1981 in the study region, accounting total of 91.67 percent workers in agriculture. Only 8.33 percent of workers are involved other than agriculture. In 2011, there were 32.70 percent of cultivators and 56.49 percent of agricultural Labourers together 89.19 percent

and only 10.82 percent of workers have engaged in other than agricultural activity. During the last two decades, 13.20 percent of cultivators have found a decrease and 10.72 percent of agricultural labors have increased in the agricultural sector. The proportion of other workers is found less and it has decreased by 2.34 percent because of high illiteracy, lack of skills and technical education among the tribal population.

Location Map of Study Area

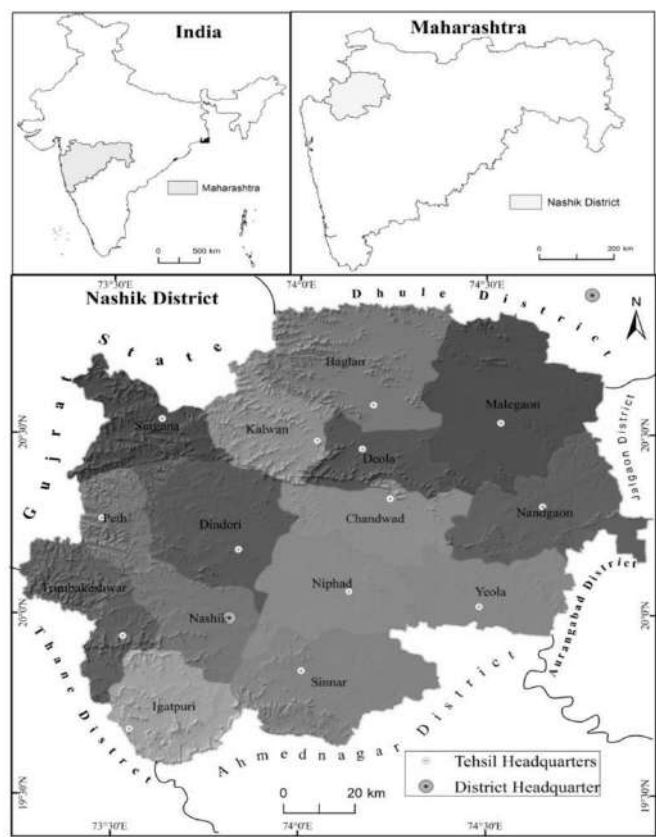


Fig. No. 1

Tribal Cultivators in Nashik District

“A person is classified as cultivator if he or she is engaged in the cultivation of land owned or held by government or held from a private person or institution for payment in cash or other kind of share. The cultivators include supervision or direction of cultivation, plugging, sowing, harvesting and production of cereals and millet crops and other crops such as wheat, paddy, jawar, bajara, rabbi, sugarcane, tobacco, ground-nuts, etc. and pulses, raw jute and kindred fiber crop, cotton, cinchona and other medical plants, fruits and vegetables growing or keeping orchards or groves etc. cultivation does not include the crops i.e. tea, coffee, rubber and coconut.” (District Census Handbook, Nashik District, 2011). Table No. 3 presents that 45.90 percent of the main workers among tribals were

engaged as cultivators in 1981. The Table also reveals that Surgana tahsil has the highest number of tribal cultivators 74.35 percent whereas, Igatpuri (69.47) and Peint (68.74) tahsil have found more than 60 percent cultivators in the study region. 40 to 60 percent of cultivators have been recorded in Dindori (51.72) and Kalvan (50.69) tahsil. The lowest cultivators of less than 40 percent were found in the central and east parts of the study region in 1981. A similar trend was found in 2011. The percentage of tribal cultivators has decreased during the study period. It is observed that the percentage of tribal cultivators has declined in the western part in tribal dominant tahsil in Surgana, Igatpuri, Peint, Dindori tahsil and drought-prone areas in Sinnar, Yevla, Nandgaon and Malegaon tahsil. The central part in Kalvan, Baglan, Chandvad and Niphad tahsil has increased tribal cultivators because these tahsil have fertile soil and irrigation facilities on the Godavari and Girna rivers. Kalvan tahsil has recorded the highest growth of tribal cultivators. Thus, the percentage of tribal cultivators has decreased by -13.20 percent in the study region.

Table 1: Distribution of Tribal Cultivators in Nashik District

Tahsil	Cultivators			Volume of Change
	1981	2001	2011	1981-2011
Nashik	39.51	34.65	11.79	-27.72
Peint	68.74	62.07	42.27	-26.47
Dindori	51.72	46.22	41.55	-10.16
Surgana	74.35	63.01	51.22	-23.12
Kalwan	50.69	61.48	52.72	2.04
Baglan	30.64	37.04	30.94	0.30
Malegaon	12.35	11.45	9.97	-2.38
Chandvad	15.47	18.13	16.94	1.47
Nandgaon	22.32	20.21	13.51	-8.81
Yevla	14.04	11.40	10.85	-3.19
Niphad	6.08	7.03	6.62	0.54
Sinnar	31.93	21.03	18.09	-13.84
Igatpuri	69.47	59.40	46.97	-22.50
Trimbakeshwar	N.A.	68.49	47.29	N.A.
Deola	N.A.	11.33	12.80	N.A.
District Total	45.90	44.33	32.70	-13.20

Source: District Census Handbook, Nashik District for 1981 and 2011.

Note: Calculated by the Researcher, Figures are given in percentage, N.A. = Data not available.

Table No. 3 shows the spatial pattern of tribal cultivators from 1981 to 2011 in the study region. In 2011, the highest percentage of tribal cultivators was recorded in Kalwan (52.72) tahsil followed by Surgana (51.22) having more than 50 percent tribal population. The lowest percent of cultivators appeared in Niphad tahsil (6.62) followed by Malegaon, Deola, Chandvad and Yevla tahsil lying in the east part and having less than 20 percent tribal cultivators in the study region. The growth of less than 10 percent of tribal cultivators was found in the north part of the study region during the study period in Kalvan, Chandwad and Baglan tahsil. Chandwad and Niphad tahsil have identified more than 40 percent irrigation; hence tribal cultivators have increased in these tahsil. The decline of tribal cultivators was found in Nashik Tahsil (-27.72) and the southwest part of the study region due to rigid topography, undulated slopes and marginal land holdings.

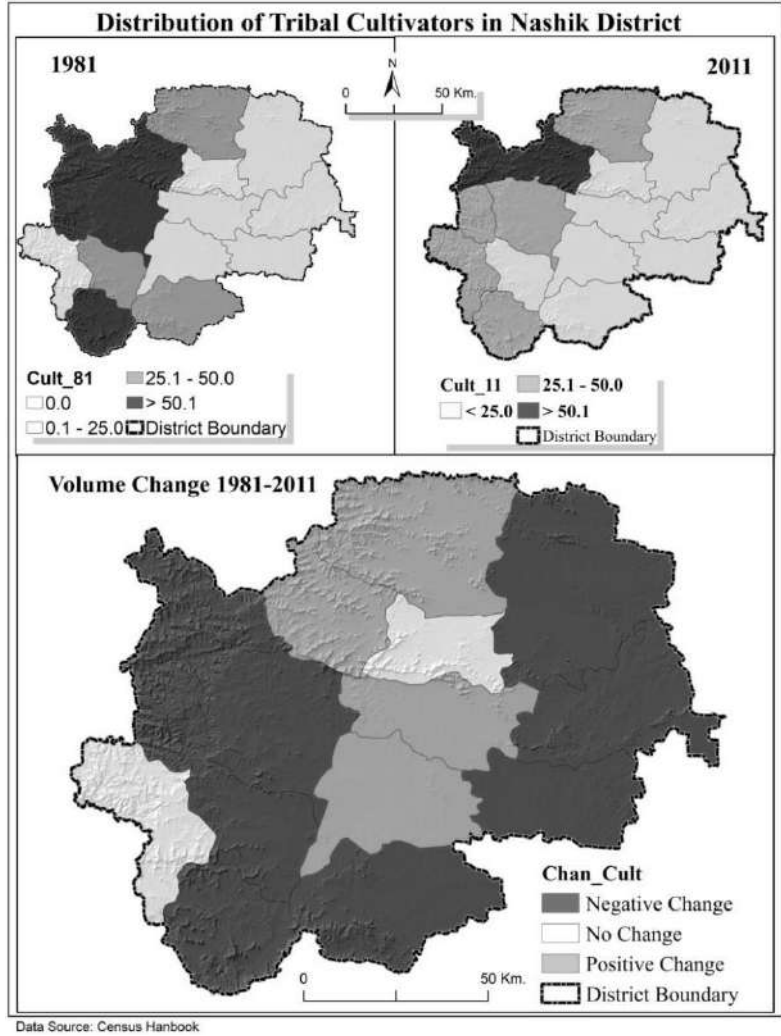


Fig. No. 2: Distribution of Tribal Cultivators in Nashik District

Finding

1. In 2011, the highest percentage of tribal cultivators was recorded in Kalwan (52.72) tahsil.
2. The lowest percent of cultivators appeared in Niphad tahsil (6.62).
3. The growth of less than 10 percent of tribal cultivators was found in the north part of the study region during the study period in Kalvan, Chandwad and Baglan Tahsil.
4. The decline of tribal cultivators was found in Nashik tahsil (-27.72) and the southwest part of the study region due to rigid topography, undulated slopes and marginal land holdings.

Suggestions

1. It has been noted that the tribal youth farmers get very low output from agricultural activity. Taking into account the difficulty, and lack of capital for agricultural activity the government has contrived the system to give subsidies for the purchase of farm implements under this scheme farmers
2. Adding to the confusion, adult services are often provided through multiple agencies with eligibility requirements that differ from agency to agency. Thus, families and counselors need to help youth see the importance of disclosure and work to educate youth to disclose appropriately.
3. To help tribal youth understand the importance of disclosure and to lead them through various situations where disability disclosure may be an issue.
4. The tribal peoples in the sinner, Nashik and Igatpuri tahsil were getting sufficient employment through some small-scale industries which have been already trained in their region in those regions such as Surgana, Peint and Trimbak, the small-scale industries have so far not been produced. In these regions also small-scale industries based on minor forest products may be started. In this way, the tribal people in these regions may make more benefit in conditions of usage. For this purpose, MIDC can play a vital role in the growth of the industrial backward region.

Conclusion

The district of Nashik is characterized by a sizable population of tribal labourers. The majority of them are engaged in the agricultural sector. As these workers are not skilled, they get low-rate of wages with no employment guarantee. Skill enhancement schemes if

implemented for these workers, could be absorbed in small and medium-scale industries. Industries located in the district, particularly at Sinnar and Nashik may play an important role in this context.

References

1. Arun, K. (2000): “Dimensions of Population Growth and its Social Implications”, Anmol Publications, New Delhi.
2. Bhende, A. and Kanitkar, T. (2000): “Principles of Population Studies”, Himalaya Publishing House, Mumbai.
3. Biswas, R. K. (2006): “Demographic Study of Primitive Tribe-A Comparative Framework”, Saad Publications, New Delhi.
4. Chopra, G. (2006): “Population Geography”, Commonwealth Publishers, New Delhi.
5. Dashora, R. and Sharma, A. (2003): “Role of Tribal Women in Education”, Yojana, Vol-47, No.6, June, Pp.40-43.
6. Government of India, (1981, 1991& 2001): District Census Handbooks, Nashik District.
7. Pant, B. R. (2010): “Tribal Demography of India”, Anamika Publisher and Distributers Private Limited, New Delhi.
8. Panwar, R. (2011): “Tribal and Indian Society-An Impact of Tribal Development”, Signature Books International, New Delhi.
9. Xaxa, V. (2004): “Women and Gender in Study of Tribes in India”, Indian Journal of Gender Studies, Sage Publication, New Delhi, Vol.11, Pp.345-367.

14. POVERTY ALLEVIATION THROUGH FINANCIAL INCLUSION IN INDIA

Mrs. Megha Vighnesh¹ Mrs. Kavitha Nadar²

^{1, 2} Assistant Professor, Department of Commerce, The S.I.A. College of Higher Education,
Affiliated to University of Mumbai, P-88, MIDC Residential Area Dombivli Gymkhana
Road, Near Balaji Mandir, Dombivli (E), District- Thane, PIN 421 203
Email: Megha.Vighnesh@thesiacollege.com

Abstract

Poverty is the state of one who lacks a usual or socially acceptable amount of money or material possessions, said to exist when people lack the means to satisfy their basic needs. As India is a home of the world's 22% poor, the government of India has already implemented some measures like improving the training of farmers, ensuring clean water, sanitization facilities, education priority, gender equality etc. to eradicate poverty. However, the extent of the alleviation of poverty during the previous decade is extremely uncertain given the lack of official household expenditure data after 2011. Considering this fact, the present paper attempts to understand the efforts made for poverty eradication through financial inclusion in India. Based on both primary and secondary data, the paper concludes that financial inclusion can elevate millions of Indians out of poverty but a comprehensive and cooperative strategy encompassing government and financial institutions technology providers and civil society is necessary.

Keywords: Poverty alleviation, financial inclusion, Government schemes, Financial Products, Sustainable development goals.

Introduction

Poverty is a socio-economic phenomenon in which a segment of society is not able to accomplish even its basic needs. The minimum needs are food, clothing, housing and education. Humankind faces pains and miseries if it does not achieve a subsistence level of such needs. It is usually agreed in India that only those who fail to reach a certain minimum consumption standard should be regarded as poor. “No society can surely be flourishing and happy, of which the far greater part of the members is poor and miserable” (Smith Adam, 1776). The ultimate goal of economic development must be the betterment of the living conditions of the poor. Economic growth that does not lead to sharp and sustained reductions in poverty may create additional problems than it solves (Jha Raghendra, 2000). India is home to 22 % of the world’s poor. Such a high incidence of poverty is a matter of concern because poverty abolition has been one of the major objectives of the development planning process (Sreedhar M., 2017). India has made notable improvements in reducing poverty during the decades leading up to the pandemic (Bhalla et al. (2022),

Edochie et al. (2022), Newhouse and Vyas (2019), and Sinha Roy and van der Weide (2022). However, the extent of the reduction in poverty during the previous decade is extremely uncertain given the dearth of official household expenditure data after 2011. The government has already implemented some measures like improving the training of farmers, ensuring clean water, sanitization facilities, education priority and gender equality etc. to alleviate poverty. Sustainable development helps to alleviate poverty by providing access to services and facilities, such as education, healthcare, sanitation, food, and job opportunities. With this background, the present study is a theoretical attempt to understand the efforts taken for poverty alleviation in India through financial inclusion. Sustainable Development Goal (SDG) 1 seeks to end poverty in all of its forms and dimensions by utilizing strategies that go beyond economic gains. SDG target 1.2 aims to bring down by 2030, “at least by half, the proportion of men, women, and children of all ages living in poverty in all its dimensions according to national definitions”.

Objectives:

The present study is aimed at understanding the concept of poverty alleviation through financial inclusion. This has been achieved through the following objectives:

1. To comprehend the government welfare schemes being implemented for poverty eradication through financial inclusion.
2. To study the availability of access to banking services for unbanked people.
3. To understand the efforts being made for encouraging savings with less dependency on cash through digital platforms.
4. To know the challenges faced in alleviating poverty through financial inclusion.

Materials and Methods

The present study is based on both primary and secondary sources of data. Discussions with citizens, government officials and empirical evidence are the primary sources used for this study. The secondary sources of data include government reports, publications, news articles, research journals and World Bank bulletins. The results of the study are presented in theoretical form.

Result and Discussions

Financial inclusion refers to the provision of beneficial products and services that cater to the requirements of individuals and businesses. This encompasses aspects such as transactions, payments, savings, credit and insurance all delivered sustainably. Financial inclusion is directly connected to reducing poverty as it plays a major role in empowering

individuals and communities. The following are some ways in which financial inclusion helps in alleviating poverty.

1. Access to Financial Services

Financial inclusion aims to ensure that everyone has access to a variety of services including savings accounts, loans, insurance, and payment options. Provision of these services to individuals in low-income communities empower them to take control of their financial plan, for the future and handle expenses more effectively.

2. Income Generation and Economic Opportunities

People, especially those living in poverty, can invest in agriculture, grow small enterprises, or learn skills to improve their chances of finding work when they have access to financing.

3. Savings and Asset Building

Having access to savings accounts encourages people to save money allowing them to gain education or any other income-generation activities breaking the cycle of poverty across the generations.

4. Education and Skill Development

Access to education and skill development can also be facilitated by financial inclusion. Providing educational loans at reasonable rates will help to gain educational facilities or skill development which will encourage people to have better employment opportunities resulting in transformation among weaker sections of the society.

5. Risk Mitigation through Insurance

Through financial inclusion, one can offer insurance products to safeguard the individual in poverty being exposed to risk by health, agriculture etc.

Government welfare scheme in alleviating poverty through financial inclusion

The government of India has implemented various welfare schemes aimed at combating poverty through financial inclusion. These schemes are designed to provide financial assistance, support economic activities and empower vulnerable sections of society which are as follows:

1. Pradhan Mantri Jan Dhan Yojana (PMJDY):

In 2014, PMJDY financial inclusion program was announced which aims to provide every household with access to a basic banking account, insurance, and a debit card. It focuses on bringing the unbanked population into the formal banking system.

2. Atal Pension Yojana (APY):

Atal Pension Yojna is a pension scheme launched to encourage workers in the unorganized sector to save for their retired life. It provides a guaranteed minimum pension to the subscribers, enhancing financial security in old age.

3. Pradhan Mantri Mudra Yojana (PMMY):

Pradhan Mantri Mudra Yojna aims to provide financial support to small entrepreneurs in the form of loans up to Rs. 10 lakhs. It is further divided into three categories - Shishu, Kishor and Tarun, based on the stage of the business, and supports micro-enterprises.

4. Stand-Up India:

Stand-Up India aims to promote entrepreneurship among women belonging to Scheduled Castes (SC) and Scheduled Tribes (ST). It provides loans ranging from Rs. 10 lakhs to Rs. 1 crore for setting up greenfield enterprises.

5. National Social Assistance Program (NSAP):

National Social Assistance Program includes various schemes like Indira Gandhi National Old Age Pension Scheme (IGNOAPS), Indira Gandhi National Widow Pension Scheme (IGNWPS) and Indira Gandhi National Disability Pension Scheme (IGNDPS), providing financial assistance to helpless groups.

6. Rashtriya Krishi Vikas Yojana (RKVY):

Rashtriya Krishi Vikas Yojna includes financial assistance for farmers to enhance productivity, invest in agriculture-related activities and increase their income.

7. Skill India Mission:

Skill India Mission aims to provide training and skill development to the youth, making them employable and enhancing their income-earning potential. The program includes various skill development schemes like Pradhan Mantri Kaushal Vikas Yojana (PMKVY).

8. Digital India:

Digital India promotes the use of digital technology to improve financial inclusion through various programs like Bharat Interface for Money (BHIM) and Unified Payments Interface (UPI), which facilitate digital transactions and financial inclusion.

Access to banking services for unbanked people

Financial inclusion is crucial for empowering individuals economically, promoting savings and a cashless economy. Several initiatives have been implemented to enhance

access to banking services for the unbanked population. Here are some of the ways to consider:

1. Biometric Identification (Aadhaar):

Aadhaar: a unique identification system, has played a crucial role in financial inclusion. Aadhaar-linked bank accounts and mobile numbers facilitate direct benefit transfers, reducing leakages and ensuring that welfare benefits reach the intended recipients.

2. Microfinance Institutions (MFIs):

Microfinance institutions provide financial services inclusive of credit and savings, to individuals who are excluded from traditional banking channels. They play a significant role in reaching out to the unbanked, especially in rural areas.

3. Payment Banks and Small Finance Banks:

Reserve Bank of India (RBI) has granted licenses to small finance banks and payment banks to provide banking services to the unbanked people. These banks concentrate on offering underprivileged communities basic banking services, such as savings and remittances.

4. Mobile Banking and Digital Wallets:

The increased use of mobile phones has paved the way for mobile banking and digital wallets. Initiatives like the Unified Payments Interface (UPI) and mobile wallet services have made financial transactions more accessible to unbanked people.

5. SHGs (Self-Help Groups):

At the local level, Self-Help Groups have played a significant role in advancing financial inclusion. Members create a culture of saving and entrepreneurship by pooling their resources and obtaining bank credit.

Encourage savings with less dependency on cash through digital platforms.

Promoting a cashless economy and financial inclusion requires digital tools to incentivize savings and reduce dependency on cash. Numerous research studies and projects have investigated ways to encourage people to use digital platforms to save money. Here are some important conclusions and tactics.

1. Digital Payment Awareness Campaigns:

Research have shown that raising awareness is essential to advance digital payments and motivate users to adopt digital platforms to save money. Government and financial institutions can launch campaigns to inform the public on the advantages of digital transactions—such as their safety, convenience, and potential for savings.

2. Incentivizing Digital Transactions:

Providing benefits for digital transactions, like rebates, discounts or prizes, can encourage people to use digital platforms to make savings. Banks and governments can work together to offer exclusive deals to people who opt to save money online.

3. User-Friendly Apps and Platforms:

Users are drawn to digital savings platforms primarily by their attractive appearance and easy use. Studies have highlighted the significance of developing user-friendly mobile apps and online platforms that make it easy for individuals, including those with limited technological literacy, to save money digitally.

4. Financial Literacy Programs:

Increasing financial awareness is essential to promote saving on digital channels. Research shows that people who are aware of the features and advantages of digital savings are more inclined to use these strategies. To improve understanding, NGOs, banks, and governments can run financial literacy initiatives.

5. Partnerships with Fintech Companies:

The development of innovative digital savings solutions can be made easier through partnerships with fintech companies. Studies highlight the significance of fostering collaborations between traditional financial institutions and fintech firms to develop user-friendly and technologically advanced platforms.

Challenges faced in alleviating poverty through financial inclusion.

Alleviating poverty through financial inclusion is a complex task that involves addressing various challenges. Various Challenges include limited access to banking services, low financial literacy, informal financial systems, technological barriers, Sustainability of Financial Inclusion Initiatives and many more. A comprehensive and multifaceted strategy with cooperation between governmental bodies, financial institutions, non-governmental organizations and local communities is needed to address these issues. Strategies for successful financial inclusion should be customized to the unique requirements and needs of the target populations.

Suggestions:

Financial inclusion is one of the important tactics to reduce poverty in India. Access to formal financial services can improve financial security, encourage savings and promote young entrepreneurs. Some of the suggestions are expanding banking infrastructure, promoting digital financial literacy, mobile banking and USSD services, incentivizing digital transactions, credit counselling and financial planning etc can help to reduce poverty

in India. By integrating these recommendations and customizing them to the unique requirements of various demographic groups, geographic areas, and policymakers, financial institutions, and development organizations can work towards a more inclusive financial landscape that contributes to poverty alleviation in India.

Conclusion

Financial inclusion is a potential instrument that promotes economic progress, individual empowerment, and the development of a more just society. Financial inclusion is an important way to reduce poverty in India. To alleviate poverty, there is a need to provide long-lasting routes to wealth, complementary initiatives in the fields of education, healthcare, and skill development are equally essential. Thus, financial inclusion can elevate millions of Indians out of poverty but a comprehensive and cooperative strategy encompassing government and financial institutions technology providers and civil society is necessary.

References

1. Bhalla, S., K. Bhasin, and A. Virmani, (2022). “Pandemic, Poverty, and Inequality: Evidence from India”. IMF Working Paper No: WP/22/69, April 2022.
2. Edochie, I. N., Freije-Rodriguez, S., Lakner, C., Moreno Herrera, L., Newhouse, D. L., Sinha Roy, S., and Yonzan, N. (2022). “What do we Know about Poverty in India in 2017/18?”. Policy Research Working Paper.
3. Jha Raghbendra, (2000). Reducing Poverty and Inequality in India Has Liberalization Helped? Working paper number 204, The United Nations University, WIDER, World Institute for Development Economics Research, Pp. 1-44.
4. Newhouse, D. L., and Vyas, P. (2019). “Estimating poverty in India without expenditure data: A survey-to-survey imputation approach”. World Bank Policy Research Working Paper, (8878).
5. Sinha Roy, S., and van der Weide, R. (2022), “Poverty in India Declined over The Last Decade but not as Much as Previously Thought”. Policy Research Working Papers, April 2022.
6. Smith Adam, (1776). An Inquiry into the Nature and Causes of the Wealth of Nations Pp.1-93.
7. Sreedhar M., (2017). Poverty Alleviation Programmes in India, International Journal of Science and Research (IJSR), Volume 6 Issue 5, Pp. 1127-1132.

EDITORS



Prof. Smt. Bharati Unni (Retd.) was Head, the Department Geography at Sathye College, Vile-Parle (E), Mumbai. Passed B (With Geography Special and Economics Subsidiary) from Pa College, Mumbai, and M. A. from the Department of Geograp University of Mumbai. Her subjects of interest are tribal stud Tourism, Environmental Protection, and Women's Studies. Tau Geography for 37 years, published one research paper in international journal, two research papers at the national level, two research papers at state level journals. Wrote jointly with authors fifteen books on Geography, Environmental Studies and Geography map books.

Attended and actively participated in more than thirty conferences and seminars. Presen she is working as a President of the Bombay Geographical Association (BGA), vice-presid of the anti-dowry movement, Mumbai, and an Executive member of YA SHE (Yo Activities for Social and Healthy Environment) Foundation. She has worked as the N program officer for thirty years and as NSS area co-ordinator for six years. She is a recipi of the Best NSS Program Officer award twice by the University of Mumbai for the acade years 2005-2006 and 2008-2009. She was in-charge of Women's Development Cell for f years.



Dr. Sumant E. Autade is presently working as an Associate Professor in Geography at Swami Vivekanand Night College in Dombivli, affiliated to University of Mumbai. He has teaching experience of 18 years at under-graduate and 4 years teaching experience at post graduate level. His research interests are in application of remotely sensed data in natural hazard assessment, particularly landslides. He has published his research work in various national and international journals.

To his credit, Dr. Autade has 24 research papers published in reputed National and International journals, 2 newspaper articles, 2 articles in "*Marathi Bhasha Vishwakosh*", 7 book chapters in edited books and 2 general articles in magazines. Dr. Autade, to his credit, has 325 citations, H-index - 4 and i-10 index 3 (Google Scholar). Dr. Autade has participated and presented papers in several national and international conferences. He has delivered over 20 talks as guest speaker in different academic conventions at various institutions. He has completed 3 minor and 1 major research project funded by University of Mumbai and ICSSR. He has successfully participated in two certificate courses on Remote Sensing and GIS at Indian Institute of Remote Sensing, Dehradun. He has also completed 12-week online certificate course on Geographical Information System organized by IIT Chennai.



Dr. Nitinkumar M. Patil, Ph. D. in Geography (Climatology), with more than thirty years' experience of teaching at both undergraduate and post graduate level is presently working as a faculty at the S.I.A. College of Higher Education, Dombivli (E), affiliated to the University of Mumbai. His areas of interest are Environmental Management, Agricultural science, Agro-climatology Population Studies, Settlement Geography and Tourism.

There are fifty-four national and international level research publications to his Credit. Dr. Patil has authored four books of geography and environmental science, completed twenty-two UGC-HRDC, PMMMNMTT and University organized training programs, presented thirty-three research papers on various national and international platforms, delivered more than twenty-five invited talks and organized seven conferences, seminars and workshops at state and national level. He has worked as a head, department of geography, member of the College Development Committee, Students' Welfare Officer, NSS Coordinator, member of the NAAC steering committee and subject expert in the university level committees constituted for the selection of assistant professor to be appointed in the colleges and committees constituted for the promotion of college teacher under Career Advancement Scheme (CAS). Dr. Patil has completed two minor research projects funded by UGC, New Delhi and Soliton NetLink Pvt. Ltd. Dombivli. He is a recipient of the 'Shikshak Ratna Award' given at national level by Samta Sahitya Academy at Goa in May 2017 and has also obtained the 'Best Oral Presentation Award' in the international conference organized by BASE-Biology association, Agriculture SciTech and Agricultural association in collaboration with college of medicine, University of Hail, Saudi Arabia in June 2021. Dr. Patil is a life member of The Deccan Geographical Society, India, Maharashtra Bhoogolshastra Parishad, Pune and Bombay Geographical Association, Mumbai.



Dr. Ramesh H. Gavit, Ph. D., NET in Geography, is working as an associate professor in the Department of Geography, University of Mumbai. His teaching experience at undergraduate and post graduate level is of eighteen years. Dr. Gavit is a research guide. With 20 national and international publications to his credit, presently two

research students are doing Ph.D. under his guidance. In all 25 post graduate students have completed their dissertation under the able supervision of Dr. Gavit. He has published two research articles in edited volumes and delivered nine invited talks. Dr. Gavit has one patent design to his credit titled Device to Analyze and Generate Hotel Planning. He is a member of BoS in Geography at University of Mumbai and S. P. College, Pune and also worked as a convener of NEP 2020 Geography syllabus framing. Dr. Gavit is a treasurer of Bombay Geographical Association (BGA) and secretary of All India Adivasi Employees Federation Branch University of Mumbai (AIAEF) from 2022. Dr. Gavit is a recipient of Best Geography Teacher Award 2023 given by the Deccan Geographical Society of India.



Mr. Dnyaneshwar D. Bombe, M.A.(Geography), M. Ed, M. Phil., NET, with his 20 years' experience of teaching is presently working as an Assistant professor and head of the Geography Department at Sathaye College (Autonomous), Vile Parle (East), Mumbai-40057. Mr. Bombe has worked for International Project as Research Assistant, Cartographic Work and Principal Investigator of two Minor Research Projects funded by University funded by University funded by University of Mumbai and ICSSR.

He has published chapters in nine Books, published Eleven Research Papers in UGC CARE listed and peer reviewed journals at national and international level. Mr. Bombe has conducted many workshops on Modern Surveying Techniques, Environment Awareness and Conservation Techniques, Travel and Tourism Management as well as Alternative Strategies and Techniques of Teaching Geography. He has attended many orientation programmes, workshops, seminars and conferences and has invited as a resource person for orientation programmes, workshops, seminars, conferences and also actively participated as an organizer of conferences and editor of research journal publications. Mr. Bombe has completed two offline capacity building training programs of DST-IGET and NMRMS, Government of India, two Refresher Courses and one Orientation Program of UGC as well as sixteen online courses from IIRS, ISRO Dehradun related to Geospatial Technology (GIS, GPS and RST). He is specialized and working as a consultant of Digital Cartography, Data Analysis and Research Activities. He is a Governing Body Member of Bombay Geographical Association (BGA), Life Member of INCA and AVEHI. Mr. Bombe is working as a NSS program officer and has organized numerous activities of social and environment awareness. He has been appointed as a Chairperson, Board of Studies in Geography and EVS, Sathaye College and Member of Board of Studies in four Mumbai based Autonomous Colleges as well as member of the syllabus framing committees in University of Mumbai.

THE BOMBAY GEOGRAPHICAL ASSOCIATION

Governing Body Members 2023 onwards

President : Smt. Bharti Unni

Vice Presidents: Prin.M.T.Telang; Shri.Prakash G.Shinde; Shri..Vilasrao R. Chawan;
Shri.B.D.Patil; Smt.Premalata Singhi; Prin.Dr.Debajit Sarkar;
Shri.Suresh Shetkar; Prin.Dr.Prakash Dongre.

Secretary : Prin.Dr.Moushumi Datta;

Jt. Secretary: Dr.Sanjuktta Sattar; **Asst.Secretary:** Shri.Dhyaneswar Bombe

Treasurer : Dr. Ramesh Gavit; **Asst.Treasurer:** Shri. Sachidanand Honna

Executive Members: Dr.Dipesh Karmarkar; Dr.Pandurang Choudhari; Dr.Minal Parab;
Dr. Ravindra Gawade; Prin.Dr.Anita Awati; Prin.Dr.Priti Mahajan;
Dr.Baban Singare; Dr.Deepali Bhide; Dr.Shweta Ranade;
Dr.Sanjyot Pritam Deuskar; Mr.Nikhil Gawai; Ms.Aastha Smarth Kapur;
Shri.Bhagwan Gangawane; Dr.Sheetal Zalte; Dr.Jayeeta Datta;
Dr.Samruddhi Chawan; Dr.Neetu Sharma; Dr.Amrita Agrawal

Advisory Committee: Shri.S.Ebeneezer;
Dr.Savitsmita Vilasrao Chawan;
Prin.Dr.H.M.Pednekar

Auditor: C.A.Manoj Pal

We are blessed with the rich legacy of BGA built strongly by well-known geographers, academicians, administrators, and philanthropists who have been the founder pillars as Presidents during their tenure in sequence as Prin.C.B.Joshi; Shri.Iyer; Dr.C.D.Deshpande; Shri.N.M.Joshi; Shri.Vakil; Prof. B. Arunachalam; Prof.Dr.K.Sita; Prof.Dr.V.S.Phadke; Shri.V.G.Amrite; Shri.S.Ebeneezer; and Prof.Dr.Savitsmita V. Chawan.



THE BOMBAY GEOGRAPHICAL ASSOCIATION

The Bombay Geographical Association is one of the oldest Geographical Association Registered Under Societies Act XXI of 1860 no. Bom.82/1958 (GBBSD), functioning from C/o Dept. of Geography, University of Mumbai, Lokmanya Bal Gangadhar Tilak Bhavan, Vidyanagari, Santacruz (East), Mumbai 400098. The legacy of BGA is built strongly by its former Presidents and their executive team such as Prin. C.B. Joshi; Shri.Iyer; Dr. C.D. Deshpande; Shri.N.M.Joshi; Shri.Vakil; Prof. B. Arunachalam; Dr. K. Sita; Prof. V.G. Amrite; Dr. V.S. Phadke; Prof.S.Ebenezer; Prof.Savitsmita Vilasrao Chawan and presently Prof.Bharati Unni. The BGA has been conducting various academic programmes for disseminating knowledge in Geography through Conferences, Seminars, Workshops, refresher courses, Orientation program, Diploma Course, field trips, training programmes, Map Exhibition etc. for college and school teachers in association with BOS Geography and Dept. of Geography, University of Mumbai at International, National, State and Regional levels, over the years with kind support from the authorities at University of Mumbai. The BGA has a total of 29 publications in the form of Annual Research Journal namely, 'Bombay Geographical Magazine', occasional papers and Monographs. B.G.A. in association with Dept. of Geography, University of Mumbai and Geography departments in its affiliated colleges has extended activities to *student community through the support of benevolent sponsors by organizing competitions for them such as*: Mrs. Kani Memorial Prize Presentation Competition, Smt. Shantidevi Banerjee Memorial Prize Presentation Competition, Shri Shankar Raghunath Rao Memorial Best Student Award Prize. The BGA is pleased and is grateful to one and all to receive support from various organizations and institutions to disseminate its academic deliberations to academicians, research fraternity and students.



THE S.I.A. COLLEGE OF HIGHER EDUCATION, DOMBIVLI (E)

The S. I. A. College of Higher Education was started in 2010 to cater to the demand for quality education in the vicinity of Dombivli and its suburban residents. The college works with the motto "Knowledge is Power." It offers undergraduate programs viz. B. Com, BBI, BAF, BMS, BMM, B.Sc. IT and two postgraduate courses including M. Com and M. Sc. IT. The institute espouses holistic development through value-based education, skill development and real-time learning. The institution encourages the students and faculty members to adapt to the emerging digital era by training them on the latest technologies and providing hands-on experience to all. All the software that is used in the college is designed by the college incubation cell – the S.I.A. Techlink. In addition, the college also offers various courses to help enhance employability. The college is reaccredited B+ in the second cycle of NAAC. The College under the able guidance of Hon.Chairman Mr.K.V.Ranganathan; Hon Secretary Mr.M.Gopalakrishnan Prin.Padmaja Arvind and its dedicated staff is strengthening the academic growth with laurels in its region.



Unit No.4, Ground Floor, Lalwani Industrial Estate, 14, G.D. Ambekar Marg, Wadala, Mumbai-400 031
Tel.: (022) 6662 4553, 6662 4554. Fax: 6662 4556. e-mail: orders@shethpublishers.com

Follow us:  /shethpublishers  /sheth.publishers



Price - ` 250.00

ENVIRONMENTAL SUSTAINABILITY IN THE ERA OF GLOBALISATION

Chief Editor
Prof. Dr. Savitsmita Vilasrao Chawan

Editors
DR. NITINKUMAR PATIL
DR. DIPESH KARMARKAR
DR. RAMESH HARI GAVIT
DR. SUMANT E. AUTADE



Environmental Sustainability in the Era of Globalisation

Chief Editor

Prof. Dr. Savitsmita Vilasrao Chawan

Editors

Dr. Nitinkumar M. Patil

Dr. Dipesh Karmarkar

Dr. Ramesh H. Gavit

Dr. Sumant E. Autade

When you care enough to be better than the best



MUMBAI

GOA ☆ NAGPUR ☆ BHAVNAGAR

Follow us:



/shethpublishers



/sheth.publishers

Price: 250

ISBN - 978-93-6268-654-1

First Edition: October, 2024

No Part of this publication may be reproduced or transmitted by any means, electronic or mechanical, including photocopy, recording or any information storage and retrieval system, without permission in writing from the copyright owners.

DISCLAIMER

The authors are solely responsible for the contents of the chapters in this book. The publishers and editors' do not take any responsibility for the same in any manner. Errors, if any are purely unintentional and readers are requested to communicate such errors with the editors and authors to avoid discrepancies in future.

Published & Printed by:

Sheth Publishers Private Ltd.
Unit No.4, Ground Floor, Lalwani Industrial Estate,
14, G.D.Ambekar Marg, Wadala Mumbai-400 031
Contact: 6662 4553/ 6662 4554 FAX: 6662 4556

Acknowledgement

This book is the result of the dedicated efforts of research scholars and academicians. We would like to express our heartfelt appreciation and gratitude to everyone who contributed to its production and publication.

We are deeply honored and sincerely thank our management: Hon. President Mr. K. V. Ranganathan and Hon. Secretary Mr. Gopalakrishnan of the South Indian Association, Dombivli, for granting us the permission to publish this book.

I also extend my sincere gratitude to Principal Dr. Padmaja Arvind and Vice Principal and IQAC Coordinator Mrs. Booma Halpeth of S. I. A. College of Higher Education, Dombivli (E), for their unwavering support throughout the completion of this book.

I express my sincere gratitude to Mrs. Bharati Unni, President of the Bombay Geographical Association (BGA), C/O Department of Geography, University of Mumbai, Lokmanya Tilak Bhavan, CST Road, Kalina, Santacruz (East), Mumbai. My heartfelt thanks also extend to Prof. Dr. Moshumi Datta, Secretary of BGA and Principal of N.K. College (Autonomous), Malad, Mumbai; Prof. Dr. Sanjukta Sattar, Joint Secretary of BGA and Head of the Department of Geography, University of Mumbai; Prof. Vilasrao Chawan, former Head, Department of Geography, B. K. Birla College, Advisory Member and former Vice President of BGA, Principal Dr. Hemant Pednekar, Advisory Member and Vice President of BGA; Dr. Ramesh Gavit, Treasurer of BGA and Associate Professor in the Department of Geography, University of Mumbai.

Additionally, I would like to acknowledge the Governing Body Members of BGA: Dr. Dipesh Karmarkar, Research Guide and Head of the Department of Geography, Smt. CHM College, Ulhasnagar-3, and Shri. Dyaneshwar Bombe, Head of the Department of Geography, Sathaye College, Vile Parle, Mumbai, affiliated with the University of Mumbai. Their association in the publication of this book has been integral to its success.

I owe my sincere and special thanks to Prof. Dr. Savitsmita Vilasrao Chawan, Advisory Member and former President of BGA, and former Head of the Department of Geography, University of Mumbai for her invaluable support and expertise guidance in achieving the outcome of publication of this book.

I am immensely grateful to all the authors for contributing chapters on topics aligned with the theme of this book and for their timely submissions. I also extend special thanks to the editorial board for their diligent efforts in editing the entire manuscript.

Words are inadequate to express my deepest thanks to Shri Kirtibhai Sheth and Shri Deepak Seth, Directors of Sheth Publications Pvt. Ltd., for publishing this book with an ISBN. I also extend my gratitude to the faculty members of S.I.A. College of Higher Education, Dombivli (E), and the entire Governing Body Members of the Bombay Geographical Association for their support and good wishes in the publication of this book.



Dr. Nitinkumar M. Patil
Faculty, the S.I.A. College of Higher
Education

PREFACE

In the rapidly evolving world of today, sustainable development and effective environmental management are more crucial than ever. Considering this fact, this book seeks to offer a thorough introduction to these related ideas, examining their significance, guiding principles and useful applications in resolving the environmental issues particularly India and our world face today. Sustainable resource use combined with a planned, methodical and strategic approach to environmental protection and preservation is known as environmental management. In contrast, sustainable development aims to address current needs without compromising the capacity of future generations to address their own. When environmental management is integrated into the larger framework of sustainable development, it ensures that social, economic and environmental objectives are pursued simultaneously, fostering a harmonious balance between progress and preservation. The theme of the present book relies on this background.

The entire text of the present book is divided into twelve chapters. The first chapter discusses the present scenario of green consumerism in India, while the second chapter deliberates on the significance of green marketing for sustainable development. As a result of preferences given to organic products by the masses, women across the world are giving priority to the use of vegan cosmetics. Consequently, the third chapter focuses on emerging green trends among cosmetics users. The emphasis of the fourth chapter is on electronic waste management. This chapter is based on a case study of the S.I.A. College of Higher Education, Dombivli, East. Chapter Five discusses the boon or bane of 'EIA 2020 Notification' for sustainable development. A critique of sustainable development goal 11 in the Mumbai context of waste management is a focal theme of Chapter Six. The causes and remedies of water pollution in India are studied in Chapter Seven while, Chapter Eight consists of the study of environmental education and policies for sustainable development in India. Chapter Nine focuses on India's G20 presidency and its impact on sustainable development. Green consumerism among the consumers of Mumbai and the role of Hariyali in sustainable development are the subject matters of chapters ten and eleven respectively. The last chapter, number twelve, of this book, discusses the role of youth in the conservation of natural resources with special reference to the students of the S.I.A. College of Higher Education, Dombivli, East.

There is a great significance of sustainable development and efficient environmental management in the era of globalisation. We can strive toward a future in

which both people and the environment flourish by taking a comprehensive strategy that strikes a balance between economic, social and environmental goals.

The chapters in this book are based on the selected paper presentations made at an Interdisciplinary National Level Conference in Hybrid Mode on 'Environment, Development and Sustainability: An Inclusive Approach for Resilient Future' held on 17th February 2023 at The S.I.A. College of Higher Education, Dombivli (E) With IQAC Affiliated to University of Mumbai, Dombivli in collaboration with The Bombay Geographical Association housed in the Department of Geography, University of Mumbai. The contributors to this book are from varied disciplines with multidisciplinary approach to the theme of this book.

The present volume on environmental management and sustainable development may act as a roadmap for this journey, offering the information and resources required to build a more resilient and sustainable world for future generations.

Dr. Nitinkumar M. Patil

Contents

Sr. No.	Title	Author	Page No.
1	A Critique of the Sustainability Development Goal 11 in the Mumbai Context of Waste Management	Dr Chandani Bhattacharjee	1
2	EIA-2020 notification: Is it boon or bane for sustainable development?	Dr Subhash B. Donde	10
3	Role of Hariyali in Sustainable development	Dr. Hastikumar Nagariya	18
4	Green Consumerism among the Consumers of Mumbai	Dr. Amrita Aggarwal	27
5	Green Consumerism in India	Miss. Diksha Pandey Miss. Kashish Pandey	36
6	India's G20 Presidency and Impact on Sustainable Development	Mrs. Hema Iyengar and Mrs. Rasika Shinde	46
7	Vegan Cosmetics- an Emerging Green Trend Among Cosmetics Users	Mrs. Booma Halpeth	55
8	A Case Study on Electronic-waste Management Initiative at The S.I.A. College of Higher Education, Dombivli (E)	Dr. Shilpa Malani Miss. Sanskriti Bhoir Mrs. Shubhangi Daptardar	64
9	Water Pollution in India: Causes and Remedies	Miss. Ganga Vinodkumar Gupta Samyak Jain	74
10	Study of Environmental Education and Policies for Sustainable Development in India	Ms. Bhakti Padmakar Mhaskar	80
11	Role of Youth in Conservation of Natural Resources with special reference to students of The S.I.A. College of Higher Education	Salochana Nagdev Babita Nagdev	86
12	Green Marketing for Sustainable Development	Mrs. Hema Iyengar, Mrs. Ranjana Mhalgi Mrs. Renu Vijay Verma	95

A CRITIQUE OF THE SUSTAINABILITY DEVELOPMENT GOAL 11 IN THE MUMBAI CONTEXT OF WASTE MANAGEMENT

Dr Chandani Bhattacharjee

Professor, H. R. College of Commerce and Economics, Mumbai.

Abstract

Sustainable Development has been implemented in the global domain with a specific deadline of 2030 enabling the performance of environmental tasks to protect, preserve and conserve. The 11th Goal delves into the Sustainable Cities and Waste management along with prevention of Air pollution is important. This paper attempts to study the position of MSW in Mumbai city and the manner in which the steps as highlighted by the NITI Aayog has been followed. The wastes have a specific character in developing countries, wherein the wet waste is significantly higher than the dry. With the Solid Waste Handling Rules, 2016, already in use in the country and study area, steps have been adopted towards waste minimalization and decentralisation. Waste volumes must be handled in a sustainable and efficient way, which includes scientific sorting, recycling, and disposal. However, during the process of waste reduction after segregation, the trash may be turned into resources, allowing for faster decimation of MSW and increased benefits to households. The success of such policy interventions will impact the waste as the SDG period comes to a close.

Keywords: MSW, SDGs, Goal 11, sustainable cities, Segregation.

Introduction

The global consciousness towards environmental stewardship has been a long journey. From the earliest understandings of global limits in the essay, “Limits to Growth”, by the Club of Rome, to the assessment of DDT poisoning in “Silent Spring” to the first global meet of 193 nations to deliberate the future of the planet in the Rio Declaration or the Earth Summit, every journey has only helped up move closer to the goal as defined. The most significant development has been the acute understanding of the use of Sustainability and Sustainable Development. The ideals that the concept holds are admirable and paradoxical at the same time. The concept, though developed with elementary global acceptability, has

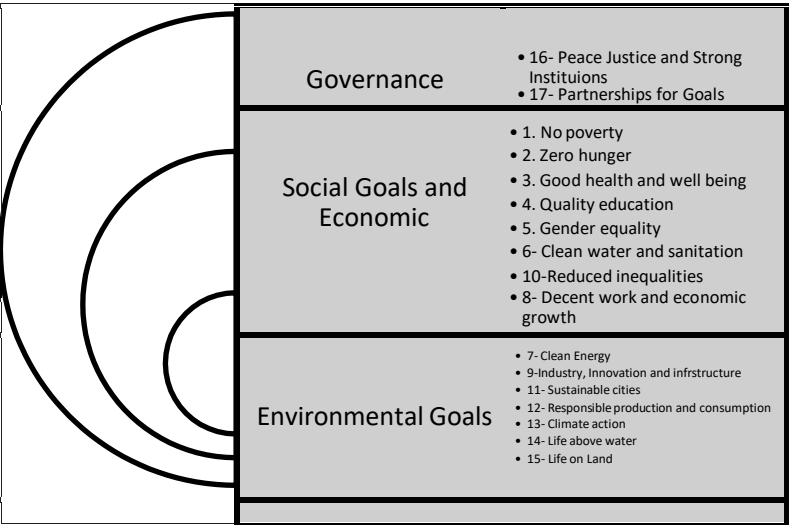
churned out developmental dichotomies which are continuously debated and addressed. Sustainability, however, is a larger term used to address development responsibly. It harbours around effective conservation practices that are followed in its implementation. The largesse of the concept lie in the universal acceptance, attempts to universalize, and retain the developmental challenges in varied economic systems. It would also enable depoliticizing the implementation process apart from the stewardship that it has begun to resemble.

The need to develop responsibly has pushed humanity to develop and harness a series of deadline-oriented Goals which encompass the need of the world to be responsible and inclusive. Thus, subsequent to the MDGs which concluded in 2008, the Sustainable Development Goals were launched to be concluded in 2030. It has one of the larger arching ideologies of “leaving no one behind” as the world develops. The Sustainable Development Goals are 17 in Number and focus on economic goals like No Poverty, Social Goals like

Education, Women empowerment, and Environmental Goals like Life under water.

Figure 1:
CLASSIFICATION OF SDGs

Based on the three pillars of sustainability, environmental, social, and economic, the Goals are



listed above. For the purposes of this study, detailed analysis of the Goal 11 will be undertaken. Goal 11 deals with Sustainable cities. Figure 1 shows the distribution of the SDGs over the sub categories. Goal 11 deals with Sustainable cities and under it 11.6 says “By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management”¹ Hence the attempt in this paper is to assess and study the waste management for the city of Mumbai critically on the basis of the ability of the city to reduce the quantum of waste.

¹ SDG Goal 11, www.sdg.un.org.

According to the Maharashtra Pollution Control Board, "solid wastes are those undesirable, useless, and unwanted materials and substances that arise from animal and human activities". Solid waste may be categorized into numerous categories based on its source. a) Household garbage is normally classed as municipal waste; b) Industrial waste as hazardous waste; c) Biomedical waste or hospital waste as infectious waste; d) Hazardous garbage; and e) electronic waste.

Mumbai, has a population of 16.37 million and a waste collection, of 8600 MTD ² (MPCB,2015-16:5). Mumbai generates the most e garbage every year, at around 3 lakh tons.³ With an area of 437.71 square kilometers and a high population density of around 46,000, it produces massive quantum of waste. It leads to high per capita waste generation, pressures of collection of the wet and dry waste and thereafter disposal of the waste in the dumpyards which are already overflowing. With the implementation of the MSW Handling Rules, 2016 and segregation of waste at source, the quantum of waste generated and collected is 6661 MT (MCGM, 2019). The per capita generated is 63kg per day (MCGM,2016). There are four landfills which collect the waste: Gorai, Deonar, Mulund, and Kanjurmarg. Some of these landfills have been exhausted and newer spots have been generated. Mumbai has twenty-four administrative wards. Some of the wards with limited access to landfills have transfer stations to collect and convey daily rubbish, including Mahalaksmi, Kurla, and Versova.

Objective

This study has been designed to help in the better understanding of the SDG 11 and its significance to the city of Mumbai which is a megacity, with problems, of excessive population and paucity of space which has created issues with the waste management Targets.

Methodology

The study is a critique based on existing data on waste and the status of its collection, transportation, segregation, and eventual disposal. It has been attempted to use, external data which have been available on public domain and few personal interviews to corroborate the authenticity of the data.

² MPCB, Annal Report in Solid Waste Management,2015,16.5

³ Et.al. MPCB,2015

Result

The Table 1, given below is a synopsis of the physical and chemical composition of the dump yards in Mumbai which is the place for dumping all the city’s refuse. The Deonar and Kanjurmarg dump yards are operational while Mulund and Gorai have been closed. Gorai is undergoing scientific closure. Deonar has one of the highest dumping yard and is one of the oldest as well. The BO at Gorai is significantly higher, while Mulund has a very high COD clearly indicating a high pollution by organic matter.

Table 1: Physical and Composition of the Municipal Solid Waste as Recorded in the three Dump yards of Mumbai

Particulars	Name of the Dumpyard			
	Deonar	Mulund	Gorai	Kanjurmarg
Site Area Hect	131.12	24	25	65.96
Area avail For dumping	116	16.60	18.45	65.96
Nos Of Years In use	51	16	16	4
Amt of disposal MTPD	4800	700	2200	4500
pH	7.9	8.2	7.8	N.A.
SS	390	152	112	N.A.
BOD	310	119	600	N.A.
COD	928	1264	1150	N.A.
TDS	-	6942	-	N.A.
Status	Operational	Closed	Closed	Operational

Source: Compiled from MCGM, www.my.gov.in, mpcb,praja.org

Table 2, indicates the difference in the waste generation between the island city and western and eastern suburbs, wherein the Island city has the highest generation of garbage at 3700 MT/day with the highest density of population followed by western suburbs. Hence there is a direct relationship between population and garbage generation.

Table 2: Compiled Data on the Study Area,⁴

PARTICULARS	AREA			
	ISLAND CITY	WESTERN SUBURB	EASTERN SUBURB	TOTAL
Garbage Generation MT / Day	3700	2500	1600	7800
Population Density Persons/Sq Kms	49,163	24,605	10,410	26, 722
Physical Characteristics by Weight in %				
Biodegradable	42.29	39.52	35.72	
Paper/ Cardboard	6.16	6.61	10.93	
Plastics	4.23	5.47	4.87	
Metals	0.85	1.42	0.65	
Glass	1.28	3.48	0.87	
Inert	18.09	23.46	26.76	
Bio-resistant	4.15	11.07	11.81	
Others	23	20/04	20.25	

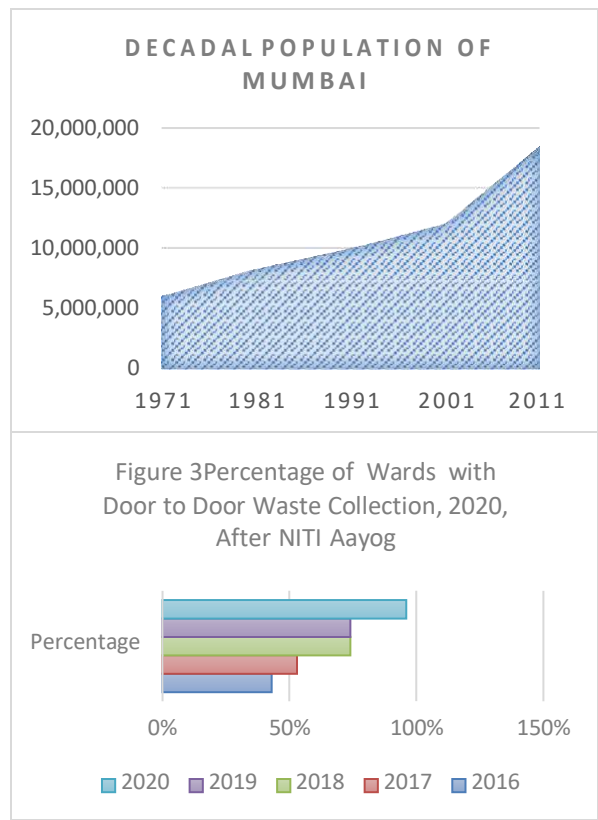
- Mumbai Solid Waste Generation, www.mygov.in, BMC, www.mcgm.gov.in.

Table 3. Target 11.6 of SDGs as Provided by United Nations, Niti AYOOG

Target 11.6
By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management.
11.6.1 Proportion of municipal solid waste collected and managed in controlled facilities out of total municipal waste generated, by cities
11.6.2 Annual mean levels of fine particulate matter (e.g. PM2.5 and PM10) in cities (population weighted).
Target 11.6 Sub-indicator—NITI Aayog
11.6.1 Percentage of wards with 100% door to door waste collection
11.6.2 Percentage of MSW processed to the total MSW generated
11.6.3 Percentage of wards with 100% source segregation
11.6.4 Installed sewage treatment capacity as a percentage of sewage generated in urban areas

Source:https://unece.org/fileadmin/DAM/pau/icpd/UNFPAUNECE_meeting_2016/10_Goal_11_and_indicator_11.a.1.pdf,NITI Ayog4

Table 3. is a list of the targets as specified by the UN and by the NITI Ayog, which handles the SDGs in Indian context. The Niti Ayog has implied that there are targets set for all urban districts, like door-to-door collection, percentages of waste which is processed, segregated and reduced



generation. Figure 3, shows the amount of door-to-door collection of waste. The percentage of waste processed has been increasing from 17% to 65% (NITI Aayog, 2021)

Figure 2: Decadal population of Mumbai

Source: Census of India.

Discussion

Every Sustainable Development Goal has been allotted targets and Indicators for the successful implementation by the given date of 2030. The Targets assigned to Goal 11, are categorised into better living

conditions in cities, such as safe housing, access to basic services, slum upgrade, better transportation, etc. It also specifies inclusive and sustainable urbanisation to work towards participatory involvement of all communities. There is an emphasis to preserve the culture, heritage too. With the emergence of increased disasters, protection of the urban dwellers is also desired. Cleanliness and hygiene of the city is also paramount to the healthy livelihood of the residents and hence the targets specify the waste management, pollution air and water to be in check and finally green spaces for all. The NITI Aayog has further emphasised that to be able to handle the waste efficiently, door to door collection, source segregation and processing of the waste is to be carried out. The Solid Waste Management Rules, 2016 and the subsequent Amendment Rules in 2020, put the onus of waste segregation and disposal on all urban and rural municipal bodies, cantonment boards, and in regions in as little as 3000 population in villages and rural areas.

The discussion is to lead to some of the glaring lacunae in the system of assessment and management of waste. For the implementation of sustainable measure, these may be observed: -

- MCGM, has claimed 100% door to door collection in 2019-20, which seems largely unrealistic, considering the volumes of waste piles that remain unpicked at some neighbourhoods in the city. It is seen from the number of complaints received in 2020 of 11,595 SWM, and out of these 34% was of unpicked garbage. (MCGM,2021)
- The segregation has challenges too. Despite several attempts to promote at source segregation, 82% has been segregated in 2019-20. Subsequently the COVID created massive havoc to the garbage collection and transportation. Mixed garbage causes problems of processing of the garbage into Waste to Energy projects, Waste Bricks and composing problems along with issues of garbage burning due to Methane emissions as seen in Deonar Dumping Ground in 2015, 2016 and 2018. For the successful management of waste, tie ups with recyclers, working with NGOs, Advances Locality Management Committees, having detailed guidelines for bulk manufacturers, residential society support, incentivisation of segregation process all need to be implemented.
- There is a huge volume of recyclables which are removable and which may become up cyclable or reprocessed for reuse. This would enable the sustainable use of the resources.
- Absence of space causes the composting and bio methanisation processes to not be very popular. With the scope of trained staff to hand hold the housing societies, community composting at the Slums areas or smaller houses will aid in waste reduction. The Dastak Vasti Yojana has been launched by the government to help the slum areas with waste management.
- The nature of the waste as collected and analysed show that there is higher amount of wet waste to the dry waste as a ratio, which may be removed at source and with awareness and segregation, be converted into compost. The recyclables have a marketable option by the collectors and handlers. The wet waste have been attempted to be used in biomethanisation plants to generate energy from waste.
- Since the per capita waste generation is very high in the study area, the population increase bears a direct corelation with higher waste. This is accentuated by the fact that the city has been growing exponentially every decade. The urban atlas shows an increase in the agglomeration area which had spread to the northern and eastern nodes of the megacity. The 24 Administrative wards of the cities have to collect the waste and dispose the waste in designated dump yards,(Gorai, Kanjurmarg,

Deonar) which causes a strain for the distant Wards. Some transfer stations like Mahalaksmi, have been aiding, but the volumes of waste that need to be transported are huge. Deonar Dumpyard one of the oldest surviving yards has almost exhausted and new yards needs to be identified to manage the large volumes of waste of the city.

Conclusion

The Government of India has worked on initiatives such as, Swachh Bharat Mission 1.0 & 2.0, Municipal Solid Waste Management Manual (2016), Smart Cities Mission, AMRUT, National Clean Air Programme—to control the issues of waste and air pollution. The purpose of these have been to reduce the impact of waste on the environment and meet the required targets of the SDGs. None of these seem workable unless community and local governmental work hand in hand to decrease the quantum of waste, clean the lanes and by lanes of the garbage dumps, segregate the waste at source and finally incentivize the process. SDG 11 will need to implement and follow up on the success of the initiatives taken, as the study shows some possibilities of improvement have been traced.

References

1. Bhattacharjee C, (2017), *Nature of Municipal Solid Waste and Pollution in the Western Suburbs, Mumbai Megacity*, Pollution Research, ISSN 0257–8050, 36(4), 183–186
2. Bluman AG, (2000), *Elementary Statistics; a step by step approach*, New York, 566:567.
3. Central Pollution Control Board, 2004, *Management of Municipal Solid Waste*, New Delhi, India
4. Central Pollution Control Board, 2000, *Status of Solid Waste Generation, Collection, Treatment and Disposal in Metro cities* Series: CUPS/46/1999-2000.
5. Central Pollution Control Board, 2000, *Status of Solid Waste Generation, Collection, Treatment and Disposal in Class I Cities*, Series: ADSORBS/31/1999-2000.
6. Chakrabarty P, Srivastava VK, Chakrabarty SN, 1995, *Solid Waste Disposal and the Environment- A review*, Indian Journal of Environmental Protection, 15(1), 39:43.

7. <http://www.fairfest.com>, *Integrated Solid Waste management Project In Mumbai: Municipality 2008.*
8. <http://www.fairfest.com>, *Programme on Energy Recovery from Urban Wastes in India; Municipalika 2008.*
9. <http://www.nrsp.org.uk>, *Natural Resources Systems Programme.*
10. <http://www.mcgm.gov.in> , *Mumbai City Development Plan 2005-2025.*
11. <http://www.ucl.ac.uk/dpu>, *The Case of Mumbai, India* by Neelima Risbud , [www.Karmayog. Com](http://www.Karmayog.Com).
12. <http://www.waste.nl>.
13. <http://www.deity.gov.in/sites/upload>. -Electronic Waste and India byDr. S. Chatterjee, Scientist-E, Department of Information Technology, New Delhi.
14. www.bcpt.org.in/webad-Understanding our civic issues: Solid Waste Management in Mumbai-The Bombay Community Trust-Dr Nita Mukherjee.
15. www.mpcb.gov.in., Information on Integrated Common Bio-medical waste treatment and disposal facilities in Maharashtra with Incineration, Autoclave and Shredder.

EIA-2020 Notification: Is it a Boon or Bane for Sustainable Development?

Dr. Subhash B. Donde

Department of Zoology, Kirti M. Doongursee College (Autonomous),
Dadar (West), Mumbai-400 028.
subhash.donde@despune.org

Abstract

The Environment Protection Act (EPA) of 1986, passed after the Bhopal gas leak, led to the 1994 Environment Impact Assessment (EIA) notification. However, amendments in 2020 were deemed contentious due to non-adherence to international regulatory frameworks & environmental conventions, domestic environmental legislations, and violation of judicial precedents. The 2020 notification excluded residents likely to be affected by developmental projects and environmentalists from decision-making, endangering the environment and contradicting India's commitments and obligations towards Sustainable Development Goals (SDGs). It excluded projects involving alleged national security and made provision for ex post facto permission, thereby violating the precautionary principle and requirements of sustainable development. The notification replaces a 2006 version that undermines environmental laws and ignores the need for sustainable development. It calls for stricter legislation to ensure vulnerable populations have access to natural resources, as significant changes to the EIA will directly impact their living and working conditions. The research article critically examines the EIA 2020 notification based on scientific facts.

Keywords: Environmental Impact Assessment (EIA), Sustainable Development Goals, Precautionary Principle, Ex Post Facto Permission, Environmental Jurisprudence.

Introduction

An environmental impact assessment, or EIA, is a study that estimates how a proposed project would affect the environment. It is a protocol used in decision-making that evaluates potential project options to determine which one best balances environmental and economic costs and benefits (Understanding EIA, 2024). It is beneficial to ascertain the possible effects a project may have on the environment, suggest ways to lessen negative effects, and forecast if major negative effects will persist even after protective measures are implemented. By considering the environmental effects of the project and minimizing them within the project planning cycle, environmental assessment offers various benefits, including safeguarding the environment, optimizing the use of existing resources, and reducing project time and expense. By promoting community involvement, educating decision-makers, and aiding in the formation of ecologically beneficial programs, a well-executed EIA also lowers conflict. Every phase of a project, from planning and exploration

to construction, operations, decommissioning, and site closure, has benefited from the inclusion of EIA. (Understanding EIA, 2024)

Due to pressure from international development banks, especially the World Bank, which requires the adoption of the EIA framework as a requirement for funding particular projects, the EIA framework has become increasingly popular, especially in developing nations. For instance, World Bank funding for the Rewa Solar Park in Madhya Pradesh, India, was contingent upon the completion of a thorough EIA (Agarwalla, 2020). Indian EIA began in 1976–1977 when the Planning Commission asked the DST to look at river-valley projects from an environmental perspective. Subsequently, projects requiring approval for public funding were added to it. Until 1994, the environmental clearance granted by the federal government was an administrative decision devoid of legal backing (Understanding EIA, 2024). In 1994, EIA notification was prepared for the first time in India under the EPA, 1986. It established the need for environmental approval for project establishment, modernization, and expansion. Since then, the EIA has been revised several times, where the most significant amendment took place in 2006.

The contentious draft of the EIA notification, which the Indian Government unveiled in May 2020, seeks to circumvent several crucial clauses, including intentions to implement retrospective permission for numerous projects and public engagement. Along with other contentious measures, it also removes the need for an EIA for numerous businesses and permits the monetization of environmental violations (Aggarwal, 2020). The contentious EIA notification - 2020 draft puts the commitment and accountability needed to achieve the SDGs on the path to unsustainable development while continuing to violate: (I) international regulatory frameworks & environmental conventions, (II) national environmental law, and (III) judicial precedents. Given this context, the research piece that is being undertaken offers a critical examination of a few contentious elements of the EIA notification 2020. To precisely address the problem, the current paper critically examines primary and published literature and data in the form of unstructured and non-numerical information that falls under the purview of qualitative content analysis.

Environmental Impact Assessment notification-2020

To ensure that natural resources are used as efficiently as possible for sustainable development, EIAs, are crucial management tools and the EPA Act of 1986 presently requires an EIA for 29 different types of development projects involving investments of at least Rs. 50 crores (Environmental Impact Assessment , 2023). However, the EIA Notification, 2020 contains certain extremely concerning and anti-environmental features,

one of which is that even businesses or sectors that have previously violated environmental regulations will now have the chance to receive clearance. This is called 'post-facto' project clearance' (Chakravarty, 2020). This clause belittles the concerns expressed by national people, civil society organizations, and environmental organizations who have written to the government to request that the draft be withdrawn but have had their requests denied.

As per India's anti-terrorism statute, the Delhi Police had sent a warning to the activist group 'Fridays for Future India' for sending excessive emails to the Ministry of Environment. (Aggarwal, 2020) Although the government is now defining the term 'strategic' for other projects likewise through this notification, programs pertaining to alleged national defence and security are regarded as strategic. According to this notification, no information will be made public about such projects which fall in this category. The danger of this is that now the way will be opened for many projects.

Industries will easily get approval for such projects by terming them as 'strategic' and they will not even need to explain the reason for the same. Further, the new notification offers a very long list of various projects that have been kept out of the scope of consultation with the public. For example, there will be no need for public hearings for projects like roads or pipelines in areas located on the country's border- 100 km from the borders of different countries. The area with an aerial distance of 100 km is defined as a 'border area'. Due to this, a large area of the northeast, which has the densest biodiversity in the country, will come under this definition. Further, all inland waterway projects and the widening of national highways have been kept out of the scope of seeking clearance under the EIA notification. (Jolly, 2020)

(I) Non-adherence to international environmental treaties and regulatory frameworks

India has made great strides in strengthening its environmental governance since taking part in the UN Conference on Human Environment, and Development in Stockholm in 1972 and the Rio Summit in 1992. Along with other international climate agreements, India is a signatory to the Kyoto Protocol and the United Nations Framework Convention on Climate Change. Both these instruments highlight the prominence and necessity for a strong EIA system to alleviate the adverse effects of climate change.

The necessity of an effective EIA procedure to protect biological resources is also emphasized by the Agreement on Biological Diversity (Chakravarty, 2020). After declaring its commitment to these international environmental procedures and then

suggesting that its own EIA framework be downgraded, India is facing cognitive dissonance. Such defiance of pledges made in international talks and agreements will damage India's standing as a global leader in environmental governance and climate policy.

The International Court of Justice has recognized the significance of EIA, in addition to international frameworks and norms. A responsibility of general international law, environmental impact assessment was acknowledged by the International Court of Justice in the '*Pulp Mills on the Uruguay River*' ruling (Pulp Mills on the River Uruguay, 2010). However, the revised draft of the EIA notification reduces these regulations, which could eventually have an impact on other countries.

(II) *Ultra vires* to domestic environmental legislation

An unprecedented period in Indian environmental jurisprudence began after 1972 and there are numerous new environmental laws since then. The 42nd amendment to the Indian Constitution, which added Articles 48A and 51A(g) that promoted environmental improvement and protection, was a significant addition. (Chakravarty, 2020) The Environment Protection Act of 1986 was subsequently passed under Article 253 of the Constitution in the wake of the tragic Bhopal gas tragedy and it served as the umbrella legislation for environmental protection in India. Section 3 of this Act serves as the basis for the EIA Act in India. The Central Government is authorized by Section 3 to take action to safeguard and enhance the environment. The purpose of this provision is to protect and improve the environment. However, the essence of this section and the Act are entirely contradicted by the revised draft. (Chakravarty, 2020).

This claim is corroborated by the circumstance that it impairs the community involvement process, permits *ex-post facto* approvals retrospectively, keeps several industries out of the EIA process, and—above all—allows the monetization of environmental infringements. The amended language is also incompatible with Article 48A of the Indian Constitution, which directs the state to protect and improve the environment as well as the country's forests and animals.

Moreover, it is in violation of Article 21 of the Constitution, which acknowledges the environmental right as an essential component of the right to life and individual freedom. Participation of stakeholders is the fundamental tenet of EIA and public involvement has always been regarded as a crucial component of the process. Various degrees of public involvement might be pertinent at different points in the EIA process, from the first community analysis and information about the planned intervention to the decision-making process for approval, monitoring, and follow-up. The Supreme Court

ruled in *Lafarge Umiam Mining Private Limited v. Union of India* that public consultation in the environmental clearance process is essential for the registration and resolution of grievances of those impacted by any project via an efficient forum. The court's ruling serves as a model for more transparent and efficient procedures in India's environmental regulations. (Kaneal, 2011)

(III) Violation of previous judicial precedents in India

The idea of *post-facto* environmental clearance for industrial undertakings that begin without clearance has been rejected by the Indian Supreme Court. Because it goes against the general direction that the Environment Ministry wishes to adopt to legalize industries operating without environmental clearance, the order has greater relevance in the case of the three industries in Gujarat. According to the Supreme Court's ruling, development should take an 'ecologically rational approach,' and environmental compliance 'should not be treated as an obstacle to development, considering the social and environmental impacts of industrial activity.' These directives should be viewed as steps toward achieving inter-generational equity and sustainable development. (Aggarwal, 2020)

It is against the '*Polluter Pay Principle*' where the Ministry approves projects that break the law. On the other side, it endorses the pollute and pay (penalty) concept, which allows you to do as much harm as you like before paying the fine and getting away with it. The Supreme Court's ruling concerned three business entities namely Alembic Pharmaceuticals Limited, United Phosphorus Limited, and Unique Chemicals Limited that had been producing pharmaceuticals and bulk drugs in the Gujarat industrial region of Ankleshwar for several years without a license: The order functioned within an approving environment. (Aggarwal, 2020)

Three industrial facilities are in Ankleshwar, Gujarat, which has continuously demonstrated high levels of air pollution, according to the Supreme Court's ruling. Ankleshwar has continuously demonstrated high levels of pollution over the years, according to the Central Pollution Control Board's Comprehensive Environmental Pollution Index. ordered three businesses to deposit a total of Rs. 10 crores in compensation with the Gujarat Pollution Control Board, to be utilized for industrial area compensation and environmental restoration. In the absence of environmental clearance, there will be no situation that protects the environment. Moreover, if environmental clearance was ultimately refused, the environment would have suffered irreparable damage. In any view of the matter, environmental law cannot support the notion of retroactive clearance. The bench stated that this would go against both the requirement for sustainable development

and the precautionary principle. To issue this ruling, the Supreme Court used Article 142 of the Indian Constitution, which gives it the authority to order full justice in any matter that is currently before it. (Aggarwal, 2020)

In addition to being blatantly against the spirit of Indian environmental jurisprudence, the draft also goes against numerous rulings rendered by the nation's High Courts and Supreme Court. In the case of *Alembic Pharmaceuticals Ltd. v. Rohit Prajapati*, the Supreme Court also referred to the decision of *Common Cause v. Union of India*, condemning ex-post or retrospective environmental clearance (Choudhury, 2020). The idea of retrospective environmental clearance is incompatible with the EIA notification of 1994, and it is an insult to the basic precepts of environmental jurisprudence.

In the *Environment Protection Association v. State of Kerala* case earlier in 2013, the Hon'ble Supreme Court ruled that initiating projects without first obtaining environmental clearance or permission is a violation of the fundamental right to life protected by Article 21 of the Constitution. While maintaining the significance of public engagement as a fundamental element of the process and in many decisions, the draft notification expressly seeks to decrease public participation through hearings and participation under the EIA procedure. The Indian courts have stressed its necessity. (Chakravarty, 2020)

The Delhi High Court emphasized the value of public hearings in the *Samarth Trust* case, stating that they are a type of participatory justice that provides opportunity and gives voice to the voiceless and allows them a forum to voice their opinions about a project. People have the chance to voice concerns about the planned project's potential effects on society and health during these public hearings. In this ruling, the court made it clear that participatory justice is facilitated by the EIA's requirement of public hearings. To fulfill the procedural formality of the consultation, the local community and the interested stakeholders serve as juries rather than just as observers. (Veera, 2020) The flawed public hearing was ruled to be a matter of law by the Supreme Court in the *Mazdoor Kisan Ekta Sangathan v. Union of India* case. Even the International Court of Justice, which referred to the EIA process as a model and exemplary procedure, emphasized the value of public involvement and the process overall in the *Costa Rica v. Nicaragua* case (<http://www.qil-qdi.org/>, 2017).

The current EIA draft notification attempts to implement several fundamental improvements, but several other precedents from Honourable Courts contradict it. Thus, at the expense of biodiversity, human rights, and the environment, it seems that the current

EIA draft notification is an attempt to support the expansion of corporations and industries. At this juncture, societal attitudes and behaviors must shift to safeguard the environment. In this sense, it is imperative that environmental preservation and responsible living become ingrained in the mindset of all citizens. They must all organize and agitate peacefully and democratically against any such toothless notification which favours such unsustainable economic development at the cost equity.

Conclusions

The Environmental Impact Assessment (EIA) framework in India has failed to ensure adequate protection for the environment and the rights of affected people, primarily focusing on economic growth. To achieve the Sustainable Development Goals (SDGs), inclusive, participatory development is essential. Efficient and effective EIA is crucial for achieving sustainable development. Political will for environmental protection must be increased, and the environmental policy committee should have broad representation from civil society, academia, and the private sector. The Central Government must ensure the draft EIA aligns with existing conventions and environmental jurisprudence. It is necessary to discard the post-facto approval proposal since it violates both the National Green Tribunal's ruling and the basic framework of environmental legislation. Since the Supreme Court ruled that ex-post facto environmental clearances are unlawful as well, there is no way to justify them.

References:

- Aggarwal, M. (2020, April 6th). Government pushes for post facto environment clearances while apex court disapproves. Retrieved from Mongabay India: <https://india.mongabay.com/2020/04/government-pushes-for-post-facto-environment-clearances-while-apex-court-disapproves/>
- Chakravarty, A. (2020, Oct 19th). Draft EIA notification 2020: Is it contra legem to international conventions, judicial verdicts. Retrieved from DownToEarth: <https://www.downtoearth.org.in/blog/environment/draft-eia-notification-2020-is-it-contra-legem-to-international-conventions-judicial-verdicts-73858>
- Choudhury, S. (2020, 4 23). Ex post facto environment clearances are derogatory to principles of environmental law. Retrieved from Lexforti: <https://lexforti.com/legal-news/ex-post-facto-environment-clearances-are-derogatory-to-principles-of-environment-law/>
- Environmental Impact Assessment . (2023, Nov 9th). Retrieved from The Ministry of Environment, Forest and Climate Change : <https://moef.gov.in/moef/division/environment-divisions/environmental-impact-assessment-eia/introduction/index.html>
- <http://www.qil-qdi.org/>. (2017, April 30th). Environmental Impact Assessment after the International Court of Justice decision in Costa Rica-Nicaragua and Nicaragua-Costa Rica: Looking backward, looking forward. Retrieved from Questions of international law: <http://www.qil-qdi.org/environmental-impact-assessment->

international-court-justice-decision-costa-rica-nicaragua-nicaragua-costa-rica-
looking-backward-looking-forward/

Jolly, S. (2020, July 31st). Draft EIA Notification 2020 Is Out of Sync With State Practices, International Law. Retrieved from The Wire: <https://thewire.in/environment/draft-environment-impact-assessment-notification-international-law>

Kanekal, N. (2011, July 6th). Sc allows Lafarge to mine in Meghalaya. Retrieved from Mint: <https://www.livemint.com/Companies/TU0PJYtwNHEZBGJCTTKHO/SC-allows-Lafarge-to-mine-in-Meghalaya.html>

Pulp Mills on the River Uruguay. (2010, April 20th). Retrieved from INTERNATIONAL COURT OF JUSTICE: <https://www.icj-cij.org/case/135>

Understanding EIA. (2024, Feb, 3rd). Retrieved from Centre for Science & Environment: <https://www.cseindia.org/understanding-eia-383>

Veera, M. P. (2020, August 5th). Whose EIA draft is it anyway — people or project proponents? Retrieved from Down To Earth: <https://www.downtoearth.org.in/news/environment/whose-eia-draft-is-it-anyway-people-or-project-proponents--72659>

Role of Hariyali in Sustainable Development

Dr. Hasitkumar Hirji Nagariya and Mr. Mahesh Kandalkar

Assistant Professor, The S.I.A. College of Higher Education, Dombivli East

Corresponding Author- Dr. Hasitkumar Hirji Nagariya

E-mail: drhasitkumarnagariya@gmail.com

Abstract

In the 21st Century Environment has undergone drastic deviations where climatic conditions have changed, the problem of global warming is on the rise, and the rain pattern has altered significantly. Due to food patterns have changed, the number of diseases is increasing at very low ages as well as life spans have been reduced. There is a need for Sustainable Development which is linked to the growth and development of Environmental Resources sensibly so that the wastage of resources can be reduced and it will be available for future generations. Hariyali an NGO is playing a significant role in sustainable development not only in Maharashtra but also all over India. In this paper, the researcher has focused attention on various sustainable environment activities systematized by Hariyali such as CSR activities, Water Conservation activities, Solid Waste Management activities as well as Environmental activities.

Keywords: Hariyali, Sustainable Development, Environmental Awareness

Introduction:

Hariyali commenced its work 25 years back in 1996, intending to spread greenery in hilly regions of Thane and the surrounding area and gather rainwater resources. Now it has spread its wings across various activities and has now turned into an environmental mission in the year 2021. It has become a prominent environmental establishment having huge engagement and group action of the public in its activities. With Plantation, Hariyali began its journey toward environmental protection in 1996. A few nature lovers who happened to visit Chitalsar, Manpada, Thane by chance were struck with an urge to change the lifeless land by introducing some life. The sight of several abandoned stone quarries and depleted barren forest land, with not even a single green shoot of life anywhere, was such a sore sight for their eyes. and began the first-ever Hariyali plantation program!

The Hariyali journey began when a small group of environmentalists, nature lovers, and ordinary but aware citizens banded together with an urge that overpowered not only them but also every other common man who became involved in the project. This journey took humanity from environmental darkness to light and from barrenness to greenery and lively flora and fauna. And over the previous 25 years, it has not only persisted unceasingly but also grown rapidly, bringing with it a whole supportive ecosystem. True to her belief that one should lead by example, Hariyali has inspired many nature enthusiasts, and with their support, we have advanced over the years. Apart from plantation and rainwater

harvesting it has also focused on environmental awareness among youth. The areas covered were solid waste management, wildlife conservation and awareness, and water conservation. They have led the foundation towards an eco-friendly environment through the merriment of festivals like Ganeshotsav and Holi. Hariyali has left its footprints all over the world by taking part in environmental and educational conferences, seminars, conventions, workshops etc. organized at national and international levels.

Objectives

- 1) To understand the concept of Sustainable Development
- 2) To identify the role of Hariyali in Sustainable Development
- 3) To explore CSR, Water Conservation and Solid Waste Management Activities of Hariyali
- 4) To know various environment awareness activities conducted by Hariyali

Methodology

The present study is based on the secondary data obtained from Hariyali Website. Annual reports and news articles related to Hariyali were also referred to obtain the data.

Results and Discussion:

1) Sustainable Development:

Today when we talk about development, one cannot forget about environmental issues such as land deprivation, soil erosion, air and water pollution, deforestation etc. Sustainable development in this regard means the development of a nation by maintaining the quality of the environment for future generations to come.

Sustainable Development Goals

- To encourage the kind of development that reduces environmental evils.
- To meet the needs of the present generation without compromising with the quality of the environment for upcoming generations.

Achieving Sustainable Development

Sustainable development can be attained if we keep an eye on the following points:

- It can be achieved by limiting human activities.
- Technological growth should be input-effective and not input-utilizing.
- The rate of consumption should not exceed the rate of salvation.
- For renewable resources, the rate of consumption should not surpass the rate of production of renewable substitutes.
- All types of contamination should be reduced.
- It can be achieved by sensible use of natural resources.

2) CSR Activities:

- **Corporate Role in Environment Protection**

As a part of society, corporates have a responsibility towards a society where they can participate in plantation, water management and other environment-related activities. They can also sponsor environmental projects and give contributions to finance the activity.

- **Hariyali's Corporate Associates**

Corporate always trust Hariyali for its environmental activities such as plantation, water conservation and environmental awareness programs due to well-qualified trustees and devoted and committed members.

Big listed companies and multi-national companies have shown interest in Hariyali's activities. They have also funded projects like afforestation and other initiatives undertaken by Hariyali from their CSR funds.

Some of the regularly participating listed companies/multinational Corporations are

- Bajaj Electricals Limited
- Hexaware Technologies
- TATA Consultancy Services
- Morgan Stanely group
- Galaxy Surfactants Limited
- Reliance Energy Limited

Past activities under CSR

Being a non-funded, unaided NGO, Hariyali conducts its activities with financial support from corporations and donations from environment-friendly people. Corporations intending to participate in environmental activities would like to know the past initiatives taken by Hariyali. In this regard, Hariyali shared the list of its activities which are as under:

- 1) Morgan Stanley hosted 500 members on a single day
- 2) Nursery project at Murar Road Nursery, as a CSR initiative
- 3) LyondellBasell celebrated their Environment Day with Hariyali and participated with 125 employees.

3) Water Conservation

Due to climate change and irregular rain patterns, we are experiencing water shortages every year. Thus, water conservation has now become a need of the hour. Hariyali's work in water conservation is highly appreciable which is highlighted in the table no.1.

Table 1: Hariyali's Work in water Conservation

Sr. No.	Activity	Details
1	Micro Dams	Construction of several small dams through stone diving and shramdan of students and members e.g. small bund dams were built at Bhavale, Bhatsa
2	Drip Irrigation	A novel way of watering the saplings is through the use of used plastic bottles which are cut at the bottom and a small hole is made in its cap. One bottle is placed near each sapling. At the time of watering, the cut bottle is filled with water which then drips through the small hole for a longer period.
3	Deluge Survey	Undertook a Survey of the Deluge of 2005 in Thane and submitted a report on repetitive Water Logging in Thane City with a well-reasoned and substantiated Engineering Solutions and Environmental Management Plan.
4	Conservation Sites	Some of the stone-pitched dams built by Hariyali are • Tikuji-ni-Wadi to Patona Pada, Yeoor Forest • Bhavale • Tetavli

4) Solid Waste Management

The other area where Hariyali has worked is solid waste management. It conducted composting activity in 75 housing societies as a part of zero garbage in association with the T-ward Municipal office of MCGM.

(MCGM - To be mentioned once as Brihanmumbai Municipal Corporation)

List of Solid waste management activities

Sr.No.	Activity	Details
1	Creating Black Gold	• Fruitfully completed biodegradable waste (cut vegetables waste from Market and restaurants) treatment at MMM Road, Mulund, West during the period from December 2015 to December- 2017. • Open-pit composting method has been implemented at this site. Initially 600 kg/day waste was treated. By June 2019, 42 MT of compost was ready. The compost was handed over to MCGM officials of Garden department.
2	Waste Management In Housing Societies	• Wakefulness program on “Solid Waste Management” and later by guiding them in establishing a suitable facility for bio-composting. • Instructs on scientific separation of household waste and converting this

		separated waste into bio-compost. • helps concerned individuals from that society by guiding them to start composting at household
3	Management of Nirmalya – Pooja Waste	• assisting MCGM with proper management (bio-composting) of ‘nirmalya’ (Pooja flowers) that are produced during the Ganesh festival • As much as 800 kg. of ‘normal’ is processed properly, this way every year.
4	Kitchen Garden – A Promising Option	• Tested with kitchen waste management and creation of a kitchen garden at the MMM road site. A preparatory course in kitchen gardening was conducted at Anand Nagar in 2019.

5) Awareness Activities:

Awareness Campaigns

HARIYALI has conducted a variety of awareness programs and campaigns over its existence over the past 25 years. Some notable activities are

Sr.No	Activity	Details
1.	Newspaper Articles	written several articles and experiences in various newspapers to spread out to the masses and enlighten the people about its activities
2.	Medicinal Plant Exhibition	organizing medicinal plant exhibitions with the cooperation of other environmental organizations
3.	Jay Hari Vitthal Abhiyan	A unique awareness campaign targeted at the workers who travel shoeless to Pandharpur every year. Sharing of seeds to be sown over the path of their foot sojourn was a unique way of the plantation as well as getting a large acknowledgment in newspapers and magazines
4.	Conducting Seminars and Lectures	on various subjects of environmental interest.
5.	Participating in vruksha Valli Exhibition	Hariyali presents itself by way of a stall in this exhibition, displaying various creativities undertaken by Hariyali in the field of environment. Hariyali's enthusiastic volunteers connect with each individual stating interest in such activities. Social media such as WhatsApp groups is created thereafter to keep such nature lovers informed about upcoming activities
6.	Participation in Shobha Yatra	visible on the social screen at most of the Shobha yatras systematized in Thane on the Hindu New Year Day of Gudi Padwa HARIYALIS PARYAVARAN RATH, Bhatsa

		Nadi parikrama, Thane Environmental Balance sheet

6) Nature Treks:

Trekking and exploring the nature trails in and around Thane and Navi Mumbai are among the most thrilling activities that Hariyali engages in on a 6 to 8 week basis. As they walk through the forest, up on the mountains, along the river beds, and discover less-traveled paths, the trekkers not only directly bond with nature but also with each other. The trekkers are rejuvenated from their monotonous routine by this realization of the basic beauty of nature. The calm of nature soothes the soul, and spending time with loved ones and friends renews the heart. The variety of flora and fauna serves as a reminder of the divine, while the verdancy calms the eyes. The participants' busy and colourless lives are made more charming by the abundance of colors found in nature.

Procedure

The schedule and specifics of the treks and tours are made available to individuals who are directly involved with Hariyali. Prospective participants are provided with thorough introductions regarding the necessary preparations, the length of the trek, and its level of difficulty or ease well in advance. A local specialist or guide is hired for some of the treks to give detailed information about different species of trees.

Destinations:

Some of the common treks are

- Kasarvadavali to Patona Pada, Yeoor Forest
- Mama-Bhanja Hills
- Munda Dongar near Gaimukh Check Post
- Tikuji-ni-Wadi to Patona Pada, Yeoor Forest
- Nagla Bunder Forest
- Ovala to Chenna Creek

7) Eco Tours:

In addition to offering nature hikes, Hariyali regularly gave its members and their families Eco-Tours. An eco-tour is a popular activity for people of all ages, particularly those who are unable to walk long distances. It does not involve the strenuousness of a trek and its goal is to gather with loved ones in an environmentally friendly location amidst nature with minimal physical exertion. Examine the previous tour locations and select to join the upcoming one.

- FY 2006-07: Kashedi Eco Tour

- FY 2008-09: Phansad Eco Tour
- FY 2009-10: Dahivali Eco Tour
- FY 2011-12: Bhavale and Pise Dam Eco tour
- FY 2012-13: Wangani Eco Tour
- FY 2014-15: Manas Organic Farm Eco Tour
- FY 2015-16: Nisargamitra Farm tour
- FY 2016-17: Saguna Baug Eco tour
- FY 2017-18: Keshavrushti Bhayandar
- FY 2018-19: Visawa Resort & Hospitality, Saralgaon Eco Tour
- FY 2019-20: Pathare Wadi Agro Tourism, Vashind
- FY 2020-21: Yusuf Meherally Centre & Go Green Nursery, Karnala Tour.

8) The Plantation

As the plantation's operations increased, it became clear that Hariyali needed to handle the plantation's water supply as well. The necessity for a nursery resulted from the feeling that owning saplings was also essential. A good nursery requires previous experience with seed collection. The many Hariyalians who donated hundreds of hours of selfless service through Shram Daan provided the enormous human resources required for the entire endeavor. The thousands of trees planted over several hundred plantation sessions by thousands of volunteers of all ages- from very elderly people to school-age children, from regular people who love the outdoors to corporate titans, from teachers to students, engineers to doctors, chartered accountants, principals, and, of course, the average man write the success story of HARIYALI. The story of Hariyali's plantation activities is one of group achievement, and we are all indebted to Mother Nature in any case.

Past Projects:

Over the course of the year, Hariyali has planted thousands of trees and reached numerous milestones. "Aata Aapule Ekach Laksha - Vruksha he laoo Laksha ni Laksh!" is its tagline in Marathi, which means, when translated into English, "We have only one goal in mind: planting lakhs and lakhs of trees." The forest at Bhavale near Lonad, Kalyan Bhiwandi Road, which was a 7-year project jointly taken up with the forest department in the year 2008 and now boasts of about 20,000 big size trees with diverse flora and fauna, the plantations at Munda Dongar near Nagla Bunder, Thane, and the plantation at Manpada, Thane, to name a few, are notable plantation projects.

Plant Nurseries – Hariyalis’ Support System:

In their respective locations around Hariyali, plant nurseries have served as both a hub of activity and a source of inspiration. For an enthusiast of the natural world, this is the first place to learn about Hariyali, its organizers, and its methods. This place brings together old and new friends who share a passion for the environment. As part of its plantation policy, Hariyali raises seedlings of many species that are beneficial to forests in this area. These sturdy trees are the main focus, not the pretty plants. Plant enthusiasts contribute seeds and young trees to the endeavor. There are many other activities done here in addition to the custom of creating saplings and gathering seeds. Over the years, nurseries have served as the backbone of numerous plantation projects, producing between 10,000 and 15,000 saplings annually. For the benefit of Hariyali volunteers, skill development and improvement programs are held, which facilitates the smoother running of plantation sessions. As a bonus, there are interactive seminars on a variety of environmental subjects, like composting and carbon foot printing, for participants.

9) Activities at The Nurseries:

In addition to planting and caring for the saplings, the nurseries also conduct several other relevant but helpful tasks. Every three years, a medicinal plant exhibition is organized in association with MCGM to raise public awareness of the significance of medicinal plants. Workshops are held in conjunction with these exhibitions. Additionally, a leaflet with information on therapeutic plants is created and distributed to the public. The Nurseries serve as the main training facility for the plantation activity, and this is where new volunteers receive their first practical training. Composting naturally is another helpful but supportive activity. On the spot, compost is made, and the methods are taught. Plantations are cultivated using the compost generated on-site.

Major Nurseries:

- 1. Hariyali nursery at Kasarvadavli, Thane head office.
- 2. Hariyali nursery at Murar Road, Mulund Branch.

Conclusion

The following initiatives, including CSR, environmental, solid waste management and water conservation initiatives, highlight the role of Hariyali in sustainable development. Through newspaper articles, plant exhibits, seminars, and lectures on environmental topics, they have also raised public awareness of environmental issues. Additionally, they have aided corporations in effectively carrying out their CSR initiatives.

References

<http://www.hariyalithane.com/about.html>

<https://www.indiamart.com/hariyali-ngo/aboutus.html>

<https://mumbaimirror.indiatimes.com/environment/haryali-towards-green-mumbai/articleshow/16022948.cms>

<https://mumbaimirror.indiatimes.com/mumbai/other/exhibition-of-ayurvedic-plants-gets-a-warm-welcome-from-thaneites/articleshow/16211620.cms>

<https://earth5r.org/reusing-plastic-bottles-plantation-new-water-conservation-hariyali-earth5r/>

GREEN CONSUMERISM AMONG THE CONSUMERS OF MUMBAI

Dr. Amrita Aggarwal,
Asst. Prof, Nagindas Khandwala College, Malad West, Mumbai.
amrita@nkc.ac.in

Abstract

In Mumbai, the sprawling metropolis on the western coast of India, green consumerism has witnessed a growing trend among its diverse and dynamic population. Fueled by an increasing awareness of environmental issues, residents of Mumbai are actively seeking sustainable and eco-friendly options in their purchasing decisions. With this background, the research objectives to understand the consumption preferences of the consumers in study area, to highlight the level of knowledge of green consumerism among the consumers of the study area and to give applicable solutions to bridge the gap between consumerism and green consumerism. The research methodology is a systematic one with collection of secondary data from various online and offline sources and a survey to collect primary data to understand the perception and awareness of people about the topic. The major findings indicate that the awareness is low, people mostly purchase offline for green products, however they are skeptical about the purchasing it regularly due to higher prices and lack of trust. The recommendations include awareness drives, clear certified labels, community and government partnership. Therefore, it can be concluded green consumerism is the need of the hour but, there are many challenges in the implementation of the thought in full swing.

Keywords: urban areas, consumers, green, organic, awareness, cost, challenges

Introduction

In Mumbai, the sprawling metropolis on the western coast of India, green consumerism has witnessed a growing trend among its diverse and dynamic population. Fueled by an increasing awareness of environmental issues, residents of Mumbai are actively seeking sustainable and eco-friendly options in their purchasing decisions. The city's consumers are influenced by a combination of factors, including heightened environmental consciousness, the availability of information through various channels, and the emergence of businesses adopting green practices. Government initiatives, such as waste management programs and public transportation improvements, also play a role in shaping the eco-friendly landscape. Despite the challenges presented by the fast-paced urban lifestyle, the consumers of Mumbai are gradually embracing green choices, emphasizing the importance of sustainable living in this bustling, vibrant city.

Review of Literature

(Sanan, 2021) Data for consumers` preference towards green products has been collected and analysed on the basis of three demographic factors such as gender, age and income. In

order to tackle this problem, a product needs to be assessed on the basis of its impacts on the environment at each stage of its life cycle from raw material procurement to its disposal. There is huge need for the development of standards in regard to green products as well as implementation of the same. To have an accurate understanding of preference of consumers towards green products, data was collected from the residents of Kharghar area. From the study it is seen that preference for green products does not depend on gender, age or income and is gaining popularity but still a certain community is hesitant in buying the products. **(Bhattacharya, 2022)** People are increasingly ditching chemical infused products amid the need to ensure what they consume is clean and good for their health and also with the objective of leaving behind a greener and cleaner planet for future generations. The market for eco-friendly, healthy and clean products has grown exponentially in the last 10 years and India is not far behind in contributing to this growth. In a study by Nielsen, it was found that consumers in India are increasingly shifting to environment-friendly, natural, clean and organic products – something that even Goldman Sachs had predicted 5 years ago. In this rising tide of green, consumers will continue to embrace eco-friendly and healthy practices and products. There is also a new crop of brands that are providing a platform for green and sustainable products, making life healthy and convenient for the consumers at the same time. **(Nagpal, 2023)** This research aims to explore the consumer behaviour towards green products and green marketing strategies among citizens of Mumbai Suburban. Primary data is collected through surveys administered to a sample of consumers residing in different suburbs of Mumbai. Additionally, the research will explore demographic and psychographic factors that may affect consumer behaviour towards green products. The analysis will provide valuable insights into the level of consumer demand for green products. This study is conducted through a survey questionnaire designed to collect data from consumers residing in Mumbai Suburban. The questionnaire includes both open-ended and closed-ended questions to collect data on consumer perception, awareness, and attitude towards green products and green marketing strategies. 62% people are down to pay more to go green among the 75% who are aware of the green products.

Research Objectives

- To understand the consumption preferences of the consumers in study area
- To highlight the level of knowledge of green consumerism among the consumers of the study area

- To give applicable solutions to bridge the gap between consumerism and green consumerism

Research Hypothesis

H1= All green consumers practice green consumerism only through e-commerce

H1o= All green consumers do not practice green consumerism only through e-commerce

Research Methodology

The area chosen for the research is Greater Mumbai. Its latitudinal extension is from 18⁰ East to 19⁰ East and longitudinal extension is from 72.82⁰ North to 73.00⁰ North approximately. There are 24 wards in Greater Mumbai. The area comprises of Mumbai District and Mumbai Suburban District. The Arabian Sea borders it on the south and west, the Ulhas River on the north, and Thane Creek on the east.

It serves as both the financial and state capital of Maharashtra. It is a significant industrial centre for the entire country. The area is under the management of Municipal Corporation of Greater Mumbai and is one of the largest (administrative area) municipal corporations of the country. The total area of Greater Mumbai is 437.71 sq. kms.

• Data Collection

The tool used for collection of data is a close-ended questionnaire prepared using Google Forms for the ease of data collection and storage. The method used is survey method. The total number of samples is 101. The respondents are spread

across the city because the link of the Google Form was circulated through social media making sampling style as snowball sampling.

• Data Analysis

The data has been analyzed using software like QGIS v. 3.16, MS-Excel and IBM SPSS 21 software. The same has been represented using maps, figures and charts.

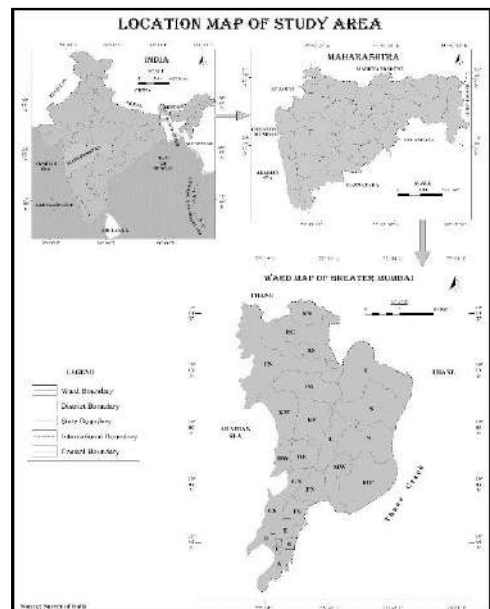
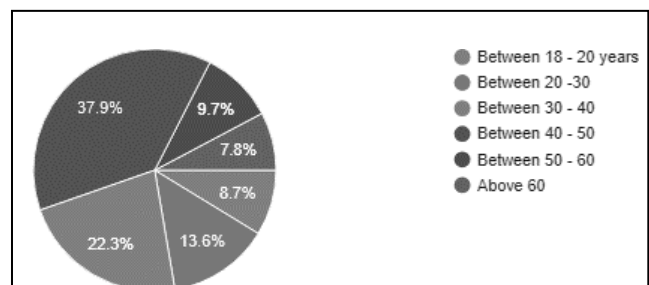


Figure 01: Location of Study Area



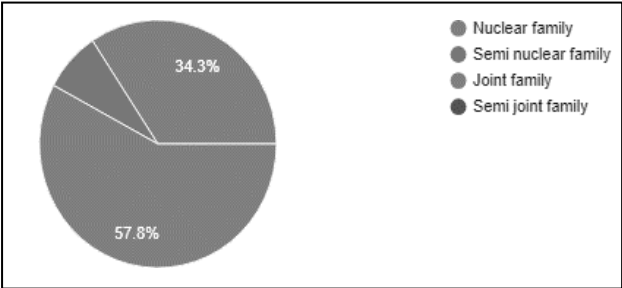
Results, analysis and discussion

1. Age

From the pie chart about age, we can analyse that the highest number of green consumers is between the age group of 40 to 50 with 37.9%. This is followed by the age group between 30 to 40 with 22.3%. Then it is followed by the age groups between 20 to 30, 50 to 60 and 18 to 20 respectively. The lowest number of consumers is recorded in the age group above 60 with 7.8%.

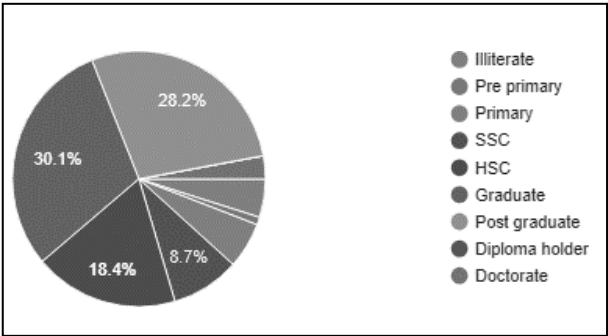
2. Size of the family

From the pie chart about size of the family, we can analyse that the highest number of green consumers is in nuclear family with 57.8%. This is followed by the joint family with 34.3%. The lowest number of consumers is recorded in semi joint family which is nearly 0%.



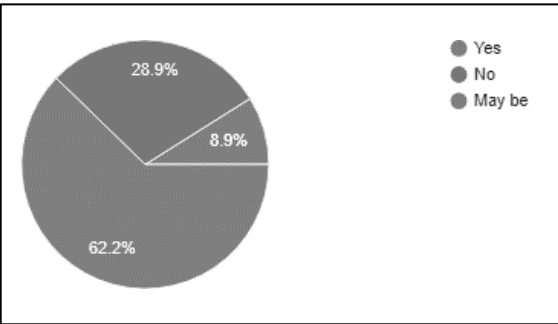
3. Educational qualification

From the pie chart about educational qualification, we can analyse that the highest number of green consumers is graduated people with 30.1%. This is followed by post graduates with 28.2%. Together they are occupying more that 50% on the chart. The lowest number of consumers based on the survey is recorded among pre-primary, diploma holders.



4. Purchase of green products

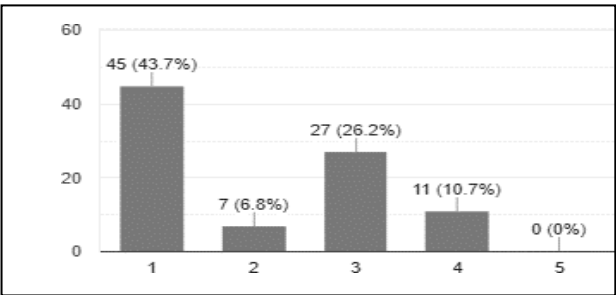
From the pie chart on purchase of green products maximum people with 62.2% have agreed on investing more on green products. Only 28.9% have said no to the answer and 8.9% have no clue which side to choose.



Therefore, we can say that with the increasing awareness more and more people are indulge in making their lifestyle and the environment a better place not only for themselves but also for the future.

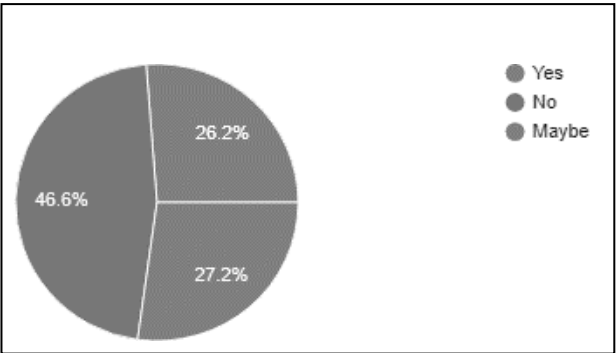
5. Knowledge of Organic farming

From the bar graph about the knowledge of organic farming, we can say that maximum number of people that is 43.75% has the least amount of knowledge about organic farming. This graph is based on ranking where 1 represents the least amount of knowledge and 5 to be the highest level of knowledge where 0% has highest level of knowledge.



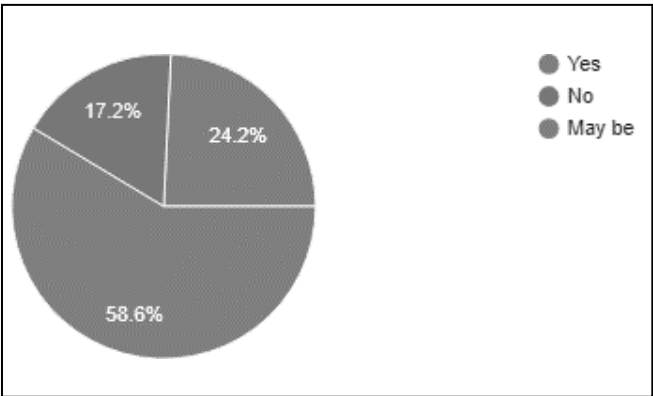
6. Cost effectiveness

From the pie chart on the cost effectiveness of the green products, 58.6% believes that green product is cost effective and 17.2 % believes that they are not cost effective. While 24.25 has no opinion on the cost effectiveness. Therefore, more people are ready to pay extra to get natural products without chemicals

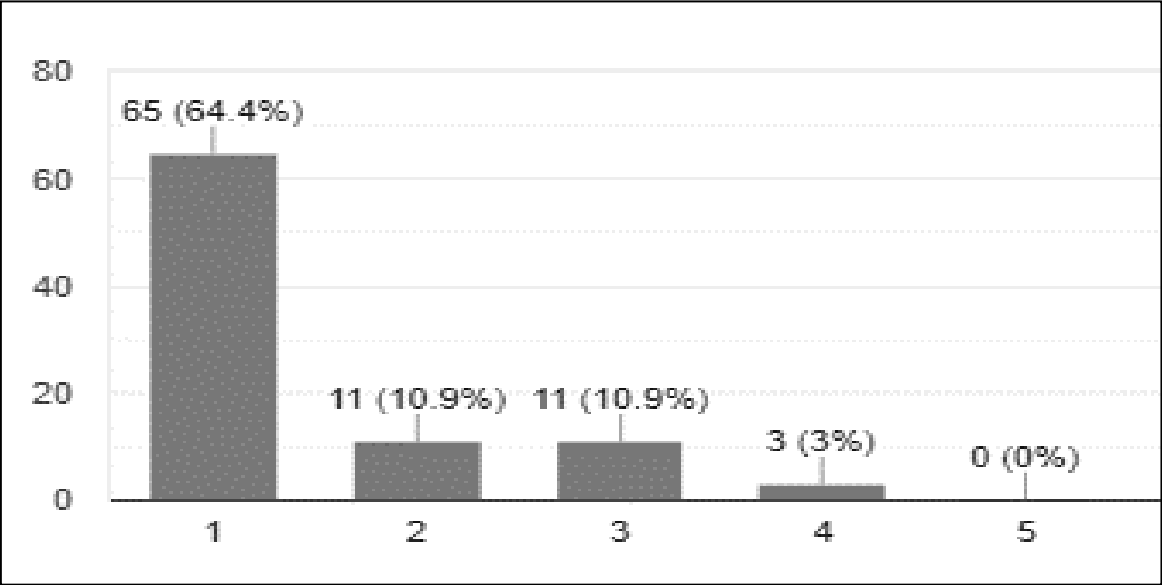


7. Green consumerism

From the pie chart about green consumerism maximum number of people that is 46.6% does not use green products, and the lowest number that is 26.2% has no comment on buying green products. As the purchase rate in the previous pie chart is higher than the consumption of green products, we can say that majority of people are not even aware about buying green products.

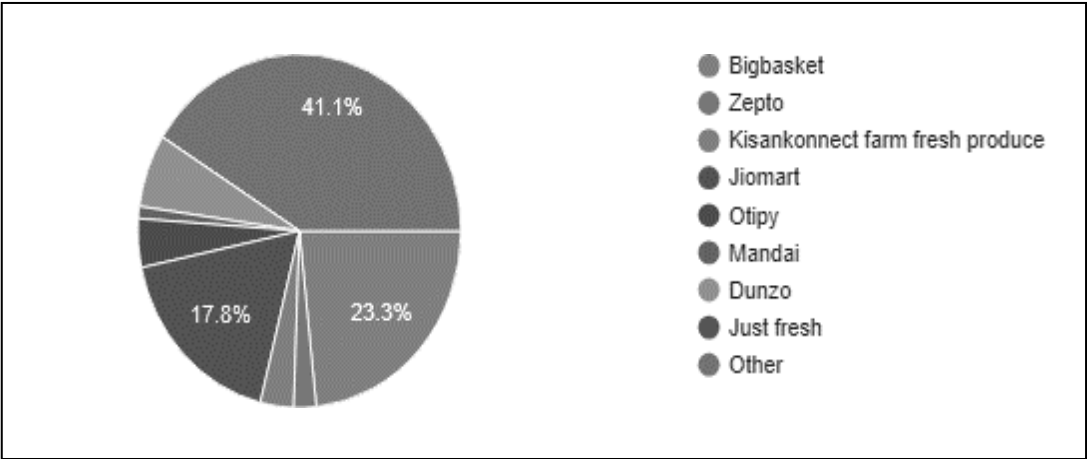


8. Awareness about green consumerism



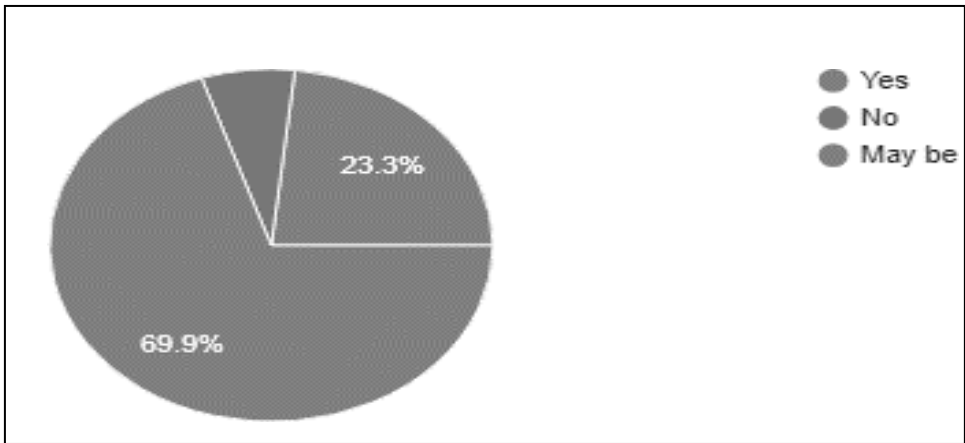
From the bar graph about awareness about green consumerism, we can say that maximum number of people that is 64.4% has the least amount of awareness about green consumerism. This graph is based on ranking where 1 represents the least amount of awareness and 5 to be the highest level of awareness where 0% has highest level of knowledge. This can be due to less knowledge about organic farming and the advantage of green product in our life and the environment.

9. App used to purchase organic food.



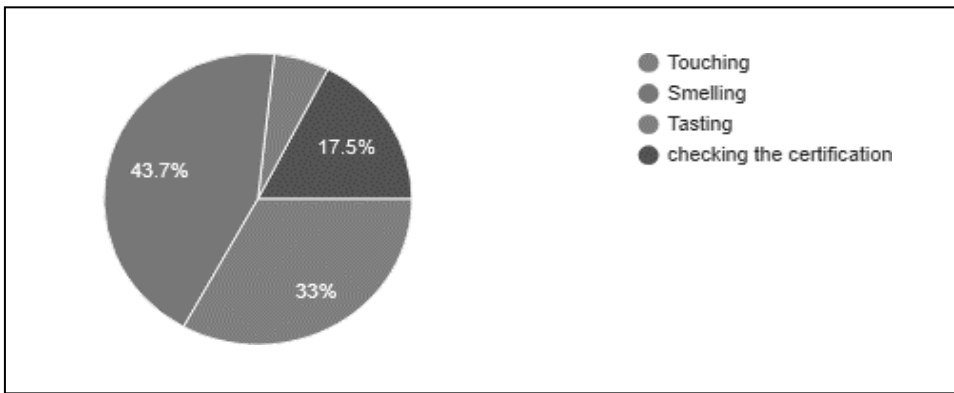
From the pie chart about app used purchase organic food, not a single well-known app is used to purchase green products. Therefore 41.1% of the people comes under another category. The app used least to buy green product is ‘just fresh’ which is nearly 0%. Following the other category ‘bigbasket’ records the highest sell of green products with 23.3%.

10. Need to increase the production of organic farming



From the pie chart about the need to increase the production of organic farming, 69.9% people feel the need to increase the production. 23.3% has no comment on the question and least amount of people are against it. Therefore, we can say that people are eager to improve their daily life products.

11. How do people check the quality of food products?



From the pie chart about the method people uses to check the quality of food products, touching is used by 33% of the people that is the maximum number and least people uses the method of tasting. This is because least people want to risk in taking foreign objects to test.

H1= All green consumers practice green consumerism only through e-commerce

H1o= All green consumers do not practice green consumerism only through e-commerce

The value of Karl Pearson’s correlation(r) is 0.13 and the value of p at 99% confidence for 2 degrees of freedom is 0.22 which suggests that the value of r is smaller than the p value. This implies that the null hypothesis is accepted with 99% confidence. This further

indicates that all green consumers do not practice green consumerism only through e-commerce

Recommendations

- Increase public awareness about the environmental impact of consumer choices, sustainable practices, eco-friendly products, and the importance of making green choices.
- Promote and use recognized eco-labels and certifications (e.g., Energy Star, Fair Trade, USDA Organic) to help consumers easily identify green products.
- Implement reward programs for consumers who make sustainable choices, such as discounts, loyalty points, or exclusive access to eco-friendly events.
- Foster collaborations between businesses, government agencies, non-profits, and educational institutions to collectively promote green consumerism.
- Partner with influencers and celebrities to promote sustainable living and eco-friendly products.
- Advocate for and support policies that promote sustainability, such as tax incentives for green businesses and regulations encouraging environmentally friendly practices.
- Foster a sense of community around environmentally friendly practices, encouraging collective action.
- Encourage innovation in packaging, transportation, and production methods to minimize ecological footprints.

Conclusion

Green consumerism is gaining traction among consumers as a growing awareness of environmental issues prompts individuals to make more sustainable and eco-friendly choices in their purchasing habits. This shift in consumer behavior reflects a heightened concern for the planet's well-being, with people actively seeking products and services that align with environmentally responsible practices. Green consumerism extends beyond mere product selection; it encompasses a lifestyle centered on minimizing ecological footprints. Consumers are increasingly informed about the environmental impact of their choices, demanding transparency, and supporting businesses that prioritize sustainability. As the movement towards green consumerism continues to burgeon, it holds the potential to drive

positive change in industries, encouraging businesses to adopt eco-friendly practices, reduce carbon footprints, and contribute to a more sustainable future.

Bibliography

- Sanan, P. (2021). A Study on Consumer preference towards green products in Kharghar area of Navi Mumbai. SSRN. <file:///C:/Users/Admin/Downloads/SSRN-id3834329.pdf>
- Bhattacharya, A. (2022). The big shift away from chemicals: Rise of green consumerism. 10:22 PM. Times of India. <https://timesofindia.indiatimes.com/blogs/voices/the-big-shift-away-from-chemicals-rise-of-green-consumerism/>
- Nagpal, J. (2023). Consumer Behaviour towards Green Products and Green Marketing Strategies in Mumbai Suburban. IJAR SCT. Mumbai. <https://ijarsct.co.in/Paper14862.pdf>

GREEN CONSUMERISM IN INDIA

Miss. Diksha Pandey and Miss. Kashish Pandey

The S.I.A. College of Higher Education, Affiliated to the University of Mumbai
P-88, MIDC Residential Area, Dombivli Gymkhana Road,
Near Balaji Mandir, Dombivli (E), 421 203

Corresponding Author: Miss. Diksha Pandey

E-mail- k.diksha1923@gmail.com

Abstract

Green consumerism is one of the recently developed concepts that supports sustainable development. In view of coping with the various environmental issues, people are now taking care of the environment. A green environment is one of the bold steps taken in that direction. With this background, the present study aims to understand the concept and the current scenario of green consumerism in India and suggest strategies for effective implementation of it. The study utilizes both primary and secondary data and reveals that India should accelerate the shift towards a more sustainable and eco-friendly economy.

Keywords: Green Consumerism, India, strategy, sustainable, eco-friendly.

Introduction

Green consumerism is a present marvel that has built up an extraordinary critical in the modern business environment (Kanetkar Medha, 2020). Conventionally, the idea of "green consumerism" has been defined as the practice of making careful decisions resulting from an individual moral standpoint or a set of environment-friendly principles and beliefs (Sachdeva, Jordan & Mazar, 2015). According to the argument, environmental concerns cannot be a deciding factor until basic human needs have been satisfied (Akenji, 2014). Consequently, green customers may be scarce in emerging economies. In contrast, the outcomes of the Regional Geographic and Globes surveys conducted as part of the (Azrai et al 2019) study, which measures the sustainability of global consumerism, designate that people are extremely concerned with the environment, resulting in an impact on their everyday customers' preferences. Considering these facts, the present study is conducted to understand the present scenario of green consumerism in India.

Objectives

1. To understand the concept of green consumerism
2. To know about the current scenario of green consumerism in India
3. To comprehend the limitations and future of green consumerism in India
4. To suggest strategies for green consumerism.

Methodology

Both primary and secondary data are the foundation of the current investigation. For this study, secondary sources of data including publications, news articles, research papers and reports from government agencies were used. The primary data used was empirical evidence. A theoretical presentation of the findings is made.

Results and Discussion

Based on both primary and secondary data, the study tries to understand the concept of green consumerism and the present scenario of green consumerism in India. It also suggests the remedies for invigorating the practice of green consumerism.

Green Consumerism

Green consumerism, also known as sustainable or eco-friendly consumerism, is a theory that encourages consumers to place a high value on protecting the environment and social responsibility when making purchasing decisions. It revolves around the idea of utilizing goods and services in a way that lessens their negative environmental effects and promotes sustainable supply chain methods. Environmental awareness is one of the core principles of green consumerism. Eco-aware consumers understand the impact of their consumption habits on the environment. They are aware of issues like resource depletion, pollution, deforestation, and climate change brought on by global warming. Product life cycle is taken into account by green consumerism. Considering a product through its entire lifecycle, from manufacture to disposal, is a component of green consumerism. This includes things like obtaining raw materials, manufacturing processes, delivery, consumption, and disposal or recycling. It Favors environmentally friendly products.

Customers who care about the environment actively look for products made from sustainable resources, such as recycled, organic, or renewable materials. They also attach great importance to products that last a long time and have a minimal environmental impact during their entire life. Supporting companies and brands that are committed to sustainability, ethical labour practices and social responsibility is a component of green consumerism. Choosing products from companies that have open supply chains or eco-friendly certifications may fit into this category.

Eco-conscious consumers make an effort to minimize waste by choosing reusable products over single-use ones, recycling, or disposing of products correctly after their useful lives have ended. The use of energy- and water-saving devices, along with other products that reduce carbon emissions and resource consumption, is promoted by green consumerism. Green consumerism can involve advocating for sustainable businesses, environmental laws, and other causes in addition to individual purchasing decisions. The concept of "green

consumerism" generally recognizes that consumers can affect positive change through their purchasing decisions, which in turn encourages businesses to adopt more sustainable practices.

Current Scenario of Green Consumerism in India

The situation about green consumerism in India was improving, although there were still several obstacles to overcome. The term "green consumerism" describes the expanding trend of people selecting goods and services that are socially conscious, sustainable and have a low impact on the environment. The following are some salient details about India's present state of green consumerism:

1. **Growing Awareness:** Indian consumers now have a pronounced greater understanding of environmental issues, climate change and the value of sustainable living. Several things have contributed to this awareness, such as media coverage, education and environmental organizations' advocacy work.
2. **Growing Demand for Eco-Friendly Products:** The market for eco-friendly goods and services is expanding in several industries, including food, fashion, personal care and home goods. Products that are organic, natural, biodegradable and constructed of sustainable materials are actively sought after by customers.
3. **Growth of Eco-Friendly Brands:** In response to consumer demand for environmentally friendly products, numerous Indian businesses are launching sustainable substitutes for traditional goods. Renewable energy, ethical sourcing and environmentally friendly manufacturing techniques are the main areas of focus for many new and well-established brands.
4. **Government Initiatives:** To encourage sustainability and green practices in a variety of industries, the Indian government has started several initiatives. These include initiatives to decrease the use of plastic, financial incentives to switch to renewable energy sources and laws supporting sustainable farming practices.
5. **Obstacles:** Although green consumerism is gaining popularity, several obstacles are preventing it from being widely adopted in India. These include the scarcity of environmentally friendly products, their increased price when compared to traditional products, the ignorance of some population groups, and the poor infrastructure for waste management and recycling.
6. **Changing Consumer Behaviour:** Although green consumerism is on the rise, it is still very difficult to change consumer behavior on a broad scale. Convenience, affordability,

and brand reputation are among the top priorities for many consumers, surpassing environmental concerns.

Limitation to Green Consumerism in India

Although India's green consumer market appears to have a bright future, several obstacles and issues must be resolved:

1. Affordability

- **Higher Initial Cost:** A sizable section of the population cannot afford green products because some of them are typically more expensive than their non-green counterparts.
- **Low Per Capita Income:** Many Indians have little extra money to spend, which makes it difficult for them to purchase eco-friendly goods and innovations.
- **Return on Investment (ROI):** The higher initial cost of many green products like solar panels may discourage consumers, even though they often result in long-term cost savings.

2. Absence of Infrastructure:

- **EV Charging Stations:** The adoption of environmentally friendly transportation options is hampered by the underdeveloped infrastructure for electric vehicles (EVs).
- **Waste Management:** Throughout much of the nation, there is a deficiency in the infrastructure necessary for effective recycling, composting and waste management.
- **Energy Storage:** Adoption of renewable energy sources, such as solar and wind power, may be hampered by inadequate energy storage infrastructure.

3. Awareness Among Consumers:

- **Limited Knowledge:** A large number of consumers are unaware of how their consumption habits affect the environment or that there are green alternatives available.
- **Lack of Education:** To educate consumers about the advantages of eco-friendly products and the significance of sustainable living, more comprehensive education and awareness campaigns are required.
- **Misconceptions:** Consumers may be discouraged from selecting green products due to misconceptions regarding their efficacy and advantages.

4. Accessibility and Availability:

- **Limited Availability:** Consumer options may be restricted by the lack of readily available green products in some areas of the nation.
- **Accessibility in Rural Areas:** Green products and technologies may be harder to come by in rural areas.
- **Supply Chain Difficulties:** Problems in the chain of supply may cause delays and shortages of environmentally friendly goods.

5. Regulation and Policy:

- **Absence of Strict Regulations:** Products that are marketed as eco-friendly but actually have detrimental effects on the environment may be greenwashed if there are lax regulations and lax enforcement.
- **Inconsistent Policies:** Investment in green technologies may be hampered by inconsistent government policies and regulations that breed uncertainty for consumers and businesses.

6. Cultural and Behavioural Factors:

- **Preference for Traditional Practices:** The adoption of new, environmentally friendly technologies and practices may be impeded by traditional practices and beliefs.
- **Status Symbol:** It can be difficult to encourage green consumerism when using non-green products is viewed as a status symbol.
- **Short-Term Focus:** The adoption of green products may be hampered by consumers who place a higher value on immediate gratification than long-term sustainability.

7. Technological Restrictions:

- **Technological Gaps:** The availability of environmentally friendly goods and services may be hampered by a lack of technological innovation and advancements in some fields.
- **Energy-Intensive Industries:** Because their operations require a lot of energy, some industries, like heavy manufacturing, may find it difficult to implement green practices.

8. Financial Aspects:

- **Economic Downturn:** Consumers may place a higher value on affordability than sustainability when the economy is struggling.
- **Unemployment:** A predilection for less environmentally friendly industries may result from worries about jobs.

9. Greenwashing:

- **False Marketing Claims:** Certain businesses participate in this practice by presenting their products' environmental benefits inaccurately or deceptively, which damages customer confidence.

10. Lack of Local Solutions:

- **Inappropriate Global Solutions:** Indian contexts may not be suitable for all global green solutions; instead, more indigenous and localized solutions are needed.

Overcoming the limitations:

- **Government Initiatives:** Putting laws and rules in place to encourage environmentally friendly consumption.
- **Corporate Responsibility:** Encouraging businesses to implement eco-friendly procedures

and provide more reasonably priced eco-friendly goods.

- **Consumer Awareness:** Funding instructional initiatives to increase knowledge of the advantages of eco-friendly goods.
- **Technological Innovation:** Putting money into R&D to lower the cost and increase accessibility of green technologies.
- **Infrastructure Development:** Constructing the facilities required to enable green practices and technologies.

These constraints must be addressed if green consumerism is to flourish in India. To overcome these obstacles and move toward a more sustainable future, cooperation between the government, businesses, non-governmental organizations and consumers is crucial.

Future of Green Consumerism in India

Green consumerism in India has a bright future ahead of it thanks to several factors like rising consumer preference for sustainable products, government initiatives and increased environmental awareness. The following main ideas describe how green consumerism will develop in India going forward:

1. Raising Awareness of the Environment:

- **Education and Awareness Initiatives:** There will be an increase in the number of initiatives to increase public awareness of environmental problems and the value of sustainable living. Governments, businesses and non-governmental organizations will all be crucial in enlightening the public about the value of environmentally friendly consumption.
- **Youth Involvement:** Younger people are becoming more aware of environmental issues. The demand for eco-friendly goods and services will be driven by this market.

2. Government Proposals:

- **Policy Support:** Green products and services will be more widely adopted as a result of laws and regulations. To encourage sustainable practices, new tax breaks, subsidies, and incentives will be implemented.
- **Renewable Energy:** The adoption of green technologies in the residential and commercial sectors will be aided by the Indian government's emphasis on renewable energy.

3. Corporate Responsibility:

- **Corporate Sustainability:** Enterprises will encounter mounting demands from stakeholders and customers to implement sustainable measures. To satisfy consumer demand, many

businesses will implement eco-friendly policies and make investments in green technologies.

- **Eco-labeling:** More businesses will use eco-labeling to help customers recognize and select sustainable products.

5. Growth of Green Products and Services:

- **Demand for Green Products:** Demand for green products is expected to rise significantly in several industries, including food, fashion, electronics, and transportation.
- **Innovation:** More efforts will be made to make environmentally friendly goods and services more widely available and reasonably priced.
- **Circular Economy:** As more people adopt this concept, waste will be decreased and resources will be optimized.

6. Eco-Friendly Style and Way of Life:

- **Ethical Fashion:** The use of organic materials, fair trade, and lowering carbon footprints are just a few of the sustainable and ethical practices that the fashion industry will adopt.
- **Minimalism:** Conscious consumption and minimalism will become more popular.

7. Green Technology:

- **Clean Energy:** Both at the commercial and residential levels, there will be a rise in the use of clean energy sources like solar and wind power.
- **Electric Vehicles (EVs):** As consumers grow more environmentally conscious, the demand for EVs will rise significantly in the Indian automotive sector.
- **Waste Management:** Creative approaches to recycling, upcycling, and waste management will become more popular.

7. Difficulties: 1. **Cost Barrier:** Given that many green products are currently more expensive than conventional ones, affordability is still a problem. Prices, however, should become more competitive due to increased demand and technological advancements.

- **Infrastructure:** It will be essential to build infrastructure to support green technology, such as electric vehicle charging stations.

- **Consumer Awareness:** In order to educate consumers about the advantages of eco-

friendly goods and services, more comprehensive awareness campaigns are still required, even in light of the advancements.

8. Digital Transformation:

- **E-commerce:** This industry will be crucial to the expansion of green consumerism as it offers a means for environmentally friendly products to be seen by a larger number of people.
 - **Digital Platforms:** Technology will always be essential for introducing environmentally friendly products to consumers and for raising awareness.
 - . **Local and Indigenous Solutions:**
 - **Community Initiatives:** Community-driven projects that emphasize sustainability, such as local and indigenous responses to environmental problems, will become more prevalent.
10. **International Partnerships and Global Collaborations:** India will be able to adopt and apply best practices in green consumerism with the aid of international partnerships and global organizations.

In conclusion, green consumerism appears to have a bright future in India. India can lead the way toward a future that is more environmentally friendly and sustainable with the correct combination of governmental regulations, corporate social responsibility, consumer awareness, private-public partnership and technological advancements.

Strategies for Green Consumerism

In India, promoting green consumerism necessitates a multidimensional strategy involving a range of stakeholders, such as businesses, government agencies, civil society organizations and consumers. The following are some strategies to encourage eco-friendly purchasing in India:

1. **Education and Awareness Campaigns:** To educate customers about how their purchases affect the environment, start extensive education and awareness campaigns. These advertisements ought to emphasize the advantages of selecting environmentally friendly goods and offer helpful advice for leading sustainable lives.
2. **Product Labelling and Certification:** Put in place certification programs and labelling to make it easier for customers to recognize environmentally friendly products. Products with labels like "organic," "fair trade," "biodegradable," and "energy-efficient" can help customers make decisions that are less harmful to the environment.

3. **Subsidies and Incentives:** Offer financial aid and other incentives to companies that implement environmentally friendly procedures and manufacture eco-friendly goods. Green practices can be promoted by government funding for sustainable agriculture, tax breaks for eco-friendly companies and subsidies for renewable energy projects.

4. **Platforms for Consumer Engagement:** Establish web and mobile applications that let users compare the environmental effects of eco-friendly products, read product reviews and leave recommendations. By empowering customers to make knowledgeable decisions, these platforms can promote a feeling of community around sustainable living.

5. **Collaboration with Businesses:** Work together with companies to create and market environmentally friendly goods and services. Encourage companies to implement sustainable practices in all aspects of their supply chains, such as distribution, packaging, manufacturing and raw material sourcing.

6. **Green Procurement Policies:** Put in place green procurement guidelines to encourage the purchase of environmentally friendly goods and services in government departments, public institutions and big businesses. These organizations have the power to stimulate demand for sustainable products and shift the market by setting an example.

7. **Support consumer advocacy and activism:** Encourage green consumerism and hold companies responsible for their environmental effects by lending your support to consumer advocacy groups and environmental organizations. Boycotts and petitions from customers can put pressure on businesses to use more environmentally friendly procedures.

8. **Infrastructure Development:** To encourage green consumerism, make investments in waste management, recycling and environmentally friendly transportation infrastructure. Enhance public transit systems, encourage composting and create effective recycling programs to cut down on carbon emissions and pollution from the environment.

9. **Green Product Innovation:** Promote the development of sustainable product designs and green technology research and innovation. Encourage new businesses and entrepreneurs to create environmentally friendly substitutes for traditional goods, such as sustainable textiles, biodegradable packaging and renewable energy sources.

10. Cooperation with International Partners: To exchange best practices, share knowledge and take advantage of global expertise in promoting green consumerism, collaborate with international organizations, governments and businesses. Engage in global endeavors like the Sustainable Development Goals and the Paris Agreement to jointly tackle environmental challenges on a global scale.

Conclusion

All things considered, green consumerism is still a way off from becoming widely accepted and adopted in India, even though it is growing in popularity. Governments, businesses and civil society organizations need to continue working together to encourage further progress in this area. By coordinating the implementation of these strategies and empowering consumers to make more environmentally conscious decisions in their daily lives, India can accelerate the shift towards a more sustainable and eco-friendly economy.

References:

- Akenji, L. (2014). Consumer scapegoatism and limits to green consumerism. *Journal of Cleaner Production*, 63, Pp.13-23.
- Azrai, E. P., Sigit, D. V., Heryanti, E., Ichsan, I. Z., Jajomi, Y. P., & Fadrikal, R. (2019, October). Green consumerism among students: A survey in the campus. In *Journal of Physics: Conference Series* (Vol. 1317, No. 1, p. 012200). IOP Publishing.
- Kanetkar Medha (2020). Concept Note
- Sachdeva, S., Jordan, J., & Mazar, N. (2015). Green consumerism: moral motivations to a sustainable future. *Current Opinion in Psychology*, 6, Pp. 60-65.

INDIA'S G20 PRESIDENCY AND IMPACT ON SUSTAINABLE DEVELOPMENT

Mrs. Hema Iyengar and Mrs. Rasika Shinde

The S.I.A. College of Higher Education, Affiliated to the University of Mumbai
P-88, MIDC Residential Area, Dombivli Gymkhana Road,
Near Balaji Mandir, Dombivli (East), Dist. Thane, PIN 421 203

Corresponding Author: Mrs. Hema Iyengar
hema.iyengar@thesiacollege.com

Abstract

Recently, the 18th G20 summit was conducted under India's presidency. Sustainable development was at the core of all meetings held under the Summit. India was able to demonstrate its strengths including cultural diversity, the power of democracy, digital supremacy and focus on greener energy solutions to the world. However, the success of the summit will rely highly on continuing the momentum in the successive summits and coordinated efforts taken by all member nations to ensure that the gains of one nation are transferred to all. With this background, based on both primary and secondary sources of data, the present study attempts to understand the impact of India's G20 presidency on sustainable development. The study reveals that the unprecedented success of the 18th G20 Summit has positioned India to have an even bigger influence on how the global economy develops.

Keywords: G20, presidency, Sustainable Development Goals (SDG's), Economic Development, Digital India.

Introduction

The Group of Twenty (G20) is a premier international forum that brings together leaders from the world's largest economies to discuss and coordinate issues related to global economic growth and stability. It consists of 19 countries (Argentina, Australia, Brazil, Canada, China, France, Germany, India, Indonesia, Italy, Japan, Republic of Korea, Mexico, Russia, Saudi Arabia, South Africa, Türkiye, United Kingdom and the United States) and the EU who come together to achieve certain common objectives related to all major international economic issues. The G20 members represent around 85% of the global GDP, over 75% of the global trade, and about two-thirds of the world population. After the massive debt crisis that spread in the late 1990's coupled with the Asian financial crisis of 1997, the economies of the world felt the need for a forum where global economic and financial issues could be deliberated upon and resolved. It was also believed that the developed countries of the world alone, comprising the G7, could not provide stability against all major global setbacks without the support and cooperation of the emerging

economies. The G7 was thus expanded to include the emerging economies, forming the G20. The latest entry in the group is the African Union (AU), which joined during India's presidency at the G20.

India became a founding member of the G20 in 1999, and its involvement has become more significant over time. With a fast-growing economy, averaging 6-7%, India is becoming a more significant G20 participant. The 18th G20 Summit was presided over by India in 2023, with the theme "*Vasudhaiva Kutumbakam*," or "One Earth, One Family, One Future". India was given a global stage at the G20 Summit to highlight its cultural richness and further its goals, which can aid in the advancement of the member nations collectively. Since its inception, the objective of G20 has always been to look for international cooperation and find universally applicable solutions. While most member countries are battling common global concerns related to rising food and fuel inflation, mitigating natural disasters, recovering from the aftereffects of the Covid-19 pandemic and dealing with the Russia-Ukraine war; issues related to communal fights, drug wars, human rights violations, poverty, and corruption are specific to certain member countries. However, one major global issue that concerns all member nations and the world alike is environmental conservation and sustainability, and it has been universally accepted that environmental conservation cannot be done in isolation; rather it needs cooperation and continued efforts taken at various levels by all the stakeholders.

Objectives of the study

1. To know about the inception and working of G20
2. To analyze the measures taken by G20 for sustainable development
3. To understand the role of India as a member of the G20
4. To study the achievements of G20 Summit 2023

Research Methodology

The information provided in the present study is sourced mainly from secondary sources, including government reports and official websites, private publications, news articles and research papers. Some of the information is also obtained from electronic media. Empirical data provided in the study is collected from primary sources, wherever available.

Result and Discussion

The focus of the present study was on understanding the impact of India's G20 presidency on sustainable development revealing the following features.

Structure and Working

The working areas under the G20 are divided into two main tracks, the Finance track and the Sherpa track. The finance ministers, central bank governors and deputies are responsible for the finance track. Their focus is to provide insight on monetary and fiscal issues in all their meetings. The finance track aims to create policies targeting Global Economic Growth, Financial Regulatory Reform, Infrastructure Financing, Financial Inclusion, Fossil Fuel Subsidies, Health Finance, Global Remittances, International Taxation, Green Finance, and Anti-Terrorism Financing.

The Sherpa track, on the other hand, addresses Geo-political issues such as Political Engagement, Anti-Corruption, Development, Energy, etc. Each G20 country is represented by its Sherpa, who plans, guides, and implements on behalf of the leader of their respective country. The major work streams include Employment, Agriculture and Food Security, Culture, Development, Digital Economy, Employment, Climate change, Education, Energy Transition, SDGs, and improvement of healthcare. The G20 presidency (also called TRIOKA) works on a rotational concept where each country that earns the presidency will work closely with the past as well as future president countries. This structure ensures the participation and representation of every region and maintains consistency in the agenda and policies of the G20. Being an advisory body, the G20 provides a platform for different countries to bring new ideas to the table to promote growth and development without any binding treaty or laws. It also allows members to brainstorm suggestions for local and global issues. As G20 is an advisory body, it does not provide any binding treaty or law, rather it recommends certain changes for its members.

Focus on Sustainability

With the increase in global population and the different crises looming over many developed and developing nations, the need for sustainable solutions has become inevitable. This is achieved through the following measures:

1. Climate Change and Biodiversity Conservation:

The growing issues related to global warming, climate change, and biodiversity extinction are impacting both developed and developing economies. To create more stability, the G20 abide by the Paris Treaty and work towards sustainable development.

2. Sustainable Development Goals (SDGs):

The G20 complies with the Sustainable Development Goals given by the United Nations. All member countries strive to achieve the targets in time.

3. Energy Transition:

Most recent G20 discussions focused on transitioning to cleaner and greener energy sources to reduce carbon footprints and conserve depleting energy resources.

4. Sustainable Finance:

While finance is at the core of any economic activity, G20 understands and promotes investment in sustainable projects, incorporating the private sector in decisions related to environmental considerations as well.

5. Circular Economy:

Along with promoting sustainable production, it is equally important to promote sustainable consumption, which is done by encouraging people to “Recycle and reuse”, rather than “use and throw”.

6. Global Health and Pandemic Response:

The impact of COVID-19 on the most powerful global economies has shown that a focus on proper healthcare systems is the need of the hour. Hence, G20 countries are committed to creating sustainable healthcare systems that can provide a rapid response to global pandemic signals.

7. Technology Transfer and Innovation:

The G20 forum encourages technology transfer so that the wide gap in technological advancement between nations can be bridged smoothly in such a way that developed countries get a market to try out newer ideas and innovations while developing countries get the resources to make affordable substitutes.

While the purpose of G20 is to bring together all member nations to discuss their issues and find ways to resolve them, the success will depend on the commitment and consistency of each member nation in achieving global goals while focusing on achieving personal goals.

India and G20

India is one of the founding members of G20. India assumed the presidency of the G20 forum on 1st December 2022 along with Indonesia and Brazil in the TRIOKA as past and future presidents respectively. Former NITI Aayog CEO, Amitabh Kant, was appointed as India's Sherpa for the G20 2023 Summit. Different cities of India hosted over 200 meetings where the diversity of Indian culture and the scale of its presidency was unmatched. The 18th G20 Summit was conducted at Bharat Mandapam, New Delhi's International Exhibition Convention Centre. India's G20 Presidency focused on promoting the universal sense of one-ness, and the theme for the same was – “*Vasudhaiva Kutumbakam*”, which means 'One Earth, One Family, One Future'. This theme is inspired by Maha Upanishad

and highlights the importance of all forms of life and their interdependence, while also signifying India's focus on environmentally sustainable and responsible lifestyle choices. During the Presidency, India prioritized and got a universal declaration from all member countries regarding the following areas:

1. Green Development, Climate Finance & LiFE

India encouraged member countries to focus on transition to greener and more sustainable energy sources and promoted LiFE – Lifestyle for Environment, which is synonymous with the Indian traditional way of life, where all living forms coexist and are treated with respect.

2. Accelerated, Inclusive & Resilient Growth

While rapid economic growth is the focus of all G20 countries, India stressed achieving the same through the promotion of medium and small-scale enterprises, protecting the rights of laborers, and fostering agricultural value chains and food systems that will bring global food security.

3. Accelerating Progress on SDGs

India reiterated its commitment to achieve the targets set for 2030 as per the UN SDG summit. However, it also underlined that the progress had been halted due to the COVID-19 pandemic, and efforts need to be taken to restart the same.

4. Technological Transformation and Digital Public Infrastructure

India demonstrated to all member countries that technological transformation was one of the major focus areas, and India was all set on the path of making it a Digital economy.

5. Women-led Development

Women's empowerment and representation have been incorporated into the policy-making of the country, which can be witnessed in the participation of women in all areas of planning, policy-making and implementation. In a country where women represent almost half of the total population of the country, their representation in planning is imperative for faster economic growth and welfare.

While the above-mentioned areas gained popularity during the recently concluded G20 summit, other areas where India has always focused on and continues to promote include renewable energy, sanitation and waste management, Afforestation and Biodiversity Conservation, Climate Change Mitigation, Water Conservation, Smart Cities and Sustainable Urban Development, Environmental Education and Awareness, Plastic Waste Reduction, Eco-friendly Agriculture Practices, and Green Building Practices. Focusing on these areas also helps in achieving Sustainable Development Goals, and as per

the report of Capri Global Capital Hurun India Impact 50 published in 2021, the companies including Grasim Industries, Tech Mahindra, Tata Power Company, Wipro, Ambuja Cement, Hindustan Unilever, Tata Steel, Infosys and Marico are ranked highest in working extensively towards sustainable development.

Achievements of the G20 summit

The 2023 G20 summit marked a historic moment as India was able to achieve unanimous approval for all 83 paragraphs of the Leader's Declaration, related to various global issues. India was also able to get acceptance for allowing the African Union to be a part of the G20, thus bringing the concerns of the global South to the G20 forum. The major achievements of the G20 summit can be summarized below:

1. Commitment to a global green development pact:

To lower greenhouse gas emissions and advance sustainable development, the G20 leaders decided to prioritize investments in renewable energy sources, phasing out coal-fired power by 2030 and reaching net zero emissions by 2050.

2. Global biofuel alliance:

To encourage the development and application of sustainable biofuels, the G20 leaders decided to form a worldwide biofuel alliance. Enhancing energy security and lowering greenhouse gas emissions are anticipated outcomes of this partnership.

3. Commitment to ending plastic pollution:

The leaders of the G20 decided to take action to eliminate plastic pollution by 2030. These actions include clearing up existing plastic pollution, raising recycling rates, and lowering the manufacture of single-use plastics.

4. Consensus on a debt relief framework for developing countries:

The G20 leaders reached a consensus on a framework to help developing nations who are having financial difficulties repaying their debts to avert debt catastrophe for developing nations.

5. Recommendations on financial inclusion and productivity gains through digital infrastructure:

The G20 leaders reached a consensus on a set of suggestions to advance digital infrastructure-based financial inclusion and productivity improvements. These suggestions include creating policies that encourage digital innovation, investing in digital infrastructure, and extending access to digital financial services. The unanimity was achieved by demonstrating how Central Bank Digital Currency will work through India's UPI platform.

6. India-Middle East-Europe Corridor (IMEC):

THE IMEC was a key focus of the summit and was viewed as an alternative to China's Belt and Road Initiative. The development of IMEC envisions stronger economic integration between Asia, the Arabian Gulf, and Europe which will stimulate economic development through enhanced connectivity.

In addition to the above-mentioned achievements, the 2023 G20 summit was also particularly successful in bringing countries together to improve global health through research and development, promoting gender equality and women empowerment, combating corruption and strengthening international cooperation, and promoting peace and security at a global level.

Suggestions

Although the 18th G20 summit received much appreciation for all the agreements it was able to achieve regarding important economic and political decisions, there is still a long way to go for these achievements to materialize. Some of the suggestions to make G20 summit more effective are listed below:

1. All G20 summits must be attended by all member nations to ensure the effective implementation of policies at the global level, with universal agreement. The absence of Chinese and Russian Presidents in the Summit meant that the Universal Declaration would remain incomplete.
2. G20 is just a forum for member countries to deliberate on issues and discuss measures to resolve them. It is not binding in any way. Hence, if discussions are not succeeded by the implementation of policies at the local and global levels, then the issues may not be resolved timely.
3. The 18th G20 Summit was successful in achieving unanimous approval for all the 83 paragraphs of the Leader's Declaration, the momentum needs to be continued in the upcoming summits to ensure that the agreements are implemented, and the required changes are brought in. It is suggested that future presidents of the G20 also work in line with the recommendations of the current summit.
4. The summit failed to address certain pressing global issues related to debt relief for poor countries, reforming multilateral institutions, ensuring equitable access to COVID-19 vaccines, and resolving regional conflicts among nations.
5. Certain specific issues related to climate change, nuclear proliferation, cyber governance, and international terrorism also remained outside the purview of the

current summit but should be addressed in the upcoming summits, as they can hinder the achievement of the objectives of the G20 member nations.

Conclusion

The unprecedented success of the 18th G20 Summit positioned India to have an even bigger influence on how the global economy develops. Its capability and accountability as a global leader will contribute to a more sustainable and inclusive world. However, the challenges and limitations of the current summit should be borne in mind as India prepares to support Brazil in the upcoming G20 summit so that the lacunae of the current summit can be addressed in the upcoming summits. This will ensure consistency and track the progress made in the achievement of global goals.

References:

- “A Green and Sustainable Growth Agenda For The Global Economy” July 28 - 29, 2023 [REVISED Report-on-G20-Conference-on-Green-Growth FINAL-REVISED.pdf \(niti.gov.in\)](#)
- “About the G20”, [About the G20](#)
- Dubey Priyanka, “*G20 and its Significance: India Takes over G20 Presidency*”, International Journal of Political Science and Governance 2023; 5(1): 107-112
- Gautam Ashriti, “*India and G20: Strengthening and Shaping Global Governance*”, EPRA International Journal of Multidisciplinary Research (IJMR) -Peer Reviewed Journal Volume: 8| Issue: 10| October 2022 pp. 80 to 83, [View of INDIA AND G20: STRENGTHENING AND SHAPING GLOBAL GOVERNANCE \(eprajournals.net\)](#)
- “*G20 for a Better Global Economic Order during India’s Presidency*”, 17th K P Hormis Commemorative Lecture by Shri Shaktikanta Das, Governor, Reserve Bank of India, Kochi, March 17, 2023 pdf
- “Grasim Industries emerges India’s most sustainable company”, [Grasim Industries emerges India’s most sustainable company - The Hindu BusinessLine](#)
- “Group of 20”, [The Group of Twenty \(G20\)| National Portal of India](#)
- “India’s role in the G20: How it can contribute to global economic growth and stability”, [India’s role in the G20: How it can contribute to global economic growth and stability \(indiatimes.com\)](#)
- “Key Outcomes of the 2023 G20 Summit Held in India”, [Key Outcomes of the 2023 G20 Summit Held in India \(india-briefing.com\)](#)
- Mukherjee Bhaswati, “*India and the G20 Presidency: Its Priorities and Challenges*”, India Foundation Journal November-December 2022, Vol III, Issue No. 6, pp.15 to 23, [E:IF](#)

data-2017\ALL IF Publications\Journal of India Foundation - All\2022\November-December 2022 Journal\November-December 2022 IF Journal-31 Oct 2022.pmd

“Overview of G20”, Overview of G20 | Ministry Of Earth Sciences (moes.gov.in)

“Top Ten Global Challenges Facing the G20”, Top Ten Global Challenges Facing the G20 - Homeland Security Digital Library (hsdl.org)

“What Are The Key Achievements Of G20 Summit Under India’s Presidency? All You Need To Know”, Top Key Achievements Of G20 Summit Under India’s Presidency (aeologic.com)

VEGAN COSMETICS- AN EMERGING GREEN TREND AMONG COSMETICS USERS

Mrs. Booma Halpeth

The S.I.A. College of Higher Education, Affiliated to the University of Mumbai
P-88, MIDC Residential Area, Dombivli Gymkhana Road,
Near Balaji Mandir, Dombivli (E), 421 203
E-mail: Vice.principal@thesiacollege.com

Abstract

The desire to look better and be appreciated is a common expectation of every woman. The desire is fulfilled through a range of cosmetic products that are available in the market. The staggering competition has indeed resulted in a range of cosmetics as well as several brands in the market place. However, many of the brands are considered to be chemical-based and are tested on animals before being introduced into the market. The ethical debate that cruelty to animals to be prevented and on the other hand the purpose of testing it on animals is to provide a safe product to consumers has been on for several years. consumers too are concerned about the quality of products they are consuming especially with increasing health issues many of them would not want to take a chance. This has resulted in consumers showing interest in cruelty-free products. Among the several products that claim to be cruelty-free an emerging range of cosmetics namely vegan cosmetics have seemed to gain a foothold in the market. This study aims to understand the cruelty-free cosmetics and vegan cosmetics preferences among consumers.

Keywords: Cruelty-free Cosmetics, Vegan Cosmetics, Sustainability, Green Products, Green Marketing.

Introduction

Sustainability refers to fulfilling the needs of the current generation without compromising on the ability to meet the requirements of the future generation (Brundtland, 1987). Environmental deterioration occurs due to unsustainable production and consumption practices (Barcena, 1992) This has necessitated the need for environmental conservation and introduce products and practices that would ensure sustainability as well as the protection of environmental resources. Green Marketing is one such practice endorsed by organizations the world over. Green product is something like traditional products in terms of characteristics however, it is less harmful to the environment and is developed according to environmental standards. This preference for environmentally sustainable products has extended to cosmetics as well. Consumers of cosmetics around the world are adopting cleaner and greener consumption habits and are looking for a beauty brand that follows ethical and sustainable organizational policies (Beck and Ladwig 2021)

Globally the search for vegan products has extended to not just food but also cosmetics. According to Statista (2022 a, b) the revenue of vegan products is expected to grow 6.3% per annum and reach 20.8 billion US dollars by 2025. A major contribution to this growth comes from social media. Bedard and Tolmie (2018) and Pop et al. (2020) investigated the relationship between social media and consumer purchase intention for green products and suggested that social media brings in motivation among consumers thereby resulting in the purchase of green products.

The Federal Food, Drug and Cosmetic Act of the United States Food and Drug Administration (USFDA)² defines cosmetics as: “Articles intended to be rubbed, poured, sprinkled or sprayed on, introduced into, or otherwise applied to the human body for cleansing, beautifying, promoting attractiveness or altering appearance (USFDA, 2002)” The European and USFDA Directives define the production and marketing of cosmetics in a way to protect and safeguard the health of the consumers however there are no such directives for cosmetics that belong to the green category. Though there is a shift in the attitude of consumers towards vegan cosmetics, however in the absence of clear directives there is possibility of consumers misinterpreting chemical free cosmetics to be vegan cosmetics. This paper aims to understand the meaning of vegan cosmetics and the difference between vegan and animal-based cosmetics and its significance in the cosmetics market and among users

Research Objectives

1. To understand the concept of veganism in cosmetics
2. To study about animal-based cosmetics and its impact
3. To learn about various plant-based ingredients in cosmetics

Research Methodology:

The study is based on previously done and documented research works, references from websites, blogs etc.

Results and Discussion

Traditionally cosmetic brands around the world have ingredients derived from chemicals. With growing health consciousness marketers offered chemical-free cosmetics which however had ingredients derived from animals. These ingredients were used either after killing the animals or taking them through a torturous process to extract the ingredients. Cosmetics manufacturers use animal-based ingredients to get the end products. These ingredients add to the color, stability and final look of the products. Some of the commonly used ingredients are:

Bees wax, Honeycomb – The wax is obtained by boiling the honeycomb from virgin bees. It is used for manufacturing various beauty products like lipsticks, face creams, lotions, mascara, eye creams, eye shadows, lip balms etc. It is very cheap but harmful to the skin

Squalene- Squalene is known to have anti-aging properties and hence used in lip balms, tanning oils, creams and moisturizers. The product is extracted from the liver of the sharks.

Carmine – This is extracted from cochineal insects by crushing them. The crimson color extracted from the insect is used to make dyes that are used in food coloring like sweets, baked goods, seasonings and jam. It is also used in blush, nail paints, lipsticks etc.

Guanine – This is found in crushed fish scales. It is a crystalline substance that shimmers or diffuses light. This is used in nail polishes, lipsticks, mascara etc.

Tallow- it is prepared by boiling the carcasses of slaughtered animals wherein a fatty substance is produced. This is used in eye makeup, lipsticks, foundations etc.

Gelatin- gelatin is the boiled skin, tendons, ligaments and bones of animals. It is used in manufacturing creamy cosmetics and nail treatments.

Lanolin – It is extracted from sheep's wool or excretion from wool-bearing mammals and it is found in most lipsticks and makeup removers, lip balms, lip glosses, hair products like conditioners, face and body creams, moisturisers.

Shellac-Shellac is an amber-colored resin that is made from a tiny scale insect called the lac. Because of its thermoplastic qualities and glossy appearance, shellac is used in nail varnish and hair lacquers.

Ambergris- It is a waxy substance that is seen in the lining of the whale's stomach. This is used to make the scent of perfumes.

Collagen – it is taken from animal tissue and is used in lip glosses and is known to reproduce collagen.

Estrogen – Estradiol is a hormone widely used in most perfumes, restorative creams, lotions etc. it is extracted from the urine of Pregnant horses.

Retinol – a potent source of Vitamin A is known for its anti-aging properties, but it is almost derived from animals.

Plant-based cosmetics.

Glycine Max- it is also known as soybean which is rich in several components such as phenolic acids, flavonoids, isoflavonoids, small proteins, tannins and proanthocyanidins. The soybean seed extract and fresh soymilk are reported to have several cosmetic benefits such as anti-inflammatory, collagen stimulatory, antioxidant, skin whitening and sun protective effects.

Black bean sprouts: is safe and can be used as an additive for anti-aging and whitening-effective cosmetics. the extract of black bean sprouts is safe and can be used as an additive for anti-aging and whitening effective cosmetics. The Korean red ginseng is a traditional Korean medicinal plant and is often consumed as foods

There is a shift in the consumer attitude towards chemical-free cosmetics and there is a growing concern towards health issues because of the harmful chemicals. In addition, cruelty to animals during the testing of these cosmetics has been debated for long. To provide a sustainable solution animal-based cosmetics were introduced claiming to be safer. However, the animals were tortured in the process of extracting the ingredients for the cosmetics. This has resulted in the emergence of new range of cosmetics called vegan cosmetics and marketers seem to have moved from plant-based fragrances into chemical products to complete plant-based cosmetics. Consumers are aware of the emerging trend and there seems to be a shift towards plant-based cosmetics.

Consumer behavior towards vegan cosmetics: social media plays an important role in consumers developing motivation towards vegan cosmetics. Several marketers use social media to place their brand and the users of the brand provide reviews which plays a significant role in consumers showing interest in the brand. Bedard and Tolmie (2018) and Pop et al. (2020) have stated that the media especially social media played an important role in consumer motivation and purchase of green products. Napoli and Ouschan (2020) studied the relationship between the communication channels and consumers in forming purchase intentions towards vegan cosmetics. Also, the credibility of the source of information played an important role in consumers developing purchase intentions toward vegan cosmetics. In addition to this the attractiveness of the source, its expertise and trustworthiness significantly affect the purchase intention. Silva et al. (2020) says that in addition, Digital influencers are also used to endorse veganism and vegan products and their followers would develop a favorable opinion towards the products.

Need for vegan cosmetics: Vegan cosmetics have become necessary considering the ethical and sustainability perspective. To prevent cruelty to animals and protect them collective effort from the consumers is needed. When the consumers refuse to consider cosmetics with animal ingredients then the marketers have no choice but to switch over to plant-based products for their survival. In addition, to protect the food web, the survival of every animal must be important. Also, from a health point of view, it is necessary to switch over to plant-based cosmetics to avoid health problems in the future.

Other issues: Consumer concern towards vegan cosmetics include the product concept, expected efficacy, factors that need to be considered before purchase, image and the ingredients in the cosmetics. Consumer satisfaction factors include color, consumer service, efficacy, packaging design, smell, price, and formulation of cosmetics while they are dissatisfied with smell, flavor, formulation, shipping delay, actual color and the color shown in the screen and concerned about the use of items that are prohibited. So vegan cosmetics manufacturers need to understand the concerns of the consumers and address them through the products.

Limitation to Vegan Cosmetics

Although the ethical and environmental appeal of vegan cosmetics has led to their increasing popularity, there are still certain restrictions attached to them:

1. Restricted availability of some ingredients: Vegan substitutes for some traditionally animal-derived cosmetic ingredients may not be readily available. This may limit how some products are formulated or how effective they are.

2. Issues with stability and shelf life: Vegan substitutes for some ingredients might not provide the same stability or longevity as their counterparts derived from animals. This may have an impact on the longevity and general quality of vegan makeup.

3. Cost: Producing vegan cosmetics can be more expensive due to the need for specialized or pricey ingredients. Retail costs might go up as a result in comparison to non-vegan options.

4. Texture and performance: It can be difficult to get the right textures and performance qualities in vegan cosmetics. To get the right results, formulators might have to try different plant-based ingredients, which could affect the efficacy and consistency of the final product.

5. Regulation: Regional regulatory frameworks of cosmetic ingredients differ, and certain vegan substitutes may be subject to more stringent guidelines or necessitate supplementary testing to guarantee their safety and effectiveness.

6. Limited selection of shades and finishes: In comparison to non-vegan options, vegan cosmetics may offer a more constrained selection of shades and finishes. Customers may find it challenging to locate goods that complement their tastes and skin tones as a result.

7. Reliance on synthetic ingredients: Although a lot of vegan makeup uses plant-based ingredients, some formulas may need synthetic substitutes to get the desired results. Customers who prefer products made entirely of natural ingredients may find this to be concerning. Notwithstanding these restrictions, the market for vegan cosmetics is still

expanding, which is spurring advancements in formulation science and creativity to meet these obstacles.

Future of Vegan Cosmetics

Vegan cosmetics appear to have a bright future ahead of them, as several trends and advancements are expected to influence the sector:

- 1. Developments in formulation technology:** As long as formulation technology keeps improving, cosmetic companies will be able to produce vegan products with better performance, texture and stability. This involves creating novel plant-based ingredients and eco-friendly substitutes for animal-derived ingredients.
- 2. Product offering expansion:** Cosmetic companies anticipate that as consumer demand for vegan cosmetics grows, they will be able to offer a greater variety of products, such as skincare, haircare and fragrance products. The expansion aims to accommodate the varied requirements and inclinations of vegan customers.
- 3. Sustainability and ethics:** Aside from going vegan, more and more people are looking for cosmetics made in an ethical and ecologically responsible way. Companies that make cosmetics will have to give sustainability top priority across the board.
- 4. Using cutting-edge ingredients:** Plant stem cells, botanical extracts, and biodegradable polymers are a few examples of cutting-edge ingredients that will be seen in more vegan cosmetics. These ingredients adhere to vegan principles and provide special benefits for skincare and cosmetic formulations.
- 5. Personalization and customization:** Cosmetic companies may now offer vegan cosmetics that can be customized to a person's preferences and skin type, given the increasing popularity of personalized beauty solutions. This might entail analyzing skin conditions and suggesting appropriate products using technology like artificial intelligence and machine learning.
- 6. Partnerships and collaborations:** New and creative vegan ingredients may result from cooperation between cosmetic companies and other sectors, like food and agriculture. Collaborations with social media platforms, celebrities, and influencers will also play a key role in promoting vegan cosmetics to a wider audience.
- 7. Regulations and certifications:** To guarantee authenticity and transparency in product labelling, regulatory bodies may impose stronger standards and certifications in response to the growing demand for vegan cosmetics. Customers will feel more assured about the vegan status of cosmetics as a result.

The demand from customers for products that reflect their values and beliefs will drive innovation, sustainability and inclusivity in the future of vegan cosmetics. We can anticipate more varied and easily accessible options for vegan beauty enthusiasts globally as the industry develops.

Suggestions for the Effective Use of Vegan Cosmetics

In addition to supporting moral and environmental principles, using vegan makeup encourages better skin care choices. Here are some suggestions for using vegan makeup successfully:

- 1. Carefully read the labels:** Make sure the goods you select are approved as vegan. Seek out certifications or labels from respectable groups such as The Vegan Society, Vegan Action, or PETA.
- 2. Recognize Your Skin Type:** Knowing what kind of skin you have—dry, oily, combination, or sensitive—is essential when using any kind of makeup. Select skincare products that are appropriate for your skin type to prevent breakouts or irritation.
- 3. Patch Test New Products:** To ensure there are no allergic reactions or negative reactions, test new vegan cosmetics on a small section of your skin before using them on your face or body.
- 4. Wash Your Skin:** Make a blank canvas your starting point. Before using any vegan makeup, wash your face with a vegan cleanser to get rid of any oil, debris, and makeup residue.
- 5. Hydrate your skin:** Smooth skin makes makeup application easier. Apply a vegan moisturizer that is appropriate for your skin type before putting on makeup.
- 6. Use primers:** Vegan primers reduce pores, even out the skin's surface, and provide a canvas on which makeup can be applied. Additionally, they prolong the wear of makeup throughout the day.
- 7. Select High-Grade Tools and Brushes:** Invest in synthetic-material makeup brushes and tools that are vegan-friendly instead of ones that use animal hair. Regular brush cleaning will help to prevent the growth of bacteria. Layer Goods Use caution when applying makeup. Begin with lighter products, such as BB creams or tinted moisturizers, and add more coverage as necessary with vegan foundation or concealer. This stops the cakey, thick appearance.

8. Mix, Mix, Mix: The secret to getting a flawless, natural-looking finish is blending, whether you're applying eyeshadow, blush, concealer, or foundation. To blend products evenly, use blending brushes or sponges.

9. Set Your Makeup: To ensure that your makeup stays in place and lasts longer, use a vegan setting spray or powder at the end of your routine.

10. Take Off Makeup Correctly: Use a vegan makeup remover to completely cleanse your skin and get rid of any makeup residue at the end of the day. To make sure your skin is clean and renewed, use a mild cleanser afterward.

11. Proper Storage: Keep your vegan cosmetics out of direct sunlight and in a cool, dry place to preserve their quality and efficacy.

One can effectively use vegan cosmetics to improve the beauty routine and support cruelty-free and environmentally friendly practices by adhering to these guidelines.

Conclusion

The shift in trend towards safer cosmetics has been on for several years. Marketers made consumers believe that animal-based cosmetics are safer to use. However, the processes that are used to extract the ingredients are cruel affecting the ecological balance and also, they are ethically wrong. This resulted in a need for more sustainable alternatives. The veganism concept was emerging in the areas of food and slowly it seeped into the cosmetics segment too. From the traditional ingredients to the kitchen to plant-based ingredients the journey has evolved. The secret of natural ingredients like turmeric, lemon, and amla on the skin and hair also paved for more plant-based products to be introduced. This study aims to understand the difference between animal-based and plant-based cosmetics and consumer motivation towards the purchase of vegan cosmetics. The study has been done based on the research reports of other studies. In the future, a primary study covering respondents of different age groups can be undertaken to understand the awareness and preferences of consumers towards vegan cosmetics, social media and its impact on consumer vegan brand choices and so on.

References

Animal Ingredients Common In Natural Beauty Products,
<https://www.greenqueen.com.hk/animal-ingredients-beauty-products/>

Beck V, Ladwig B (2021) Ethical consumerism: veganism. *Rev Clim Change* 12:e689.
<https://doi.org/10.1002/wcc.689>.

Bedard S, Tolmie CR (2018) Millennials' green consumption behaviour: exploring the role of social media. *Corp Soc Responsib Environ Manag* 25:1388–1396. <https://doi.org/10.1002/csr.1654>.

Common Cosmetic Ingredients That Are Derived From Animal Products, <https://www.onegreenplanet.org/animalsandnature/common-cosmetic-ingredients-derived-from-animal-products/>

Jenkins K, Kiviat J, Hamann D. Concomitant phytophotodermatitis and allergic contact dermatitis due to "natural" and "vegan" cosmetics. *Dermatitis*. 2020;31(1): e2-e3.

Napoli J, Ouschan R (2020) Vegan stories: revealing archetypes and their moral foundations. *Qual Mark Res* 23:145–169. <https://doi.org/10.1108/QMR-06-2018-0064>

Pop RA, Săplăcan Z, Alt MA (2020) social media goes green—the impact of social media on green cosmetics purchase motivation and intention. *Information* 11:447. <https://doi.org/10.3390/info11090447>

Statista (2022a) Topic: Cosmetics Industry in Brazil. <https://www.statista.com/topics/5424/cosmetics-industry-in-brazil/>. Accessed 21 March 2022a.

Statista (2022b) Consumer preferences for natural beauty products in Brazil as of September 2019. <https://www.statista.com/statistics/1127118/consumer-preference-natural-beauty-products-brazil/>. Accessed 27 March 2022b.

Silva MJB, Farias SA, Grigg MK, Barbosa MLA (2020) Online engagement and the role of digital influencers in product endorsement on Instagram. *J Relatsh Mark* 19:133–163. <https://doi.org/10.1080/15332667.2019.1664872>

Waqas MK, Akhtar N, Mustafa R, Jamshaid M, Khan HM, Murtaza G. Dermatological and cosmeceutical benefits of Glycine max (soybean) and its active components. *Acta Pol Pharm*. 2015;72(1):3-11.

A CASE STUDY ON ELECTRONIC-WASTE MANAGEMENT INITIATIVE AT THE S.I.A. COLLEGE OF HIGHER EDUCATION, DOMBIVLI (E)

***Dr. Shilpa Malani, ** Miss. Sanskriti Bhoir and *Mrs. Shubhangi Daptardar**

*Assistant Professor, The S.I.A. College of Higher Education, Dombivli (E), PIN 421 203

** Student, The S.I.A. College of Higher Education, Dombivli (E) PIN 421 203

Corresponding Author: Dr. Shilpa Malani

E-Mail: bhagtanishilpa.k5@gmail.com,

Abstract

With the continuous advancement of electronic technology, there are increasingly more consumer electronic products in the market. Increased consumption of gadgets has also accentuated the amount of electronic waste generated and the challenges of safe disposal and recycling of precious metals used in these products. Due to improper end-of-life processing of e-waste, the landfills accumulate the e-waste, whereby incineration of such waste leads to significant health hazards for the living beings in the surroundings. It becomes essential to sensitize ourselves and the people around us to better manage the consumption and recycling of devices. Young students entering into real-world businesses must be exposed to sustainable manufacturing and product life-cycle practices. This case study presents interventions undertaken over three years with college-level students toward experiential learning in responsible consumption and handling of electronic items.

Keywords: E-waste, recycling, EPR (Extended Producers' responsibility), e-waste management, awareness.

Introduction

Faster upgradation of electronic gadgets is tempting consumers to discard their old electronic device possessions and buy newer ones. The consumer electronics market has been on the boom. However, most of these products are being manufactured in a single country that is China. Additionally, the development of newer technologies and affordable manufacturing has reduced the cost of these products. Due to the rise in the working-class population, more and more people have increased disposable incomes. On the e-commerce platform websites, users read reviews of the products, compare prices and make pricing decisions from the comfort of their homes. This makes the buying decision quicker. The process of buying is sped up through the availability of digital payment mechanisms. Lastly, increased spending on advertisements, offline as well as online, and innovative pricing strategies and customization (personalization) tactics by companies tempt the consumers to buy more products. In our country, the Digital India program was launched in 2015 with a vision to transform India digitally and empower in the field of technology. However, the utility life of many electronic products has declined leading to an increase in

the frequency of newer purchases. At times, repairing a faulty device is inconvenient and costlier compared to getting a new product. All of these factors also have resulted in an excess amount of electronic waste all over the world.

E-waste refers to any electronic product that has come to the end of its useful life, as decided by its user. This includes old and discarded electronic items like mobile phones, batteries, set-up boxes, Wi-Fi routers, calculators, CDs, adapters, C.P.U, monitors, laptops, extension cords, headphones, earphones, electric tools, remote control devices, mice, digital keyboards, and so on. When electronic items are not recycled, they end up in a dump and threaten to destroy our planet.

Since some of the developed countries find recycling infrastructure costly, some nations export large quantities of e-waste to developing countries that offer comparatively cheaper recycling services. Collectively increased consumerism, outdated electronic gadgets and technological advancements are posing major hazards to the environment.

Currently, it is observed that the majority of our populace is unaware of the safe disposal of electronic waste. So, they hand these over to local *kabadiwalas* in return for a small amount of money or utensils in exchange. And these *raddiwalas* are not trained in the proper handling of electronic waste. So, they dump these devices in open grounds, after extracting the recyclable plastic casing and precious metals, for example. This dumping results in the release of other toxic elements and harmful chemicals in the environment, through land, water and air. This toxicity in the environment negatively impacts the health of nearby citizens.

E-waste contains lead and cadmium and when it is burnt toxic gasses are being released which damages our lungs for our whole life. As most industries dump their e-waste in our water bodies, toxic elements percolate our reservoirs i.e. rivers, lakes by killing fish and marine life and our drinking water also becomes poisonous. Piles of e-waste are lying in landfills, which degrades our soil, contaminates our fruits and veggies and causes cancer and heart diseases.

Manufacturers have been allotted EPR targets for every year to collect and recycle e-waste. And if the targets are not achieved then the targets get accumulated for next year. And if the targets are not achieved up to a certain date, then producers may have to pay a penalty.

Literature study

To understand the situation of electronic waste around us, we studied research papers that were published globally; certain related policy documents and news reports on e-waste

generation and management in recent years. We observed that India is the 3rd largest generator of e-waste globally and the capital of Delhi is the hub of e-waste generation. “According to the UN, the world produced as much as 57.4 million tonnes of electronic and electrical waste (e-waste) a year, weighing more than all of the commercial airliners ever made, and this figure is expected to increase to 74 MT by 2030. Of this vast mass of waste, only 20% can be formally recycled globally because of the available capacity. In India, according to the Central Pollution Control Board (CPCB), India generated 1 million tonnes of e-waste in 2019-20.” [Ref 1]

As per the Central Pollution Control Board (CPCB) the e-waste generation is as follows [Ref 2, 3]

Financial Year	Generation (tonnes)	Quantity of e-waste collected, dismantled & recycled/disposed
2017-18	7,08,445.00	69,414.0
2018-19	7,71,215.00	1,64,663.0
2019-20	10,14,961.21	2,24,041.0
2020-21	13,46,496.31	NA
2021-22	16,01,155.36	NA

Maharashtra generated and processed 18559 tonnes of e-waste in 2021-22. [Ref 4]

Vijay N Bhoi et. al. (2014) showed the dangers of e-waste through the contamination of water and the possible formation of explosive gas. He suggests each stakeholder including manufacturers, sellers, users and waste handlers share responsibility for handling electronic waste. [5]

Sikdar and Vaniya (2014) concluded that e-waste should be incorporated into the syllabus as the education system alone has the power to sensitize and transform youngsters at an early age. Awareness programs like street plays, dramas, debates, seminars, etc. can be helpful. [6]

Sivakumaran et. al. (2013) has suggested manufacturers should participate in social awareness for e-waste management. The government should allocate funds and impose strict regulations for the disposal and recycling of e-waste. People should be made aware of heavy metals, and toxic chemicals leading to dangerous diseases like respiratory disorders, skin diseases, damaging nerves, and increasing cancer cases. [7]

Peeranart Kiddee et al. (2013) encourage the development of ecodesign devices, using effective methods to dispose of e-waste and strict prohibition for the transfer of e-waste to developing countries. [8]

The Ministry of Electronics and Information Technology (MeitY) provides support to industries for setting up e-waste recycling units by extracting precious metals from e-waste components. As per EPR policy, the producers have allocated certain fixed targets for e-waste collection which should only be dismantled and recycled by authorized dismantlers and recyclers only as specified by the Central Pollution Control Board for sustainable development. [9]

The Ministry of Environment, Forest and Climate Change has notified the e-waste (Management) Rules 2016 to channel e-waste into the formal sector to ensure its safe handling and disposal. Recognizing that e-waste can be a valuable source of secondary resources such as precious and rare earth metals, the Government is in the process of developing recovery and recycling strategies to utilize the e-waste generated in the country. This would be a major step towards sustainable consumption and production enabling the transition of the Indian economy into a circular economy. [10]

Project activities and research methodology

To get a firsthand experience in understanding the quantum of e-waste generated in our surroundings as well as the processing of e-waste, we, the Eco-Club of The S.I.A College of Higher Education situated at Dombivli affiliated to Mumbai University conducted an e-waste collection drive in the last three years since 2021. These drives have aimed to serve our community by:

A) Planning a project as an outreach involving students collecting e-waste from various areas

B) Sensitizing young students and their neighboring people towards the harmful effects of disposing of electronic waste indiscriminately

In this community outreach program, students participated and collected e-waste from their neighbors, friends, relatives and family. After collecting e-waste, students brought their collection to the drop box point located on the ground floor where large bins were kept to accumulate all the items collected.

Research Methodology

To understand the e-waste recycling processes, we conducted an interview survey from Threco Recycling Company located in Mumbai. We discovered the policies of e-waste management which are timely amended. The following are the key points:

1. Threco collects e-waste from B2C i.e. Businesses to consumers which includes individuals, communities, NGOs, schools, colleges, Rotary clubs as well as manufacturing and processing industries.
2. As dumping grounds are government-owned, recycling companies are technically not allowed to collect e-waste from landfills.
3. The majority of e-waste is handled loosely by the informal sector.
4. Most rag pickers are untrained in handling e-waste; they do not look at the hazards of the chemicals. And they are only concerned about revenues. Lower caste people are hired and forced to work in slavery without proper safety and tools. It is harmful for these workers who extract important metals and dispose of plastic in landfills. Of the waste which is given to *kabadiwala* only 10% is recycled and the rest is discarded to landfills. Compared to e-waste recycling companies, kabadiwalas offer higher rates to customers as they resell at higher margins and do not pay extra costs for disposing. However, recyclers ensure that nothing from the collected e-waste should enter the landfill. This is a recent law and their license can get canceled if they violate this law. Extracted chemicals need to be treated separately. Recycling companies do not offer any better prices to the *kabadiwalas* either. There is no incentive for the *kabadiwalas* to send materials to the recyclers.
5. The government has made it mandatory for companies to manage e-waste. Pollution Control Boards have newer laws coming in, for e-waste disposal.
6. Manufacturers have to meet EPR targets each year and if the target is not achieved it gets accumulated in the next year's targets. So, a certain amount of e-waste needs to be recycled otherwise companies are made to pay a penalty. So, they have to recycle to maintain their license.
7. The government is attempting to educate consumers regarding waste disposal.
8. Threco conducts seminars, webinars, awareness sessions, and workshops for corporates, schools and colleges for e-waste management. Slowly and steadily things are happening. Life cycle assessment and supply chain management are two factors newly established and developed in India.

9. There is no accurate data of e-waste recycling as it is only recorded in the formal sector whereas in the informal sector there are no records. Population is increasing and so is the dependency of people on devices. With changing times people have switched their preferences to electronic items for example instead of buying a normal watch people prefer to buy a smartwatch providing fitness features like calculating heart rate, number of steps walked daily, calling and messaging features via Bluetooth connections. With planned obsolescence the shelf life of products is limited, for example, a mobile phone which was earlier used for 6 years now the lifespan has reduced to 3 years. Thereby forcing consumers to buy newer versions of products leading to more e-waste generation.

The outcome of e-waste drive:

After collecting e-waste items, students mentioned the details of the list of e-waste items collected, from whom e-waste is collected, weighed each item digitally and wrote an experience-sharing report on the same while interacting with people.

1. Students improved their communication; convincing skills increased their self-confidence.
2. This community-based project led them to make friendships with strangers, neighbors etc.
3. Students enjoyed doing this project and felt a sense of encouragement towards waste management and expressed that they would like to make more contributions in the future.
4. By doing this assignment students realized that lots of e-waste is available at their own house and which was being dumped till now in open areas, harming our environment. Students expressed that this is the smartest move with a better approach & their family members were happy as due to this assignment their houses were cleaned & at least some part of the drawer can now have space.
5. Students were very happy with this realistic project, as they had a wonderful experience communicating with the people. Communicating with strangers was a bit challenging as many expressed their introvertedness but I convinced people and made them aware of serious environmental problems.
6. Students shared that their friends studying in other colleges also want their college to give such projects. And their neighbors, friends were very proud to extend a

helping hand to save our environment. Their neighbors expressed that they will also take admission of their child in SIA college due to such projects.

7. E-Incarnation Recycling Pvt. Ltd. (ERPL), a recycling company Certified Maharashtra Pollution Control Board (MPCB) was invited to collect and dispose of e-waste in an eco-friendly manner and provided a destruction certificate to the college.
8. Through these programs, 246 students, and faculty members participated in this e-waste recycling drive in 2021-22 whereas 454 students participated in 2022-23 and 394 students in 2023-24.
9. In 2021-22 we collected 370 kgs of e-waste that generated a revenue of ₹ 7,650. In 2022-23 we collected almost double i.e. 772 kgs of e-waste. This drive generated revenue of ₹17,832 that was deposited in the college fund. In 2023-24 we collected 382 kgs and the revenue generated was ₹ 6,838.
10. Through this community outreach program, students became aware and shared with the community about the hazards of e-waste recycling by the unorganized sector and educated them about alternate methods of disposing of their e-waste. Students also made a handmade banner of cotton cloth and painted it. They spread awareness to other students about the harmful effects of flex banners on the environment, whereas cotton cloth banners are environment-friendly. Handmade banners made them work together in groups and the promotion of e-waste collection drive in the college developed leadership qualities among themselves and sensitivity towards the environment.

Observations:

We made the following observations altogether at the end of three e-waste collection drives

1. E-waste is informally handled by the informal sector i.e. local *kabadiwalas* and *raddiwalas*. They dispose of e-waste in an unscientific manner and cause major environmental pollution endangering human health. These unauthorized dealers make a profit from e-waste and cause damage to the environment. E-waste contains harmful chemicals like lead, cadmium, mercury and nickel. They burn this e-waste which contains some plastic elements also. Burning of fine particles causes air pollution. Piles of mountains of e-waste is being dumped at landfills, due to which chemicals pass from electronic products to the earth and affect groundwater also.

2. E-waste consists of a rich source of valuable metals that can be recovered and reincorporated into the production process.
3. In informal sectors, rag pickers extract valuable metals like gold, and silver using untreated processes which harm our environment. Authorized recyclers and dismantlers are regulated by the government and process e-waste sustainably.
4. If e-waste is recycled safely by authorized dismantlers, it may not create any damage to the environment and health. However, when e-waste is handled loosely by using crude methods for retrieval of useful components may pose harm to the environment.

Suggestions

Based on our studies, and intervention in e-waste collection, we propose the following suggestions towards addressing the growing needs of e-waste around us.

1. The government should set limits for the disposal of e-waste. Credit systems should be incorporated for individuals as well as for companies to dispose of e-waste. it should apportion an adequate budget for recycling infrastructure.
2. Public awareness and educational projects on e-waste management should be incorporated into the syllabus to sensitize youngsters at an early age. Manufacturers should provide various schemes to motivate the public i.e. return of discarded electronic items, discounts on surrendering old gadgets, etc. Industry ecology should incorporate practice sustainability from an e-waste perspective.
3. The Environment Ministry should strictly monitor cross-border e-waste transfers in India.
4. Documentaries and movies should be prepared and released to make people aware of the harmful effects of dumping and submitting e-waste to local vendors. People should be educated by handing e-waste to authorized recyclers in India.
5. Initiatives for regular collection of e-waste from households, societies, educational institutions, and organizations should be promoted.
6. Capacities of e-waste recyclers should be increased to meet ever-increasing e-waste generation.
7. During the implementation of the National Education Policy, educational institutes should make it mandatory for every school and college to conduct e-waste collection drives.

8. Separate bins should be installed at railway stations, malls and public places to discard e-waste products and in return, they can benefit from credit points or cash back for new products.
9. Planning should be made from the macro level to the micro level to procure e-waste and recycle it safely.

Conclusion

Awareness campaigns on e-waste are effectively practiced but more encouragement should be given to inform the community about the disposal of heavy metals through e-waste, as these hazardous chemicals lead to different diseases like respiratory disorders, damaging nervous systems, cancers etc. The government should incentivize manufacturers to take initiatives in e-waste management. Producers should be encouraged to design more recycling-friendly electronic items that are less toxic. Repairing electronic devices should be cost-effective. Various brainstorming is required to tackle the problem of e-waste by increasing the lifespan of electronic products so that e-waste can be minimized. Burning of e-waste in open grounds leads to greenhouse gas emissions and causes global warming, whereas by recycling e-waste we can reuse the extracted material as inputs in new products. Students will become responsible consumers.

References

[Ref 1]

<https://timesofindia.indiatimes.com/gadgets-news/the-path-for-successful-e-waste-management-in-india/articleshow/95278105.cms>

[Ref 2] <https://pib.gov.in/PressReleasePage.aspx?PRID=1943201>

[Ref 3] <https://sansad.in/getFile/annex/256/AU4036.pdf?source=pqars>

[Ref 4] <https://pib.gov.in/PressReleasePage.aspx?PRID=1941054>

E-waste statistics

[Ref 5] Vijay N Bhoi and Trupti Shah, “E-Waste: A New Environmental Challenge”, International Journal of Advanced Research in Computer Science and Software Engineering, Volume 4, Issue 2, February 2014, ISSN 2277 128X

[Ref 6] Sikdar, M., Dr., & Vaniya, S. (2014). The New Millennium and Emerging Concerns. International Journal of Scientific and Research Publications, Volume 4, Issue 2, February 2014 ISSN 2250-3153 Page 1-12.

[Ref 7] Sivaramanan, S. (2013). E-Waste Management, Disposal and Its Impacts on the Environment. Universal Journal of Environmental Research and Technology, 2013 Volume 3, Issue 5: Page 531-537 eISSN 2249 0256.

[Ref 8] Kiddee, P., Naidu, R., & Wong, M. H. (2013). Electronic waste management approaches: An overview. Waste Management, Volume 3, Issue 5, 1237-1250.

[Ref 9] <https://www.pib.gov.in/PressReleasePage.aspx?PRID=1812027>

Ministry of Environment, Forest and Climate Change: Policy To Develop Recycling Industry, 31 MAR 2022 5:58PM by PIB Delhi

[Ref 10] <https://greene.gov.in/wp-content/uploads/2020/12/2020120458.pdf>

[Ref 11]

[https://www.who.int/news-room/fact-sheets/detail/electronic-waste-\(e-waste\)](https://www.who.int/news-room/fact-sheets/detail/electronic-waste-(e-waste))

WATER POLLUTION IN INDIA: CAUSES AND REMEDIES

Miss. Ganga Vinodkumar Gupta and Samyak Jain

The S.I.A. College of Higher Education, Affiliated to the University of Mumbai
P-88, MIDC Residential Area, Dombivli Gymkhana Road,
Near Balaji Mandir, Dombivli (E), Dist. Thane, 421 203

Corresponding Author: Miss. Ganga Vinodkumar Gupta

E-mail: ganga90gupta@gmail.com

Abstract

Any undesirable change in the physicochemical or biological properties of water that may cause harm to living beings is known as water pollution. In many places, water resources in India are polluted at different extents. Considering this fact, the present paper attempts to understand the causes and remedies for the prevention of water pollution. Both primary and secondary data are used for the present study. Secondary data is obtained through government reports, publications, news articles, research papers and periodicals while the empirical evidence, in the form of primary data, is used for the ground truth verification. The obtained results are presented in theoretical form.

Keywords: Water, Pollution, India, Causes, Remedies

Introduction

Water pollution means changing the natural quality of water to make it incompetent for drinking. In many ways, water pollution can be explained. This usually means that one or more substances have accumulated in the water to such an extent that they create problems for people and animals, pollutants in water include a wide spectrum of chemicals, physical chemistry and pathogens or sensory transformation. Many chemicals are toxic. Pathogens can cause waterborne diseases. Changes in the physical chemistry of water involve electrical conductivity, temperature, acidity and eutrophication. Among the most serious effects of the contamination of water are human infectious diseases (Kumar S. 2022). There are a variety of water pollutants responsible for the contamination of water resources. Water pollutants refer to the substances that are capable of making any Physicochemical or biological change in the water body. These have unwanted effects on living organisms (Pathak, J. 2018). India is rich in water resources, being endowed with a network of rivers and blessed with snow cover in the Himalayan range that can meet a variety of water necessities of the country. However, with the fast increase in the population of the country and the need to meet the increasing demands of irrigation, and human and industrial consumption, the available water resources in many parts of the country are getting depleted and the water quality has declined. Indian rivers are polluted due to the discharge of unprocessed sewage and industrial effluents. (Bharadwaj R. 2005).

Polluted water is the main cause of many diseases. It not only affects the life of the present generation but also affects the life of future generations because its effect remains for a long (Kumar S. 2017). With this background, the present paper attempts to understand the causes of water pollution and it also suggests remedies for the same.

Objective

The objective of this study is to know the causes of water pollution in India and to suggest remedies for the same.

Materials and Methods

The present study is based on only secondary data. The secondary data were collected from the various sources i.e. Government reports, publications and web resources. The results obtained are presented in textual form.

Results and Discussion

When dangerous materials—typically chemicals or microbes—contaminate water present in different water bodies including streams, rivers, lakes, oceans, aquifers or other bodies of water, the water quality is lowered and the water becomes hazardous to people or the environment. The pervasive issue of water pollution is endangering our well-being. More people are killed annually by unsafe water than by war and all other forms of violence put together. Our supplies of drinkable water are limited. We can access less than 1% of the freshwater on Earth. If nothing is done, the problems will only get worse by 2050, when there will likely be one-third more freshwater used globally than there is currently.

Causes of Water Pollution

1. Discharge from Industries

Industries release a range number of chemicals and waste products into water bodies either directly or indirectly via drainage systems. It is one of the leading sources of water pollution. Oils, plastics, pesticides, chemical fertilizers, organic substances, chemicals, heavy metals and pathogens are examples of major pollutants. The effects include contaminating sources of drinking water and being toxic to different life forms. Chemical, sugar, cotton textile, leather, Paper and fertilizer-producing industries are mainly responsible for water pollution. Thermal power stations are also polluting water resources by releasing hot water into the water bodies and contamination of surface water by mixing of fly ash released by the thermal power stations.

2. Farming activities

The farming sector, which accounts for 70 percent of water withdrawals worldwide, plays a major role in water pollution. Pollutants from farms greatly affect water quality and can be

found in lakes, rivers, wetlands, estuaries and groundwater. Farms discharge large quantities of agrochemicals, organic substances, drug residues, sediments and saline drainage into water bodies. Farm discharge from farming mainly includes sediments, nutrients, pathogens, pesticides, metals and salts. Such a farm discharge if entered into the adjacent water bodies with a variety of pollutants, creates water pollution. Eutrophication, algal blooms and the extinction of aquatic life are some of the effects of water pollution taking place due to farm activities.

3. Residential water pollution

Residential wastewater comes from ordinary living processes like bathing, toilet flushing, laundry, dish washing etc. It contains a variety of pollutants including oil, cooked food, parts of fruits and vegetables, pharmaceuticals, human waste and cleaning products like detergents, surfactants etc. Untreated residential wastewater can contaminate surface and ground water which leads to the spread of diseases.

4. Improper Trash Management

Water pollution is a result of improper waste disposal, which includes disposing of hazardous waste near water bodies. Heavy metals, chemicals and plastics are examples of major pollutants. The consequences encompass aquatic animals consuming plastics, toxicity and tainted drinking water sources. Whatever waste doesn't go into landfills or other disposal areas usually finds its way into surface water bodies including lakes, rivers, ponds, dams etc. There it breaks down and slowly contaminates water and chocks the life the water hosts. This process raises the toxicity of water making fresh water unsafe for human consumption.

5. Deposition from the Atmosphere

The deposition of contaminants from the atmosphere onto water bodies is known as atmospheric deposition. Dry and wet deposition are two ways that atmospheric materials can get into surface water, contributing to pollution and being a major factor in the eutrophication of water. In places where there is water scarcity, rainwater is an excellent substitute source of drinking water. To guarantee rainwater's microbiological safety, disinfection is required; however, this usually results in the production of disinfection by-products and increases the water's chemical risk. When water is being disinfected, dissolved organic matter from the atmosphere may play a role in the development of disinfection byproducts.

6. Leaks of Oil

Water contamination from oil spills from ships or offshore drilling platforms can be severe. Chemicals used in the cleanup process and oil are major pollutants. The demise of aquatic life, contaminating water sources, and displacing the livelihoods of those who depend on these bodies of water are some of the effects. Depending on the type and quantity of oil spilled as well as the water source, several processes may take place. The most frequent result is the oil spreading across the water's surface. Since most oil is less dense than water, spilled oil moves across the surface of the water. Oil spreads very quickly; lighter crude oils, such as gasoline, spread more quickly than heavier ones. The oil will spread more quickly due to wind, currents, and warm temperatures. Generally speaking, oil spreads just as quickly and thinly as a coat of paint. Oil spills must therefore be controlled as soon as feasible.

7. Mining Operations

Water pollution can result from mining operations due to waste product discharges and runoff from mining sites. Acid mine drainage, heavy metals and sedimentation are examples of major pollutants. Among the effects are habitat destruction, aquatic life loss and water source contamination. Significant environmental risks still exist, despite recent improvements to mining practices. Negative effects can range from water disturbance and sedimentation during mine construction to the sedimentation brought on by careless road construction during exploration. After closure, there may be a need to manage water pollution from mine waste rock and tailings for decades or even centuries. These effects rely on several variables, including the sensitivity of the surrounding terrain, the minerals being mined, the kind of technology used, the company's expertise, knowledge and environmental commitment, and, lastly, the capacity of residents and government to keep an eye on and enforce adherence to environmental laws. The fact that mining is now more mechanized and can process more rock and ore than in the past is one of the issues. As a result, mine waste has greatly increased. Future waste production will increase as mine technologies advance to make mining low-grade ore more profitable.

8. Climate Change

The quality of water can be greatly impacted by climate change due to changes in precipitation patterns, elevated temperatures and rising sea levels. Rising sea levels are causing fresh water to become salty. Water flow variations, an increase in nutrient runoff and adjustments to the availability of water resources are among the effects. Rising temperatures can lead to deadly pathogens in freshwater sources, making the water

dangerous for people to drink. Extreme weather events and changes in water cycle patterns are making it more difficult to access safe drinking water.

Remedies on water pollution

Today, there are numerous techniques available to manage water pollution, to a greater degree. It is preferable to treat sewage waste before discharging it into water bodies. By doing this, the initial toxicity can be decreased and the water body itself can break down and render any remaining substances harmless. Water that has undergone secondary treatment may be used again in agricultural fields and sanitary systems. The Water Hyacinth is a unique type of plant that can absorb dissolved harmful substances like cadmium and other similar elements. By putting these in areas where these pollutants are common, the negative effects will be significantly mitigated. Reverse osmosis, coagulation, ion exchange and precipitation are a few chemical processes that aid in the management of water pollution. Reusing, reducing and recycling on an individual basis will go a long way toward mitigating the effects of water pollution. In addition, the following remedies can be useful in managing water pollution.

1. Local government entities should draft an action plan for sewage treatment and management of water pollution. It should ensure the rigorous implementation of the action plan.
2. State governments should restore the quality of aquatic resources.
3. The local governing body should set up an online effluent monitoring system to monitor effluent discharged into rivers and other water bodies.
4. There should be an establishment of a network of monitors to evaluate water quality.
5. All the State Pollution Control Boards in the country should take action to comply with effluent standards for the improvement of surface and groundwater quality.
6. Financial support should be provided to the small-scale industrial units to install common wastewater treatment units.
7. Individuals should make efforts to maintain water quality.
8. Initiatives should be taken by the governing bodies and NGOs to aware people of water pollution.

Conclusion

1. Pollution of the water is just as risky as that of the air and soil. They all hurt both man and the environment.
2. Solid and liquid wastes, as well as microorganisms including bacteria, contaminate water directly and indirectly. Its color, flavor and aroma are altered by these pollutants, rendering it unfit for human consumption.
3. Bacteria, viruses, and different parasites are the essential pollutants. Because animal and human wastes are dumped into the water, they originate from both. When wastes are combined with sewage or agricultural drainage water, cholera and other illnesses are spread. Chlorine is therefore required to sterilize it.
4. Acid rain is an important cause of rivers and lakes pollution. When sulphur oxides and nitrogen react, sulfuric and nitric oxides are formed in part because of the acidic water in the area.
5. Among the factors contributing to water pollution are the use of pesticides and fertilizers, particularly chemical fertilizers, which are intended to promote fast crop growth.
6. A multitude of factors, including the extensive use of chemical fertilizers and pesticides, the excavation of land for the burying of waste and industrial waste, and the increase in salinity percentage caused by the infiltration of saltwater, contribute to the pollution of groundwater.

Reference

- Bharadwaj, R. (2005). Water Quality Monitoring in India, Achievements and Constraints, WG-Env, International Work Session on Water Statistics, Vienna, June 20-22, Pp.1-12.
- Kumar, S. (2022). Water Pollution in India: Causes and Effects, International Journal of Education, Modern Management, Applied Science & Social Science (IJEMMASSS) Vol. 04, No. 03(I), July – Sept., 2022, Pp. 111-114
- Kumar S., Meena, H. and Verma K. (2017). Water Pollution in India: Its Impact on Human Health: Causes and Remedies Subodh, International Journal of Applied Environmental Sciences ISSN 0973-6077 Volume 12, Number 2 (2017), Pp.275-279 <http://www.ripublication.com>
- Pathak, J. (2018). Causes, effects and control of water pollution in India, International Journal of Academic Research and Development, Vol. 3; Iss. 2; March 2018; Pp. 939-942, www.academicjournal.com

ENVIRONMENTAL EDUCATION AND POLICIES FOR SUSTAINABLE DEVELOPMENT IN INDIA

Ms. Bhakti Padmakar Mhaskar

N. G. Acharya and D. K. Marathe College

Email: bhaktimhaskar83@gmail.com

Abstract

Environmental education and environmental policies both play an important role in achieving sustainable development. The objective of this paper is to study the meaning of environmental education and sustainable development policies to achieve sustainable development goals by the year 2030. Environmental education is a part of the environmental policies and dedicated to achieving the goal of sustainable development through children and youth while environmental policy awareness is associated with people employed in various sectors of the economy. The present paper discusses the meaning, content, and views of environmental education as well as various policies related to sustainable development and includes environmental conservation in India. The role of the UGC and the Government of India in the promotion of environmental education, sustainable development goals, and related policies are also included in this paper.

Keywords: environmental education, sustainable development, youth and children.

Introduction

Environmental education and environmental policies both play an important role in achieving sustainable development. The research paper highlights environmental education, environmental policies and environmental legislation. It also includes sustainable development goals in the background of different environmental policies with special reference to India. Environmental policies are concerned with the relationship between humans and the natural environment, which will control pollution, reduce waste and limit biodiversity loss. The environmental education helps to develop a deeper understanding of environmental issues and make decisions regarding the conservation and protection of natural resources. Environmental education is a process that allows the person to understand environmental problems and find out the solution to the problem.

Objectives

1. To enlighten the youth about the urging need for sustainable development
2. To study the importance of different sustainable development policies.
3. To inculcate the values of an environment as the most imperishable property.
4. To create awareness about the need for a quality environment and quality life

Methodology

The paper is based on secondary data sources. The required information is collected from various books, articles, journals, newspapers, etc.

Results and Discussion

Environmental Policies and Environmental Education

“We belong to the environment and the environment does not belong to us”. (Chief Seattle)

In India, various laws and policies help to promote environmental conservation and sustainable development. To cite a few, the enactment of the National Forest Policy of 1952 to conserve forests, the Wildlife Protection Act of 1972 for the protection of plants and animal species, and the Water Act of 1974 to prevent and control water pollution. The Water Act aims to maintain and restore the quality and quantity of water resources in the country. The Air Act of 1981 has the objective of controlling air pollution and maintaining atmospheric composition. The Forest Conservation Act of 1980 emphasized control over deforestation and the protection of forest resources. The Environmental Protection Act, of 1986, was passed by the government of India under Article 253 of the Constitution of India in response to the Bhopal gas leak. The purpose of this act is the protection and improvement of the human environment and the prevention of hazards to human beings, other living creatures, plants, and property. The act encompasses and controls the negative impacts of industrial and infrastructure activities, especially in the coastal and eco-sensitive areas.

Sustainable Development and Sustainable Development Goals

Sustainable development is the development that meets the needs of the present without compromising the ability of future generations to meet their own needs” World Commission on Environment and Development. (WCED 1987)

In 2015, 193 countries agreed to adopt the 17 sustainable goals, which encompass the dignity, peace, and prosperity of the planet and humankind, to be achieved by the year 2030. These goals target social, economic, cultural, and environmental aspects of society.

The sustainable development goals from 11 to 15 focus on environmental aspects of sustainable development. Goal 11 is sustainable cities and communities, intending to make

cities and human settlements inclusive, safe, resilient, and sustainable. Goal 12 is responsible consumption and production, which ensures sustainable consumption and production patterns for people in everyday life. It is about ensuring sustainable consumption and production patterns, which is key to sustaining the livelihoods of current and future generations. Individuals can also adopt more sustainable lifestyles; this can involve consuming less, choosing products with lower environmental impacts, and reducing the carbon footprint of day-to-day activities. Goal 13 of climate action is to take urgent action to combat climate change and its impacts. Goal 14 Life below water is associated with the conservation and sustainable use of water resources in oceans and seas, as well as the protection and sustainable development of marine resources. Goal 15 Life on land encompasses the protection, restoration, and promotion of the land ecological system and the sustainable management of forest resources.

The National Resource Efficiency Policy

The National Resource Efficiency Policy 2019 is an important step for sustainable development. Natural resources are important for satisfying basic needs as well as achieving a better quality of life. The policy aimed to improve the resource efficiency of biotic and abiotic resources and the life cycle of products. The national resource efficiency policy placed emphasis on the use of secondary raw materials, efficient use of resources, upcycling of waste, producing high-value products, and minimization of waste. The key aspect of this policy is to create employment opportunities in waste management, recycling of products, and the maintenance and management of forest, water, and air resources. The policy is also contributing to controlling climate change and environmental damage. People are more aware of their impact on the environment in their everyday lives and the community.

Environmental Education and Sustainable Development

The idea of environmental education emerged in the world with the motive of informing people about the environmental system and educating them so that they can adopt a more responsible attitude towards the environment.

The aim of environmental education, as per the United Nations Educational, Scientific and Cultural Organization (UNESCO), at the basic level is to understand the complex nature of natural and man-made environments and to acquire the knowledge, skills, attitude, and

practical skills to participate in a responsible and effective way in problem-solving and management of the quality of the environment.

During the 1970s, the United Nations Educational, Scientific and Cultural Organization (UNESCO) and the United Nations Environmental Program (UNEP) jointly made efforts to promote environmental education by defining its scope and content. In 1977 the world's first intergovernmental conference on Environmental Education, organized by UNESCO in partnership with UNEP was held in Tbilisi, Georgia. The Tbilisi Declaration defined environmental education as “a learning process that increases people's knowledge and awareness about the environment and associated challenges, develops the necessary skills and expertise to address the challenges, and fosters attitudes, motivations, and commitments to make informed decisions and take responsible action.”

Palmer J. (1998) explained that the special feature of environmental education is that knowledge of environmental laws and principles of the functioning of the natural system is studied within the environment, which helps to develop practical skills and the ability to assess the state of the environment. The awareness of the negative impacts of humankind on the natural environment has risen remarkably, and environmental policies and programs worldwide are being developed. People are more aware of their impact on the environment in their everyday lives and, in parallel, their influence on the way their local community is run. The dual aspect of the idea is to inform people of the environmental system and educate them so that they can adopt a more responsible attitude towards the environment.

According to Thompson and Hoffman (2003) from the North American Association for Environmental Education, “environmental education is learner-centered; providing students with opportunities to construct their own understanding through hands-on, mind-on investigations involves engaging learners in direct experiences and challenging them to use higher-order thinking skills, which is supportive of the development of an active learning community where learners share ideas and expertise.”

The European Resolution on Environmental Education stated that the goals of environmental education are to increase public awareness of the problems that exist in the field, as well as possible solutions, and to lay the foundations for the fully informed and active participation of the individual in the protection of the environment and the prudent and rational use of natural resources. Environmental education offers an enriching way for

both students and teachers to connect their appreciation of the natural to academics; it creates enthusiastic students. Environmental education helps build critical thinking and relationship skills among students. It also helps students learn important life skills such as cooperation and communication.

As mentioned by Erhabor and Don in their research paper on “Impact of environmental education on the knowledge and attitude of Students towards the environment “, according to the National Educational Research Council the proposed goals and objectives of environmental education are to enable young people to participate in decision-making related to environmental issues, to enable learners to develop an operational understanding of some of the basic concepts and processes relating to environmental issues, e.g., pollution and deforestation, to develop the ability to inquire into problem situations associated with the environment and to understand the background of social and cultural factors

Higher Education and Environmental Education in India

As per the Honorable Supreme Court of India order dated December 6, 1999, in WWP No. 860/1991 and UGC notification, appropriate steps are to be taken to introduce environmental studies courses in all universities and affiliated colleges.

The University Grant Commission, according to this order, had designed a six-module syllabus of environmental studies for undergraduate courses in all branches of higher education to be compulsorily implemented. The UGC has been repeatedly reminding all the universities to comply with the directions of the Hon’ble Supreme Court. The last reminder was sent to universities on May 2, 2014, vide D.O.No. F131/2000 (EA/EVS/COC.I), and a module on environmental studies for undergraduate courses was made available on the UGC website.

The UGC syllabus consists of a core of eight modules for environmental studies for undergraduate courses in all branches of higher education. It includes topics such the definition, scope, and importance of the multidisciplinary nature of environmental studies, natural resources and associated problems such as forest, water, minerals, food, energy, and land resources, the role of individuals in the conservation of natural resources, equitable use of resources for a sustainable lifestyle, ecosystem as a holistic concept with different aspects, biodiversity and its conservation environmental pollution types, causes, effects and case studies, social issues and the environment with environmental acts, policies, and

public awareness, the human population and the environment with different dimensions and field study.

Conclusion

To conclude environmental policies and laws should be strictly implemented to achieve sustainable development. Environmental education should be taken seriously to improve the quality of life, reduce the problems of global warming, acid rain, pollution, ozone depletion, loss of biodiversity, and make our planet livable.

References

Chief Seattle Quotes. BrainyQuote.com. Retrieved March 28, 2024, from BrainyQuote.com Web site: https://www.brainyquote.com/quotes/chief_seattle_461851

Erhabor, N. I., & Don, J. U. (2016). Impact of Environmental Education on the Knowledge and Attitude of Students towards the Environment. *International Journal of Environmental and Science Education*, 11(12), 5367-5375.

Palmer J.A. (1998). *Towards Progress and Promise, Environmental Education in the 21st Century*, pp 240-244

Thomson, G., & Hoffman, J. (2003). *Measuring the Success of Environmental Education Programs*. Calgary, AB: Canadian Parks and Wilderness Society.

WCED (1987), S. W. S. (1987). *World commission on environment and development. Our Common Future*, 17(1), 1-91.

https://www.ugc.ac.in/pdfnews/8840409_english.pdf

<https://www.google.com/url?sa=i&url=https%3A%2F%2Fmoef.gov.in%2Fwp-content%2Fuploads%2F2019%2F07%2FDraft-National-Resourc.pdf&psig=AOvVaw3nrWqQF7Lz5plE317tHfUS&ust=1708100665778000&source=images&cd=vfe&opi=89978449&ved=0CAYQn5wMahcKEwjor794K2EAxUAAAAAHQAAAAAQBA>

<https://dashboards.sdgindex.org/>

ROLE OF YOUTH IN CONSERVATION OF NATURAL RESOURCES WITH SPECIAL REFERENCE TO STUDENTS OF THE S.I.A. COLLEGE OF HIGHER EDUCATION, DOMBIVLI (E). M.S. INDIA

***Mrs. Salochna Nagdev and **Mrs. Babita Nagdev**

*Assistant Professor, The S.I.A. College of Higher Education, Dombivli (E), M.S. India, PIN 421 203, **Email:** salochna.nagdev@thesiacollege.com,

Assistant Professor, The S.I.A. College of Higher Education, Dombivli (E), M.S. India, PIN 421 203, **Email: babita.nagdev@thesiacollege.com

Abstract

Natural resources are materials or substances obtained from nature that are exploited by human beings for economic gain. Without these natural resources survival of human beings is difficult. We have lost a lot of natural resources because of over-exploitation by human beings. We must preserve natural resources for generations to come. Conservation of natural resources is all about preserving and taking care of these resources that come directly or indirectly from nature. This paper attempts to study how the youth is contributing to conserving natural resources for future generations. The present paper focuses on the conservation of Water, Electricity and food resources.

Keywords: Natural Resources, Conservation, Youth, Nature.

Introduction

The natural resources that are accessible to us we use to drive everything to fulfill our daily needs. Artificial resources are also derived from the natural resources that are available in nature. However, what we fail to realize is that these natural resources are ultimately going to be depleted if we keep on largely utilizing them. Certain reasons like globalization, population growth, increasing urbanization and industrialization have resulted in higher demand for natural resources. Conservation of Natural Resources refers to reducing the waste of natural resources and assuring that the natural resources will meet not only the needs of the present but also the needs of the future. Changes in lifestyle, technological advancements, and increasing demand have a negative influence on natural resources. Certain natural resources like coal and petroleum are rapidly declining and once they are consumed, we will not be left with any other option but to have to rely on other energy sources. So as humans, it is high time to operate in such a manner as to assure that we will conserve natural resources. It can be accomplished in several ways. The basic principle is to avoid the wastage of natural resources and minimize the utilization of natural resources.

Objective of the study:

1. To Understand the need for conservation of natural resources.
2. To analyze the role of youth in the conservation of natural Resources
3. To suggest measures for the conservation of natural resources by youth

Research Methodology:

For the study, both primary and secondary data are used. Primary data is collected through a questionnaire. Secondary data is collected through Government publications, academic journals and online data.

Need for Conservation of Natural Resources:

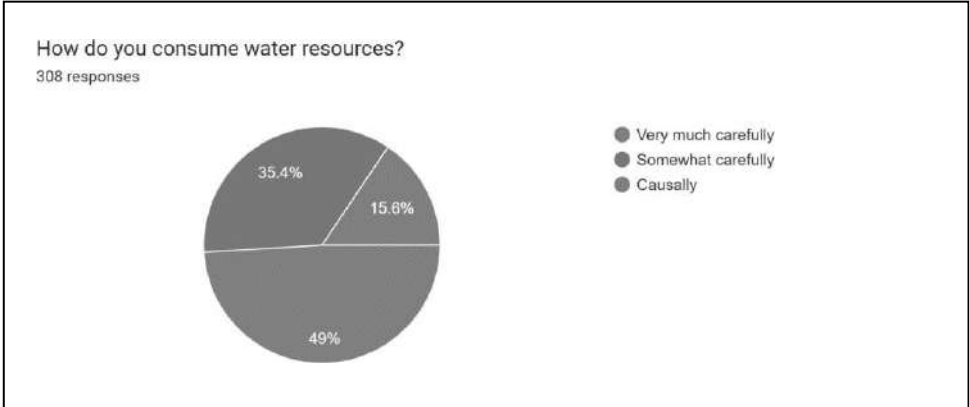
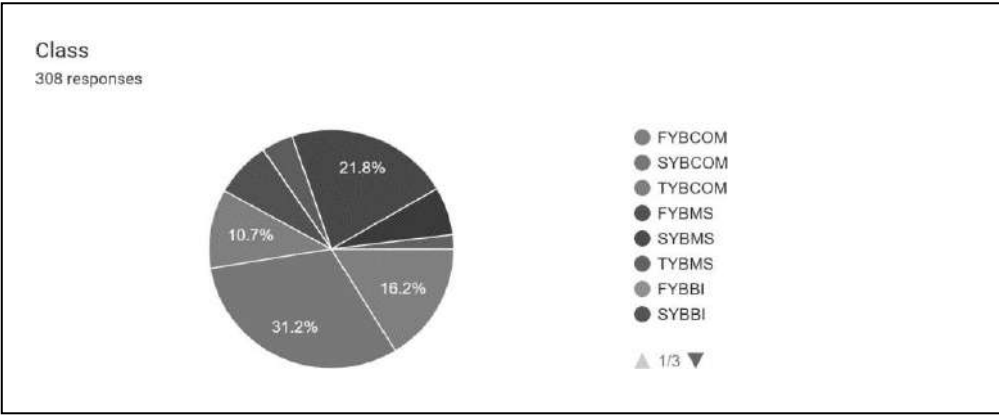
As we have seen, world population is increasing rapidly and the consumption of natural resources is also increasing at the same pace, therefore, these resources need to be conserved to maintain the ecological balance and save them for future generations. When natural resources are managed properly to prevent their destruction or exploitation it is called conservation.

The need to conserve the resources includes,

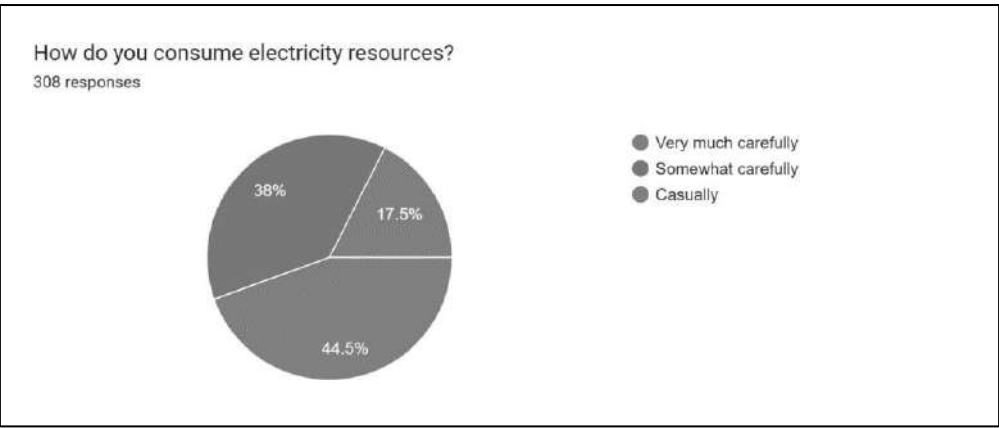
1. The most important need to conserve natural resources is to ensure sustainable use of natural resources. That is using resources in such a way that it should meet the needs of the present without compromising the needs of future generations.
2. Another important thing that assures the need to conserve natural resources is maintaining ecological balance. This means ensuring that the natural world can function properly and provide the essential services that support life, such as clean air and water, fertile soil and a stable climate
3. To preserve and protect natural ecosystems and biodiversity which includes protecting habitats, endangered species and genetic diversity is another reason to conserve natural resources.
4. Reducing pollution, greenhouse gas emissions and other forms of environmental degradation that mitigate the impact of human activities is another determinant of conserving natural resources.

Results and discussions:

For the purpose of study, data were collected through a questionnaire schedule. In all 308 responses are received from across all the classes. The analysis of the same is as follows:

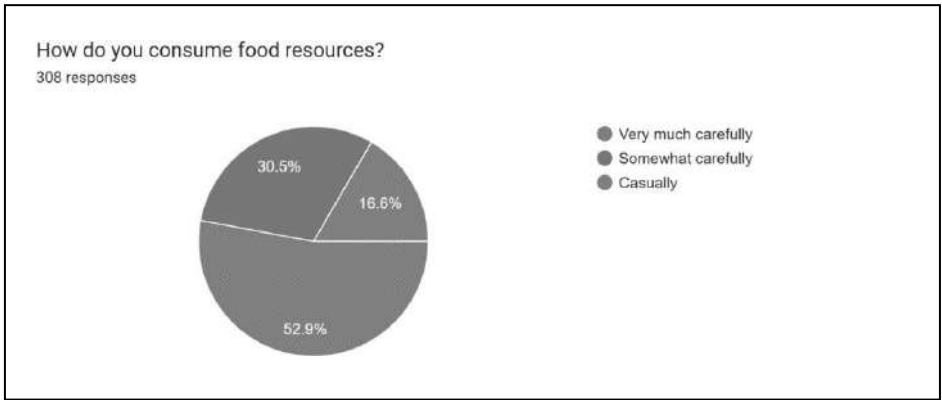


In all 49% of the respondents said that they use water very much carefully. Most of the respondents said that whenever possible, they use as little water as possible. They Check for water leaks and repair them on time. Respondents said that they reuse the washed cloth water for washing vehicles and the courtyard. Respondents said that they turned off the water tap while brushing their teeth and while shaving. Further, it was suggested that a rainwater harvesting system should be installed in all the buildings and structures.

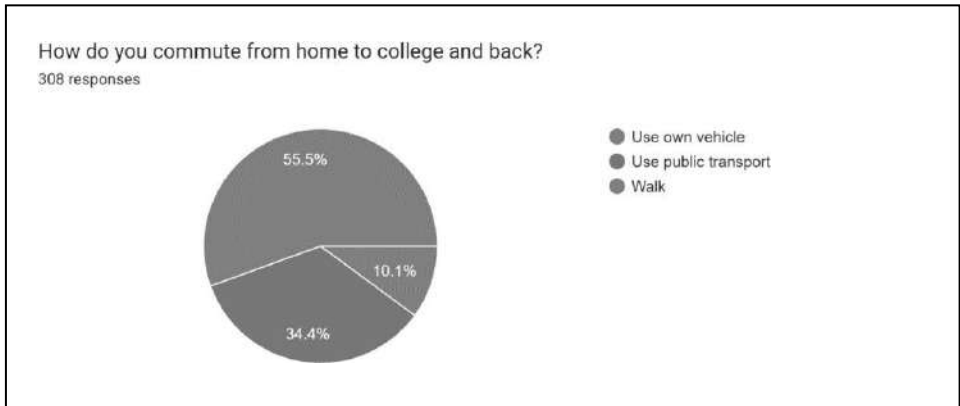


In all 44.5% respondents said that they use electricity resources carefully. Respondents are of the opinion that, electricity is an important resource in day to day life of humans, it

should be used for necessary needs and should not be wasted. Respondents said that they usually, turn off the fan, light, AC and refrigerator when not in use. These practices not only save money but also save energy consumption. Respondents believe that we must also plant more trees to get a cool breeze rather than using air conditioners.

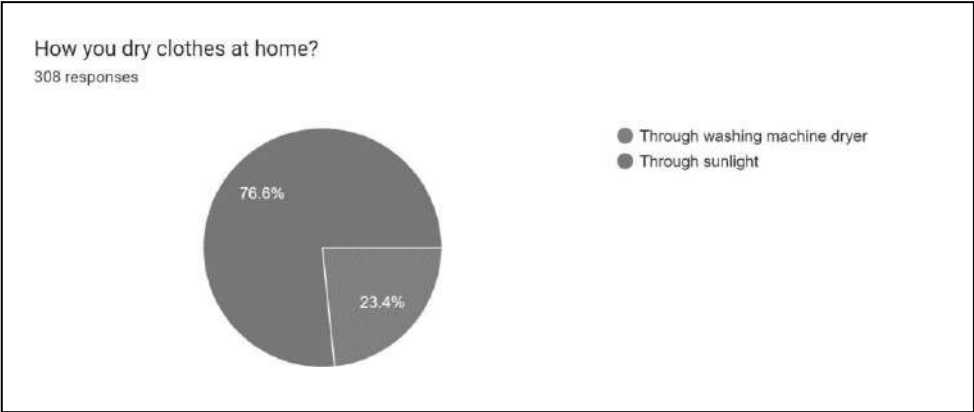


In all 52% respondents said that they use food resources very much carefully. Respondents said that their role in the conservation of food resources is to raise awareness about food waste reduction, promote sustainable food production and consumption practices and advocate for policies that support food conservation efforts. We must try to educate individuals and communities about the impact of food waste on the environment and society, encourage the adoption of responsible food purchasing and storage habits, and work towards a more efficient and equitable food system.

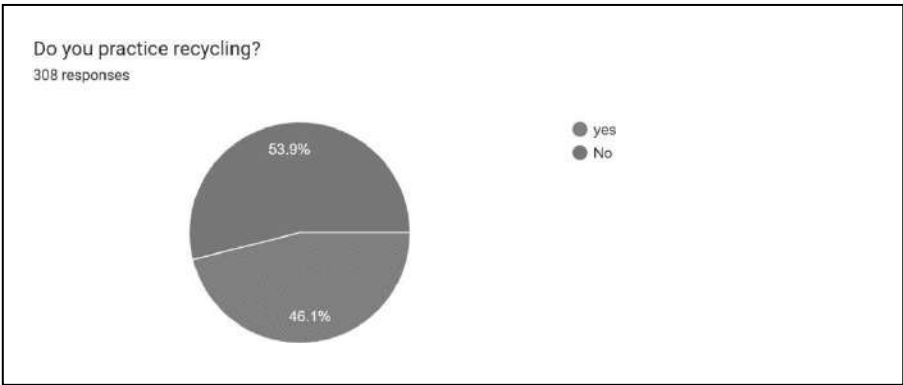


In all 55.5% respondents said that they walk from home to college and back. 34.4% of respondents use public transport and 10.1% use their vehicle. The reason for not using transport for commuting from home to college may be the prime location of the college. Again, by using public transport youth is helping to protect the natural environment as it reduces air pollution, helps to conserve energy, and reduces greenhouse gas emissions.

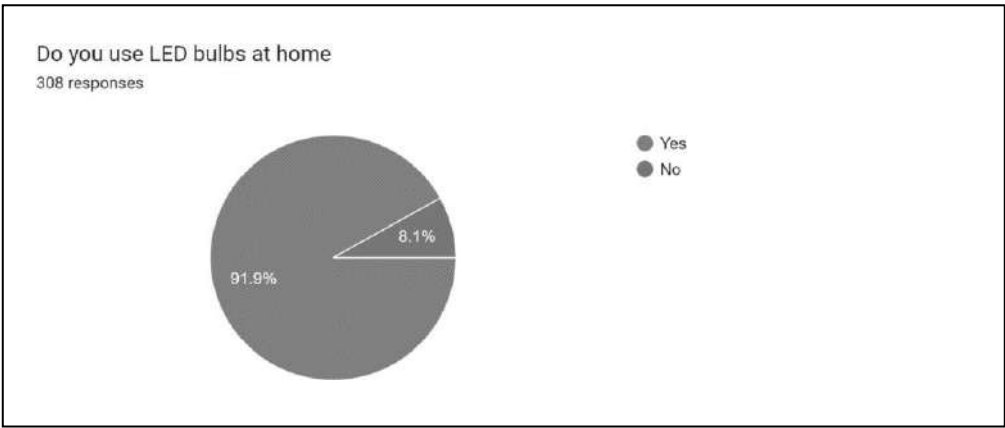
Taking public transportation instead of own vehicle helps to reduce the number of toxic gases and materials that are released into the atmosphere.



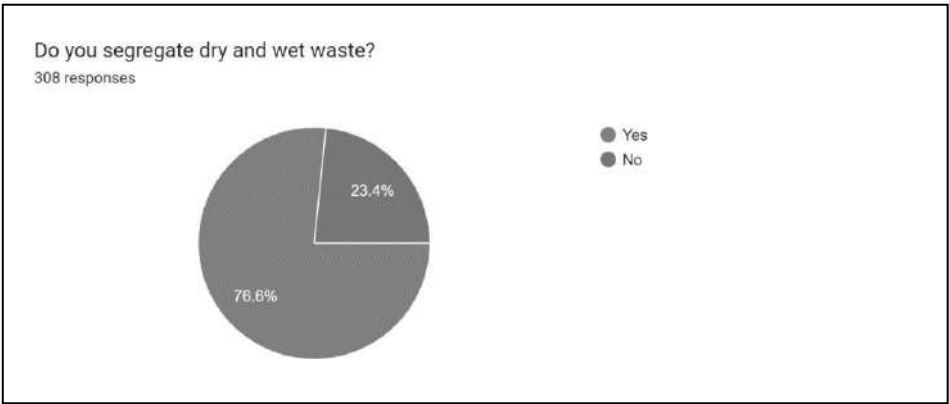
In all 76.6% of respondents said that they dry clothes through sunlight. 23.4% of respondents use washing machines for drying clothes. Drying clothes in the sun is cost-effective as it saves energy and is environment friendly. It even makes the clothes last longer and protects the clothes from fabric damage. So youth and their families are indirectly contributing to the conservation of energy resources.



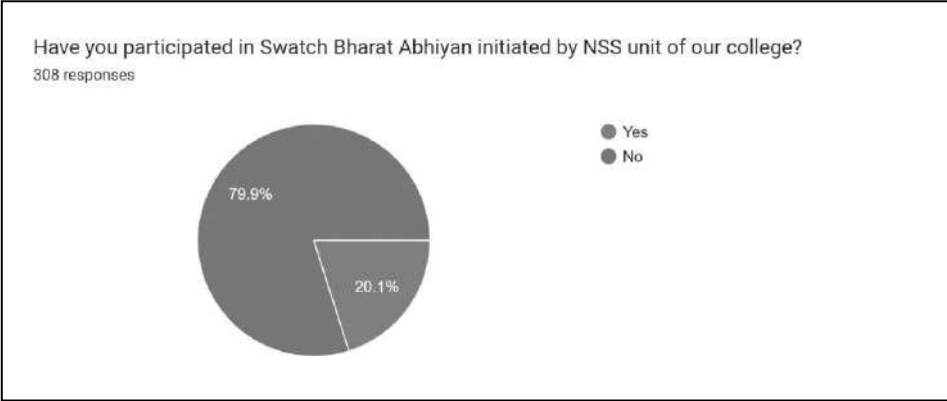
In all 46.1% respondents said that they practice in recycling of substances. Recycling is the process of collecting and processing materials that would otherwise be thrown away as trash and turning them into usable products. Recycling can benefit our community, the economy, and the environment.



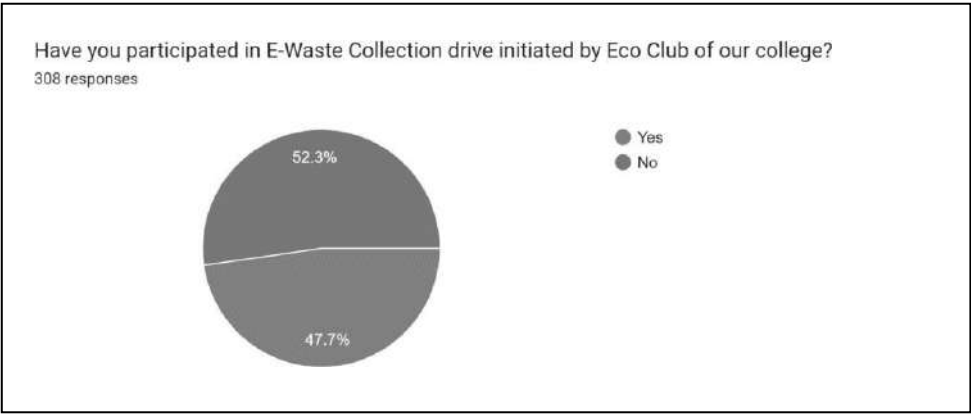
In all 91.1% respondents use LED bulbs at home and 8.1% of respondents don't use LED bulbs. There is a considerable amount of awareness among youth that LED lights are energy-efficient, long-lasting, and emit less heat. They use less energy than incandescent bulbs, last longer and offer high-quality light output.



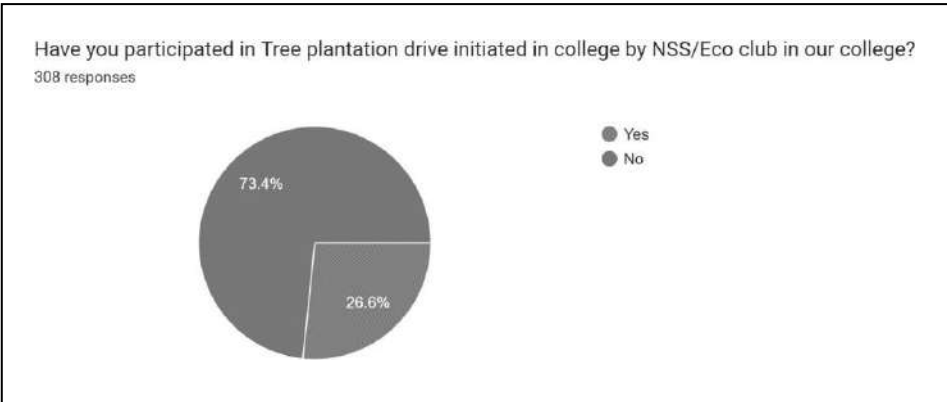
In all 76.6% respondents said that they segregate dry and wet waste. One of the reasons for the same may be awareness created by local municipal authorities on handling garbage. Under Swachh Bharat drive, a garbage pickup van goes around the society door to door to collect garbage. This garbage van plays the song “*Gadi wala aaya ghar se kachra nikal*” via a loudspeaker. It was just to tell the people that the vehicle has come and it's time to get the garbage out of your house. The van had separate bins for dry and wet waste collection. These measures by the Government have resulted in more awareness about segregation of dry and wet waste.



In all 20.1% respondents said that they have participated in Swatch Bharat Abhiyan initiated by NSS unit of the college. One of the reasons for fewer responses is that our college NSS unit has a maximum enrollment of 200 volunteers. Only enrolled volunteers participate in the activities under Swatch Bharat Abhiyan.

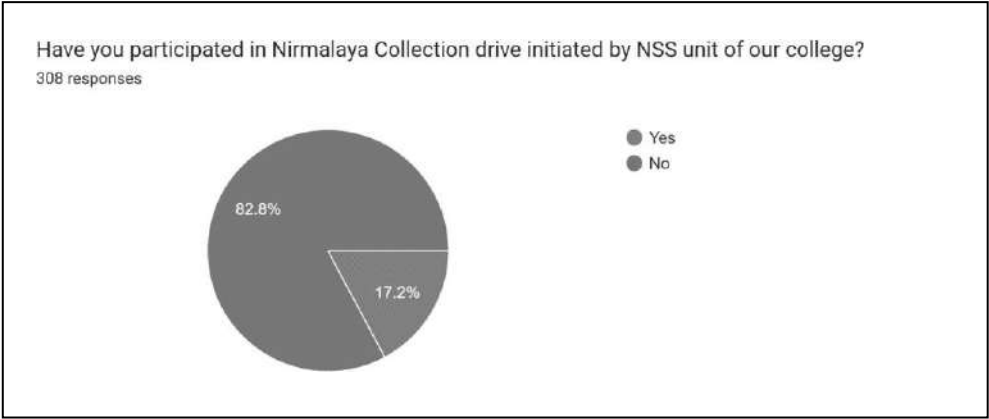


In all 47.7% respondents have participated in E-waste collection drive initiated by the Eco Club in the college. This shows that students are aware of E-waste and its harmful impact on health and the environment.



In all 26.6% respondents participated in Tree plantation drive initiated by the NSS unit/Eco club in the college. As the pollution in the environment is increasing at an alarming rate, it has become a need to plant more and more trees. Tree plantation helps to keep the

environment balanced. It prevents air pollution by taking carbon dioxide. It protects us from natural disasters.



17.2 % respondents have participated in Nirmalaya collection drive initiated by NSS unit. One of the reason for less responses is that our college NSS unit has maximum enrollment of 200 volunteers. Only enrolled volunteers participate in the Nirmalaya collection drive.

Measure to Conserve Natural Resources:

1. Reduce, Reuse and Recycle

To conserve natural resources, the most efficient way of waste management is to Reduce, reuse, and recycle. There should be a reduction in the use of products that exploit natural resources such as reducing the use of plastic and the products which are obtained from crude oil. Another way to reduce the exploitation of natural resources is to turn to the art of reusing the products we have used before.

For example, the use of soft drink bottles for drinking water or for planting saplings. We can also reuse the used tires for decoration and outside chairs. Of the 3Rs, the best and safest is to Reduce the use of exploitation of natural resources followed by Reusing the by-products of these resources and the least is to recycle.

2. Volunteering

Another step that can be taken to conserve natural resources is that we can volunteer to act in the conservation of natural resources. We can join as volunteers in the government or non-governmental organizations to reduce the over-exploitation of natural resources. we can also be involved in peaceful protest so actions can be taken against the over-exploitation of natural resources going on in the community at that time. If we keep quiet, more exploitation which has no aim of conserving the natural resources will go on and it would be detrimental to us.

3. Conserve Water

Another step that we can take to conserve natural resources is to make constant efforts to conserve natural resources. If less water is being used there will be less run and wastewater that ultimately ends up in the ocean would be reduced. Water can be conserved individually by taking shorter showers, turning off the taps while brushing our teeth, etc.

4. Conserve Energy at Home

We can conserve energy at home by turning off lights and fans when not in use, using long-lasting bulbs that are energy efficient and reducing greenhouse gas emissions.

5. Education

Lack of education and awareness is one of the most important reasons that contribute to the destruction of our natural resources. There is a need to create more and more awareness about the usefulness of natural resources and the need to conserve them. Each one of us can take the responsibility of educating our family members as well as neighbors about the importance and value of natural resources.

Conclusion:

It can be concluded that Changes in lifestyle, technological advancements and increasing demand have a negative influence on natural resources. Today's youth is becoming aware of the conservation of natural resources and directly and indirectly they are contributing to the conservation of natural resources. However, still there is a need to educate and create more awareness about the importance of natural resources and the benefits of reducing, reusing and recycling scarce natural resources.

References:

Ch-025.p65 (nios.ac.in)

Conservation of natural resources: Definition, Importance, Types and Sample Questions (collegedunia.com)

Importance of Conservation of Natural Resources - Environment Go!

Why is the conservation of natural resources important? (tutorialspoint.com)

GREEN MARKETING FOR SUSTAINABLE DEVELOPMENT

Mrs. Hema Iyengar, Mrs. Ranjana Mhalgi and Mrs. Renu Vijay Verma

The S.I.A. College of Higher Education
P-88, MIDC Residential Area, Dombivli Gymkhana Road,
Near Balaji Mandir, Dombivli (E), Dist. Thane, 421 203

Corresponding Author: Mrs. Hema Iyengar

Email: Hema.Iyengar@thesiacollege.com

Abstract

Today, the increasing number of anthropogenic activities across the globe has resulted in a variety of environmental issues at different levels including global warming-inducing climate change. Green marketing, developing and selling environmentally friendly goods and services is one of the effective measures to cope with such environmental issues. Considering these facts, based on secondary data and empirical evidence, the present paper attempts to understand the significance of green marketing in the attainment of sustainable development. The results of this study are presented in textual form and suggestions are given for the effective implementation of green practices to attain sustainable development.

Keywords: Sustainable Development, Green Marketing, Environment, Challenges, Trends.

Introduction

According to a report by the Organization for Economic Co-operation and Development (OECD), the World Bank and the United States, prepared for the G20 Summits (Mexico, 2012), without any new policy action, it has been projected that there will be about 50% increase in greenhouse gas emissions and a significant worsening of urban air pollution by 2050 (OECD, 2012). Thus, there is an urgent need to undertake measures for coping with this global environmental issue. The practice of green marketing is one of the effective measures in this context. It focuses on cost reduction and increases efficiency through environmental activities, thereby building a competitive advantage based on low cost. Green marketing positively affects the health of people and the ecological environment. People are aware of pure products and pure methods of producing, using and disposing of the products. It encourages integrated efforts for purity in production and consumption as well. (<https://www.yourarticlelibrary.com>). Green Marketing has evolved distinct implications in the contemporary market. Green indicates purity using excellence, fair price and worth in dealings. Green marketing focuses on marketing eco-friendly products to satisfy the needs and wants of customers. (M.D., P., & Akhil, A.2017). It is a tool for caring the environment for future generations. It has a positive impact on environmental safety. Because of the growing concern of environmental protection, there is a rise of a new market which is the green market. For Hotels to survive in this market, they need to go green in all aspects of their business (Perera, H. L., & Pushpanathan, A., 2015). Green marketing helps in reducing the use of plastic and plastic-based products. Plastic is not appropriate for our earth as it is non-

biodegradable. That means one piece of plastic is going to stay on the earth forever. Just think if people keep using plastic as they use it now, then there will be piles of plastic all around. We will get to see oceans and forests full of plastic rather than the beauty of nature (Bhasin, H.,2019). Green marketing can involve several different things, such as creating an eco-friendly product, using eco-friendly packaging, adopting sustainable business practices or focusing marketing efforts on messages that communicate a product's green benefits (<https://www.shopify.in>). Considering all the above-mentioned facts, the present paper attempts to understand the role of green marketing in the attainment of sustainable development.

Objective

The main aim of the present study is to understand the role of green marketing in sustainable development. This has been achieved with the help of the following objectives.

1. To know about the factors behind the growth in green marketing
2. To study the challenges in green marketing
3. Recent trends in green marketing

Data Source and Methodology

The present study is mainly based on the sources of secondary data including government reports, private publications, research papers and news articles. Some of the information is obtained from the electronic media. Empirical evidences are also taken into account in the form of primary sources of data. The results obtained are presented in textual form.

Results and Discussion

Green marketing is a strategy of best practices that are applied to minimize the negative impact of anthropogenic activities on the environment. As anthropogenic activities are increasing day by day in number, the importance of green marketing has grown significantly in recent years. The study reveals that green marketing practices play an important role in the attainment of sustainable development.

Green Marketing for Sustainable Development

Green marketing is important for businesses not only as a response to increasing environmental awareness but also as a strategic approach to meet consumer expectations, enhance corporate reputation and ensure long-term sustainability. As environmental concerns continue to rise, integrating green practices into marketing strategies becomes not just a trend but a fundamental aspect of responsible and forward-thinking business as given below.

- 1. Environmental Conservation:** Green marketing emphasizes products and practices that are environmentally sustainable, contributing to the conservation of natural resources, reduction of pollution and maintaining overall ecological balance.

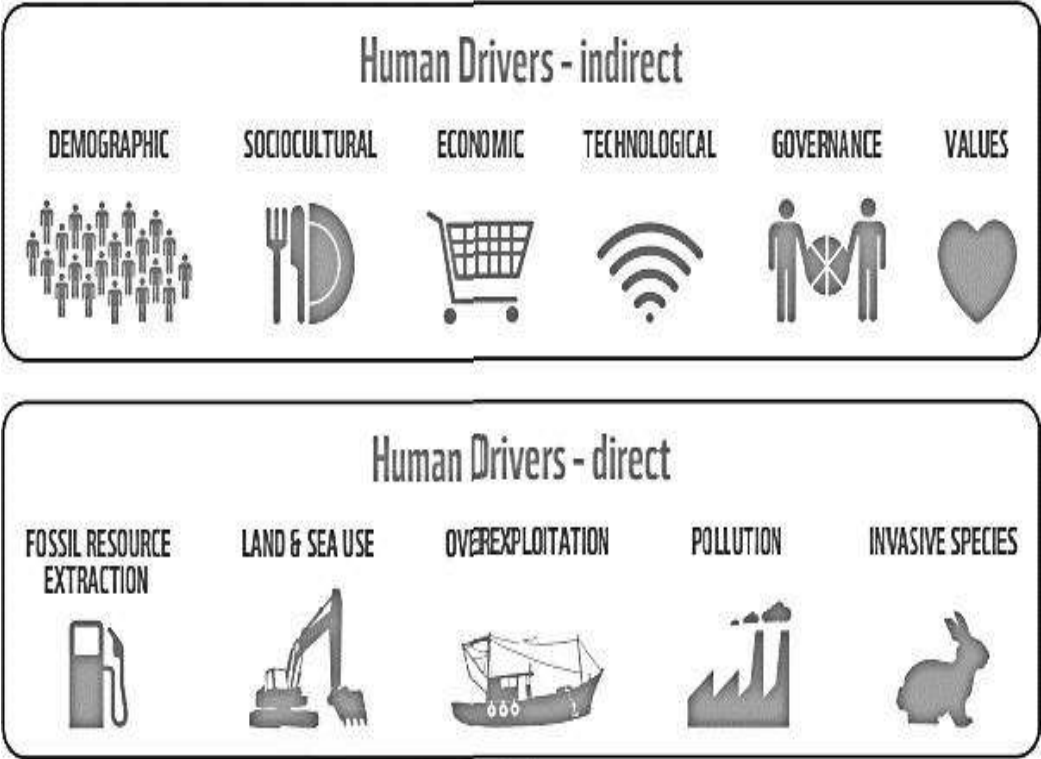
Key Considerations

Ecological Foot print	1.5 Earths (2007)	1.85 Earths (2022)
Co2 Emissions	30 billion tones (2010)	39.6 billion tones (2022)
Population	7 billion (2011)	7.9 billion (2022)

source: WWF’s Living Planet Report 2012)

- Consumer Awareness and Demand:** Consumers are becoming increasingly aware of environmental issues and are more likely to support businesses that demonstrate a commitment to sustainability. Green marketing helps meet the growing demand for eco-friendly products and services. There is a need for a rapid system-wide transformation .

THE CHOICES WE MAKE WILL SHAPE CLIMATE AND BIODIVERSITY OUTCOMES



Source: WWF Living Planet Report 2022

- Corporate Social Responsibility (CSR):** Companies engaging in green marketing often demonstrate a commitment to corporate social responsibility. This can enhance a company’s reputation and build trust with consumers who value businesses that prioritize social and environmental concerns.

Top 10 Companies with Highest CSR Spending

Name of the Company	Actual CSR Amount Spent in FY 2022-23 (In INR Cr.)
HDFC Bank Ltd.	821
Tata Consultancy Servies Ltd.	783
Reliance Industries Ltd.	744
Tata Steel Ltd.	481
ONGC Ltd.	476
ICICI Bank Ltd.	463
Infosys Ltd.	392
ITC Ltd.	366
Power Grid Corporation of India Ltd	322
NTPC Ltd.	315

Source: CSRBOX’s survey of major CSR funders India CSR Outlook Report 2023

- 4. Compliance with Regulations:** Many regions have implemented environmental regulations and standards. Green marketing helps companies align with these regulations and showcase their adherence to environmentally responsible practices.
- 5. Cost savings and Efficiency:** Adopting environmentally friendly practices can lead to cost savings in the long run. For example, energy-efficient processes, waste reduction and sustainable sourcing can improve operational efficiency and reduce expenses.
- 6. Competitive Advantages:** Green marketing can provide a competitive advantage in the marketplace. Companies that position themselves as environmentally conscious may attract environmentally conscious consumers and differentiate themselves from competitors.
- 7. Long-Term Sustainability:** Sustainable business practices promoted through green marketing contribute to the long-term viability of business. Companies that prioritize environmental responsibility are better positioned to adapt to changing consumer expectations and regulatory environments.
- 8. Innovation and Product Development:** Green marketing encourages innovation in product design and development. Companies may invest in creating more energy-efficient products, use eco-friendly materials or have a reduced environmental impact
- 9. Global Reputation and Market Access:** Companies with a strong commitment to green marketing can enhance their global reputation. This can facilitate market access in regions where environmental concerns are prioritized and consumers are more likely to support sustainable products.

10. Employee Morale and Recruitment: Green marketing initiatives can positively impact employee morale and satisfaction. Employees often take pride in working for companies that are socially and environmentally responsible and this can also be a factor in attracting top talent.

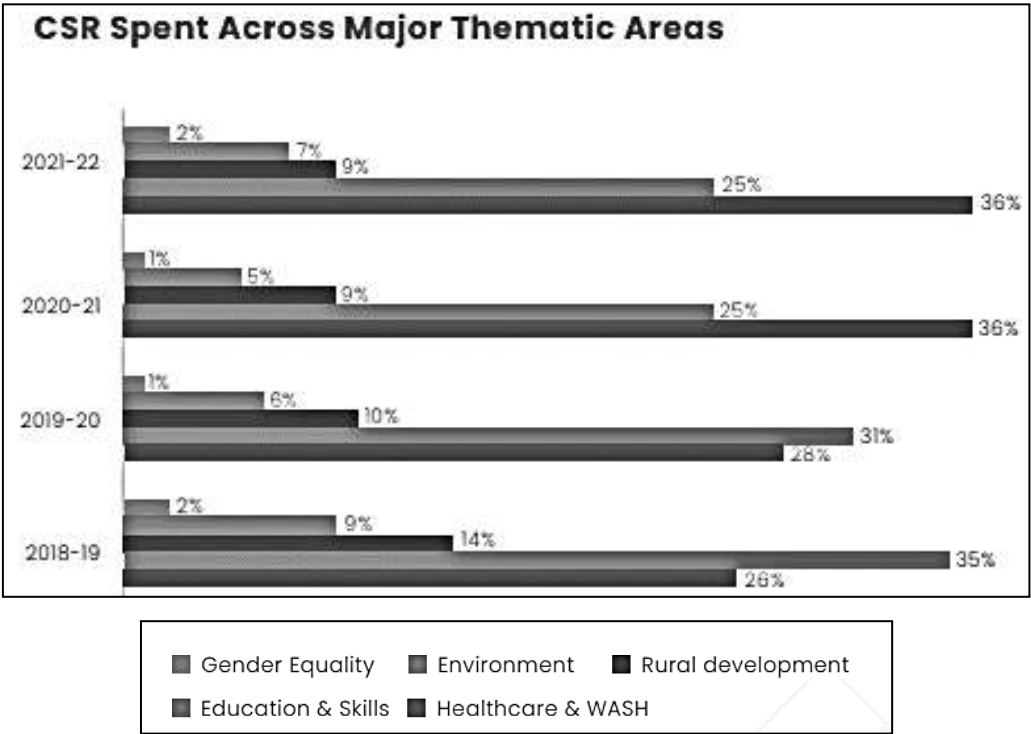
11. Mitigating Risks: Embracing green marketing practices can help companies mitigate risks associated with environmental issues. This includes reducing exposure to potential legal, financial and reputational risks related to environmental harm.

Some Facts and figures:

Preferred Intervention Areas in Environment Sustainability

Water Conservation Projects	59%
Afforestation & Plantation	55%
Climate Change Adaptation Projects	45%
Renewable Energy Solutions	41%
Waste Management	41%
Wildlife & Biodiversity Conservation	23%
Nature Based Solutions	9%
Technology for Climate Change	5%

Source: CSRBOX’s survey of major CSR funders India CSR Outlook Report 2023



Source: CSRBOX’s survey of major CSR funders India CSR Outlook Report 2023

Challenges in Green Marketing

The practice of green marketing faces many challenges.

The primary obstacle in green marketing is to avoid green marketing myopia. There are two goals of green marketing including maintaining better environmental quality and accomplishing customer satisfaction. Both of these goals must be attained. It is because of the marketers' narrow focus on their products' greenness rather than the broader expectations of consumers, that green products have failed. To prevent myopia, three fundamental guidelines have been suggested by Ottman. These are the positioning of consumer value, the measurement of consumer knowledge and the veracity of product claims. The first fundamental idea, "Consumer Value Positioning," states that environmental product designers should aim to outperform competitors in their field. Marketers should focus on relevant consumer market segments and communicate the value that consumers want from environmental products. Promoters should combine or add desired value for consumers with environmental products to increase their appeal to a wider audience.

The second fundamental principle, "Calibration of Customer Knowledge," clarifies that marketers ought to inform consumers by tying environmental product attributes to desired consumer value, such as "energy-efficient products save money." Environmental product features should be presented by marketers as "solutions" to customer problems. Rechargeable batteries, for instance, have a longer lifespan. It is recommended that marketers develop interesting and informative websites regarding the desired consumer value of environmental products. Marketers should use precise, significant, modest and capable claims for consumer benefits and environmental products. This is explained by the third key principle, "Credibility of Product Claims." It is recommended that marketers obtain eco-certifications from reliable sources and inform consumers of the significance of these designations. Marketers ought to stimulate consumer evangelism by providing consumers with engaging, fascinating, and/or entertaining information about environmental products through their social and online communication networks. "Greenwashing" is another issue that has an impact on green marketing. Businesses are realizing the advantages of green marketing more and more, but there's often a fine line between acting in a way that serves their interests and that of their social responsibility.

All sectors that adopt ostensibly environmentally friendly practices with the ulterior goal of boosting profits are collectively referred to as "greenwashing." Giving customers the impression that a company is making the required efforts to manage its ecological footprint responsibly is the main goal of "greenwashing." It's possible that the business isn't doing much to help the environment. Environmentalist Jay Westerveld coined the phrase "greenwashing" to describe the practice of hoteliers asking their guests to reuse towels in their rooms in an effort to "save the environment." The hoteliers' inclination to wash fewer towels appeared to be driven more by a desire to save money than by a desire to lessen their environmental impact, according to Westerveld, who also observed that there was little other evidence to support their concerns.

Greenwashing has since gained prominence in discussions concerning marketing communications and sustainability, and various initiatives, laws, and guidelines have been created to lessen or stop it. There are now "awards" for greenwashing. It is important to approach these two issues diplomatically to help green marketing realize its true potential and accomplish its goals.

Besides the above, the problem of Lack of awareness of green products and their uses is also faced and consumers are not willing to pay premium price for green products if they are not having the perception of getting additional value.

Recent Trends in Green Marketing

While defining an organization's goals and policies, all parties that are impacted by its operations, whether directly or indirectly, should be taken into consideration. This has already contributed to the recent trend of businesses becoming more "green." Green marketing trends are explained by Kiwano Marketing's founder and co-owner, Sofia Ribeiro, a specialist in the Green Corporate Climate Series (GCCS). The following are some of the main conclusions drawn from her research for an "Expert Green Marketing Study": Most Marketers Want to Invest More in Environmental Marketing: Over 80% of those surveyed said they planned to increase their future spending on green marketing. That figure is noticeably greater among manufacturers. The majority of respondents, if not all of them, intend to use Internet Marketing in the future. Marketers' Perception of Green Marketing's Greater Effectiveness: Not Less than 28% of marketers believe that green marketing outperforms other marketing messages, while only 6% disagree. With 46% of managers expressing a belief that green marketing is more effective; management is even more upbeat. Only 23% of operations personnel believe that green marketing is more successful.

Suggestions

1. Redefine goods in the context of green marketing.
2. Modify the markets in an eco-friendly manner.
3. Identify the advantages that come with utilizing eco-friendly products.
4. Disseminate marketing material not to influence but to inform about eco-friendly products.
5. Creating a focus that goes beyond the needs of the present customer base.
6. Being prepared to handle demands and expectations regarding eco-friendly products.
7. Emphasize cost rather than price.
8. Producers, traders, transporters, distributors, salespersons and customers should shoulder greater responsibility in popularising green marketing for sustainable development.

Conclusion

As the concept of green marketing is the savior of mankind, markets across the planet have accepted it to implement meticulously. However, although awareness and appreciation towards green marketing are increasing day by day, the responsible application of green marketing practices is expected shortly. In developing countries like India, where the environment is extremely competitive in several areas, and resources are unevenly distributed, green marketing is likely to

play an important role in years to come however, the industries, buyers and governments should implement this concept effectively.

References

Bhasin, H. (2019). Green Marketing - Definition, Benefits, Importance and Examples. Retrieved from <https://www.marketing91.com/green-marketing-definition-benefitsexamples/>

CSRBOX's (2023). Survey of major CSR funders India CSR Outlook Report.

<https://www.yourarticlelibrary.com>

<https://www.shopify.in>

M.D., P., & Akhil, A. (2017). Green Marketing to Meet Consumer Demands and Sustainable Development-Challenges and Opportunities. Retrieved from https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2980024

OECD, World Bank, United Nations, (2012, June). Incorporating green growth and sustainable development policies into structural reform agendas, G20 Summit.

Perera, H. L., & Pushpanathan, A. (2015). Green Marketing Practices and Customer Satisfaction: A Study of Hotels Industry in Wennappuwa Divisional Secretariat. Retrieved from <https://www2.nau.edu/nabej-p/ojs/index.php/igutourism/article/view/280>

WWF's (2012) Living Planet Report

EDITORS



Prof. Dr. Savitsmita Vilasrao Chawan (M.A., M.Phil Geography, University of Mumbai; PhD Population Sciences, I.I.P.S. Mumbai) retired in December 2019, marking the culmination of a distinguished 38-year teaching career. She served 26 years and 6 months at Smt. CHM College, Ulhasnagar, and 11 years at the Post Graduate and Research Department of Geography, University of Mumbai, Kalina Campus.

Her scholarly focus spans Urban, Tourism, Population, Environmental, and Applied Geography, with an impressive portfolio of 50 research papers published in esteemed international and national journals, as well as book chapters. Prof. Chawan has mentored six Ph.D. scholars and three M.Phil scholars to successful completions.

A seasoned academic organizer, she has led UGC-sponsored refresher courses, orientation programs, workshops, national seminars, and conferences. Her expertise has been sought after as a keynote speaker, guest speaker, and panel member at numerous international, national, and state-level conferences and seminars.

Prof. Chawan's administrative acumen is evident through roles such as NSS Programme Officer, Director of Women Studies Centre, Coordinator for the Travel and Tourism Management course, and Convener of the Environment Research Centre at Smt. CHM College. She also headed the Geography Department at both Smt. CHM College and the University of Mumbai.

As former President of The Bombay Geographical Association, and in her current roles, including committee member of the Carbon Neutral Campus of the University of Mumbai and Regional Representative for Western Region (Gujarat, Maharashtra & Gos State) for Environment with NGO Bharat Vikas Parishad. She is awarded with best member for her contribution in BVP Kalyan Branch. Prof. Chawan is an Honorary Member of the Kunwar Surjit Singh Institute for Spatial Planning and Environment Research, Panchkula; Convener for an online lecture series instituted by Prof. Devendra Prasad Singh Director Institute for Environmental Research and Rural Development, Patna, Bihar. She continues to contribute significantly to the academic community. A life member of several academic associations, she has been honoured with the Bhoogol Bhushan Award by the Deccan Geographical Society of India for her outstanding contributions to academia, administration, and extracurricular activities



Dr. Nitinkumar M. Patil, Ph. D. in Geography (Climatology), with more than thirty years' experience of teaching at both undergraduate and post graduate level is presently working as a faculty at the S.I.A. College of Higher Education, Dombivli (E), affiliated to the University of Mumbai. His areas of interest are Environmental Management, Agricultural science, Agro-climatology Population Studies, Settlement Geography and Tourism. There are fifty-four national and international level research publications to his Credit. Dr. Patil has authored four books of geography and environmental science,

completed twenty-two UGC-HRDC, PMMMNMTT and University organized training programs, presented thirty-three research papers on various national and international platforms, delivered more than twenty-five invited talks and organized seven conferences, seminars and workshops at state and national level. He has worked as a head, department of

geography, member of the College Development Committee, Students' Welfare Officer, NSS Coordinator, member of the NAAC steering committee and subject expert in the university level committees constituted for the selection of assistant professor to be appointed in the colleges and committees constituted for the promotion of college teacher under Career Advancement Scheme (CAS). Dr. Patil has completed two minor research projects funded by UGC, New Delhi and Soliton NetLink Pvt. Ltd. Dombivli. He is a recipient of the 'Shikshak Ratna Award' given at national level by Samta Sahitya Academy at Goa in May 2017 and has also obtained the 'Best Oral Presentation Award' in the international conference organized by BASE-Biology association, Agriculture SciTech and Agricultural association in collaboration with college of medicine, University of Hail, Saudi Arabia in June 2021. Dr. Patil is a life member of The Deccan Geographical Society, India, Maharashtra Bhoogolshastra Parishad, Pune and Bombay Geographical Association, Mumbai.



Dipesh Karmarkar, Ph.D. in Historical Geography, is an Associate Professor and Head of the Department of Geography at Smt. C. H. M. College (Ulhasnagar), University of Mumbai. He ranked among the top 10% of teachers globally in the International Teachers' Olympiad in 2023. He has published three books, twenty papers in journals, proceedings, edited books, nineteen textbooks and more than twenty Marathi articles in periodicals.

His recent article "Mahim Before Bombay: The Story of a Lost Port" published in the volume "Gateways to the Sea: Historic Ports and Docks of Mumbai Region" has received appreciation from the academicians. This volume has been compiled by the Maritime Mumbai Museum Society and published by the Government of India. He has contributed geographical entries to the Marathi Vishwakosh and academic blogs. He is a Ph.D. Research Guide, a Member of the Board of Studies in Geography at the University of Mumbai and a Governing Body Member of the Bombay Geographical Association.



Dr. Ramesh H. Gavit, Ph. D., NET in Geography, is working as an associate professor in the Department of Geography, University of Mumbai, Mumbai. His teaching experience at undergraduate and post graduate level is of eighteen years. Dr. Gavit is a research guide. With 20 national and international publications to his credit, presently two research students are doing Ph. D. under his guidance. In all 25 post graduate students have completed their dissertation under the able supervision of Dr. Gavit. He has published two

research articles in edited volumes and delivered nine invited talks. Dr. Gavit has one patent design to his credit titled Device to Analyze and Generate Hotel Planning. He is a member of BoS in Geography at University of Mumbai and S. P. College, Pune and also worked as a convener of NEP 2020 Geography syllabus framing. Dr. Gavit is a treasurer of Bombay Geographical Association (BGA) and secretary of All India Adivasi Employees Federation Branch University of Mumbai (AIAEF) from 2022. Dr. Gavit is a recipient of Best Geography Teacher Award 2023 given by the Deccan Geographical Society of India.



Dr. Sumant E. Autade is presently working as Associate Professor in Geography at Swami Vivekanand Night College in Dombivli, affiliated to University of Mumbai. He has teaching experience of 18 years at under-graduate and 4 years teaching experience at post graduate level. His research interests are in application of remotely sensed data in natural hazard assessment, particularly landslides. He has published his research work in various national and international journals. To his credit, Dr. Autade has 24 research papers published in reputed National and International journals, 2 newspaper articles, 2 articles in “*Marathi Bhasha Vishwakosh*”, 7 book chapters in edited books and 2 general articles in magazines. Dr. Autade, to his credit has 325 citations, H-index - 4 and i-10 index 3 (Google scholar). Dr. Autade has participated and presented papers in several national and international conferences. He has delivered over 20 talks as guest speaker in different academic conventions at various institutions. He has completed 3 minor and 1 major research projects funded by University of Mumbai and ICSSR. He has successfully participated in two certificate courses on Remote Sensing and GIS at Indian Institute of Remote Sensing, Dehradun. He has also completed 12-week online certificate course on Geographical Information System organized by IIT Chennai.

THE BOMBAY GEOGRAPHICAL ASSOCIATION

Governing Body Members 2023 onwards

President	:	Smt. Bharti Unni
Vice Presidents	:	Prin. M. T. Telang; Shri. Prakash G. Shinde; Shri. Vilasrao R. Chawan; Shri. B. D. Patil; Smt. Premlata Singhi; Prin. Dr. Debajit Sarkar; Shri. Suresh Shetkar; Prin. Dr. Prakash Dongre.
Secretary	:	Prin. Dr. Moushumi Datta;
Jt. Secretary	:	Dr. Sanjukta Sattar; Asst. Secretary: Shri. Dhyaneshwar Bombe
Treasurer	:	Dr. Ramesh Gavitt; Asst. Treasurer: Shri. Sachidanand Honna
Executive Members	:	Dr. Dipesh Karmarkar; Dr. Pandurang Choudhari; Dr. Minal Parab; Dr. Ravindra Gawade; Prin. Dr. Anita Awati; Prin. Dr. Priti Mahajan; Dr. Baban Singare; Dr. Deepali Bhide; Dr. Shweta Ranade; Dr. Sanjyot Pritam Deuskar; Mr. Nikhil Gawai; Ms. Aastha Smarth Kapur; Shri. Bhagwan Gangawane; Dr. Sheetal Zalte; Dr. Jayeeta Datta; Dr. Samruddhi Chawan; Dr. Neetu Sharma; Dr. Amrita Agrawal
Advisory Committee	:	Shri. S. Ebenezer; Dr. Savitsmita Vilasrao Chawan; Prin. Dr. H. M. Pednekar
Auditor	:	C. A. Manoj Pal

We are blessed with the rich legacy of BGA built strongly by well-known geographers, academicians, administrators, and philanthropists who have been the founder pillars as Presidents during their tenure in sequence as Prin. C. B. Joshi; Shri. Iyer; Dr. C. D. Deshpande; Shri. N. M. Joshi; Shri. Vakil; Prof. B. Arunachalam; Prof. Dr. K. Sita; Prof. Dr. V. S. Phadke; Shri. V. G. Amrite; Shri. S. Ebenezer; and Prof. Dr. Savitsmita V. Chawan.



THE BOMBAY GEOGRAPHICAL ASSOCIATION

The Bombay Geographical Association is one of the oldest Geographical Association Registered Under Societies Act XXI of 1860 no. Bom.82/1958 (GBBSD), functioning from C/o Dept. of Geography, University of Mumbai, Lokmanya Bal Gangadhar Tilak Bhavan, Vidyanagari, Santacruz (East), Mumbai 400098. The legacy of BGA is built strongly by its former Presidents and their executive team such as Prin. C.B. Joshi; Shri.Iyer; Dr. C.D. Deshpande; Shri.N.M.Joshi; Shri.Vakil; Prof. B. Arunachalam; Dr. K. Sita; Prof. V.G. Amrite; Dr. V.S. Phadke; Prof.S.Ebenezer; Prof.Savitsmita Vilasrao Chawan and presently Prof.Bharati Unni. The BGA has been conducting various academic programmes for disseminating knowledge in Geography through Conferences, Seminars, Workshops, refresher courses, Orientation program, Diploma Course, field trips, training programmes, Map Exhibition etc. for college and school teachers in association with BOS Geography and Dept. of Geography, University of Mumbai at International, National, State and Regional levels, over the years with kind support from the authorities at University of Mumbai. The BGA has a total of 29 publications in the form of Annual Research Journal namely, 'Bombay Geographical Magazine', occasional papers and Monographs. B.G.A. in association with Dept. of Geography, University of Mumbai and Geography departments in its affiliated colleges has extended activities to *student community through the support of benevolent sponsors by organizing competitions for them such as*: Mrs. Kani Memorial Prize Presentation Competition, Smt. Shantidevi Banerjee Memorial Prize Presentation Competition, Shri Shankar Raghunath Rao Memorial Best Student Award Prize. The BGA is pleased and is grateful to one and all to receive support from various organizations and institutions to disseminate its academic deliberations to academicians, research fraternity and students.



THE S.I.A. COLLEGE OF HIGHER EDUCATION, DOMBIVLI (E)

The S. I. A. College of Higher Education was started in 2010 to cater to the demand for quality education in the vicinity of Dombivli and its suburban residents. The college works with the motto "Knowledge is Power." It offers undergraduate programs viz. B. Com, BBI, BAF, BMS, BMM, B.Sc. IT and two postgraduate courses including M. Com and M. Sc. IT. The institute espouses holistic development through value-based education, skill development and real-time learning. The institution encourages the students and faculty members to adapt to the emerging digital era by training them on the latest technologies and providing hands-on experience to all. All the software that is used in the college is designed by the college incubation cell – the S.I.A. Techlink. In addition, the college also offers various courses to help enhance employability. The college is reaccredited B+ in the second cycle of NAAC. The College under the able guidance of Hon.Chairman Mr.K.V.Ranganathan; Hon Secretary Mr.M.Gopalakrishnan Prin.Padmaja Arvind and its dedicated staff is strengthening the academic growth with laurels in its region.



Unit No.4, Ground Floor, Lalwani Industrial Estate, 14, G.D. Ambekar Marg, Wadala, Mumbai-400 031
Tel.: (022) 6662 4553, 6662 4554. Fax: 6662 4556. e-mail: orders@shethpublishers.com

Follow us: /shethpublishers /sheth.publishers

ISBN - 978-93-6268-489-9

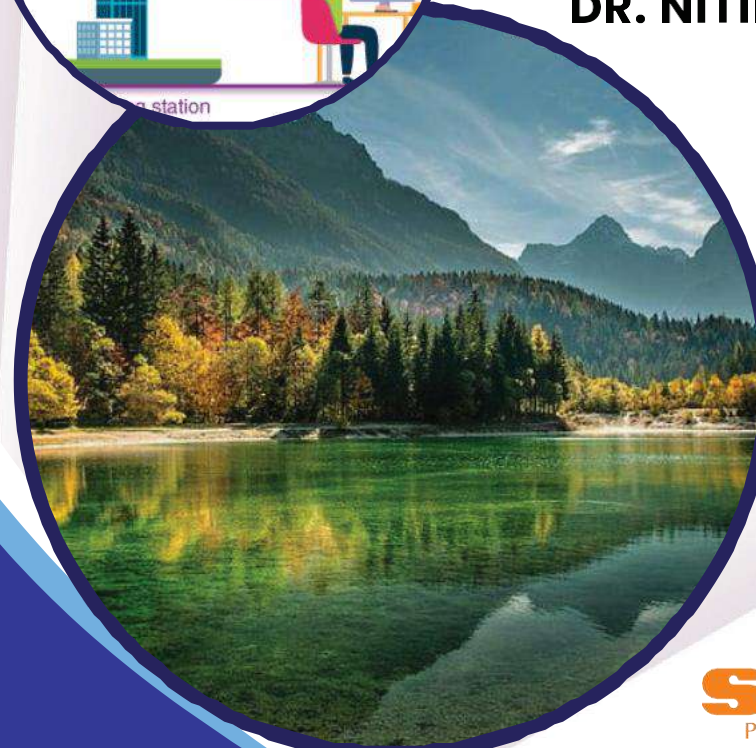


Price - ₹ 250.00

ROLE OF MODERN TECHNOLOGY IN ENVIRONMENTAL CONSERVATION

CHIEF EDITOR
PRIN. DR. MOUSHUMI DATTA

EDITORS:
DR. DIPESH KARMARKAR
DR. SUMANT AUTADE
DR. RAMESH HARI GAVIT
DR. NITINKUMAR PATIL



Role of Modern Technology and Environmental Conservation

Chief Editor:

Prin. Dr. Moushumi Datta

Editors:

Dr. Dipesh Karmarkar

Dr. Sumant Autade

Dr. Ramesh Hari Gavit

Dr. Nitinkumar Patil

When you care enough to be better than the best



MUMBAI

GOA ☆ NAGPUR ☆ BHAVNAGAR

Follow us:



/shethpublishers



/sheth.publishers

Price: ` 250

ISBN - 978-93-6268-489-9

First Edition: October, 2024

No Part of this publication may be reproduced or transmitted by any means, electronic or mechanical, including photocopy, recording or any information storage and retrieval system, without permission in writing from the copyright owners.

DISCLAIMER

The authors are solely responsible for the contents of the chapters in this book. The publishers and editors' do not take any responsibility for the same in any manner. Errors, if any are purely unintentional and readers are requested to communicate such errors with the editors and authors to avoid discrepancies in future.

Published & Printed by:

Sheth Publishers Private Ltd.
Unit No.4, Ground Floor, Lalwani Industrial Estate,
14, G.D.Ambekar Marg, Wadala Mumbai-400 031
Contact: 6662 4553/ 6662 4554 FAX: 6662 4556

CONTENTS

Acknowledgement		04
Preface		06
1. Innovating the Oil Frontier: AI Adoption in The Indian Energy Landscape	: Dr. Rashmi Aggarwal	09
2. Landslide Hazard Assessment Along Neral-Matheran Road (MDR-9) Maharashtra, India.	: Sidhant Shinde and Dr. Sumant Autade	21
3. Identification of Green Cover of Urban Area from Liss-III Satellite Image Using NDVI Techniques: A Study of Pune and Pimpri Chinchwad City	: Bambale Anita Vitthal, Sagar Bhausaheb Dongare, Pallavi Sunil Subandh	28
4. Sustainable Development of Spatio-Temporal Changes in Land Use and Land Cover (LULC) of the Upper Kundalika River Basin	: Rajendra Shingate	33
5. Morphometric Analysis for Sustainable Water Conservation of Irai River Basin in Chandrapur District of Maharashtra.	: Sheetal S. Asekar, Dr. Ramesh R. Gavit	44
6. Avenues of Internet of Things (IoT): Implementation of technologies through Smart Cities	: Tejaswini Sudesh Shivsharan	58
7. Digital Finance for a Sustainable Future: Assessing the Environmental Impacts and Eco-Friendly Innovations in E-Banking	: Dr. S. R. Dhembre, Rajkumar Balan Pillai	69
8. Impact of Variation in Rainfall on Crop Production in Jalgaon District: Using Geospatial Technology	: Sagar Dongare and Rohit Sonawane	80
9. Assessment of Climate Suitability for Ginger Crop in Pune District Using Eco crop Model	: Prerana Dalvi and Dnyaneshwar Bombe	91
10. The Media's Role in Environmental Conservation	: Samgir Bhushan Sopan	101

ACKNOWLEDGEMENT

This book is the result of the dedicated efforts of research scholars and academicians. We would like to express our heartfelt appreciation and gratitude to everyone who contributed to its production and publication.

We are deeply honoured and sincerely thank our management: Hon. President Mr. K. V. Ranganathan and Hon. Secretary Mr. Gopalakrishnan of the South Indian Association, Dombivli, for permitting us to publish this book.

I also extend my sincere gratitude to Principal Dr. Padmaja Arvind and Vice Principal and IQAC Coordinator Mrs. Booma Halpeth of S. I. A. College of Higher Education, Dombivli (E), for their unwavering support throughout the completion of this book.

I express my sincere gratitude to Mrs. Bharati Unni, President of the Bombay Geographical Association (BGA), C/O Department of Geography, University of Mumbai, Lokmanya Tilak Bhavan, CST Road, Kalina, Santacruz (East), Mumbai. My heartfelt thanks also extend to Prof. Dr. Moshumi Datta, Secretary of BGA and Principal of N.K. College (Autonomous), Malad, Mumbai; Prof. Dr. Sanjukta Sattar, Joint Secretary of BGA and Head of the Department of Geography, University of Mumbai; Prof. Vilasrao Chawan, former head, Department of Geography, BK Birla College and Vice President of BGA, Principal Dr. Hemant Pednekar, Advisory Member and former Vice President of BGA; Dr. Ramesh Gavit, Treasurer of BGA and Associate Professor in the Department of Geography, University of Mumbai.

Additionally, I would like to acknowledge the Governing Body Members of BGA: Dr. Dipesh Karmarkar, Research Guide and Head of the Department of Geography, Smt. CHM College, Ulhasnagar-3, and Shri. Dnyaneshwar Bombe, Head of the Department of Geography, Sathaye College, Vile Parle, Mumbai, affiliated with the University of Mumbai. Their association in the publication of this book has been integral to its success.

I owe my sincere and special thanks to Prof. Dr. Savitsmita Vilasrao Chawan, Advisory Member and former President of BGA, and former Head of the Department of Geography, University of Mumbai for her invaluable support and expertise guidance in achieving the outcome of the publication of this book.

I am immensely grateful to all the authors for contributing chapters on topics aligned with the theme of this book and for their timely submissions. I also extend special thanks to the editorial board for their diligent efforts in editing the entire manuscript.

Words are inadequate to express my deepest thanks to Shri Kirtibhai Sheth and Shri Deepak Seth, Directors of Sheth Publications Pvt., Ltd., for publishing this book with an ISBN. I also extend my gratitude to the faculty members of S.I.A. College of Higher Education, Dombivli (E), and the entire Governing Body Members of the Bombay Geographical Association for their support and good wishes in the publication of this book.

Dr. Nitinkumar M. Patil

Faculty, the S. I. A. College of Higher Education

PREFACE

In today's world, where the interplay between environmental sustainability, technological advancement, and socioeconomic development is more critical than ever, it is imperative to delve into the multifaceted dimensions of these complex issues. This book represents a compilation of diverse research endeavours that explore various aspects of environmental science, technology, and sustainable development, with a focus on the dynamic landscape of Maharashtra, India.

In an era defined by rapid technological advancement and increasing environmental challenges, the convergence of modern technology and environmental conservation has become increasingly imperative. The book you hold in your hands, titled "Role of Modern Technology and Environmental Conservation," embarks on a journey to explore this critical intersection, offering a comprehensive examination of how innovative technologies can be harnessed to protect and preserve our planet.

It was a shared commitment to explain the essential role that modern technology plays in addressing the multi-dimensional environmental issues confronting our world today. Drawing upon the expertise of esteemed contributors from diverse disciplines, this book brings together a wealth of knowledge, insights, and perspectives aimed at advancing the discourse on environmental conservation.

Authors of this book have contributed and dealt with a range of topics ranging from the application of geo-informatics in natural hazard assessment, landslide hazard assessment, vegetation analysis, AI application in the innovation of crude oil, the environmental impact of innovative banking services, drainage morphometric analysis, land use land cover analysis, the impact of rainfall on crop production and crop suitability analysis.

Each chapter within this book delves into a specific aspect of environmental conservation, showcasing the myriad ways in which modern technology can be leveraged to monitor, mitigate, and manage environmental risks. From remote sensing and geographic information systems to artificial intelligence and the Internet of Things, the chapters explore a wide array of technological tools and methodologies that hold promise for enhancing our understanding of environmental processes and informing evidence-based decision-making.

Moreover, this book underscores the importance of collaboration and cross-disciplinary dialogue in tackling complex environmental challenges. By fostering a deeper appreciation for the interconnectedness of technology, society, and the environment, we hope to inspire readers to embrace innovative solutions and catalyse positive change in their respective fields.

We are deeply grateful to the contributors whose scholarly contributions have enriched this volume, as well as to the readers whose engagement and interest drive the ongoing conversation on environmental conservation. It is our sincere hope that this book serves as a valuable resource for researchers, practitioners, policymakers, and students alike, fostering greater awareness, dialogue, and action towards a more sustainable and resilient future for our planet.

The chapters contained within this book encapsulate the tireless efforts and scholarly pursuits of researchers and scholars who are dedicated to unravelling the intricacies of our environment and advancing solutions for a more sustainable future. From the assessment of landslide hazards along transportation routes to the exploration of digital finance for eco-friendly banking practices, each chapter offers unique insights into pressing environmental challenges and innovative approaches to address them.

These studies shed light on crucial topics such as urban green cover assessment, water conservation strategies, the integration of artificial intelligence in the energy sector, and the impact of climate variability on agricultural production. By employing cutting-edge technologies such as satellite imagery, geospatial analysis, and ecological modelling, the researchers showcased here strive to deepen our understanding of environmental processes and inform evidence-based decision-making.

Moreover, this collection underscores the importance of interdisciplinary collaboration and the integration of diverse perspectives in tackling complex environmental issues. It highlights the indispensable role of scientific inquiry and technological innovation in driving sustainable development and fostering resilience in the face of environmental challenges.

The chapters in this book are based on the selected paper presentations made at an Interdisciplinary National Level Conference in Hybrid Mode on 'Environment, Development and Sustainability: An Inclusive Approach for Resilient Future' held on 17th

February 2023 at The S.I.A. College of Higher Education, Dombivli (E) With IQAC Affiliated to University of Mumbai, Dombivli in collaboration with The Bombay Geographical Association housed in the Department of Geography, University of Mumbai.

The contributors to this book are from varied disciplines with a multidisciplinary approach to the theme of this book. We are immensely grateful to the contributors whose scholarly contributions have enriched this book. It is hoped that this book will serve as a valuable resource for researchers, policymakers, practitioners, and students alike, inspiring continued exploration and action towards a more sustainable and resilient future for Maharashtra and beyond.

Dr. Dipesh Karmarkar

Associate Professor & Head, Department of Geography,

Smt. CHM College, Ulhasnagar – 3

INNOVATING THE OIL FRONTIER:

AI ADOPTION IN THE INDIAN ENERGY LANDSCAPE

Dr. Rashmi

Assistant Professor at Sree Narayana Guru College of Commerce, Chembur, Mumbai.

agg29rashmi@gmail.com

Abstract: *The research paper investigates the pivotal role of oil companies in the Indian economy, focusing on their contributions to energy security, GDP, and infrastructure development. It highlights the growing significance of Artificial Intelligence (AI) in the oil sector and predicts substantial growth in the global AI in the Oil & Gas market. The paper conducts a comparative analysis of motivators and barriers to AI adoption between public and private sector oil companies, revealing significant differences. This research provides critical insights into AI adoption in the oil industry, offering valuable guidance for sustainable growth and competitiveness. The study further recommends expanding the sample size, exploring specific AI technologies' impact, considering temporal dynamics, addressing data privacy concerns, and enhancing workforce AI skills.*

Keywords: *Artificial Intelligence (AI), Oil company, India, motivators, barriers*

INTRODUCTION

Oil companies play a significant role in the Indian economy, as they are integral to the nation's energy security and economic stability (Sakariya, 2011). India is a rapidly growing economy with a burgeoning energy demand, and oil remains a primary source of energy for transportation, industries, and households. Oil companies, both public and private, contribute substantially to the country's GDP through exploration, production, refining, and distribution of petroleum products. These companies generate substantial revenue for the government through taxes and royalties, which in turn fund critical infrastructure and social development projects. Furthermore, the oil and gas sector is a major employer, providing job opportunities across various skill levels. The efficient functioning of oil companies is essential for maintaining price stability, fuelling economic growth, and ensuring the

nation's energy security, making them pivotal players in India's economic landscape. The oil and gas sector is among the eight core industries in India and plays a major role in influencing the decision-making for all the other important sections of the economy (Ministry of Commerce and Industry, 2023).

Artificial Intelligence (AI) is increasingly playing a transformative role in Indian oil companies. Like any other industry, the Oil & Gas industry also recognizes the power and impact that artificial intelligence can have on the industry's performance. The research analysis from Mordor Intelligence estimates that the Global Artificial Intelligence (AI) in Oil & Gas market will reach a value of US\$3,349.89 million by 2026, registering a CAGR of 10.14% between 2021-2026 (Wolfe, 2021). These companies have recognized the potential of AI in optimizing exploration and production processes (Hooper, 2023), improving efficiency, and reducing operational costs (Salvaterra, 2019). AI-driven technologies, such as predictive analytics and machine learning algorithms (Bangert, 2021), are used to analyse vast datasets, enabling more accurate reservoir modelling (Gupta and Shah, 2021), predictive maintenance of equipment, and enhanced decision-making. AI also contributes to safety improvements by identifying potential hazards and suggesting preventive measures. Moreover, AI-powered automation enhances the monitoring and control of refining and distribution operations, improving product quality and supply chain management (Ali, 2019). As India continues to expand its energy sector and seek energy independence, the integration of AI technologies is pivotal in ensuring sustainability, competitiveness, and efficiency in the country's oil industry.

Understanding the factors that drive or impede its adoption is crucial for organizations to remain competitive and efficient. However, the extent of AI adoption varies among public and private oil sector companies, influenced by distinct motivators and barriers. This study employs a comparative analysis using the chi-square test to identify significant differences in motivators and barriers between public and private sector entities. The findings contribute to a deeper understanding of the unique challenges and opportunities faced by these organizations in their AI adoption journeys.

REVIEW OF LITERATURE

In the realm of AI adoption within the oil sector, a comprehensive examination of the existing literature underscores a multitude of factors that both encourage and impede progress in this domain. According to Rahman et al., (2021), the pursuit of Operational Efficiency stands as a pivotal motivator, wherein AI technologies manifest their capability to optimize various facets of the sector, encompassing exploration, drilling, and production processes resulting in the reduction of operational expenditures. Further, AI-driven predictive maintenance strategies have demonstrated their capacity to enhance asset reliability while simultaneously minimizing downtime, thereby proving invaluable to the industry (Waqar et al., 2023). Also, AI's prowess in processing and analysing vast datasets empowers data-driven decision-making processes, facilitating informed choices across the sector (Rahmanifard and Plaksina, 2019).

However, in tandem with these motivators, a series of formidable barriers emerge, demanding careful consideration. Foremost among these obstacles is the issue of Data Privacy and Security. Concerns surrounding data breaches and the looming threat of cyberattacks loom large, necessitating robust safeguards (Zhao et al., 2013). Additionally, High Implementation Costs present a significant hurdle. The initial capital investment required for the adoption of AI technology and the establishment of the necessary infrastructure can be a formidable deterrent (Tang et al., 2018). Furthermore, the Lack of Skills in the workforce poses a challenge. The shortage of AI talent and expertise compounds the difficulties faced by organizations seeking to embrace AI-driven solutions (Ahmad et al., 2021). However, as already mentioned, a study of AI adoption among public and private oil sector companies is still untouched. Therefore, this study targets the following objectives.

RESEARCH OBJECTIVES & HYPOTHESIS SETTING

This study aims to achieve the following objectives:

- To identify and compare the primary motivators for AI adoption in public and private oil sector companies.
- To identify and compare the primary barriers hindering AI adoption in public and private oil sector companies.

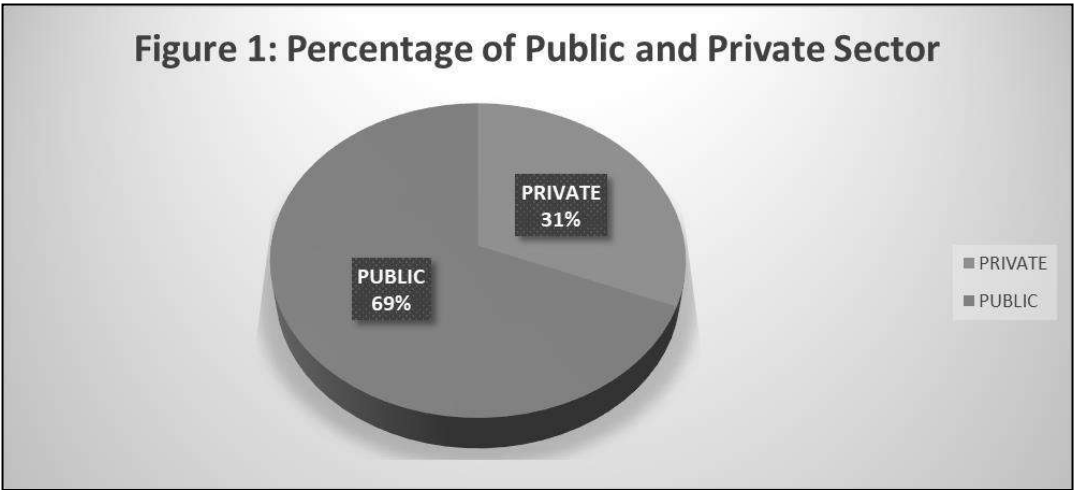
To achieve the above objectives, the following hypotheses are set:

H1: There are significant differences in motivators for AI adoption between public and private oil sector companies.

H2: There are significant differences in barriers to AI adoption between public and private oil sector companies.

DATA COLLECTION & RESEARCH METHODOLOGY

Data for this research is collected through structured surveys administered to employees and decision-makers in public and private oil sector companies. The selection of the oil and gas sector as the subject of this research paper is strategic due to its significance in the global economy. The survey questionnaire includes items related to motivators and barriers to AI adoption. To acquire this valuable information, a well-structured questionnaire was distributed among managerial and senior managerial personnel within these public as well as private sector undertakings which was made by taking the reference from HOLON IQ. In total, 115 questionnaires were distributed and subsequently collected. However, 6 questionnaires were excluded from the analysis due to incomplete information. Consequently, the data analysis was conducted using the dataset derived from the 109 fully completed questionnaires. Out of 109 respondents, responses from the private sector were 34 as compared to 75 responses received from the public sector as shown in Figure 1.



The chi-square test is used to compare the distribution of responses related to motivators and barriers in public and private oil sector companies. Chi-square analysis determines if observed differences are statistically significant.

DATA ANALYSIS

Jamovi 2.3.28.0 version is used for data analysis by setting the following codes as shown in Table 1.

Table 1: Code, Description and Main head of variables

Code	Description of item	Main head
B	Cost savings due to automation	Motivators of AI
C	First mover advantage	
D	Improved learner outcomes	
E	Improved agility	
F	Improved employee engagement	
G	Improved learner outcomes	
H	Increased revenue	
I	Want to disrupt the market	
J	Stakeholders demand it	
K	Lack of talent with appropriate skill sets for AI work	Barriers to AI
L	Under-resourcing for AI	
M	Lack of technological infrastructure to support AI	
N	Lack of leader's ownership of and commitment to AI	
O	Personal judgement overrides AI-based decision-making	
P	Lack of clear strategy for AI	
Q	Lack of available (i.e. collected) data	
R	Functional silos constrain end-to-end AI solutions	
S	Lack of changes to frontline processes after AI's adaption	
T	Limited relevance of insights from AI	
U	The limited usefulness of data	
V	Uncertain or low expectations for return on investments	

Reliability Analysis

To check the internal consistency of items, Cronbach's alpha is calculated. Results are shown in Table 2.

Table 2: Value of Cronbach α

Scale/Code	Description of item	Cronbach's α	If the item is dropped
B	Cost savings due to automation	0.689	0.618
C	First mover advantage		0.675
D	Improved learner outcomes		0.649
E	Improved agility		0.609
F	Improved employee engagement		0.667
G	Improved learner outcomes		0.721
H	Increased revenue		0.739
I	Want to disrupt the market		0.629
J	Stakeholders demand it		0.628
K	Lack of talent with appropriate skill sets for AI work	0.780	0.794
L	Under-resourcing for AI		0.768
M	Lack of technological infrastructure to support AI		0.757
N	Lack of leader's ownership of and commitment to AI		0.787
O	Personal judgement overrides AI-based decision-making		0.788
P	Lack of clear strategy for AI		0.769
Q	Lack of available (i.e. collected) data		0.764
R	Functional silos constrain end-to-end AI solutions		0.729
S	Lack of changes to frontline processes after AI's adaption		0.751
T	Limited relevance of insights from AI		0.767
U	The limited usefulness of data		0.740
V	Uncertain or low expectations for return on investments		0.751

Figure 2: Correlation Heatmap of Motivators of AI

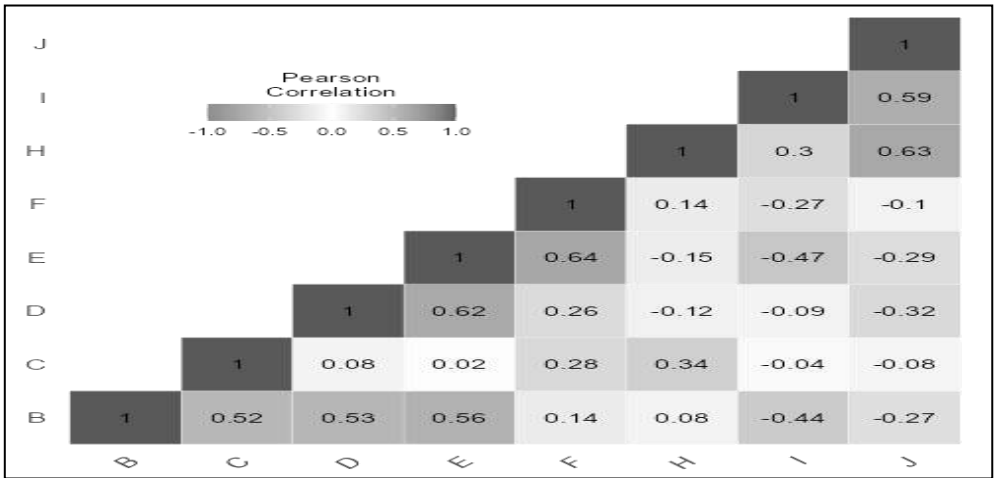
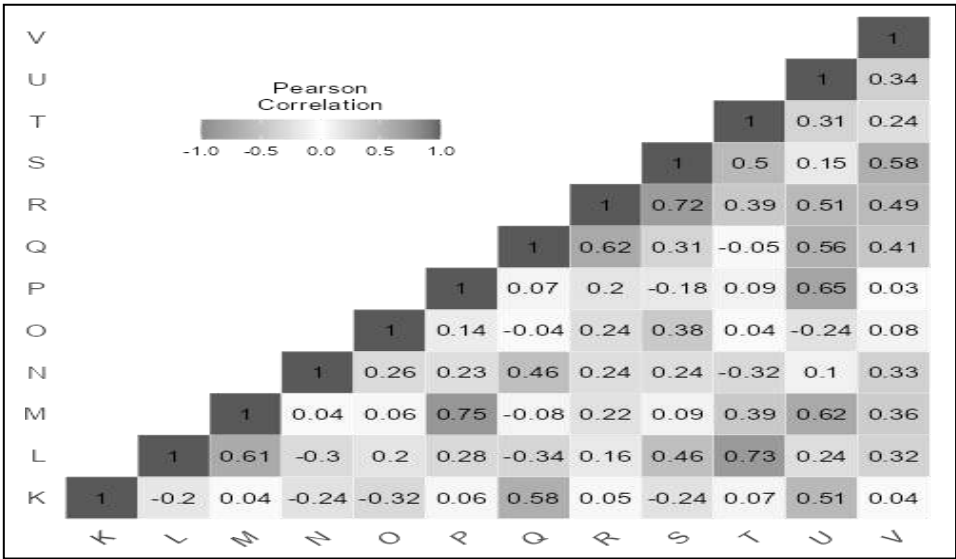


Figure 3: Correlation Heatmap of Barriers of AI



The above information shows the results of a reliability analysis. According to Nunnally (1978), a value of 0.7 or above is taken as an acceptable measure. Therefore, an item, “Improved learner outcomes” is dropped for further analysis which has resulted in the value of Cronbach α as 0.721. The correlation heatmaps (Figure 2 and Figure 3) provide insights into how different components of motivators and barriers of AI are related to each other. These visualizations can help you understand the relationships between the variables and identify any patterns or associations.

Further, Chi-square analysis is performed separately for motivators and barriers to AI adoption. The results provide p-values, which indicate whether the observed differences are statistically significant.

Table 3: Motivators of AI

χ^2 Tests When N = 109	Value	df	P
χ^2	119	8	< .001
χ^2 continuity correction	119	8	< .001
Likelihood ratio	21.2	8	0.007
Nominal measures			
Contingency coefficient	0.722		
Phi-coefficient	NaN		
Cramer's V	0.737		
		95% Confidence Intervals	
Gamma	Standard Error	Lower	Upper
0.222	0.166	-0.104	0.548

The chi-squared (χ^2) value is 119 with 8 degrees of freedom (df), and the p-value is less than 0.001 ($<.001$). This suggests that there is a statistically significant relationship between the motivators of AI adoption and whether it occurs in the public or private sector. In other words, there are differences in motivators between these two sectors.

χ^2 Continuity Correction

This is another version of the chi-squared test with continuity correction, and it also shows a highly significant relationship ($p < .001$) between the variables.

Likelihood Ratio

The likelihood ratio chi-squared test has a value of 21.2 with 8 degrees of freedom and a p-value of 0.007. This suggests that there is a significant association between the motivators and the sector in which AI adoption takes place.

Nominal Measures

The contingency coefficient, Cramer's V, and Gamma are measures of association between categorical variables.

Contingency coefficient: It has a value of 0.722, indicating a strong relationship between the variables.

Cramer's V: This measure is 0.737, which also suggests a strong association.

Gamma: Gamma has a value of 0.222 with a 95% confidence interval from -0.104 to 0.548. This suggests a moderate positive association between motivators and the sector.

Table 4: Barriers to AI

χ^2 Tests When N = 109	Value	df	P
χ^2	138	6	$< .001$
χ^2 continuity correction	138	6	$< .001$
Likelihood ratio	41.6	6	$< .001$
Nominal measures			
Contingency coefficient	0.745		
Phi-coefficient	NaN		
Cramer's V	0.791		
		95% Confidence Intervals	
Gamma	Standard Error	Lower	Upper
0.102	0.195	-0.279	0.484

χ^2 Tests

The chi-squared (χ^2) value is 138 with 6 degrees of freedom (df), and the p-value is less than 0.001 ($<.001$). This indicates a highly significant relationship between the barriers to AI adoption and whether it occurs in the private or public sector. In other words, there are differences in barriers between these two sectors.

χ^2 Continuity Correction

This is another version of the chi-squared test with continuity correction, and it also shows a highly significant relationship ($p < .001$) between the variables.

Likelihood Ratio

The likelihood ratio chi-squared test has a value of 41.6 with 6 degrees of freedom and a p-value of less than 0.001 ($<.001$). This suggests a significant association between the barriers and the sector in which AI adoption takes place.

Nominal Measures

The contingency coefficient, Cramer's V, and Gamma are measures of association between categorical variables.

Contingency coefficient: It has a value of 0.745, indicating a strong relationship between the variables.

Cramer's V: This measure is 0.791, which suggests a strong association.

Gamma: Gamma has a value of 0.102 with a 95% confidence interval from -0.279 to 0.484. This indicates a relatively weak positive association between barriers and the sector.

CONCLUSION

This research paper explores the significant role of oil companies in the Indian economy, emphasizing their contributions to energy security, economic stability, and GDP through the exploration, production, refining, and distribution of petroleum products. The integration of Artificial Intelligence (AI) is noted as a transformative factor in the oil sector, with predictions of substantial growth in global AI in the Oil & Gas market. AI is recognized for optimizing processes, reducing costs, enhancing decision-making, and

improving safety in the industry. The paper conducts a chi-square analysis to identify differences in motivators and barriers to AI adoption between public and private sector oil companies, revealing statistically significant distinctions in both cases. The study aims to provide insights into the unique challenges and opportunities faced by these organizations in their AI adoption journeys, offering valuable contributions to the oil and gas sector's future in India.

LIMITATIONS

The research paper exhibits several limitations that warrant consideration. Firstly, the study's findings are based on a relatively small sample of 109 respondents, with a significant imbalance in responses between the public and private sectors. This could introduce potential bias and limit the generalizability of results. Secondly, the research focuses on motivators and barriers to AI adoption in the oil sector but lacks an in-depth exploration of the broader context, such as the specific AI technologies used or their impact on operational performance. Additionally, the reliance on survey data may lead to self-reporting bias, as participants might provide socially desirable responses. Lastly, the paper lacks a discussion of the temporal aspect of AI adoption, which is crucial in a rapidly evolving technological landscape. A more extensive analysis, incorporating longitudinal data and a larger, more balanced sample, would enhance the robustness and applicability of the research's findings.

RECOMMENDATIONS AND FUTURE RESEARCH

The research paper offers several recommendations and avenues for future research. Firstly, it is advisable to expand the sample size and achieve a better balance between public and private sector respondents to ensure more representative findings. Future research could delve deeper into the specific AI technologies and strategies adopted by oil companies and their impact on operational efficiency and cost reduction. Additionally, exploring the temporal dynamics of AI adoption within the oil sector and assessing the evolving role of AI in sustainability and energy independence would be valuable. It's also recommended to investigate the implications of data privacy and security concerns on AI adoption, as well as strategies to address the lack of AI skills in the workforce.

Furthermore, examining the role of AI in enhancing asset reliability and minimizing downtime in the oil and gas sector is an area of potential research interest. These recommendations can contribute to a more comprehensive understanding of AI adoption in this critical industry and inform strategies for sustainable growth and competitiveness.

REFERENCES

- Ahmad, T., Zhang, D., Huang, C., Zhang, H., Dai, N., Song, Y. and Chen, H. (2021), “Artificial Intelligence in Sustainable Energy Industry: Status Quo, Challenges and Opportunities”, *Journal of Cleaner Production*, 289, <https://doi.org/10.1016/j.jclepro.2021.125834>
- Ali, U. (2019), “Exploring the Impact of Artificial Intelligence on Offshore Oil and Gas”, Available at: <https://www.offshore-technology.com/features/application-of-artificial-intelligence-in-oil-and-gas-industry/?cf-view>
- Bangert, P. (2021), “Introduction to Machine Learning in the Oil and Gas Industry”, 10.1016/B978-0-12-820714-7.00004-2.
- Gupta, D. and Shah, M. (2022), “A Comprehensive Study on Artificial Intelligence in Oil and Gas Sector”, *Environmental Science and Pollution Research*, 29. 10.1007/s11356-021-15379-z.
- Hooper, B. (2023), “Artificial Intelligence has Big Implications for the Oil and gas Sector”, Available at: <https://aliresources.hexagon.com/articles-blogs/artificial-intelligence-has-big-implications-for-the-oil-and-gas-sector>
- Ministry of Commerce and Industry (2023), Available at: <https://www.ibef.org/industry/oil-gas-india>
- Rahman, M.S.A., Jamaludin, N.A.A., Zainol Z., Sembok, T.M.T. (2021), “Machine Learning Algorithm Model for Improving Business Decisions Making in Upstream Oil & Gas”, In 2021 International Congress of Advanced Technology and Engineering (ICOTEN), p. 1–5.

Rahmanifard, H., Plaksina, T. (2019), “Application of Artificial Intelligence Techniques in the Petroleum Industry: A Review”, *Artificial Intelligence Review*, 52, 2295–2318. <https://doi.org/10.1007/s10462-018-9612-8>

Sakariya, S. (2011), “Indian Oil And Gas Industry - An Overview, The Case Centre”, Available at: https://www.researchgate.net/publication/321245149_INDIAN_OIL_AND_GAS_INDUS TRY_-_AN_OVERVIEW

Salvaterra, S. (2019), “Oil and Gas Companies turn to AI to cut Costs”, *The Wall Street Journals*, Available at: <https://www.wsj.com/articles/oil-and-gas-companies-turn-to-ai-to-cut-costs-11571018460>

Tang, Y., Huang, Y., Wang, H., Wang, C., Guo, Q., Yao, W. (2018), “Framework for Artificial Intelligence Analysis in Largescale Power Grids based on Digital Simulation, *CSEE Journal of Power and Energy Systems*, 4, 459–468. <https://doi.org/10.17775/cseejpes.2018.01010>

Waqar, A., Othman, I., Shafiq, N., Mansoor, M.S. (2023), “Applications of AI in Oil and Gas Projects towards Sustainable Development: A Systematic Literature Review”, *Artificial Intelligence Review*, 56, 12771–12798 (2023). <https://doi.org/10.1007/s10462-023-10467-7>

Wolfe, T. (2021), “13 Remarkable Applications of AI in the Oil & Gas Industry”, Available at: <https://www.birlasoft.com/articles/13-remarkable-applications-ai-oil-gas-industry>

Zhao, Y., Xiao, F., Wang, S. (2013), “An Intelligent Chiller Fault Detection and Diagnosis Methodology using Bayesian Belief Network”, *Energy and Buildings*, 57, 278–288. <https://doi.org/10.1016/j.enbuild.2012.11.007>

LANDSLIDE HAZARD ASSESSMENT ALONG NERAL-MATHERAN ROAD (MDR-9) MAHARASHTRA, INDIA

***Dr. Sumant Autade and **Mr. Sidhant Shinde**

*Assistant Professor, Swami Vivekanand Night College, Dombivli (E)

sumantautade@gmail.com

**Undergraduate Student, Swami Vivekanand Night College, Dombivli (E)

Abstract: *Landslide is a process of downslope movement of weathered material or soil under gravitational influence usually moving over a relatively confined zone or surface of shear. The western flank of the Western Ghats is one of the three major concentrations of landslide hazards in India. The present study aims to assessment of landslide occurrences and their distribution along Neral - Matheran road(Main District Road No. 9) in Raigad District of Maharashtra using historical landslide records from the Public Works Department and field investigations. Matheran is a hill station situated at 766 meters above mean sea level in Raigad District. The total length of the road connecting Neral and Matheran is 11.50 kilometres. A total of 73 landslides have been reported from the year 2010 to 2012. Occurrences of these landslides are mainly associated with rainfall during the monsoon season. Debris slide is a common type of slope failure in this area. Intense monsoon rain is a major landslide-triggering factor responsible for slope failure in the hilly tracks of Matheran. After the analysis of landslide occurrences and rainfall, it is observed that there is a positive correlation between rainfall occurrence and landslide events. It is also observed that rainfall occurrence before landslide events is a major cause of landslides in the study area. Landslides in the study area are often responsible for traffic disruption, loss of topsoil cover and loss of vegetation.*

Keywords: *Landslide Hazards, Daily Rainfall, Landslide frequency, Landslide Geometry*

INTRODUCTION

A landslide is referred to as the movement of rock, debris or earth down the slope. (Varnes, 1984). Landslides are downward movement of earth slope forming material

without the aid of running water as a transporting agent (Crozier.,1986). Landslide hazard is the probability of landslide occurrence within a specified period and area prone to landslide (Cruden & Varnes, 1996).Landslides are major geological hazards that cause the loss of around 1000 lives and loss of property worth \$4 billion annually (EMDAT, 2007). According to Brabb (1993), at least 90% of landslide losses can be avoided if the problem is recognized before the landslide event. The western flank of the Western Ghats is one of the three major concentrations of landslide hazards in India. Monsoonal rainfall is the main trigger of landslides in India. 89.2% of the total fatalities caused by landslides are triggered by intense rainfall (SADR, 2007).

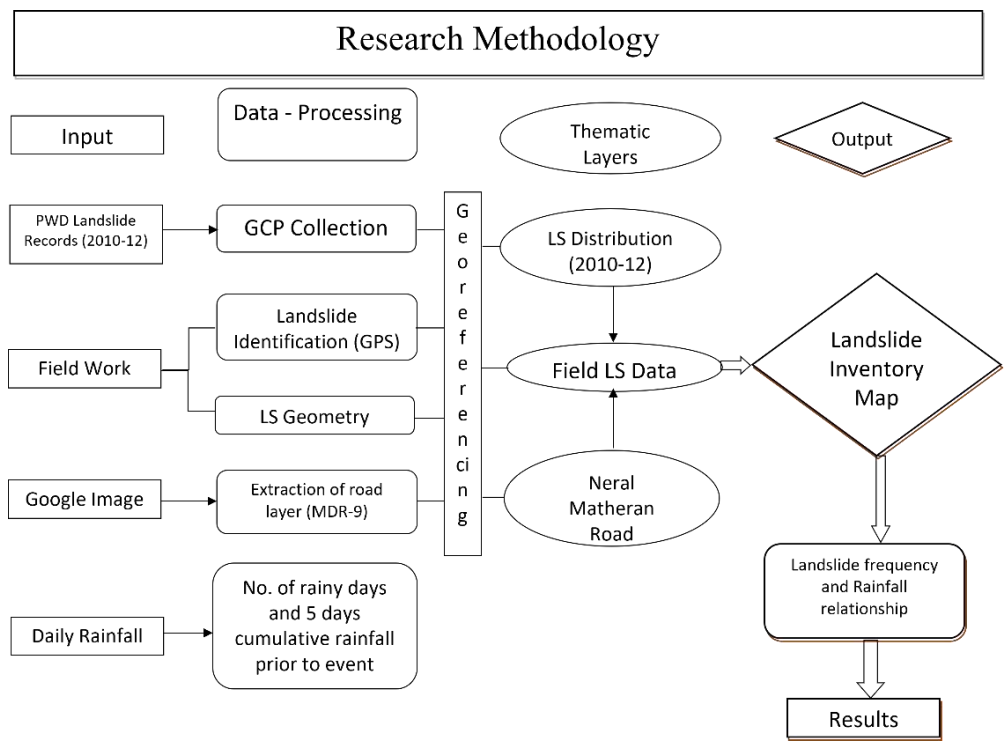
A landslide occurs when soil or worn debris slides down a slope while being pulled downward by gravity. Typically, this movement occurs across a small area or shear surface. One of the three main areas in India where landslide hazards are concentrated is on the western flank of the Western Ghats. The current study uses field research and historical landslide records from the Public Works Department to estimate the frequency and distribution of landslides along the Neral-Matheran road (Main District Road No. 9) in the Raigad District of Maharashtra. Raigad District's Matheran hill station is located 766 meters above mean sea level. The route that runs between Neral to Matheran is 11.50 kilometres long. From 2010 to 2012, a total of 73 landslides were reported. Occurrences of these landslides are mainly associated with rainfall during the monsoon season. Debris slide is a common type of slope failure in this area. Intense monsoon rain is a major landslide-triggering factor responsible for slope failure in the hilly tracks of Matheran. After the analysis of landslide occurrences and rainfall, it is observed that there is a positive correlation between rainfall occurrence and landslide events. It is also observed that rainfall occurrence before landslide events is a major cause of landslides in the study area. Landslides in the study area are often responsible for traffic disruption, loss of topsoil cover and loss of vegetation.

OBJECTIVES OF THE STUDY

- To identify and map Landslides along Neral-Matheran Road.
- To establish a relationship between Landslide occurrence and daily rainfall.

DATA USED

- Google images of the study area have been used to extract road layers.
- Landslide records from Public Works Department, Alibag have been obtained for the period 2010-2012. Besides, newspaper archives have been visited to identify past landslide records.
- Daily rainfall data for the said period have been acquired from the India Meteorological Department, Pune to ascertain the association of rainfall with landslide occurrence.
- GPS surveys and Field investigations have been conducted in the study area. Parameters including location, photographs of the landslide scare, adjacent geomorphology, land use and landcover, landslide geometry parameters, landslide classification etc. have been recorded in the field empirically.



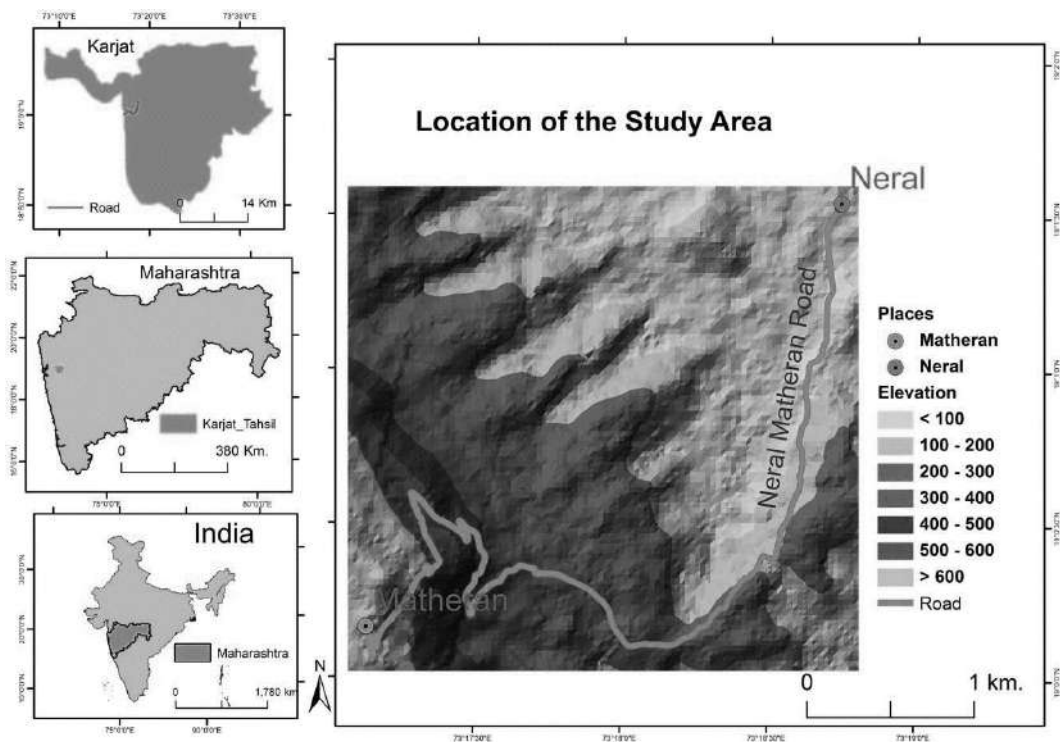
Software used: The data obtained from various sources are analyzed and mapped using ArcGIS 9.3, Global Mapper 8 and Google Earth.

MATERIALS AND METHODS

The present work is an empirical approach to map and analyze the characteristics of landslides along the Neral-Matheran road. The detailed methodology is presented in the flow chart given below.

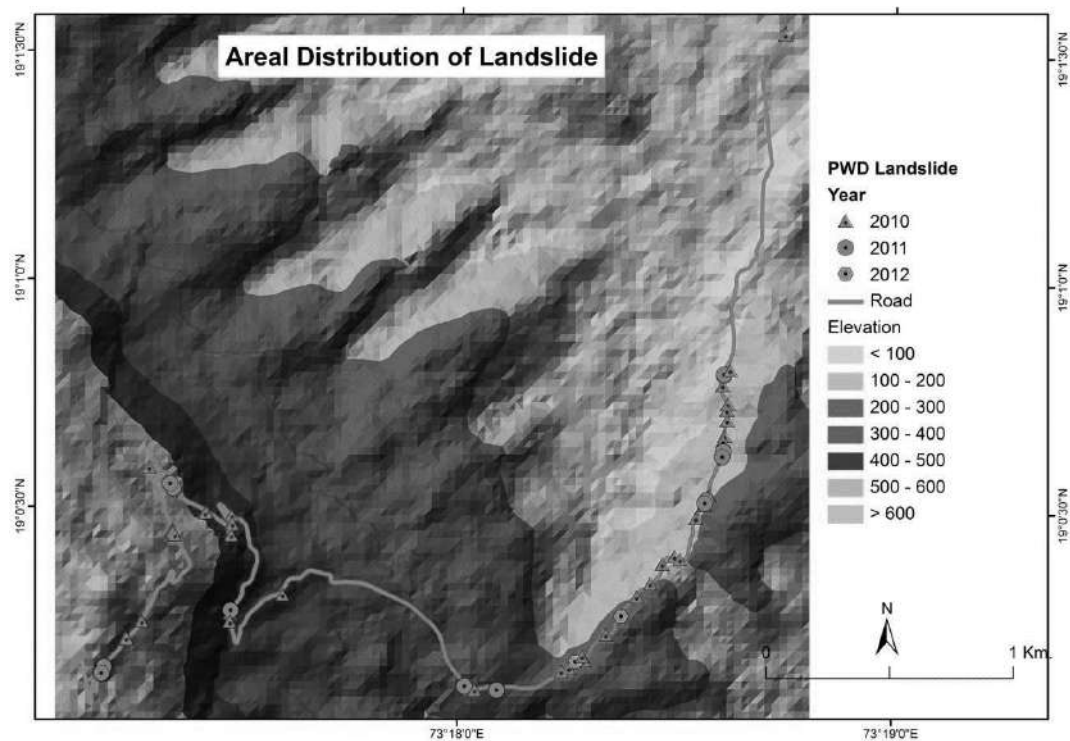
STUDY AREA

Neral - Matheran road (Main District Road No. 9) is an important route connecting Neraland Matheran, a famous hill station in Raigad District of Maharashtra. Matheran is a hill station situated at 766 meters above mean sea level in Raigad District. The total length of the road connecting Neral and Matheran is 11.50 kilometres. The area is situated on a low-level plateau of Deccan Traps. The area is covered by basaltic lava flows of the upper Ratangarh formation classified under the Sahyadri group in the Deccan Traps (GSI, 2001). Primary laterite with a thickness of 10 meters is exposed on the hilltop whereas the middle and lower slopes are dominated by 4Aa flows and Magacryst flows (M2 and M3) and 6 mainly Pahoehoe flows. (GSI, 2001).



RESULTS

A total of 73 landslides have been reported from the year 2010 to 2012. The landslide hazards have been assessed using historical landslide records from the Public Works



Department and field investigations.

Occurrences of these landslides are mainly associated with rainfall during the monsoon season. Debris slide is a common type of slope failure in this area. Intense monsoon rain is a major landslide- triggering factor responsible for slope failure in t he hilly tracks of Matheran. After t he analysis of landslide occurrences and rainfall, it is observed that there is a positive correlation between rainfall occurrence and landslide events. It is also observed that rainfall occurrence before landslide events is a major cause of landslides in the study area. Landslides in the study area are often responsible for traffic disruption, loss of topsoil cover and loss of vegetation. Past landslide records for the period from 2010-2012 have been mapped. The distribution of landslides along Neral-Matheran road depicts that a concentration of landslide events is observed between KM 1/950 to KM 3/500 and KM 6/00 to 7/400. Debris slides and slumps are common types of slope failure in the northern parts of the road whereas rock falls are also observed at some locations near the hilltop of Matheran.

Landslide /inventory distribution map based on records and field investigations can provide the relevant database for Landslide Hazard Assessment. The landslide distribution map of Neral-Matheran road shows two major concentrations; one in the lower slopes (covered by megacrysts 3 and Pahoehe lava flows) and another in the upper hill slopes of Matheran dominated by Aa lava flows. Debris slides and slumps are common types of slope failures in this area followed by a few boulders falls near Matheran hilltop.

Intense and prolonged monsoonal rainfall is an important trigger of landslides in this area though slope failures in this area are caused by complex natural as well as anthropogenic processes. The majority of landslide events in the study area are confined to intense rainfall. July and August are the months with the highest landslide frequency. Due to intense rainfall, the slope-forming material in this area gets saturated with rainwater and the material becomes viscous in nature. After reaching the desired threshold, the material starts moving in a downslope direction under the influence of gravity. Hence, rainfall is proved to be the most important landslide-triggering factor in the study area.

Month	Rainy Days	LS events	% of Average
Jun-10	18	17	131.95
Jul-10	30	18	122.71
Aug-10	28	11	125.41
Sep-10	18	6	118.28
Jun-11	24	5	124.24
Jul-11	27	1	150.4
Aug-11	28	4	121.76
Aug-12	30	2	92.29

CONCLUSIONS

- Landslide /inventory distribution map based on records and field investigations can provide the relevant database for Landslide Hazard Assessment.
- The landslide distribution map of Neral-Matheran road shows two major concentrations; one in the lower slopes (covered by megacrysts 3 and Pahoehe lava flows) and another in the upper hill slopes of Matheran dominated by Aa lava flows.
- Debris slides and slumps are common types of slope failures in this area followed by a few boulders falls near Matheran hilltop.

- Intense and prolonged monsoonal rainfall is an important trigger of landslides in this area though slope failures are caused by complex natural as well as anthropogenic processes.

REFERENCES

Brabb E Proceedings of 7th International Conference and field workshop on landslide in Czech and Slovak Republics. Proposal for worldwide landslide hazard maps 1993, 15-27.

Cruden, D. M., & Varnes, D. J. (1996). Chapter 3 Landslide Types and Processes. *Landslides: Investigation and Mitigation, Transportation Research Board Special Report 247, Washington D.C., Bell 1992, 36–75.*

EM-DAT: *Emergency Disasters Data Base, Volume 2007: Brussels, Belgium, Centre for Research on the Epidemiology of Disasters.* Université Catholique de Louvain: Ecole de Santé Publique;2007.

Varnes, D. I. (1984). Landslide Hazard Zonation: A review of principles and practice. United Nations Scientific and Cultural Organization, Paris.

IDENTIFICATION OF GREEN COVER OF URBAN AREA FROM LISS-III SATELLITE IMAGE USING NDVI TECHNIQUES: A STUDY OF PUNE AND PIMPRI CHINCHWAD CITY

Bambale Anita Vitthal¹, Sagar Bhausaheb Dongare², Pallavi Sunil Subandh³

¹Assistant Professor, Smt. Chandrakala Kishorilal Goyal Arts and Commerce College
Dapodi, Pune, MS, anitavbambale88@gmail.com,

²Assistant Professor, Moolji Jaitha College (Autonomous), Jalgaon, MS

³Assistant Professor, Dr. D. Y. Patil ACS College, Akurdi, MS

Abstract: *Urban areas are characterized by heterogeneous land uses. The city development pattern, socio-economic and anthropogenic activities remote sensing and GIS is the important tool for land cover analysis. This paper analyses per pixel detection of green vegetation cover in Pune and Pimpri Chinchwad cities which cover around 552 sq. km of geographical area. Normalized Difference Vegetation Index (NDVI) is the remote sensing indices applied for land cover analysis in the study area. From the output of NDVI data classification of three different classes of vegetation group according to reflectance value detected from LISS-III sensor and DN value from the same image. The vegetation analysis can be used for the situation of unfortunate natural disasters to provide humanitarian aid, damage assessment and to devise new protection strategies. The output of NDVI data vegetation cover is good for the study area.*

Keywords: *Green Cover, Urban, LISS-III, NDVI Technique, Remote sensing, Multispectral LISS-III, unsupervised classification of NDVI, vegetation area identification.*

INTRODUCTION

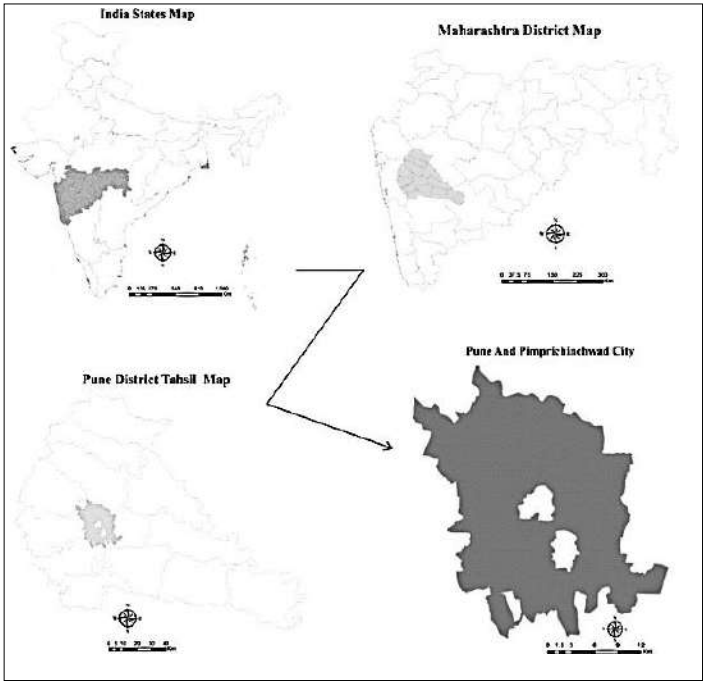
Land Cover detection using satellite data is an important application of remote sensing science Land is one of the prime natural resources of each country. Land Cover is a general term for the human modification of the Earth's terrestrial Surface. It is widely understood

that urban green spaces have a natural ability to filter pollution from the air and reduce local air quality. The satellite data capture using different characteristics of the earth's surface and emittance properties in different parts of the electromagnetic spectrum with the help of different satellite sensors GIS is a powerful tool to analyse and map satellite data. The main aim of this work is to study the spatial distribution of Land Surface vegetation cover using the Normalized Difference Vegetation Index (NDVI) from the use of LISS-III data. Pune is a very fast-growing city in India due to increasing industries and traffic pollution are more in Pune and Pimpri Chinchwad city cause of this we have to monitor the vegetation cover of the city for sustainable growth of Pune city the main aim of this research. according to the satellite data of 2019, Pune city has good vegetation cover.

OBJECTIVE

In the present study, the emphasis is given to mapping of urban land cover transformation process caused due to urban sprawl keeping the main objective of using remote sensing technology and Geographical information system tools. However, the specific study objectives are to analyse of land Cover of Pune and Pimpri Chinchwad city.

Map no. 1



STUDY AREA

The study region of Pune and Pimpri Chinchwad city located in western Maharashtra is located between 18°72'24'' to 18°40'42'' North Latitude and 73°70'99'' to 74°00'72'' East Longitude. In the Study areas, there is an urban area located along the Mula and Mutha Rivers.

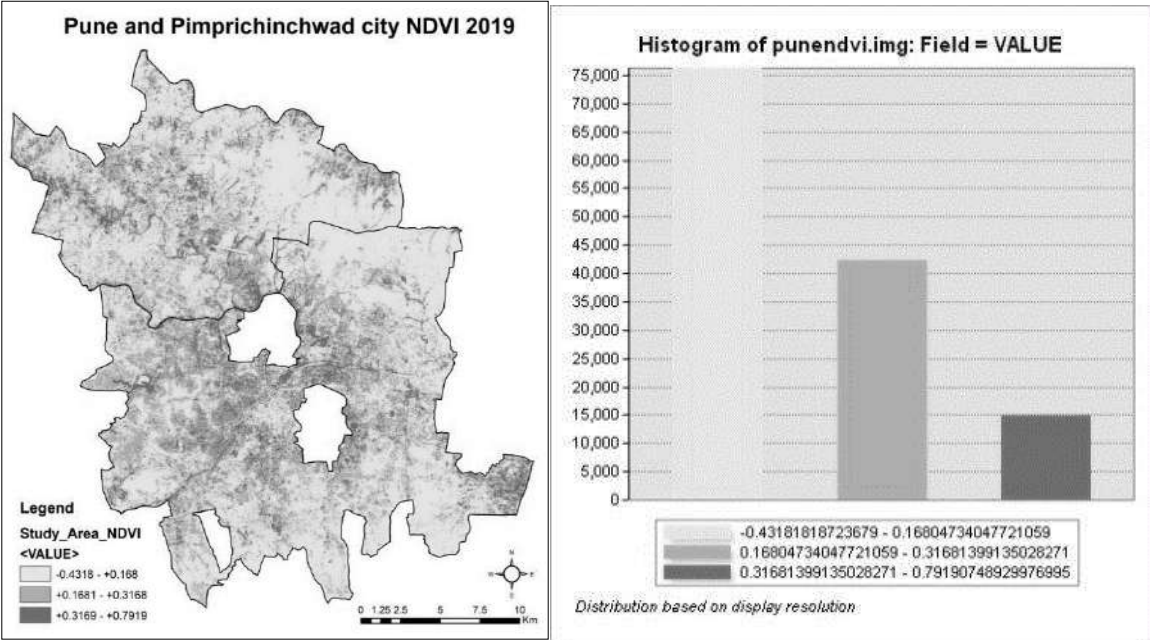
DATABASE AND METHODOLOGY

Use of Multispectral Images: Multispectral remote sensing systems detect variation using radiation in a small number of broad wavelength bands. Multispectral satellite remote sensing technologies have been utilized as a widespread source for remote classification of vegetation cover. Depending on geographic area, vegetation diversity, field size, and vegetation condition their deepness growth using different band ratios of multispectral data and Classifications schemes have been applied Using a multi-date IRS LIIS-III dataset of Pune and Pimpri Chinchwad area to map vegetation distribution area multi-temporal data improve the accuracy of classification. Have used LISS-III Data for the identification of different vegetation classifications for February 2019 data using an unsupervised classification method spatial resolution & spectral band selection affect the classification results depending on spectral s digital number value. The study of this area used multi-date IRS LISS III data for multi-vegetation class identification and difference estimation of each class of study area (Pune and Pimpri Chinchwad). The unsupervised classification of NDVI performs various class vegetation group identification using this group of temporal data generalizes changes of an area of the study area using a comparison of NDVI of the results and with the same class of image. In conclusion, is the use of a histogram of output data of unsupervised classified images of IRS LISS III data it was possible to identify various vegetation areas in the study.

Normalized Difference Vegetation Index: The Normalized Difference Vegetation Index (NDVI) is an index of plant “greenness” or photosynthetic activity and is one of the most commonly used in vegetation identification. Vegetation indices are based on the observation that different surfaces reflect different types of vegetation cover like dense forest or grassland. Photo synthetically active vegetation, in particular, absorbs most of the red light that hits it while reflecting much of the near-infrared light. Vegetation that is dead or stressed reflects more red light and less near-infrared light. Likewise, non-vegetated surfaces have a much more even reflectance across the light spectrum. By taking the ratio of red and near-infrared bands from a remotely-sensed image; an index of vegetation “greenness” can be defined. The (NDVI) is probably the most common of these ratio indices for vegetation. NDVI is calculated on a per-pixel basis as the normalized difference between the Red and near-infrared bands from an image. $NDVI = (Near\ Infra-Red - Red) / (Near\ Infra-Red + Red)$.

RESULT AND DISCUSSION

The Normalized Difference Vegetation Index (NDVI) is a simple numerical indicator that can be used to analyse remote sensing measurements, typically but not necessarily from a space platform, and assess whether the target being observed contains live green vegetation or not. $NDVI = (Near\ IR - Red) / (Near\ IR + Red)$ The sub-scene bands 2 and 3 for each were used to create an NDVI from the image and then differencing of the images was carried out to detect vegetation cover. Differencing involved the subtraction of the February 2019 data NDVI image using a calculator in the software.

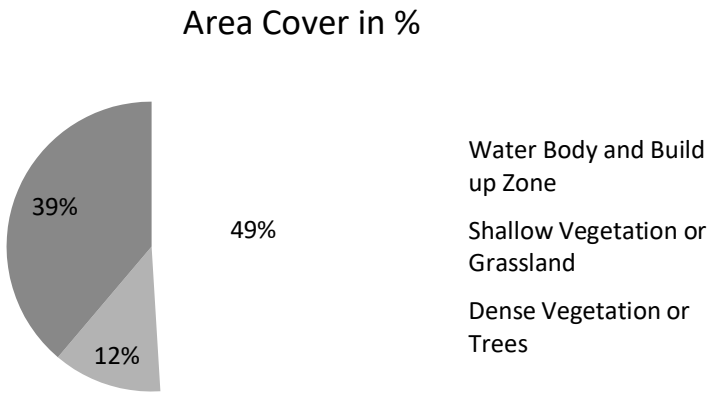


Map no. 2

Graph no 1

The Index(Map no2) shows data for NDVI difference Value used for built-up and water ranges from -04318 to 0.168 NDVI value for open grassland between 0.1681 to 0.3168 and Dense Vegetation or Trees are 0.3169 to 0.7919 using a histogram (Graph no1) generated from NDVI from this data prepare a pie chart(Graph no2) shows that Water Body and Build up Zone highest land use is 49.02% in study area flowed by Shallow Vegetation or Grassland is 12.15% and Dense Vegetation or Trees 38.82% from this data the study area has very good distribution of Vegetation cover.

Class	Area Cover in %
Water Body and Build-up Zone	49.02
Shallow Vegetation or Grassland	12.15
Dense Vegetation or Trees	38.82
	100



Graph no2

REFERENCES

Bharat L. Gadakh, Ravindra G. Jaybhaye, Analysis of Land Use and Land Cover on using Remote Sensing and GIS Techniques: A Case Study of Nashik City, Maharashtra.

Alisha Chowdhury, Venkata Sai Krishna Vanama, Valliappan AL3 Examining The Effect of The Physical Characteristics of The Urban Green & Blue Spaces In Heat Mitigation: A Case Study Of Pune.

Krishna Das NDVI and NDWI-based Change Detection Analysis of Bordoibam Beelmukh Wet landscape, Assam using IRS LISS III data

Dongare Sagar Bhausahab, Detection Of Agriculture Area of Sangamner Tahsil from Liss-Iii Satellite Image Using NDVI Techniques.

Rajesh K Dhumal, Yogesh, Rajendra, K. V. Kale, S. C. Mehrotra, Classification of Crops from Remotely Sensed Images: An Overview

Rubina Parveen, Dr. Subhash Kulkarni Dr. V.D. Study of IRS 1C-LISS III Image and Identification of Land Cover Features Based on Spectral Responses

SUSTAINABLE DEVELOPMENT OF SPATIO-TEMPORAL CHANGES IN LAND USE AND LAND COVER (LULC) OF THE UPPER KUNDALIKA RIVER BASIN.

Mr. Rajendra Mahadeo Shingate

Dr. Patangrao Kadam Arts and Commerce College, Pen

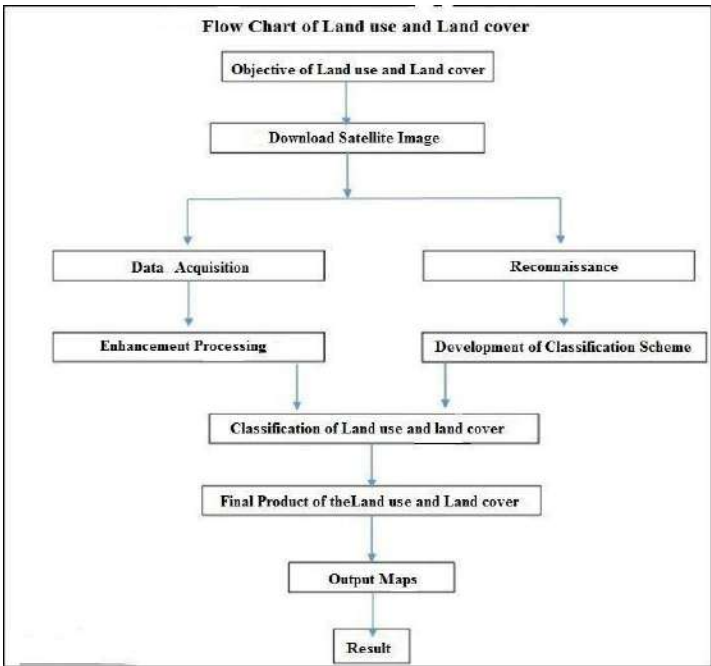
Abstract: *The research has main objective is to analyze the change of land use patterns and their spatial variations in the study area. The research methodology is LULC classification involves the development of Training Patterns using Unsupervised Classification followed by classifying pixels with supervised classification i.e. Hybrid Classification. The present study introduces the collective use of Unsupervised as well as Supervised Image Classification Techniques to detect LULC classes. The Digital Satellite Image-based Classification acts as an effective tool for the classification of Land Use and Land Cover (LULC) into classes like Building, Agricultural land, Barren land, Vegetation covers, and Water bodies. Digital Satellite Image-based Classification uses Recognizing, Delineating and Mapping as key steps. Land Use and Land Cover (LULC) is a significant component to understanding the interactions of human accomplishments with the situation and thus it is necessary to monitor and put on variations. The present study identifies changes in Land Use and Land Cover (LULC) in the Upper Kundalika River watershed over the span of twenty years (2001 and 2021).*

INTRODUCTION

The research region is divided between two districts in Maharashtra: Pune District and Raigad District. Figure 1.1 shows the latitudinal extent of 18°20'North to 18°35'North and the longitudinal extent of 73°40'East to 73°11'East. This area is covered by the SOI toposheets 47F/3, 47F/6, and 47F/7. The Upper Kundalika continues a reasonably straight course in an E-W direction until it reaches Roha when it then turns SE-NW. The Upper Kundalika was a tiny river that flowed from the Sahyadri hills to the Arabian Sea. The Upper Kundalika basin was 42.5 kilometres long and had a total area of 356.74 square kilometres.

From 2001 to 2021, this chapter examined spatial and temporal trends in land use and cover. This occurred due to environmental, anthropological, and physiographic/climatic changes. To address Land Use and Land Cover changes, researchers chose Agriculture, Built, Water Bodies, Barren Land, and Vegetation. These modifications were summarized using Remote Sensing and GIS for satellite image analysis. The researcher used Hybrid Classification because it has 91.57% accuracy. Scientific research and policymaking are more accurate using Hybrid Classification. Kappa Co-efficient computing is recommended by researchers.

METHODOLOGY



LULC classification uses Hybrid Classification to categorize pixels after developing Training Patterns using Unsupervised Classification. This work combines unsupervised and supervised image classification to find LULC classes. Spectral Recognition of the Unsupervised Classification in performance mode and sample site selection from a PCA picture of the Supervised Classification in training mode are developed. Heckbert Quantization and Maximum Likelihood (ML) are then used in the Unsupervised and Supervised Classification Algorithms. Researchers tested Hybrid Classification using 2001 and 2021 Landsat ETM+ and 8 OLI photos. The present study has used Primary as well as Secondary databases where Primary data was collected through GPS survey and Fieldwork.

FIELDWORK

Pre-field work involves the introductory field visit to carefully chosen appropriate

locations, the literature assessment, the preparation of a database for a base map of the study area, observation in the field, identification of landforms, and GPS Survey for marking location. The researcher has adopted the classification process for Land Use Land Cover as portrayed in the flow Chart Fig. No. 1.1.

LAND USE AND LAND COVER (LULC) CLASSIFICATION SYSTEM

The National Remote Sensing Centre's (NRSC 2006) Categorization Scheme for Land Use and Land Cover prescribes three Categorized Levels. Table 1.1. illustrates the taxonomy of Land Use and Land Cover (LULC) types at various phases. The general pattern of Land Use and Land Cover (LULC) Classificationⁱ for the present study was reached at two separate points. Based on the Spatial Resolution of the employed satellite data, levels I and II are classified.

Table 1.1: Land Use and Land Cover (LULC) classification system

Sr. No.	LULC Level - I	LULC Level - II	LULC Level – III
1	Built-up Land	Urban	Residential, Mixed built-up, Public / Semi-Public, Communication, Public utilities/facility, Commercial, Transportation, Reclaimed land, Vegetated Area, Recreational, Industrial, Industrial / Mine dump, Ash / Cooling Pond
		Rural	Rural
2	Agricultural Land	Crop Land	Kharif, Rabi, Zaid, Two cropped, more than two cropped
		Plantation	Plantation - Agricultural, Horticultural, Argo- Horticultural
		Fallow Land	Current and Long Fallow
3	Vegetation	Evergreen/ Semi-evergreen	Dense/Closed and Open category of Evergreen / Semi-evergreen
		Deciduous	Dense/Closed and Open category of Deciduous and Tree Clad Area
		Forest Plantation	Forest Plantation
4	Wasteland / Barren Land	Scrub land	Dense/Closed and Open category of scrubland
		Barren rocky	Barren rocky
5	Water bodies	River and Lakes	Perennial & Dry River, Lakes, Reservoirs and Tanks
		Canals	Line & Unlined Canal/Drain

GROUND TRUTH DATA COLLECTION AND CROSS-VERIFICATION

Ground Truth Verification is done under uncertain land use and cover. Field visits from 2015 to 2020 validated uncertain locations in the research area and provided topographical conditions and Land Use and Land Cover (LULC) patterns for theme information modification. GPS surveys of the study region in various seasons are used in this step. It helped explain Land Use and Land Cover (LULC) and real changes in the studied region.

POST FIELD MODIFICATION

Corrections and modifications of Unsure Land Use and Land Cover (LULC) if any were done through the Ground Intelligence and the summary was attached to the final Land Use and Land Cover (LULC) map.

ACCURACY ASSESSMENT

Satellite images of Landsat were classified through the *Hybrid Classification Method* to check the accuracy of the Land Use and Land Cover (LULC) class with Ground Truth Information before it can be used in scientific investigations and decision-making policies (Jensen, 2005).

The Kappa coefficient sorts between 0-1 and a Negative Kappa is an indicator of very poor classification (Lille sand et al., 2000). The Kappa statistic was calculated from the result of the Land Use and Land Cover (LULC) classification, with six classes shown in the above table. The agreement standards for Kappa statistics were defined by Landis and Koch (1987). The agreement is *poor* when K is less than 0.4, *good* when K is between 0.4 - 0.7 and *excellent* when K is more than 0.75.

The quantitative assessment of the K_{hat} (Kappa) coefficient was measured which was found to be 0.79 for 2001 and 0.85 for 2021 images. Since the overall accuracy obtained for the past two decades of images was above 70% and overall kappa statistics were above 0.7, it indicated that *the classification accuracy was reasonably excellent*.

LULC CLASS	2001		2021	
	Producers	Users	Producers	Users
Water Body	89.9	85.2	82.8	86.1
Vegetation	73.4	88.2	84.1	82.6
Agriculture	89.9	84.8	87.1	86.8
Settlement or Built-up land	90.1	91.4	84.6	89.2
Waste Land or Barren land	77.8	76.1	88.6	80.2
Overall Accuracy	86.5		88.4	
Kappa Coefficient	0.79		0.85	

Table 1.2: Kappa Accuracy assessment of classified Landsat images

DATA ANALYSIS

The rate of change was calculated for each Land Use and Land Cover (LULC) class and presented in Table 1.2 using the following formula.

$$RateofchangeinPercent\ (PercentArea\ /\ year) = (R\% - P\%) /\ Y$$

Where:

- R = Recent area of LULC in Percent,
- P = Previous area of LULC in percent,
- Y = Interval between X and Y in years

RESULT AND CONCLUSION

Change detection involves monitoring an object or event over time to identify changes (Singh, 1989). Effective use of Satellite Remote Sensing Data for Land Cover Change Detection requires an understanding of landscape features, imaging technologies and information extraction methods related to the analysis's aims (Yang and Lo, 2002). An appropriate change recognition approach determines categorization and if substantial change data can be obtained from the picture (Jensen, 2005). A post-classification change detection method was applied. Even if post-classification accuracy relies on it.

The objective of this effort is to create Temporal Land Cover and Land Use Maps quickly for change detection research. Although this hybrid technique performs better at discriminating between different types of land cover, particularly in the higher section of the research region.

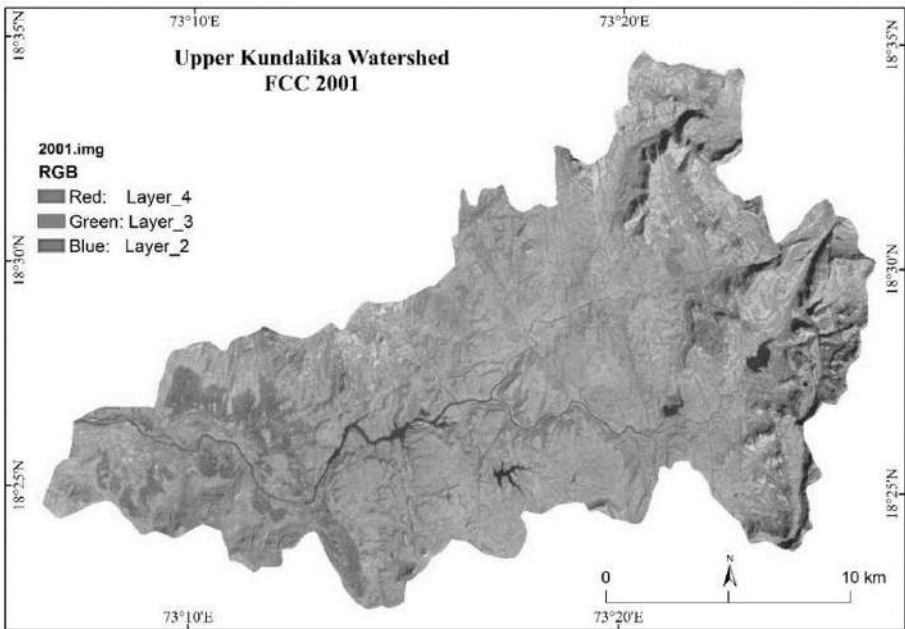


Figure 1.2: False Colour Composite of 2001

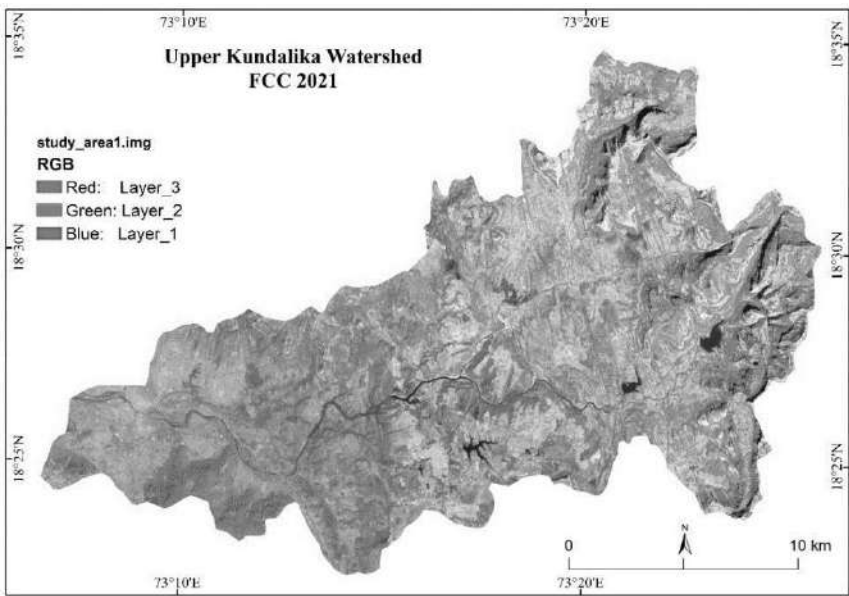


Figure 1.3: False Colour Composite of 2021

The Upper Kundalika River Watershed has been classified using Supervised Classification Techniques divided into five Land Use and Land Cover (LULC) classes. The composition

and distribution of Land Use and Land Cover (LULC) classes of images include Settlement or Built-up land, Agriculture, Water bodies, Vegetation and Barren land. The Land Use and Land Cover (LULC) Map illustrates Spatial and Temporal variation in the given study area. The finding reveals that there were drastic and rapid change increases in the built-up area and decreases in the area of Barren land.

Table 1.3: LULC classification Landsat images 2001

Sr. No.	Class	Area in Hectors	Area in Percent
1	Agriculture	2317.80	6.21
2	Waterbody	649.56	1.74
3	Built-up Land	1850.98	4.96
4	Barren Land	22828.68	61.20
5	Vegetation	9654.48	25.88
Total		37301.50	100.00

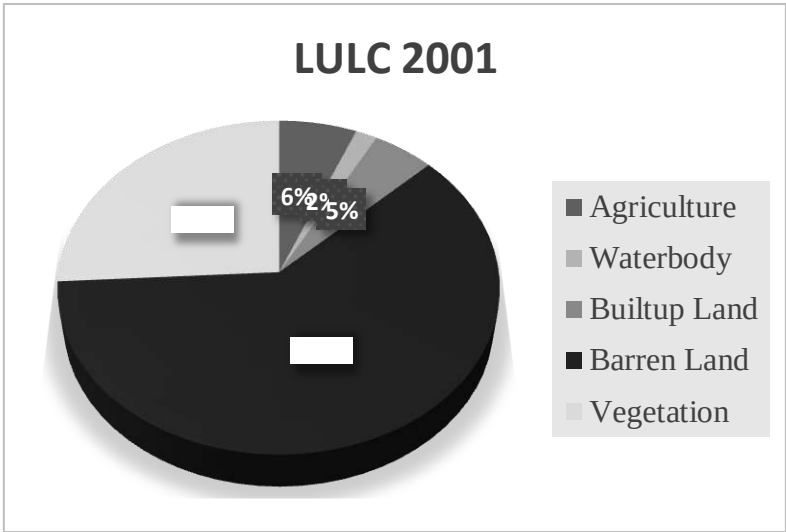


Figure 1.4: LULC classification Landsat images 2001

Table 1.4: LULC classification Landsat images 2021

Sr. No.	Class	Area in Hectors	Area in Percent
1	Agriculture	1131.84	3.04
2	Waterbody	301.41	0.81
3	Built-up Land	5275.90	14.15
4	Barren Land	16950.30	45.47
5	Vegetation	13620.70	36.54
Total		37301.50	37280.15

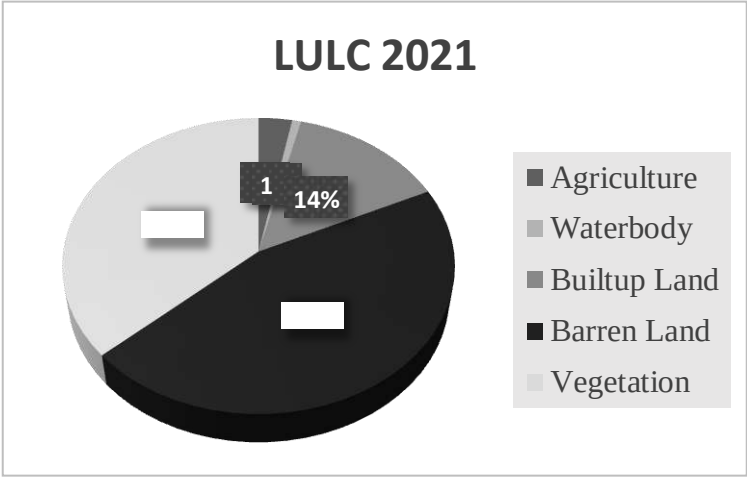


Figure 1.5: LULC classification Landsat images 2021

The Kundalika River watershed has been classified using the Supervised Classification Technique into five Land Use and Land Cover (LULC) classes. Table 1.4 represents the LULC of the year 2001 having the highest concentration of Barren land or Wasteland followed by Vegetation while the Water body and Built-up land are occupied by very little area in the study region. Figures 1.4 and 1.6 also represent the graphical and Spatial distribution of LULC classes in the study region.

Table 1.5 represents the LULC of 2021 having also the highest concentration of Barren land followed by Vegetation while the Water body and Agriculture are occupied by very less area in the study region. Figures 1.5 and 1.6 also represent the Graphical and Spatial distribution of LULC classes in the study region respectively.

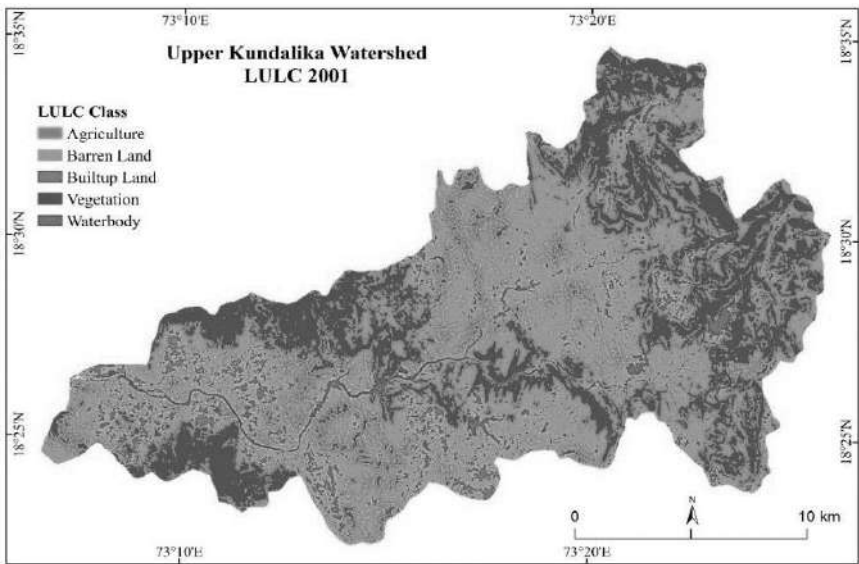


Figure 1.6: Spatial Distribution of LULC classification Landsat images 2001

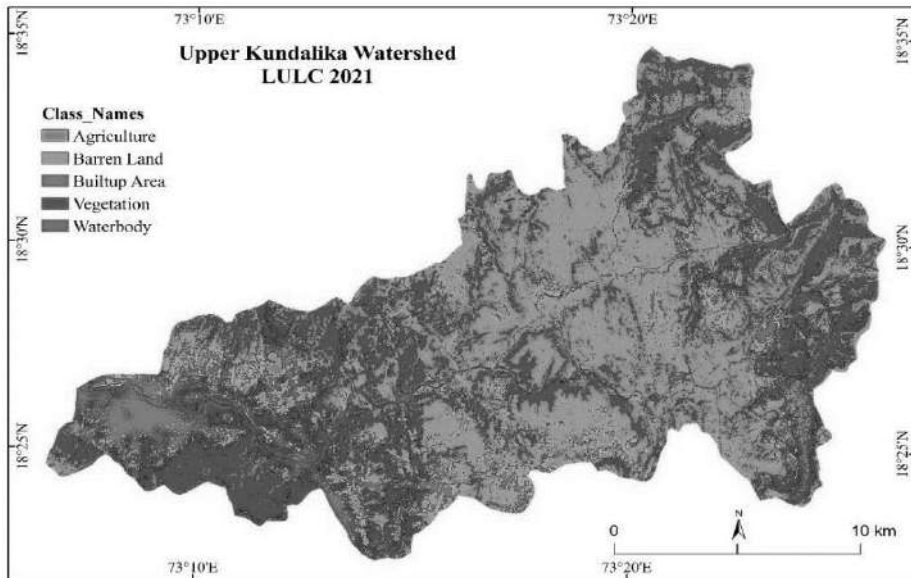


Figure 1.7: Spatial Distribution of LULC classification Landsat images 2021

SETTLEMENT OR BUILT-UP LAND: The study area indicates that the Built-up area has increased from 1850.98 hectares, and 5275.90 hectares in 2001 and 2021 years respectively. The built-up area has increased respectively by 4.96 percent and 14.15 %. The built-up area has increased because of the increase in population, therefore agricultural laying areas are converted into Built-up areas in the study area Roha Kolad, Pale and Chinchvi and other major villages. These cities are rapidly increasing in population as well as built-up areas in the study region.

AGRICULTURE: The analysis of spatial change indicates the expansion of urban settlement over prime agricultural land in the area. The area under agriculture has decreased from 2317.79 hectares in the year 2001, and 1131.84 hectares in 2021 year. Agricultural land decreases from the year 2001 to 2021 in almost half of the area. With Steep, Slopes and Rigid Topography near hilly areas, the Konkan Region has always become less favourable for agriculture therefore fruit plant comprises a main part of agriculture in the study region.

BARREN LAND OR WASTELAND: Barren Land is land occupied by hilly and relatively slope areas that are not used for growing crops. The land is capable of growing crops only with proper plans and practices. The area under the Barren land has decreased from

22828.68 hectares in year 2001 to 16950.3 hectares in year 2021year. The change detection represents that the given area was used for Vegetation plantation and agricultural practices.

WATERBODY: In 2001, Water bodies in the Upper Kundalika River watershed covered 649.56 hectares which later declined to 301.41 hectares in 2021. The Water bodies in the Upper Kundalika River watershed basin include the Mhasewadi dam as a major reservoir followed by the Bhira dam reservoir and other small tanks as well as channels. The percentage of water bodies represents a decline due to the seasonal and monsoon impact of the study region.

VEGETATION: In the given study area, forest cover is well distributed in hilly regions. It is above the average forest cover of India and Maharashtra with 9654.48 hectares which was 25.88 % in 2001 and later increased to 13620.7 hectares i.e., 36.54 % in 2021. Sustainable Watershed Conservation Practices and Horticulture (mainly in fruit crops) have increased the forest cover in the study region.

DRIVING FORCE: The yearly population increase has changed the land cover. However, population increase and land cover change may not be linked. Some say population increase boosts resource availability. The change detection analysis of the study region in Table 1.7 shows that most desert land was converted to agriculture. Except for dry terrain and heavy vegetation, all LULC classes rise. Additionally, agricultural, construction, and water body regions are rising.

Table 1.5: LULC classification Changes from 2001 to 2021

Sr. No.	Class	LULC 2001		LULC 2021		Percent Change	
		Area	Area in Percent	Area	Area in Percent	Change in Area	Yearly Percent Change
1	Agriculture	2317.80	6.21	1131.84	3.04	-3.18	-0.16
2	Waterbody	649.56	1.74	301.41	0.81	-0.93	-0.05
3	Built-up Land	1850.98	4.96	5275.90	14.15	9.19	0.46
4	Barren Land	22828.68	61.20	16950.30	45.47	-15.73	-0.79
5	Vegetation	9654.48	25.88	13620.70	36.54	10.65	0.53
Total		37301.50	100.00	37280.15	100.00		

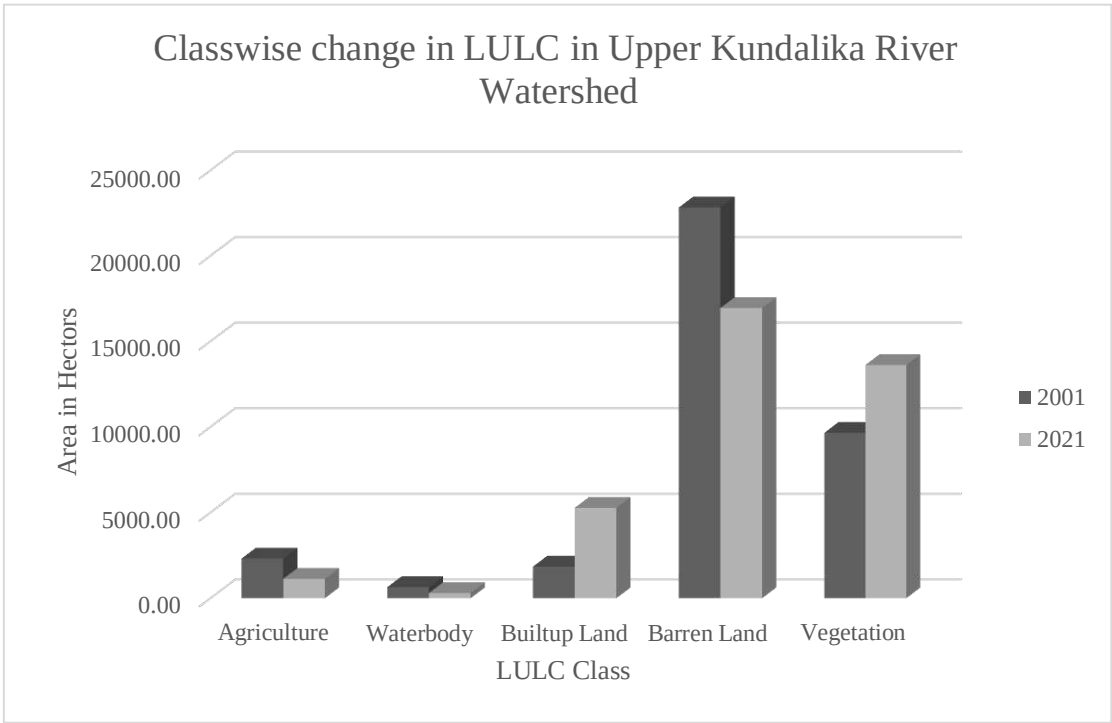


Figure 1.7: Change in LULC classification from 2001 to 2021.

REFERENCES

SLUSI (2012). The Watershed Atlas of India, Soil and Land Use Survey of India (SLUSI), IARI Building, PUSA, Delhi.

Singh, S. (1999). Geomorphology, Chapter 19: Morphometry of Drainage Basins. Prayag Pustak Bhavan, Allahabad, pp.353-384.

NRSA (1995). Integrated Mission for Sustainable Development Technical Guidelines. National Remote Sensing Agency (NRSA), Dept. of Space, Govt. of India, 182 Hyderabad

NRSA (2006). Manual National Land Use and Land Cover Mapping using Multitemporal Satellite Data. Land Use Division, NRSA, Hyderabad, May 2006, pp. 18-56.

MORPHOMETRIC ANALYSIS OF THE IRAI RIVER BASIN FOR SUSTAINABLE WATER CONSERVATION IN CHANDRAPUR DISTRICT OF MAHARASHTRA

Sheetal S. Asekar¹ Dr. Ramesh H. Gavit²

¹Research Scholar, Department of Geography, University of Mumbai.

² Associate Professor, Department of Geography, University of Mumbai.

Abstract: *Land, water and soil are such natural resources that have the potential to fulfil human needs. The sustainability of water conservation is the need of the hour to mitigate the demand and supply gap between resources and ever-increasing demand, it is of prime importance to conserve natural resources with proper techniques for sustainable development. Morphometry is a measurement and mathematical analysis of landforms. The linear and areal morphometric aspects are significant for sustainable water conservation. The entire study area is drawn from a survey of India (SOI) topomap on a scale of 1:50,000 and as a scan map digitized and processed in ArcGIS 10.2. Software. The drainage pattern of Erai River is dendritic and the stream orders of the basin area are mainly controlled by physical and lithological conditions of river basin area there is good groundwater potential.*

Keywords: *Remote sensing, GIS, Morphometric analysis, Conservation, Water Sustainability*

INTRODUCTION

Land and Water are both the most important natural resources of the earth as life and various development activities depend on them. These resources are limited and their use is increasing day by day due to population growth. Therefore, Sustainable Development of a country like India requires planning, conservation of water resources and better management for its sustainable use, watershed management plays an important role in the conservation of water and soil resources and their sustainable development. Problems of

drought, flood, overflow, soil erosion, human health and low productivity can be overcome by adopting good watershed management practices.

Horton (1932,1945) has highlighted the need for quantitative geomorphological analysis in water resources management. Many geographers have since developed methods of watershed morphometry (Strahler, 1957, Szilard & Singh, 2016; Singh Mustak, Srivastava, Szabo & Islam, 2015; Yadav, Singh, Gupta & Srivastava, 2014) and more authors used remote sensing and GIS tools in morphometric analysis, Morphometric analysis is an important tool for Sub – Watershed prioritization regardless of Soil map (Biswas, Suahakar& Desai, 1999) Morphometry is a measure of the configuration of the shape of the Earth's Surface and its topological dimensions (Clark,1996). It provides quantitative descriptions of drainage basins that are very useful in studies such as hydrologic modelling, Watershed prioritization, natural resource conservation and management and rehabilitation.

The Literature review suggests that previously drainage morphometric parameters were extracted from either topographic maps or field surveys with the advent of the High-Resolution Digital Elevation Model (DEM); the majority of researchers have obtained morphometric parameters from the shuttle Radar Topographic Mission (SRTM), DEM and CRARTOSAI DEM. (Yadav et al, 2014, 2016). These satellite products provide a great way to predict accurate Morphometric parameters due to the sophisticated computer program for any basin in high spatial resolution and fast way.

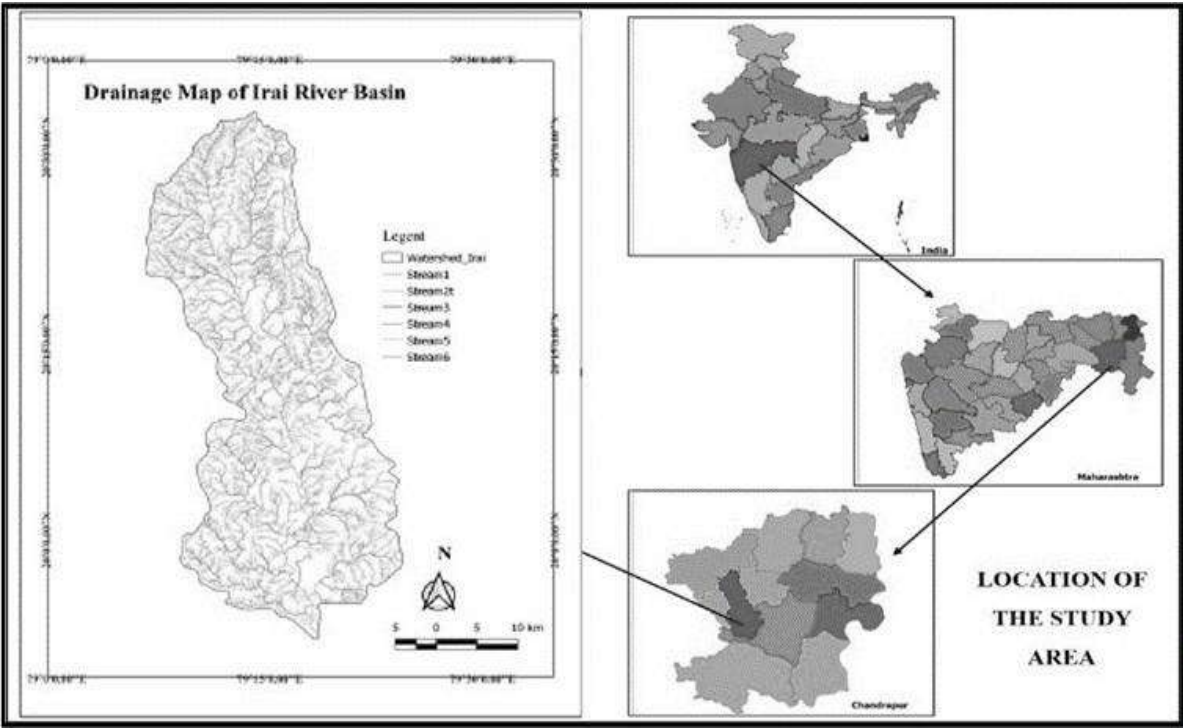
The Morphometric parameters of any watershed play an important role in Sub – Watershed prioritization, In the present study, Morphometric analysis and primary authentication of sub – Watersheds are carried out for the watershed of the Irai River basin in Chandrapur district of Maharashtra, India, the objectives of the present study are to derive morphometric parameters like Linear and Areal from DEM using GIS technique.

STUDY AREA

Irai River falls in Chandrapur District of Maharashtra state. It covers an area of 1303.5 km². The Irai River basin is geographically located between 19⁰45'N to 20⁰30'N latitude and 79⁰0'E to 79⁰30'E longitude. Irai Rive is a tributary of the Wardha River Chandrapur is situated on the eastern edge of Maharashtra state in 'Vidarbha' region. Geologically,

Chandrapur district forms a part of the Gondwana sedimentary basin. The Gondwana sedimentation took place in Wardha Valley where Gondwana sediments have overlay the Archean rocks. The Wardha River flows into the district from the western boundary and then flows along the boundaries of Warora, Chandrapur, Korapna, Rajura, Ballarpur and Gondpipri talukas. Penganga and Irai rivers are tributaries of Wardha River.

Map 1. Location map of the study area



OBJECTIVES

- 1. To study linear and areal aspects of the Irai river basin.
- 2. To evaluate watersheds for sustainable development.

METHODOLOGY

The entire study area is drawn from a survey of India toposheet (SOI) i.e. 55^{P/2}, 55^{P/3}, 55^{P/4}, 55^{P/6}, 55^{P/7}, 55^{P/8}, 56^{M/1}, 56^{M/5} on 1:50,000 Scale. The topographical maps were georeferenced. Morphometric analysis of the drainage system requires a description of all existing streams, Drainage basins were digitized for morphometric analysis in ArcGIS 10.2

software, Attributes were assigned to create a digital database for the drainage layer in the river basin, various morphometric parameters such as liner and areal aspect of drainage basin were calculated, Digitization work was performed for a complete analysis of the drainage morphometric network, different morphometric parameters have been determined according to the standard method applied (Table 1) to performed morphometric analysis of the basin.

Table 1. The formula used for the Computation of Morphometric Parameters.

Morphometric Parameters	Formula/Definition	References
Stream order(U)	Hierarchical order	Strahler,1964
Stream Length (L _u)	Length of the stream	Hortan,1945
Mean stream length (L _{sm})	L _{sm} =L _u /N _u ;Where, L _u =Mean stream length of a given order (km), N _u =Number of streams Segment	Hortan,1945
Stream length ratio (R _L)	R _L =L _u /L _{u-1} where, L _u =Total stream length of order (u), L _{u-1} = The total stream length of its next lower order.	Hortan,1945
Bifurcation Ratio (R _b)	R _b =N _u /N _{u+1} where, N _u =Number of stream segments present in the given order N _{u+1} =Number of segments of the next higher-order	Schumn 1956
Basin relief (B _h)	Vertical distance between the lowest and highest points of the basin	Schumn 1956
Relief Ratio (R _h)	R _h =B _h /L _b where, B _h =Basin relief, L _b =basin length	Schumn 1956
Ruggedness Number (R _n)	R _n =B _h ×D _d where, B _h =Basin relief, D _d =Drainage density	Schumn 1956
Drainage density (D _d)	D _d =L/A where, L=Total length of stream, A=Area of basin	Hortan,1945
Stream frequency (F _s)	F _s =N/A where, N=Total number of streams, A=Area of basin	Hortan,1945
Texture ratio (T)	T=N ₁ /P where, N ₁ =Total number of first-order streams, P=Perimeter basin.	Hortan,1945

Form factor (R _f)	$R_f = A/(L_b)^2$ where, A= Area of basin, L _b =Basin length	Hortan,1945
Circulatory ratio (R _c)	$R_c = 4\pi A/P^2$ where A=Area of basin, $\pi=3.14$, P=Perimeter of basin	Miller,1953
Elongation ratio (R _e)	$R_e = \sqrt{(A/\pi)}/L_b$ where, A= Area of basin, $\pi=3.14$, L _b =Basin length	Schumn 1956
Length of overland flow (L _g)	$L_g = 1/2D_d$ where, Drainage density	Hortan,1945
Constant channel maintenance (C)	$C = 1/D_d$ where Drainage density of basin	Hortan,1945

RESULTS AND DISCUSSIONS

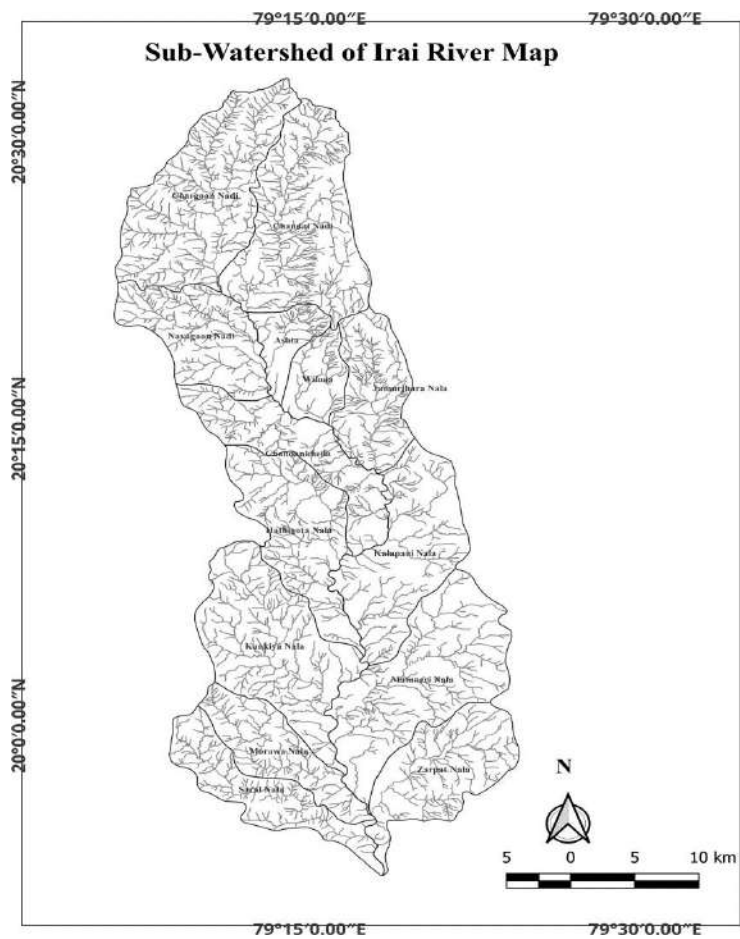
The study of basin morphometry deals with the transmission of water and sediment through a basin and stream network geometries, to systematically describe the geometry of a drainage basin and its flow channel, it is necessary to measure the linear aspects of the drainage network. The Areal aspects of the drainage basin, the relief aspects of the channel network and the contributing ground slopes (Strahier,1964). In the present study morphometric analysis is performed in terms of stream order, stream length, bifurcation ratio, Stream length ratio, drainage density, stream frequency, elongation ratio, circularity ratio, form factor etc., Using the mathematical formula given in (Table 1), and the results are summarized in Table (2,3 and 4). The properties of the flow network are very important for studying the process of landform formation (Strahler, and Strahler, 2002). Morphometric parameters such as relief, shape and length also strongly influence the basin discharge pattern by different efferent effects on log, time. (Gregory and Walling, 1973). Natural runoff is the most powerful geographical agency shaping the area’s landscape. The land area supplies small streams of water to the mainstream from its catchment area of the drainage basin. The flow structure in the drainage system forms the drainage pattern, which in turn reflects the structural or lithological controls of the underlying rocks (Eesterbrooks, 1969).

The hydrological and morphological behaviour of any basin can be best understood through the areal and relief morphometric parameters, respectively.

1. Linear Morphometric Parameters

In the present study linear aspects of the morphometric analysis of drainage basin consist of aspects like stream order, stream length, mean stream length, bifurcation ratio, stream length ratio etc. Sub-basin-wise mathematical calculation of the liner aspect of the Irai River is given in the table. no.2

Map 2: Drainage map of the study Area Showing Stream Ordering



1.1. Stream Order

Stream ordering is the first step taken in any drainage basin analysis. In this work, the streams are sorted according to the method suggested by Strahler (1964). There are 3236 streams linked with 6 orders of streams (Table No.2) spread over an area of 1303.5 sq. km. The Streams of the Irai River basin have been ranked according to the method described by Strahler (1964) when two 1st order channels give a channel segment of 2nd order. Two 2nd order streams join to form a segment of 3rd order and so on, when two channels of different orders join then the higher order is maintained. It is found that the Irai River tributaries area of 6th order drainage basin. It is observed that as stream order increases the stream number decreases. Thus, the law of the lower the order higher the number of streams is implied throughout the catchment.

Table 2. Linear Morphometric Parameters

Sr. No	Sub – Basin	Stream Order	Stream Order (in %)	Stream Length	Stream Length (in %)	Mean Stream Length (in %)	Bifurcation Ratio (Rb)
1	Chargaon Nadi	371	15.21	325.34	13.65	8.82	17.98
2	Chandai Nadi	351	14.39	326.31	13.69	6.52	17.19
3	Navegaon Nadi	170	6.97	150.54	6.32	6.33	17.22
4	Ashta Nadi	66	2.70	54.96	2.31	4.87	8.63
5	Wiloda	58	2.37	56.55	2.37	2.75	12.02
6	Jamarjhari Nala	186	7.62	154.49	6.48	5.91	15.32
7	Chandankheda	161	6.60	144.25	6.05	6.70	13.93
8	Hathigoda Nala	177	7.25	179.52	7.53	5.75	14.15
9	Kalapani Nala	135	5.53	165.09	6.93	8.39	15.61
10	Kankiya Nala	192	7.87	234.66	9.84	9.66	15.52
11	Mataneri Nala	163	6.68	204.42	8.58	11.02	17.43
12	Morawa Nala	133	5.45	120.85	5.07	7.67	15.35
13	Sara lNala	132	5.41	121.19	5.08	9.99	15.07
14	Zarpat Nala	144	5.90	145.18	6.10	5.62	14.46

Source: Compile by researcher

1.2. Stream Length

The length of the stream is the most important variable in a drainage basin. The stream lengths of the Irai River basin were calculated based on the law proposed by (Horton, 1945). Horton's second law suggested that the length of a stream increases as the order of

flow decreases. It means that the flow length is the maximum for the first-order stream. The total length of the Irai River is 2407.13 km., the sequential stream lengths are expressed in (table – 2). This explains the permeability of rock formation in the basin. The change may indicate the flowing of streams from high altitudes, lithological variation and moderately steep slopes (Singh 1997).

1.3. Mean Stream Length (L_m)

The stream length of various orders is calculated as a topographical map. Horton's low stream Length (Horton, 1932) supports the theory that geometrical similarities are generally preserved in the basins of increasing order (Strahler, 1964). The average channel ^{L_u} length of order U is the ratio of the total length of the number of streams of the given order. The average length of the channel segments of a given order but shorter than the next higher order. The mean stream length is presented in (Table – 2). In the study area, it is noted that L_m varies from 0.71 to 79.7 km

1.4. Stream Length Ratio (R_l)

Stream Length Ratio is defined as the ratio of the mean stream length of an order to the next lower order of stream segments. The ratio of the length of the stream between the different sequential streams of the study area does not follow any trend. This change can be attributed to the variability of slope and topography. This indicates the late youth stage of geomorphic development in the currents of the study area (Vittala, Govindiah, & Honne Gowda, 2004). The values of various orders of stream length ratio are presented in Table 2. The length ratio gives a general idea about the relative permeability of rock formation in basins. The stream length ratio of the Irai River basin showed an increasing trend. R_l in the Irai River basin range from 1.84 to 17.75.

1.5. Bifurcation Ratio (R_b)

The bifurcation ratio is the ratio of the number of streams of an order to the number of streams of the next higher order (Horton, 1945, Strahler, 1964). Theoretically, the bifurcation ratio is 2.0 and the natural drainage is 3.0 – 5.0 in systems. Geological structures do not distort drainage patterns (Strahler, 1964). The Values of the bifurcation ratio are presented in Table 2. The average bifurcation ratio for the Irai River Basin is 4.56 which indicates a moderate to high hilly region, moderate ground slope, runoff and

moderate permeability of bedrock. This indicated that the drainage pattern of the basin has not been affected by structural disturbance.

2. Areal Morphometric Parameters

The different areal or basin parameters (basin area, form factors, circulatory ratio, elongation ratio, stream frequency, drainage density and drainage texture) are important for any river basin management. The sub-basin-wise calculated values of the liner aspect of the Irai River are given in the table. no.2.

Table: 3. Areal Morphometric Parameters

Sr · No	Sub – Basin	Form Factor s	Circulator y Ratio	Elongatio n Ratio	Stream Frequenc y	Drainag e Density	Drainag e Texture
1	Chargaon Nadi	0.27	0.63	0.59	2.47	2.16	6.79
2	Chandai Nadi	0.31	0.66	0.63	2.35	2.18	6.60
3	Navegaon Nadi	0.31	0.56	0.63	2.12	1.88	4.04
4	Ashta Nadi	0.24	0.22	0.55	2.38	1.98	1.66
5	Wiloda	0.35	0.09	0.66	1.80	1.75	0.90
6	Jamarjhari Nala	0.28	0.22	0.59	2.68	2.23	3.02
7	Chandankhed a	0.04	0.31	0.21	2.05	1.84	2.89
8	Hathigoda Nala	0.20	0.38	0.50	1.78	1.84	3.11
9	Kalapani Nala	0.24	0.58	0.56	1.17	1.43	2.72
10	Kankiya Nala	0.25	0.95	0.57	1.39	1.70	4.51
11	Mataneri Nala	0.27	0.55	0.58	1.11	1.40	2.83
12	Morawa Nala	0.19	0.24	0.50	2.10	1.91	2.35
13	Saral Nala	0.14	1.32	0.42	1.93	1.77	5.19
14	Zarpat Nala	0.36	1.48	0.67	1.61	1.62	5.23

Source: Compile by researcher

2.1 Drainage Area (A)

A drainage area is defined as a collection area from which water would go to a stream or

river. The boundary of the area is determined by the ridge separating water flowing in opposite directions, the area of the basin was computed by converting the merged geo-referenced and modified SOI Toposheets into a polygon on a 1: 50,000 scale. The total area of the basin is found to be 1304.74 km².

2.2. Drainage Density (D)

(Horton, 1932) Introduced Drainage Density. This is an expression to Indicate the closeness of the channel distance, the significance of drainage density is recognized as a factor determining the time travel by water (Schumm, 1956). The measurement of Drainage density is a useful numerical measure of landscape dissection and runoff potential (Chorley, 1969). Drainage density is known to vary with climate and vegetation, soil, rock properties, relief and landscape evolution processes (kelson and Wells, 1989; Oguchi, 1997; Moglenet et al. 1998). There are four classes of drainage density with the value ranges (km/km²), which are low (< 2) moderate (2 – 4) high (4 – 6) and very high (> 6).

Drainage density helps us to analyse a numerical measurement of landscape dissection and run-off potential Reddy. Maji, Gajbhiye2004: Yadav et.al. 2014). The result shows the average value of 1.82 km² in the study suggesting that the Irai River Basin area has low drainage density indicates the basin has impermeable soil and sparse vegetation cover. The Drainage density Value in the sub-basin area ranges from 1.40 to 2.23 km², highly permeable sub-soil material under dense vegetation cover and low relief.

2.3. Drainage Frequency (Fs)

Stream frequency (Fs) channel frequency or drainage frequency for unit area can be defined as the total number of stream sections in a basin (Horton, 1945). The Drainage frequency of the entire basin is 1.83 km², as shown in Table – 3, which indicates moderate permeability and moderate soil erosion.

2.4. Textural Ratio (T)

Texture ratio or drainage texture signifies the relative spacing of drainage lines, it is considered as the number of stream segments of all order present per perimeter of that area (Horton,1945). Drainage texture of any drainage Basin depends on the climate, rainfall, rock types, relief and stage of development (Horton, 1945) texture is classified into four categories i.e. coarse (< 4) intermediate (4 -10), fine (10-15) and ultra-fine (> 15).

The texture ratio of the Irai River basin is 6.50 which has been categorized as to the presence of high reliefs. The high values of the drainage texture for the basin indicate intermediate to fine texture (Smith 1950). Rock type is an important control of the drainage texture. In areas underlain by resistant and hard rocks, such as basalt, granite coal, gneiss etc. the drainage is coarse textured. The 8 Sub-basin Watersheds below 4 per km indicate Coarse Drainage Texture and 6 sub-basin watersheds have intermediate texture, which indicates less infiltration and higher soil erosion.

2.5. Form Factor (F_f)

According to Horton (1932) Form factor – Quantitative expression of drainage basin outline form through a form factor ratio which is the dimensionless ratio of basin area to the square of basin length, Basin shape may be indexed by a simple dimensionless ratio of the basic measurements of area, parameters and length (Singh,1998). The form factor value of the basin is low, 0.26 which represents the elongated shape. The elongated basin with a low form factor indicates that the basin will have a flatter peak of flow for a longer duration, also lesser value shows an elongated shape.

2.6. Circulatory Ratio (R_c)

Circulatory ratio is the ratio of the basin area to the area of a circle with the same perimeter as the basin (Miller, 1953). The ratio is more influenced by geologic structure, climate, relief, land cover stream length and slope of the basin. It is a significant ratio, which indicates the dendritic stage at a basin, its low, medium and high values are of the youth, mature and old stages of the life cycle of the tributary basins. R_c value of the Irai River basin is 0.10. It is a significant ratio. Which indicates the dendritic stage of a basin?

2.7. Elongation Ratio (Re)

Schumm (1956) defined elongation ratio as the ratio of the diameter of a circle of the same area as the drainage basin and the maximum length of the basin, The higher rate of elongation ratio of a basin indicates an active denudational process with high infiltration capacity and low runoff in the basin and lower indicates higher elevation and higher headward erosion with higher altitude and tectonic lines (Reddy et al., 2014; Yadav et al., 2014). The Values of the Elongation ratio usually vary from 0.6 to 1.0 in different climatic and geological types (Rudraiah, Govindaiahs, & Srinivas, 2008). The elongation Rate for the Irai River basin is 0.58 which indicates the long-term low peak flow, and the increased size of the basin.

2.8. Length of overland flow (La)

According to Norton (1945), the length of overland flow is the length of water over the ground before it gets concentrated into definite stream channels; It is one of the most important independent Variables that affect the Hydrological and Physiographic development of the drainage basin. The length of the overland flow is approximately equal to half of the correlation of drainage density. This factor is inversely related to the average slope of the channel and is a quiet synonym with a large sheet flow length. In this study, the length of the overland flow of the Irai River drainage basin is 0.27km which shows low surface runoff in the study area.

2.9. Constant of Channel Maintenance (C)

The constant of channel maintenance is the inverse of drainage density (Schumm, 1956). In general, lowering the c values of the watershed indicates the permeability of the rocks and vice versa. The value C of the Irai River basin is 0.55 which means that on an average 0.55sq.ft. Surface is needed in the basin for the creation of one linear foot of the stream channel.

SUSTAINABLE FOR WATER CONSERVATION

Analysis of morphometric parameters especially areal parameters is important to identify and determine areas of sustainable water conservation. The average value drainage density of the Irai River basin was observed at 1.82 km². It suggested that studies are suggesting

that the Irai River Basin area has low drainage density indicating the basin has impermeable soil and sparse vegetation cover. Out of 14 sub-watershed basins in the study area, 8 sub-watershed basins indicate coarse drainage texture and 6 sub-watersheds have intermediate texture, which indicates less infiltration and higher soil erosion. As the study area is a plain and lava-formed plateau, the rivers in this region have high silt content, so morphometric parameters are useful in future planning measures for sustainable water development.

CONCLUSION

Drainage basins are frequently selected as a unit of morphometric analysis due to their topographical and hydrological integration. GIS software is of great use in the analysis of linear and Areal morphometric aspects of drainage basins, studies have shown that the GIS-based approach is more suited than traditional methods for evaluating drainage morphometric parameters at river basin level. The bifurcation ratio, the length ratio, and the stream order of the basin indicate that the basin is a six-order basin with a homogeneous drainage pattern and no structural or tectonic control.

The drainage density of 14 sub-basin areas ranges from 1.40 to 2.23 km². The low drainage density is often found to be favoured by highly permeable subsoil regions bearing dense vegetation cover whose relief is low, whereas high drainage density is always favoured in regions having weak or impermeable sub-surface materials, sparse vegetation and high mountain relief. Drainage frequency indicates moderate permeability and moderate soil erosion, a form factor which represents an elongated shape. The complete morphometric analysis of the drainage basin indicates that there is good groundwater potential in a given area and from the above discussion it can be concluded that the drainage of water in the catchment area is a good feature of water conservation. Hence proper water conservation can be practiced and adopted in the basin. It is useful for natural water resource management for sustainable water.

REFERENCES

- B.N Suma, C. V. Srinivasa. 2017 – A Study on Morphometric Parameter of a Watershed for Sustainable Water Conservation S
- Das, A.K. and Mukherjee, S. (2005) –“Drainage morphometry using satellite data and GIS in Raigad district, Maharashtra”. Jour Geol. Soc. India, v.65, pp.577-586.
- Gavit, R.H. and Sonule, B. (2018) Morphometric Analysis of Auranga River Basin: A GIS-Based Approach. IOSR Journal of Applied Geology and Geophysics, 6, 38-43
- Horton, R.E. (1945) – Erosional development of streams and their drainage density. Hydro physical approach to quantitative geomorphology, Geol. Soc. Amer. Bull., no.56,pp.275-370.
- Katiyar R., Garg P.K. and Jain S.K. (2006) – Watershed Prioritization and Reservoir Sedimentation Using Remote Sensing Data. GeocartoInternat., v.21(3),pp.55-60.
- P. P. Choudhari, Gaurav K. Nigam, Sudhir Kumar Singh & Sapana Thakur, 2018 – Morphometric-based prioritization of watershed for groundwater potential of Mula river basin, Maharashtra, India.
- Rao, L.A.K., Rahman, Z., Sadique, M. and Zahoor, I. (2009) -“Hydrogeomorphological Studies for groundwater prospect” using IRS 1D, LISS-III images, in parts of Agra district along the Yamuna River. Jour, Environ. Res. Develop., v.3 (4), pp. 1204-1210.
- Schumm, S.A. (1956) Evolution of drainage systems and slopes in Badlands at Perth Amboy, New Jersey. Bull. Geol. Soc. Amer., v.67,pp.597-646.
- Sheetal S. Asekar, Dr. B. B. Sonule (2022), Morphometric Analysis of Irai River Basin Chandrapur District, Maharashtra India, Journal of Interdisciplinary Cycle Research Volume XIV, Issue V, May/2022 ISSN NO: 0022-1945, Volume XIV, Issue V, pp. 439-454.
- Strahler, A.N. (1964)- Quantitative geomorphology of drainage basins and channel networks. In: V.T. Chow (Ed.), Handbook of Applied Hydrology, McGraw-Hill, New York, pp.4.39-4.76.

AVENUES OF INTERNET OF THINGS (IOT): IMPLEMENTATION OF TECHNOLOGIES THROUGH SMART CITIES

Tejaswini Sudesh Shivsharan

Assistant Professor, Dept. of Information Technology,

The S.I. A, College of Higher Education Dombivli, Maharashtra, India

tejaswini.shivsharan@thesiacollege.com

Abstract: *This paper reviews the implementation of smart cities as an avenue of the Internet of Things (IoT) and other advanced technologies. This paper is based on a comparative study of advancements in the Internet of Things, sensors and processor interactions, artificial intelligence, web technology and application development from reviewed literature. The paper also highlights the Internet of Things as a backbone technology behind developing Smart city projects. The paper lists all specific objectives of Smart City projects, types of developments and needed techno-infrastructure to attain development for the scheme. The paper critically reviews challenges to the development of smart cities in India.*

Keywords: *Urban IoT, smart city project, internet of things, network, technologies*

INTRODUCTION

Smart City is an urban IoT network that uses information and communication Technology. This is built with an infrastructure that is more interactive, accessible and efficient to lead [15]. The need for a smart city arose due to the rapidly growing urban population, fast depleting natural resources, the changes in environment and climate and better management of various available technologies to improve the standard of living. The smart City impacts sectors such as the economy, governance, people, mobility, environment etc. This technology has accessed a wide variety of devices such as home appliances, surveillance

cameras, monitoring sensors, actuators, displays, vehicles, and so on. IoT will cater for the technology with huge generated data for administrators, data scientists, companies, services and manufacturing industries. This urban IoT system has wide applications such as home and industrial automation, medical aids, mobile healthcare, elderly assistance, intelligent energy management and smart grids, automotive, traffic management, and many others. The Internet of Things has many definitions but prominently is just a collection of everything that is connected with large and atomized brains. Embedded systems have ruled common lives during the last decade. It has experienced living atomization in the common people's lives. IoT is a superset of embedded systems with the advantage of access to network connectivity. The basic components of an IoT system are sensors, actuators, processors or controllers and suitable connectivity mechanisms, suitable means technologies such as low power networks, Bluetooth, 6LoWPAN, RPL etc. These things have a tremendous significance. Things are different types of input sensors like acoustic, electromagnetic, motion, chemical, temperature etc. Output actuators are mainly hydraulic, pneumatic, electrical, thermal or mechanical. The transformation of information into different forms is the basic key behind the operation of the Internet of Things system. The Internet of Things includes the basic computing implemented in sectors such as transport, railways, hospitals, schools, traffic control, waste management, banking and police. The technology is implemented smartly.

SMART CITY PROJECT

The Government of India has launched a Smart City project in 2017 [12]. This proposal has listed features for developing Smart cities. The following are some of the main features of the Smart Cities project. The land-use planning is to make use of land efficiently by recognizing unused land and planning it for commercial, residential and other uses. The state government can issue subsequent guidelines for the efficient use of unplanned land

- The housing planning to provide affordable housing to all, especially the poor.
- Provide basic infrastructure such as adequate water and electricity supply to all the people.
- Implement good sanitation including solid waste management.

- Implement robust IT Connectivity and digitalization. Creating smart roadways is a part of the project in which the roads are planned for vehicles, pedestrians and cyclists to avoid traffic congestion.
- Bestow a sustainable environment considering the safety and security of citizens, particularly women, children and the elderly.
- Grant good governance, particularly e-Governance through active citizen participation.
- Administer smart health and education system.

BACKGROUND AND RELATED WORK

This research paper reviews the various technologies implemented to develop Smart cities in India. India is a land of veracity where a huge population plays a significant role in developing and implementing technology at large [15]. Invented technologies for IoT in India have applications in domestic as well as commercial sectors. The technological advancement happened in the internet, Wi-Fi, surveillance systems, smart street lights, environmental sensors vehicle monitoring systems etc. The paper reviews the implementation of these technologies and also discusses their future scope in workflow. [1] [16]. The smart city project is based on the sustainable development goals of the millennium. This project is mainly to upgrade the standard of living of common people. [15] The development goals also focus on water, sanitation, food, security, health, energy, economy and employment opportunities for dwellers. It should also provide efficient solutions for preventing ozone depletion and controlling the greenhouse effect to reduce global warming. [2] [3]. The literature referring to the topic glances over the need for technologies to develop such cities and implement them in efficient ways. The technologies are also classified for domestic and commercial purposes. [4]. The papers also reviewed the recent research in wearable technologies developed to design IoT systems. The research from sensors, actuators, communication and networking etc. lead to a new foundation for the community of ubiquitous systems. The reviewed paper critically glances over the agendas of the smart city project and its implementation. It comprehends the existing situation in comparison with the highest degree of technical development. [5] [6]. The reviewed paper discussed the reference framework for the development of urban IoT

systems. This paper reviewed the development of the Padova smart city project for the network of the city. [1] Another important part is people's perspective towards such advancement. The paper reviews the awareness level of people towards development through a survey method. The survey was conducted with specific questions and statistical analysis was carried out for the same. [11]

SMART CITY PROPOSAL BY THE GOVERNMENT OF INDIA

The government has divided smart city development into three main sections

1. City improvements or retrofitting: Retrofitting is the concept of introducing planning in the initial built-up structure of the existing city to make it more efficient and liveable. This can be accomplished in more than 500-acre areas of land in consultation with citizens or residents of it. The strategy of becoming smart will be decided by the infrastructural development, vision of the residents and intensive services to be implemented at large. Retrofitting may require less time to complete. [12] [14]
2. City renewal or redevelopment: City redevelopment contains the replacement of new built-up as well co-creation of new layouts with enhanced infrastructure and technology. The strategy implemented more than 50-acre area for mixed land uses and increased density like higher FSI and high ground coverage. [12]
3. City extension or greenfield development: Greenfield development introduces more smart solutions and innovations in vacant areas of more than 250 acres. The plans include affordable housing, especially for the poor with smart innovation and low finance. [15] The smart city proposals were shortlisted for either of the above three categories of development types. Apart from the above, PAN city interventions are considered to be the basic ones that make the transformation journey smooth. It involves the use of information, technology and data to provide smart solutions to bring in efficiency in the infrastructure and services provided such as water, sanitation, food, transport, food, security, and traffic management.

Funds and Revenue

The smart city has a budget of almost in crores which may implement some extra revenue taxes on users for example parking charges etc. Additionally, these taxes the funds may be

raised by partnerships with private sectors, in such cases different types of contracts are introduced to revert the expenditure from development projects which are based on 14th Finance Commission recommendations by the government of India. The government has divided projects into app-based projects and housing projects. The app-based projects are related to technological advancement in smart cities while housing projects are part of Greenfield development. The smart city development has two rounds for the attainment of smart architecture and services. The government has proposed a duration of two years for round 1 development, after which the city will again participate in the selection process for advanced development avenues. Uttar Pradesh is one of the states with the highest number of proposed smart cities -13. The other states are Tamil Nadu, Maharashtra, Madhya Pradesh, Karnataka etc. with a major number of proposed smart cities to be developed under this project.

The government has proposed mobile applications as well as website-based projects like integration of public and private parking sectors data availability on common platforms. This app will show the data available for parking vehicles with different configurations. [12] This application has launched under Intelligent Government Service (App-based Governance). This Intelligent Government Service (App based Governance) has proposed projects like smart Services Operations, Emergency response intake through calls, app or panic-button, CAD- First Responder Coordination(Emergency Response and City Incident Management - Integrated City Operation Management Centre - ICOMC, Bus System Intelligent Traffic Management System (ITMS),e-Challan, Mobile App and Website for Pan City Water, Air Quality Monitoring With App(Smart and Sustainable Infrastructure), Geo-tagging of bins etc. for various smart cities appeared in the first round selection list released by The Government of India. [12]

Technological Avenue And Progress In Smart City Project

The objective of this paper is to discuss the infrastructural framework needed for smart city development in urban IoT. The specific characteristics of urban IoT are compared with current technical specifications with reference to the proposed projects by the government. The key initiatives taken for this project were, efficient hardware infrastructure to make it future-ready with a population that is 4 times now across the sectors of security, mobility,

sewage management and water. Enhance the liveability standard to the international level through intelligent infrastructure.

- Improve the sustainability quotient of the region.
- Provide ICT solutions to people for e-governance.
- Urban IoT and connectivity principles

The Urban IoT will work with many types of protocols for different applications such as for connectivity between sensors and IoT chambers generally 6LowPAN, RPL can be used. While identifying devices EPC, uCode, IPv6, URIs can be implemented. The short-distance communication or transport Wi-Fi, Bluetooth, LPWAN protocols will be better as they require low power for operations. IoT will generate huge amount of data and it can be used with different perspectives hence data protocols such as MQTT, CoAP, AMQP, Websocket, Node will be useful. The other protocols like Physical Web, mDNS, DNS-SD will become part of the smart systems. Alljoyn, IoTivity, Weave, and Homekit will get the multi-layer framework for app development.

a) Urban planning and e-governance with ICT: The proposed projects like e-governance , urban planning of cities needs Internet Wi-fi network, CCTV surveillance cameras mainly of two types of 2 MP IR Fix cameras and 2 MP- 20X (or better) Optical zoom IR PTZ cameras. This device will also help in redesigning of streets. The devices mainly wired or wireless connectivity with good bandwidth for transmitting the video feed. For e-governance, the mobile application is proposed for citizen services and it will be connected with Google Maps with voice based Local language directions. The application shall be limited to smart city only. The Help desk and call centre will be provided as preventive maintenance.

b) Transport: This area is involved with intelligent road management, Bus system and smart bus stops, street lighting projects. The automatic number plate recognition is one of the utilities where the system should be a full ANPR system that processes, stores and makes available data collected to the control Room. Vehicle Speed detection will be implemented with an alert should be generated at the command and control room when any vehicle is crossing maximum speed limit and automatic challan shall be generated (Database shall be connected to RTO database). Data (Image and Video) of supporting

evidence must be kept in the control room for at least a month. The challan system is also e-challan which will be generated through robotic process automation.

c) Water and Sanitation: Clean and potable water is the part of sustainable development goals. In urban IoT infrastructures smart meters are the solutions to the problem of wastage of water. The installed system has a smart meter, leakage sensor and multi sensor which will detect water leakage, send a notification to the control room. The multi sensors will work for ground water detection and other parameters such as conductivity, pH, salinity, temperature, dissolved oxygen, chlorine residual and turbidity and water pollution by electricity due to power plants etc. Chlorine residual sensor, Total organic carbon sensor, PH sensor, Turbidity Sensor, Conductivity sensor are commonly used sensor types. The recent technology to find water contamination is through remote sensing technique which uses the UV sensors. The principle behind remote sensing is when electromagnetic spectrum is passed through water bodies, the reflection, absorption, and transmittance of electromagnetic radiation are highly dependent on the concentrations, types, and presence of substances in water. This will able to detect the type of contamination in large water presence in lakes.

Sanitation is about drainage systems and water consumption. Smart cities will be able to adopt new designs of drainage and washrooms to avoid wastage of water. Dry and waste management is also done by sensors and machines. The technology uses sensors that work on the principle of measuring reflectivity with light in nanometre wavelength. Materials such as plastic, paper, and food waste will have their characteristics that help machines segregate dry and wet waste.

d) Energy: Implementing a smart grid is one of the solutions for the power sector. Smart grids are electrical automation power generation systems that are capable of monitoring points of generation and points of consumption. It can also control the power flow and provide load matching for optimizing power. Using solar and wind energy are also solutions listed by sustainable development systems.

e) Health: The health sector will use more robotic, pervasive types of equipment during surgeries and other types of medication. Remote patient monitoring and nano-drug delivery systems will become more popular in smart cities. Affordable medical facilities will be the main objective of implementing smart amenities by the government.

f) Environmental protection: The air, water and noise pollution has caused hazardous impacts over the atmosphere hence resulting in global warming, melting of glaciers, floods, droughts, irregular weather schedules etc. Continuous monitoring is a preventive measure to attain less pollution and different environmental sensors integrate to capture, display and provide temperature, humidity, air pollutants, noise pollution, electromagnetic radiation etc.

g) Web technology, Artificial intelligence and neural network: A large amount of the city's infrastructure is underutilized, overused or used inefficiently due to a lack of real-time information among individuals, companies, and government agencies. Artificial intelligence provides a better solution in almost all fields of smart city planning. Sensors installed in parking lots, traffic signals and intersections accumulate a huge amount of useful data for planning smart city initiatives. Adaptive signal technologies allow traffic lights to change their timings based on real-time data. 5G connectivity among the various IOT devices and sensors allows the urban smart city to function efficiently. The Global Positioning System (GPS) helps in transportation management and connectivity among vehicles. The vehicle-to-vehicle and vehicle-to-infrastructure communication through GPS and 5G technology gives real-time solutions. The Global Information System (GIS) helps in building the urban model with geo-referenced data.

CHALLENGES

In this paper, we have discussed the concept of Smart cities, planning by the Government, projects initiated and needed technology while implementing them in Smart cities. The smart city will be built with high-end technology-based infrastructure. [15] After reviewing recent developments in sectors such as the Internet of Things, sensor technology, networking and backbone areas like artificial intelligence and machine learning, the Smart City project is technically strong and also has enough scope to get implemented in a very few years in India.

OPPORTUNITIES

Still, this project has many challenges, understanding the concepts of retrofitting, redevelopment and Greenfield development by different stakeholders will require capacity

assistance. Residents' opinions are also equally important when making infrastructure changes. India being a developing country the budget, aid, and involvement by private sectors is a major challenge which has to carve a way for investment of time and resources. Technology has to be generalized to common people hence citizen's literacy towards smart and e-governance will be able to bring success. Arranging training sessions may lead the scope but still it will take to reach to mass. Citizens should be involved in decisions or deploying smart solutions, implementing reforms, should have oversight to see beyond implementation through sustainability. The project needs skilled people who will be experts in electronics, programming, processor technology, web development and app developments. The project will provide ample employment opportunities for the people working in networking, virtualization and cloud management. This project will enable long term economic impacts in terms of privatization, revenue and generating wages for the huge community.

REFERENCES

1. Cenedese, A. Zanella, L. Vangelista and M. Zorzi, "Padova Smart City: An urban Internet of Things experimentation," Proceeding of IEEE International Symposium on a World of Wireless, Mobile and Multime- dia Networks 2014, Sydney, NSW, 2014, pp. 1-6, doi: 10.1109/WoW- MoM.2014.6918931.
2. T. S. Brisimi, C. G. Cassandras, C. Osgood, I. C. Paschalidis and Y. Zhang, "Sensing and Classifying Roadway Obstacles in Smart Cities: The Street Bump System," in IEEE Access, vol. 4, pp. 1301-1312, 2016, doi: 10.1109/ACCESS.2016.2529562.
3. F. Alam, R. Mehmood, I. Katib, N. N. Albogami and A. Albeshri, "Data Fusion and IoT for Smart Ubiquitous Environments: A Sur- vey," in IEEE Access, vol. 5, pp. 9533-9554, 2017, doi: 10.1109/AC- CESS.2017.2697839.
4. Alwarafy, K. A. Al-Thelaya, M. Abdallah, J. Schneider and M. Hamdi, "A Survey on Security and Privacy Issues in Edge Computing- Assisted Internet of Things," in IEEE Internet of Things Journal, doi: 10.1109/JIOT.2020.3015432.
5. Y. Yorozu, M. Hirano, K. Oka, and Y. Tagawa, "Electron spectroscopy studies on magneto-optical media and plastic substrate interface," IEEE Transl. J. Magn. Japan,

- vol. 2, pp. 740–741, August 1987 [Digests 9th Annual Conf. Magnetics Japan, p. 301, 1982].
6. M. Masera, E. F. Bompard, F. Profumo and N. Hadjsaid, "Smart (Electricity) Grids for Smart Cities: Assessing Roles and Societal Impacts," in *Proceedings of the IEEE*, vol. 106, no. 4, pp. 613-625, April 2018, doi: 10.1109/JPROC.2018.2812212.
 7. L. Cui, G. Xie, Y. Qu, L. Gao and Y. Yang, "Security and Privacy in Smart Cities: Challenges and Opportunities," in *IEEE Access*, vol. 6, pp. 46134-46145, 2018, doi: 10.1109/ACCESS.2018.2853985.
 8. F. Sivrikaya, N. Ben-Sassi, X. Dang, O. C. Göçer and C. Kuster, "Internet of Smart City Objects: A Distributed Framework for Service Discovery and Composition," in *IEEE Access*, vol. 7, pp. 14434-14454, 2019, doi: 10.1109/ACCESS.2019.2893340.
 9. V. Javidroozi, H. Shah and G. Feldman, "Urban Computing and Smart Cities: Towards Changing City Processes by Applying Enterprise Systems Integration Practices," in *IEEE Access*, vol. 7, pp. 108023-108034, 2019, doi: 10.1109/ACCESS.2019.2933045.
 10. S. H. Alsamhi, O. Ma, M. S. Ansari and F. A. Almalki, "Survey on Collaborative Smart Drones and Internet of Things for Improving Smartness of Smart Cities," in *IEEE Access*, vol. 7, pp. 128125-128152, 2019, doi: 10.1109/ACCESS.2019.2934998.
 11. Office of the Government Chief Information Officer, "Smart city development in Hong Kong," in *IET Smart Cities*, vol. 1, no. 1, pp. 23-27, 6 2019, doi: 10.1049/iet-smc.2019.0036.
 12. <http://smartcities.gov.in/documentation>
 13. S. Urban and M. D. Lytras, "Artificial Intelligence for Smart Renewable Energy Sector in Europe—Smart Energy Infrastructures for Next Generation Smart Cities," in *IEEE Access*, vol. 8, pp. 77364-77377, 2020, doi: 10.1109/ACCESS.2020.2990123.
 14. Kirimtat, O. Krejcar, A. Kertesz and M. F. Tasgetiren, "Future Trends and Current State of Smart City Concepts: A Survey," in *IEEE Access*, vol. 8, pp. 86448-86467, 2020, doi: 10.1109/ACCESS.2020.2992441.
 15. "Smart Cities—Opportunities and Challenges", Springer Science and Business Media LLC, 2020, Volume 58, ISBN : 978-981-15-2544-5
 16. U. Singh and A. Sharad, "The Smart City: A Holistic Approach," 2020 11th International Conference on Computing, Communication and Networking Technologies (ICCCNT), Kharagpur, India, 2020, pp. 1-7, doi: 10.1109/ICCCNT49239.2020.9225489.

17. Xiaoting Li, Jingling Bao, Jianguang Sun, Ji Wang, Development of circular economy in smart cities based on FPGA and wireless sensors, Microprocessors and Microsystems, Volume 80, 2021, 103600, ISSN 0141-9331, <https://doi.org/10.1016/j.micpro.2020.103600>.

DIGITAL FINANCE FOR A SUSTAINABLE FUTURE: ASSESSING THE ENVIRONMENTAL IMPACTS AND ECO- FRIENDLY INNOVATIONS IN E-BANKING

***Dr. S.R. Dhembre and ** Mr. Rajkumar Balan Pillai**

*Head and Research supervisor, Bahirji Smarak Mahavidyalaya, Basmatnagar Dist.
Hingoli. 431 512

**Assistant Professor, The S.I.A. College of Higher Education, Dombivli (E) Dist. Thane
rajkumarpillai1208@gmail.com

Abstract: *The digital transformation of the financial sector, particularly E-banking, is one of the keys focuses of the sustainable development of the financial sector. The study examines the environmental implications of e-banking and defines eco-friendly solutions for these implications. Along with the carbon footprints, energy consumption, and resource usage resulting from e-banking transactions, the primary objective of this study is to identify the challenges and opportunities of the incorporation of financial sustainability into digital finance. The study highlights the considerable potential of digital finance to make an environmentally friendly contribution to the preservation of the environment, thus helping to create a sustainable world through the functional direction that is driven by financial sustainability of emerging technologies such as blockchain and artificial intelligence, and environmentally friendly regularly taken steps in cooperation with the regulatory framework of ecology with such as green data.*

Keywords: *E-Banking, Sustainable development, Digital Finance, Artificial Intelligence, green data.*

INTRODUCTION:

In the rapidly evolving panorama of finance, the convergence of digital technology and sustainability imperatives has emerged as a paramount concern. As the world grapples with

urgent environmental challenges and strives for a greater sustainable future, the monetary sector finds itself at a pivotal crossroads. The introduction of digital finance, mainly in the realm of e-banking, affords both possibilities and challenges in these pursuits. Digital finance encompassing a big selection of technological improvements such as Internet banking, mobile banking, UPI payments, and blockchain has revolutionized traditional banking practices, imparting unheard-of convenience, accessibility, and performance. However, as monetary enterprises an increasing number of embrace digitization, there arises an essential need to scrutinize their environmental footprint and explore avenues for eco-friendly innovation.

This comprehensive evaluation delves into the environmental impacts of virtual finance and examines the role of e-banking in fostering sustainability. By reading the complete life cycle of virtual monetary services -from infrastructural improvement and electronic transactions to record control and disposal- we goal to clarify the ecological ramifications inherent in this burgeoning area. In mild of these considerations, this examination of digital finance for a sustainable destiny serves as a call to movement for stakeholders across the monetary environment. Considering that consideration this exam of digital finance for a sustainable destiny serves as a call to motion for the stakeholders throughout the economic surrounding- from policymakers and regulators to monetary institutions, generation firms, investors, and purchasers. By embracing innovation, collaborations, and a shared commitment to sustainability, we can harness the transformative power of virtual finance to construct a more resilient, inclusive, and environmentally sustainable international financial system.

DIGITAL FINANCE

Digital finance can significantly contribute to a sustainable future in India across various aspects which includes economic inclusion, environmental sustainability, and financial development. Some of the key aspects of digital India are as:

- a. Financial Inclusion: Digital finance structures such as mobile banking, virtual wallets, and price gateways have already performed a pivotal role in increasing economic inclusion in India. These systems allow humans in far-off areas to get admission to

monetary offerings without the want for bodily bank branches. By presenting easier entry to banking offerings, virtual finance can empower people and corporations, particularly those in rural regions, to take part greater completely within the formal economic system.

- b. Reducing cash Dependency: India has traditionally been a coins-structured economy, which poses demanding situations in terms of transparency, tax compliance, and financial inclusion. Digital finance answers which include cell payments and digital wallets offer options to coin transactions, thereby lowering the reliance on physical forex. This now not handiest complements comfort for clients but additionally enables better monitoring of financial transactions, contributing to more transparency and duty.
- c. Promoting green Finance: Digital finance can facilitate investments in sustainable tasks and technology by offering efficient channels for capital allocation. Through virtual platforms, investors can without difficulty get entry to data about environmentally pleasant funding possibilities, including renewable electricity tasks or inexperienced bonds. Additionally, digital finance can streamline the system of financing green initiatives, making it less difficult for businesses and individuals to take part in sustainability efforts.
- d. Supporting renewable energy Adoption: India has bold dreams for renewable strength adoption, and digital finance can play an important function in accomplishing those targets. By presenting modern financing answers together with peer-to-peer lending and crowdfunding systems, virtual finance can mobilize capital for renewable energy projects, inclusive of solar and wind farms. Moreover, digital charge solutions can allow simpler charge collection for rooftop solar installations and other allotted strength structures, further selling the adoption of clean energy technology.
- e. Enhancing efficiency and transparency: Digital finance platforms leverage technologies that include blockchain and synthetic intelligence to beautify performance and transparency in monetary transactions. Blockchain, as an example, can allow secure and obvious record-keeping for transactions, lowering the danger of fraud and corruption. Artificial intelligence-powered analytics also can assist economic establishments higher verifying risk and allocating capital more efficaciously, ultimately contributing to a greater sustainable and resilient monetary gadget.
- f. Empowering small and medium-sized enterprises: Digital finance answers can provide SMEs with simpler right of entry to credit scores and financial offerings, enabling them

to grow and thrive. By leveraging opportunity information assets and virtual lending systems, SMEs that could have been underserved through traditional economic institutions can get the right of entry to funding to spend money on sustainable practices and technology. This guide for SMEs not most effective fosters economic boom however additionally encourages the adoption of sustainable commercial enterprise practices.

REVIEW OF LITERATURE

The essence of digital finance and eco-friendly innovations in E-banking is widely discussed in the research literature. In this context, many researchers have expressed their views on previous and recent developments, initiatives, challenges, and measures in the banking sector related to digital finance.

Karan Pratap (2020): The researcher here focuses on the pivotal position of inexperienced finance in fostering inclusive, resilient, and environmentally useful monetary increases. It underscores the importance of the banking quarter in selling environmentally sustainable ventures and financing green era tasks to lessen carbon emissions. Specifically focusing on India, the study explores green banking tasks, worldwide tendencies, and challenges in inexperienced financing. It is predicated on secondary statistics from authorities reports and publications from both public and private quarter companies and banks.

Dr Vivek Sharma, Dr Priyanka Kumar Singh, Mr Gopal Ramchandran, Dr Shweta Rani (2022): This study analyses the rising idea of inexperienced banking in India, with objectives to combine technological improvements and converting consumer behaviour within the banking quarter to promote environmental sustainability and monetary growth. The research makes a speciality of the efforts of personal quarter banks in imposing inexperienced banking practices, addressing both their innovations and the challenges they face. Based on a survey of 287 banking quarter professionals, the look emphasizes the important position of technology in driving inexperienced banking projects inside private zone banks in India. Overall, the findings underscore the pressing want to prioritize and put into effect inexperienced banking practices to create a greater environmentally pleasant and sustainable commercial enterprise sector.

Jamnani Jyoti, Ajay.B. (2022): This paper investigates the awareness and usage of inexperienced banking projects among clients of public and personal zone banks in Karnataka, India, especially at some point during the COVID-19 pandemic. It explores the effect of the pandemic on banking offerings, stages of cognizance about inexperienced banking, and the usage patterns of green products consisting of debit playing cards, cellular banking, and Internet banking. The look identifies three principal advantages of inexperienced banking: improved UPI transactions through cellular banking, greater transaction protection, and environmental benefits. The findings propose opportunities for banking institutions to promote and put in force green banking services correctly.

OBJECTIVES

To better assess the environmental impact of digital finance, especially e-banking, and identify non-environmental innovations in the sector, insights and suggestions will be made to promote sustainable practices and reduce the environmental footprint of financial services.

MATERIALS AND METHODS

The present data study is based on both primary and secondary data sources. The sources of primary data include empirical evidence and discussions held with people who are using e-banking, various publications, reports, news articles, and web resources provide secondary data.

ENVIRONMENT AND E-BANKING

1. Paper Reduction: E-banking drastically reduces the want for paper-based total transactions together with tests, statements, and receipts, therefore saving bushes and reducing carbon emissions associated with paper manufacturing and transportation.
2. Energy Consumption: While e-banking operations require power for fact centres, servers, and IT infrastructure, they typically devour much less strength compared to

conventional brick-and-mortar banks. However, the energy resources powering those operations (e.g., fossil fuels vs. Renewable electricity) greatly affect the general environmental impact.

3. E-Waste generation: The proliferation of digital gadgets like smartphones, pills, and computers for gaining access to e-banking services contributes to digital waste (e-waste) when these devices are disposed of improperly. Proper disposal and recycling practices are essential to mitigate this effect.
4. Data security and privacy concern: Maintaining facts protection and privacy in e-banking includes sturdy IT infrastructure and non-stop updates, that can bring about power intake and electronic waste due to the frequent improvements and replacements of hardware.

ECO-FRIENDLY INNOVATIONS IN E-BANKING

1. Renewable energy resources: Many banks are investing in renewable energy sources such as solar and wind to power their data centres and operations, reducing their carbon footprint and reliance on fossil fuels.
2. Green data centres: Banks are increasingly adopting energy-efficient technologies and layout standards of their records centres, along with server virtualization, cooling optimization, and use of energy-green hardware, to limit electricity consumption and environmental effects.
3. Digital document management: Implementing digital record control structures permits banks to reduce paper usage by digitizing files, statements, and contracts, thereby minimizing the want for printing and transportation.
4. Electronic payment and transactions: Encouraging clients to apply digital charge methods like online transfers, cellular payments, and virtual wallets reduces the reliance on paper-based total transactions and lowers carbon emissions related to transportation and processing.
5. Remote work policies: Banks promoting remote work policies for their employees can reduce carbon emissions from commuting and office energy consumption, contributing to a greener and more sustainable work environment.

CHALLENGES AND OPPORTUNITIES

1. Infrastructure upgrades: Upgrading present infrastructure to support eco-friendly innovations may additionally require extensive investment and technical know-how, posing demanding situations for smaller banks with limited assets.
2. Data security concerns: Balancing the need for sturdy statistics safety features with strength-green IT practices is crucial to make certain of the sustainability of e-banking operations without compromising sensitive customer information.
3. Regulatory compliance: Adhering to environmental rules and requirements whilst keeping operational efficiency is a complex task for banks working in special jurisdictions with varying regulatory requirements.
4. Customer Adoption: Encouraging clients to include green e-banking practices requires effective verbal exchange, person-pleasant interfaces, and incentives to inspire behavior trade.

LIMITATIONS OF E-BANKING

1. Security Issues: The possibility of security lapses is one of the main drawbacks to online banking. Cyberattacks can result in fraud and identity theft by compromising customers' sensitive financial information through methods like phishing, malware, and hacking.
2. Technology Dependence: Electronic devices and internet access are key components of the technology infrastructure that e-banking depends on. Customers' ability to access their accounts and complete transactions may be hampered by any disruption in these services, such as power outages or system malfunctions.
3. Digital Divide: Not everyone has access to the internet or the digital literacy needed to make efficient use of e-banking platforms. This has the potential to widen the digital divide by denying access to vital financial services to groups like the elderly and people living in remote areas.
4. Transaction Limitations: Customers who conduct a lot of high-value transactions may find it inconvenient when certain e-banking platforms place restrictions on the amount and frequency of their transactions.
5. Lack of Personal Interaction: When conducting complex transactions or requesting individualized help, some customers may prefer in-person interactions with bank employees,

which are eliminated by online banking.

6. **Regulatory Compliance:** Financial institutions that provide e-banking services have to abide by several laws about data security, privacy, and electronic transactions, which makes their business operations more difficult and expensive.

SUGGESTIONS

1. **Enhanced Security Measures:** To protect consumer data and transactions, make ongoing investments in strong security measures like encryption, biometric authentication, and real-time fraud detection systems.
2. **User-Friendly Interface:** Create e-banking platforms with intuitive and user-friendly interfaces that guarantee simple navigation, features for accessibility, and consistent user experiences on various screens and devices.
3. **Mobile Optimization:** To meet the needs of the growing number of users accessing e-banking services on mobile devices, give priority to mobile optimization by creating responsive mobile apps and websites that provide seamless functionality and performance on smartphones and tablets.
4. **Personalization:** Use artificial intelligence and data analytics to provide customers with a more customized online banking experience. This can include proactive alerts, individualized financial insights, and product recommendations based on user behaviour and preferences.
5. **Streamlined Onboarding Process:** Reduce paperwork, use digital identity verification tools, and let users finish the process fast online or with a mobile device to streamline the account opening and onboarding process.
6. **Multi-Channel Support:** To quickly resolve customer questions and issues across various communication channels, offer multi-channel support for customer service inquiries and assistance. This includes live chat, email support, phone helplines, and thorough online FAQs.
7. **Integration with Third-Party Services:** Support open banking programs and cultivate alliances with outside service providers to provide a wider array of financial goods and services on the e-banking platform, increasing client convenience and selection.
8. **Financial Management Tools:** To assist users in successfully managing their finances and achieving their financial objectives, incorporate tools for budgeting, tracking expenses, and goal-setting into the e-banking platform.

9. **Educational Resources:** To encourage financial literacy, equip clients with necessary money management skills, and improve their overall financial well-being, offer tutorials, interactive learning modules, and educational resources within the e-banking platform.
10. **Continuous Innovation:** To stay ahead in the cutthroat world of e-banking, cultivate an innovative and agile culture within the company by promoting experimentation with cutting-edge technologies, investigating novel business concepts, and adjusting to changing consumer demands and industry trends.

FUTURE OF E-BANKING

1. **Enhanced Security Measures:** E-banking platforms are expected to invest in advanced security measures like biometric authentication, multi-factor authentication, and artificial intelligence-based fraud detection systems due to the growing threat of cyberattacks and fraud.
2. **Customized User Experience:** By utilizing data analytics and machine learning algorithms, e-banking platforms can provide users with individualized user experiences, product recommendations, and financial advice based on their unique preferences and behavior.
3. **Integration of Emerging Technologies:** Blockchain for safe and transparent transactions, Internet of Things (IoT) for linked banking devices, and augmented reality (AR) or virtual reality (VR) for immersive banking experiences are examples of emerging technologies that e-banking is likely to incorporate.
4. **Mobile-First Approach:** With the increasing global adoption of smartphones, e-banking services will place a greater emphasis on mobile-first strategies. They will provide customers with feature-rich, user-friendly mobile apps that meet their banking needs while they are on the go.
5. **Expansion of Open Banking:** Through the use of a single interface, customers will be able to access a wider range of financial products and services from multiple providers, thanks to initiatives that will promote greater collaboration and integration between banks and third-party service providers.
6. **A Greater Focus on Financial Wellness:** To assist users in enhancing their financial well-being and achieving their goals, e-banking platforms may include tools and resources that support budgeting, savings targets, and financial literacy.
7. **Seamless Cross-Channel Integration:** Online, mobile, and in-person banking is just a few of the channels that e-banking will aim to integrate seamlessly across to give users the flexibility to

switch between them without any disruption to their banking experience.

8. **Rise of Chatbots and Virtual Assistants:** With their ability to respond instantly to customer inquiries, chatbots and virtual assistants driven by artificial intelligence are expected to become more prevalent in the world of online banking. They will also be able to facilitate transactions by interacting with users in natural language.
9. **Regulatory Evolution:** To handle new threats and guarantee the safety and security of online financial transactions, regulatory frameworks governing e-banking, such as data privacy and consumer protection laws, will keep changing.
10. **Global Expansion and Financial Inclusion:** E-banking will increase financial inclusion by giving marginalized groups more access to banking services.
11. **Technical Issues:** Customers may be unable to access their accounts or complete transactions due to technical issues or outages with e-banking platforms.
12. **Fraud and Scams:** Even with security precautions in place, e-banking customers are still susceptible to different kinds of fraud and scams carried out via online means.
13. **Privacy Issues:** Because e-banking entails the gathering and storing of private and sensitive financial data, privacy and data protection issues are brought up.
14. **Dependency on Third Parties:** To handle tasks like data storage and payment processing, e-banking systems frequently depend on outside service providers. Any problems with these outside suppliers may have an impact on the dependability and security of online banking services.

CONCLUSION

In conclusion, the adoption of digital finance, particularly e-banking, holds immense potential for fostering sustainability and mitigating environmental impacts within the financial sector. Our assessment of environmental impacts and eco-friendly innovations in e-banking has highlighted several key findings. Firstly, e-banking can significantly reduce the carbon footprint associated with traditional banking operations by minimizing paper usage, branch infrastructure, and commuting. Moreover, advancements such as digital payments, electronic statements, and mobile banking further contribute to resource conservation and emissions reduction. However, it is crucial to acknowledge that digital finance is not without its environmental challenges. The proliferation of electronic devices,

data centres, and internet infrastructure demands substantial energy consumption, which if not managed sustainably, could exacerbate carbon emissions and resource depletion. Additionally, the disposal of electronic waste poses a significant environmental threat if not properly regulated and managed.

REFERENCES

Animesh singh, Dr, Azmee Zaheer (2023) – Review on Impact of AI on green banking towards sustainability with special reference to Indian public and private banks. Vol.10 4s, special issue 4.

Dr, Shikha Arora Bakshi (2013)- Turning towards the green innovations: A need of the hour in Indian banking sector. Vol-II Page (162 to 168)

Jamnani, J. A., & Jamnani, A. B. (2022). Green Banking for Sustainable Development: An Empirical Study on Customers' Perspective During the Covid-19 Pandemic. *IUP Journal of Bank Management*, 21(3).

Nilufha khatun, Md. Nazirul islam sarkar, Sandip Mishra (2021) – Green banking and sustainable development in Bangladesh. Vol.14 no 5.

Pratap, K. (2020). A study of green banking as an innovative tool in environment sustainability.

Rodrigues Jewilla (2019) – Environmental management through green banking: A study on green banking practices with special reference to SBI Vol.9 issue 4. Page (79-88) ISSN – 2249-6270.

Sucharita Debnath & Sangita Roy (2019)- “Customer’s awareness on green banking initiatives” IUJ journal of management vol 7, no 2.

Sohnia salman, sumaira hamid (2018)- Fostering green banking and sustainability in a developing economy: An empirical assessment. Vol 5, no,1 spring.

IMPACT OF VARIATION IN RAINFALL ON CROP PRODUCTION IN JALGAON DISTRICT: USING GEOSPATIAL TECHNOLOGY

Mr. Sagar Bhausaheb Dongare¹ Mr. Rohit N. Sonawane² & Dr. S. S. Jadhav³

¹Research Scholar, Dept. of Geography, M. J. College, Jalgaon.

^{1&3}Assistant Professor. Dept. of Geography, M. J. College (Autonomous), Jalgaon.

Abstract: *The origin of the idea for this paper came from in last three-year media report that crops were damaged by climate change or variability in rainfall. Rainfall is one of the primary factors affecting crop production. The impact of rainfall on crop production can be related to its total seasonal amount. The present research work focuses on the influence of rainfall on crop production in Jalgaon district. The data on rainfall and crop production is used. Statistical methods like graphical representation, and mean & correlation methods are used for statistical measures. Variations in rainfall mostly affected Kharif crops in the Jalgaon district which resulted in crops getting damaged which resulted in economic conditions and food availability conditions. In this project crop condition and their method of cultivation help to increase crop health. The causes behind the decreasing crop production are also shown in research. Counter methods for not damaging crops from bad climate or excessive rainfall help for better crop health. This study would help the local people to save their crops from variations in rainfall using the proper method.*

Keywords: Crop production, Rainfall, Variation, Jalgaon, Remote Sensing.

INTRODUCTION

Agriculture is strongly influenced by weather & climate, while farmers are often flexible in dealing with weather & year to year variability. Climate change could potentially impact scale agriculture productivity. Impacts of rainfall & Temperature variation are already experienced across the globe. Indian agriculture is mostly affected by changes in climate. So, it results in regional inequality in crop production. Today Jalgaon District has 7.28 lakh

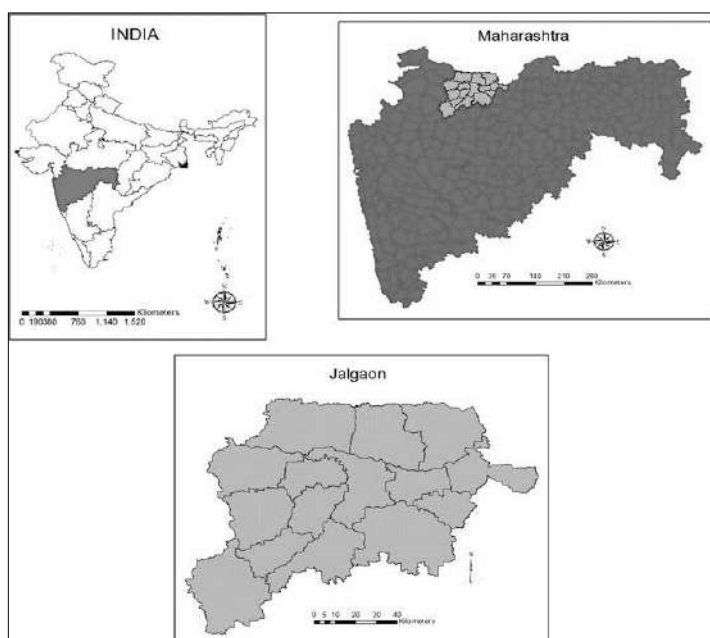
hector. For cultivation and in that 5.3 & 1.6 lakh hector under Kharif season. These crops have affected the economy of the district in recent periods due to the bad climate kharif crop production is decreasing in the kharif season is the main concern in the Jalgaon district. In recent years kharif crop in Jalgaon district has faced problems, including excessive rainfall as compared to the average rainfall required for the kharif crop unpredictable rainfall, excessive rainfall during harvesting time and its impact on kharif crop production. It's important to solve this problem because the economy & food availability depend on it for Jalgaon District.

REVIEW OF LITERATURE

Shenoi (1975) one of them worked on agricultural productivity. He divided agricultural & agricultural development indicators into agricultural productivity & agricultural efficiency. Indicators selected by him for measuring agricultural development were crop production area under crops, crop productivity fertilizers used annual plan expenditure on agriculture. (Choudhury & Saha,2003). In the paper, it can be said that the cropping pattern and agricultural land use system in the Barwala community block in Haryana has been developed to meet the demands of food supply for an increasing population. To investigate the temporal change in agricultural land use, satellite remote sensing data can be considered the most effective data source. In this study, wheat production is increasing as compared to other crops. (Goyal and Kumar 2013). The abruptly changing climate impacts the agricultural system throughout the world, as in India (Praveen and Sharma 2019). The occurrence of extreme events, e.g., floods, droughts, heat waves, and dry days, has increased in India over the recent past, resulting in decreased agricultural productivity.

STUDY AREA

Jalgaon District is located in the north-west region of the state of Maharashtra in India. It is bounded by the Satpuda mountain ranges in the north Ajanta ranges in the south. Between 20° to 21° north latitude and 74.55° to 76.28° east longitude in the north-west of Maharashtra.



Map No.1

OBJECTIVES

- To find out how impact rainfall on crop production.
- To Identify the Role of remote sensing in crop production.
- To find ways to protect crop damage from climate.

HYPOTHESIS

- In recent years crop production has been decreasing.
- Crop production declines due to climate change.

DATABASE & METHODOLOGY

This study is based on primary & secondary data. Primary data is collected from field visits & Secondary data is collected from government and non-government sources. This study frequently uses computer software and hardware. With the help of Microsoft Office, Excel completed the task of data tabulation, data conversion, calculated percentages etc. Different diagrams, maps, graphs and, comparative statements have required different analysis tools and cartographical techniques. The collected data from various sources was converted into tabulated form with the help of Microsoft Office Excel software. To prepare maps and

graphs use GIS software like Arc GIS, Microsoft Excel, and ERDAS. Using different statistical methods for performing the hypothesis with the help of a Graphical representation of rainfall & crop production and the correlation between rainfall & crop production proved the hypothesis. Also, use the Mean operation statistical method.

CLASSIFICATION OF CROPS IN JALGAON DISTRICT

- Kharif crop: Cotton, Black Gram, Green Gram, Soybean, Sorghum.
- Rabi crop: Wheat, Gram, Sorghum.
- Cotton: This year in Jalgaon district cotton cultivation is 530449 hectares in the field.
- Sorghum: This year in Jalgaon district cotton cultivation is 82276 hectares. occurred in the field.
- Black Gram: This year in the Jalgaon district cotton cultivation is 21201 hectares. occurred in the field.
- Green Gram: This year in Jalgaon district cotton cultivation is 20273 hectares. occurred in the field.
- Gram: This year in Jalgaon district cotton cultivation is 85812 hectares. occurred in the field.
- Maize: This year in Jalgaon district cotton cultivation is 142653 hectares. occurred in the field.
- Wheat: This year in Jalgaon district cotton cultivation is 75035 hectares. occurred in the field.
- Soybean: This year in Jalgaon district cotton cultivation is 24419 hectares. occurred in the field.

FINDINGS

Kharif crop: With the help of the tables and graphs we observed that cotton, sorghum, Black Gram, Green Gram, Maize & soybean are cultivated in the rainy season there is some influence created by rainfall on crop production. When average rainfall occurred between (2014-17) the production rate became higher as compared to crop production between (2018-2021). Excessive rainfall has some Negative impact on kharif crop production.

Crop production in Jalgaon district. (Table no.1)

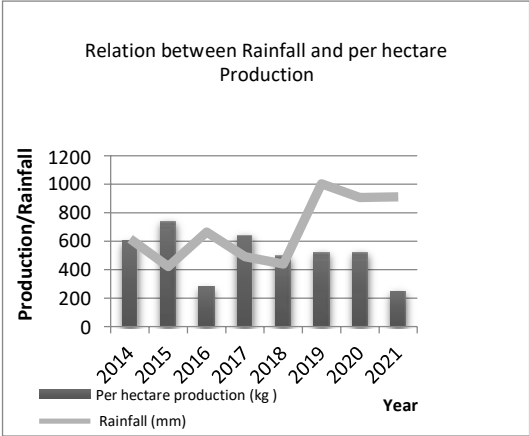
Crop production & area in Jalgaon District																
Year	Cotton		Sorghum		Black Gram		Green Gram		Gram		Maize		Wheat		Soybean	
	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y	X	Y
2014	532	304.231	1977	1166.36	760	500.97	603	274.87	1119	144.56	3855	939.9	2167	304.5	1824	25.52
2015	460	463.229	2400	839.67	816	284.1	740	290.86	563	498.58	3630	946.03	563	454.75	1906	271.11
2016	285	422.862	1197	692.74	283	294.92	281	255.94	795	298.95	1347	916.97	979	288.04	801	332.84
2017	504	426.657	2311	730.09	690	331.02	642	322.85	1383	416.93	3380	957	2680	378.67	1944	342.25
2018	404	448.447	1900	835	499	233.66	496	287.93	1268	581.55	3497	1044.7	2343	352.44	1824	241.4
2019	327	491.609	1634	586.31	521	230.87	516	261.21	1036	662.02	2427	1001.18	2063	207.01	1402	209.28
2020	495	507.583	1139	851.14	579	203.6	516	247.95	1311	715.07	877	1552.94	2260	771.33	527	188.53
2021	455	530.449	1698.5	822.76	302	212.01	246	230.27	1251	858.12	3534.66	1426.53	2344	750.35	1188	244.19
X-Per hectare production(kg)														Y-Area in Hectare (00)		

Rabi crop: With the help of the tables and graphs we observed that Wheat & Gram which are cultivated in the winter season have some positive impact of Excessive rainfall on crop production during (2018-2021). Because of excessive rainfall during the rainy season, groundwater levels increase and soil moisture is maintained in the winter season during the cultivation of rabi crops.

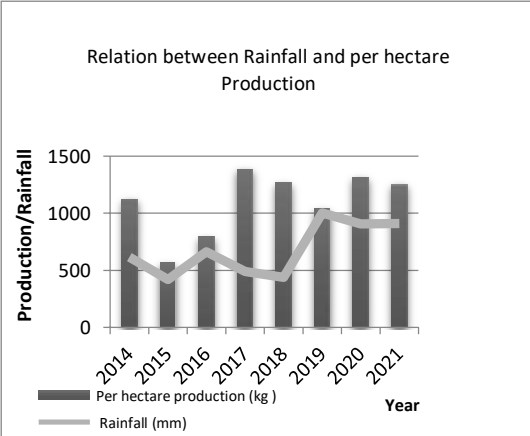
Table 2 Relationship between rainfall & per hectare production in Jalgaon

Year	Rainfall in (mm)	Per hectare production							
		Cotton	Sorghum	Black Gram	Green Gram	Gram	Maize	Wheat	Soybean
2014	615.4	532	1977	760	603	1119	3855	2167	1824
2015	420.78	460	2400	816	740	563	3630	563	1906
2016	664	285	1197	283	281	795	1347	979	801
2017	490.5	504	2311	690	642	1383	3380	2680	1944
2018	438	404	1900	499	496	1268	3497	2343	1824
2019	1001.66	327	1634	521	516	1036	2427	2063	1402
2020	906.88	495	1139	579	516	1311	877	2260	527
2021	911	455	1698.5	302	246	1251	3534.6	2344	1188

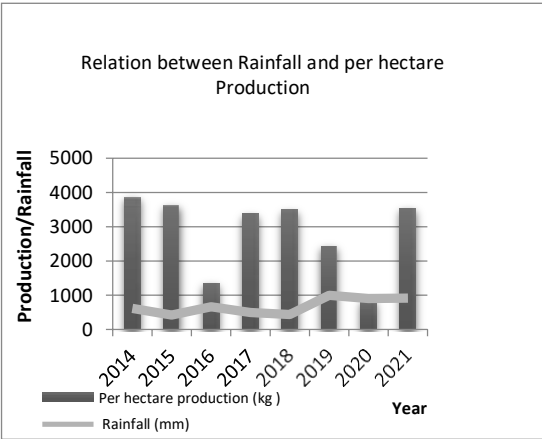
Green Gram



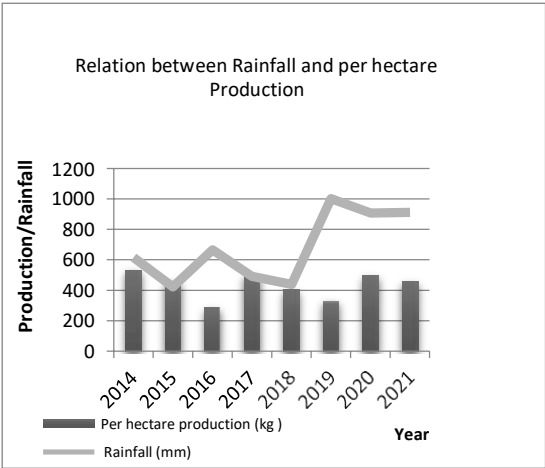
Gram



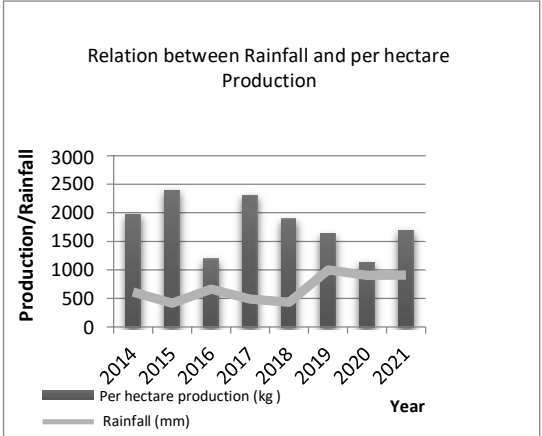
Maize



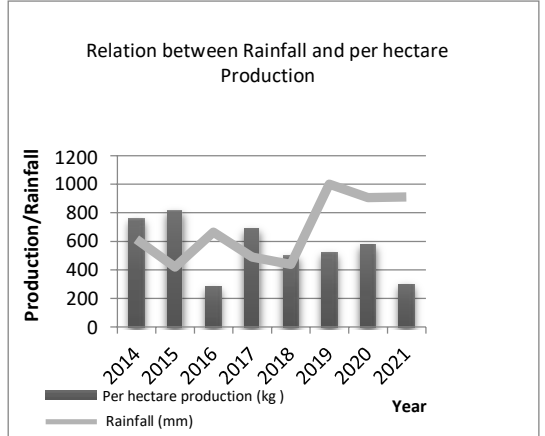
Cotton



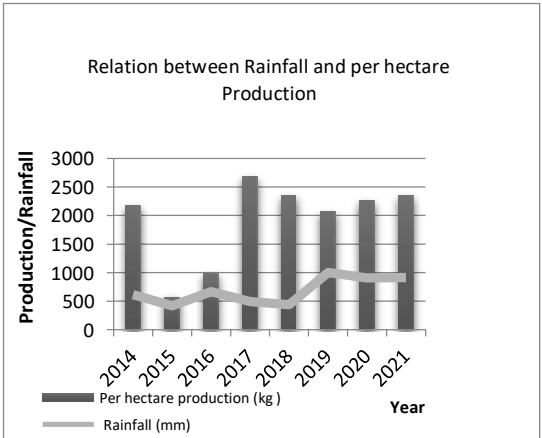
Sorghum



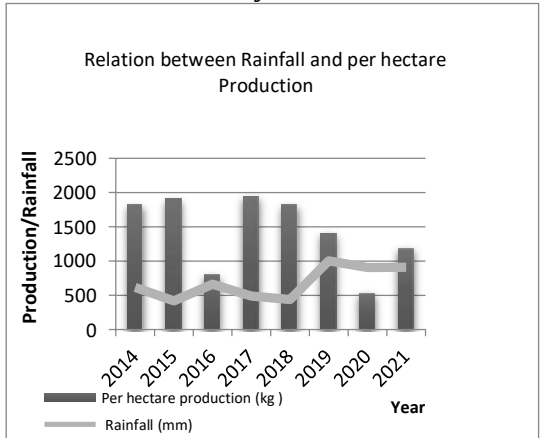
Black Gram



Wheat



Soybean



Average Crop production (Table no.3)

Year	Cotton	Sorghum	Black Gram	Green Gram	Gram	Maize	Wheat	Soybean
2014	532	1977	760	603	1119	3855	2167	1824
2015	460	2400	816	740	563	3630	563	1906
2016	285	1197	283	281	795	1347	979	801
2017	504	2311	690	642	1383	3380	2680	1944
X	Mean = 445.5	Mean = 1971.25	Mean = 637.25	Mean = 566.5	Mean = 965	Mean = 3053	Mean = 1597.25	Mean = 1618.75
2018	404	1900	499	496	1268	3497	2343	1824
2019	327	1634	521	516	1036	2427	2063	1402
2020	495	1139	579	516	1311	877	2260	527
2021	455	1698.5	302	246	1251	3534.66	2344	1188
Y	Mean = 420.25	Mean = 1592.75	Mean = 475.25	Mean = 443.5	Mean = 1216.5	Mean = 2583.91	Mean = 2252.5	Mean = 1234.5
RESULT	X>Y	X>Y	X>Y	X>Y	X<Y	X>Y	X<Y	X>Y

Kharif crop: Recent four-year (2018-2021) production is low as compared to previous four-year (2014-2017) production.

Rabi crop: Recent four-year (2018-2021) production is high as compared to previous four-year (2014-2017) production.

Correlation between Rainfall & Crop production (Table No.4)

Ye ar	Rainfall in (mm)	Crop production in (kg)							
	X	Y							
	Rainfall (2014-2021)	Cott on	Sorgh um	Black Gram	Green Gram	Gra m	Mai ze	Whe at	Soybe an
201 4	615	532	1971	760	603	111 9	385 5	2167	1824
201 5	420	460	2400	816	740	563	363 0	563	1906
201 6	664	283	1197	283	281	795	134 7	979	801
201 7	490	504	2311	690	642	138 3	338 0	2680	1944
201 8	438	404	1900	499	496	126 8	349 7	2343	1824
201 9	1001	327	1634	521	516	103 6	242 7	2063	1402
202 0	906	495	1139	579	516	131 1	877	2260	527
202 1	911	455	1698	302	246	125 1	353 4	2344	1188
The Pearson correlation coefficient is		- 0.22 7	-0.675	-0.48	-0.516	0.24 2	- 0.50 1	0.27 1	- 0.682 9

RESULT & DISCUSSION

Changes in Crop Production (Table No.5)

Sr. No	Crop	Crop production
1.	Cotton	Decrease
2	Sorghum	Decrease
3	Black Gram	Decrease
4	Green Gram	Decrease
5	Gram	Increase
6	Maize	Decrease
7	Wheat	Increase
8	Soybean	Decrease

- Positive correlation: - Gram and Wheat are both crops that show a positive correlation between rainfall and crop production. When Rainfall increases gram and wheat crop production also increases.
- Negative correlation: - Cotton, Sorghum, Black gram, Green Gram, Maize and Soybean these crops showing a Negative correlation between rainfall and crop production. When Rainfall increases crop production decreases for these crops.
- An increase in rainfall and variation in rainfall disturbed agricultural patterns which led to low crop production for those crops cultivated in rainy seasons.
- We know that cotton is an annual crop that's why the rate of decreasing crop production is very low. Cotton crops need moderate rainfall for high crop production but increased rainfall and variation in rainfall cause low crop production.
- Maize & Sorghum are kharif & Rabbi Season crops that's why the Rate of decreasing crop production is moderate due to the high effect of undulating rainfall and increased rainfall in the kharif season for these crops.
- Black Gram, Green Gram & Soybean are Kharif crops which is why the Rate of production is very high due to the effect of variations in rainfall during the Kharif season.
- Gram & Wheat, a Rabbi crops which is why the Rate of production increased due to high rainfall in the kharif season which led to moisture in the soil and increased groundwater level which helped these crops for high crop production.
- The high rate of Climate change in 2016 which a negative effect on crop production which led to low crop production in all crops
- Causes of decreased crop production
 - Variation in Rainfall
 - Water Logging
 - lack of farmers' awareness of modern technology
- Counter Measure
 - Improve Water Runoff
 - Use of Modern Technology
 - Improve farmer awareness

REFERENCES

W. Bewket, “Rainfall variability and crop production in Ethiopia Case study in the Amhara Region,” Proceeding of the 16th International Conference of Ethiopian Studies, ed. By Svein Ege and other 2009.

A.M. Tunde, B.A. Usman and V.O. Olawepo, “Effect of Climatic Variables on Crop Production in Patigi L. G.A., Kwara State, Nigeria,” Journal of Geography and Regional Planning Vol. 4(14), pp. 695-700, November 2011

Patil, B. D., (2015). Growth of Population and Agricultural Land Use Change In Jalgaon District of Maharashtra [India], Indian Streams Research Journal, 5(4), 1-6.

Majid Husain (1979) Agricultural Geography

R.S Dube, Agricultural Geography Issues and Applications

Amit Bhatnagar, Mathematical Agriculture: Concept and Numerical

Socio-economic survey report (2014-2021)

<https://en.wikipedia.org/wiki/Agriculture>

<https://agricoop.nic.in/en/agriculturecontingency/maharashtra>

<https://www.agrifarming.in/>

<http://www.indiaagrionet.com/>

<https://mahades.maharashtra.gov.in/home.do?lang=en>

<https://mausam.imd.gov.in/>

ASSESSMENT OF CLIMATE SUITABILITY FOR GINGER CROP IN PUNE DISTRICT USING ECOCROP MODEL

***Ms. Prerana B. Dalvi and **Shri. D.D. Bombe**

* Student, Department of Geography, Sathaye College (Autonomous), Vile Parle (East),
Mumbai

** Guide, Department of Geography, Sathaye College (Autonomous), Vile Parle (East),
Mumbai

Abstract: *Agriculture is the mainstay of the Indian Economy. It is characterized by a variety of crop cultivation. The district of Pune in Maharashtra State is one of the agricultural districts. The productivity and cropping pattern of the district is highly influenced by climatic conditions. With this view, the present study attempts to assess the climate suitability for Ginger Crop in Pune District using the Ecocrop Model.*

Keywords: *Agriculture, Climate Suitability, Ginger, Crop, Pune District, Ecocrop Model*

INTRODUCTION

Agriculture is an important economic activity in Pune district where the majority of the population is dependent on agriculture. Agricultural productivity and cropping patterns are immensely affected by the climate, climate change and factors like soil, physiography, capital, market, transport, etc. This research focuses on an analysis of the potential effects of changing climate on the geographical distribution of suitable areas for the cultivation of different crops especially Ginger. Ginger is a CASH crop and minor crop in Pune District. The present investigation is helpful to find out the climatic suitability for Ginger crop and impact of climate change on area of crop suitability, which is very essential for precision agriculture supports agricultural development and economic progress of nation. The aim of research is to help farmers for decision making regarding cropping patterns according to climatic suitability.

Ginger Crop

• Temperature: 28 - 30 degrees C • Altitude: up to 1500 m MSL • Soli: Sandy or Clay loam • Could be grown as inter or mixed crop • Ginger- Banana- Legume or Ginger- Vegetable Legum
• Zingiber officinale Rose. (Zingiberaceae) • Family Zingiberaceae, Native of Tropical South Asia (India) • India accounts for 70% of Total world production and 50% In World export • Avg. Yield – 15-30t/hac. • Kerala is the leading producer of Ginger.
• Carminative, Gastrointestinal stimulant. • Oleoresin is used for flavouring soft drinks & in medicine. • Appetizer, Laxative. Indigestion, Asthma, Bronchitis. • Provides relief in piles, Rheumatism, and Headache. • It reduces the opacity of the cornea. • Fresh ginger juice is useful for diabetics. • Ginger past is effective against pains. • Ginger Tea, Ginger Concoction. • Effective effect on heart muscles & improves blood supply – CAD decreases • B. P & prevents internal blood clotting.

AIMS AND OBJECTIVES

To study the climatic suitability for Ginger crop in Pune District through

- Assessment of temperature and rainfall distribution and change.
- Production and distribution of Ginger crop in Pune District.
- Mapping of climatic suitability and change using the Eco crop model.
- Suggest the measures in the planning of the precision agriculture.

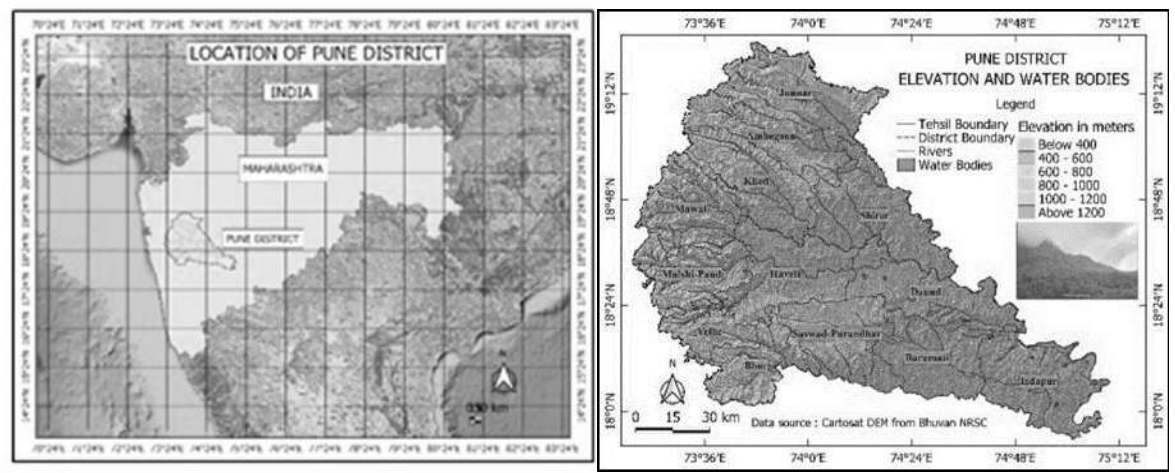
REVIEW OF LITERATURE

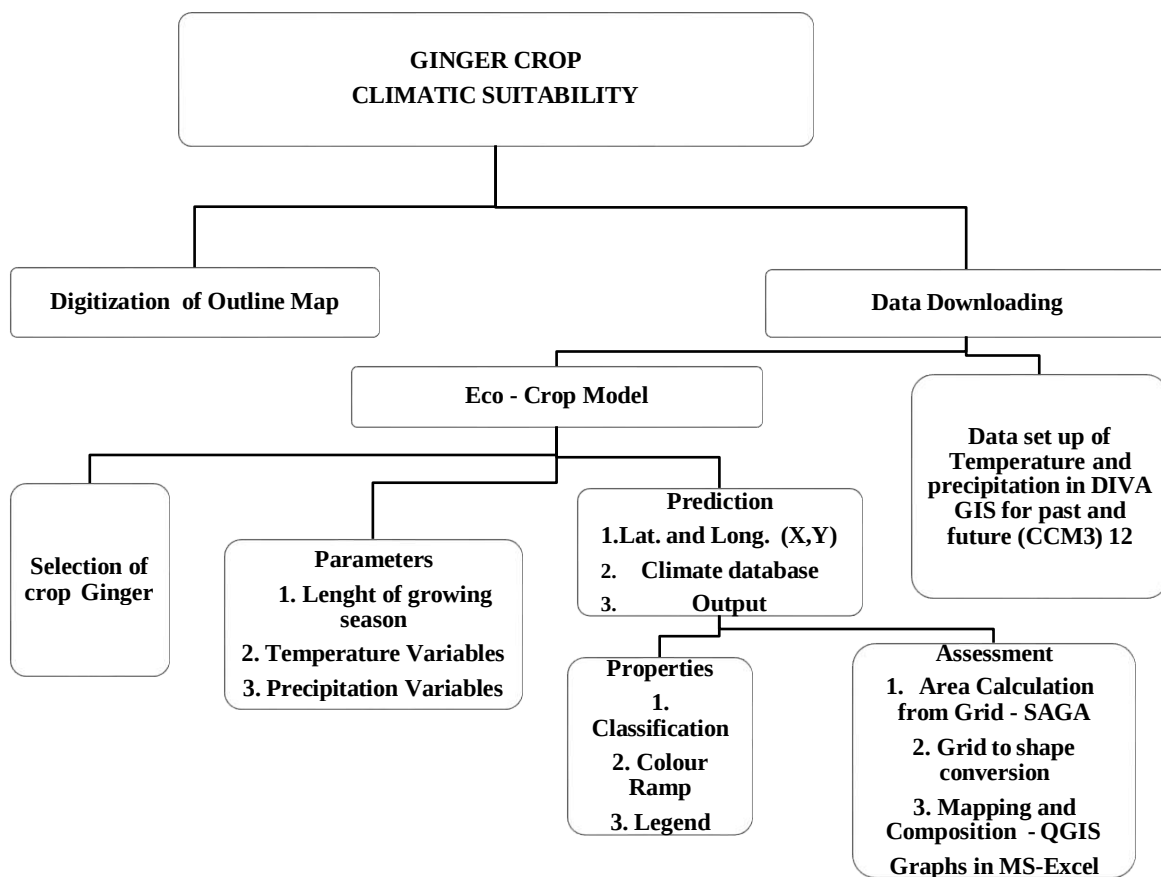
GIS-based Eco crop modelling to assess potential climate change effects on Ginger Crop Suitability Distribution - Research Article by Julian Ramirez-Villegas, Andy Jarvis, and Peter Laderach. Eco crop model approach for agro-climatic Sugarcane crop suitability in

STUDY AREA

Pune District is located in eastern side of western ghat of the Western part of Maharashtra. It is the second largest district after Mumbai in terms of population. Generally western part is hilly with laterite and red soils and eastern part is plateau with black soil. Major River is found Bhīma, Ghod, Mina, Mula, Kukadi etc. Pune district is located between 17⁰ 54' and 19⁰24' North latitude as well as 73⁰19' and 75⁰10' East longitude covers 15642 sq. km area i.e. 5.10% of Maharashtra and situated at east of the Western Ghats.

Western part is hilly and eastern part plateau with interrupted topography Pune district experiences tropical monsoon climate shows a significant seasonal and distributional variations in temperature as well as rainfall conditions. Climate of the western region of Pune is cool whereas the eastern part is hot and dry. Mula, Mutha, Pawana, Bhīma, Ghod, Indrayani, Kukadi are major rivers originates at Western Ghats and source of water for irrigation from Panshet, Khadakwasla, Bhushi, Bhatghar, Dimbhe, Pimpalgaonjoga and other dams.





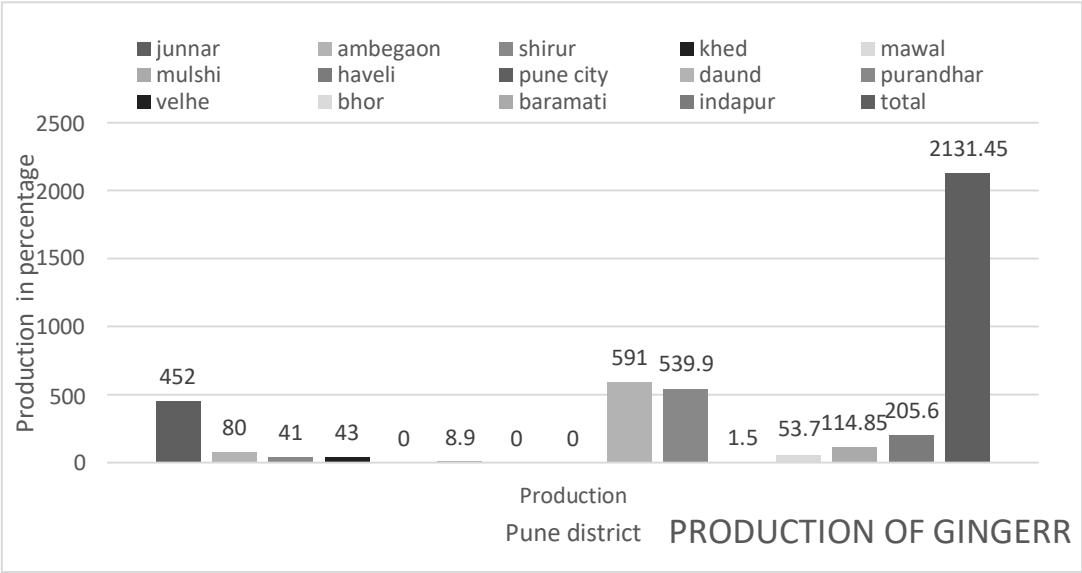
METHODOLOGY

Climate data was downloaded from World - clim (2.5 minutes spatial resolution gridded temperature and precipitation data) and assessed the climatically suitable areas by using Eco crop model technique in DIVA GIS software. Observation of crop and agricultural field was carried out. All the data analysis, mapping and graphical representation were carried out with the support of QGIS, SAGA and Excel software. Following is the Eco crop assessment methodology for climatic suitability. In this Pune map is showing the data of Rainfall and Temperature in Past and Future.

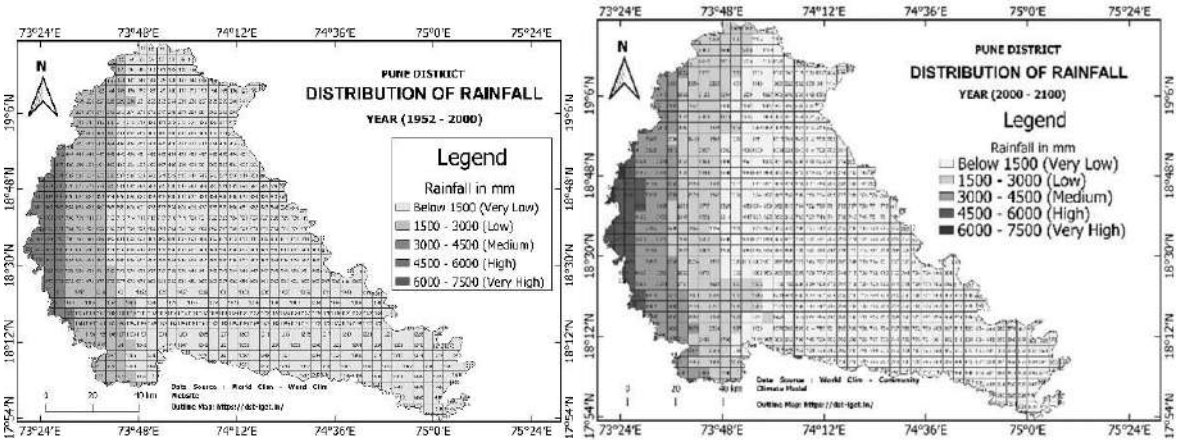
RESULTS AND DISCUSSION

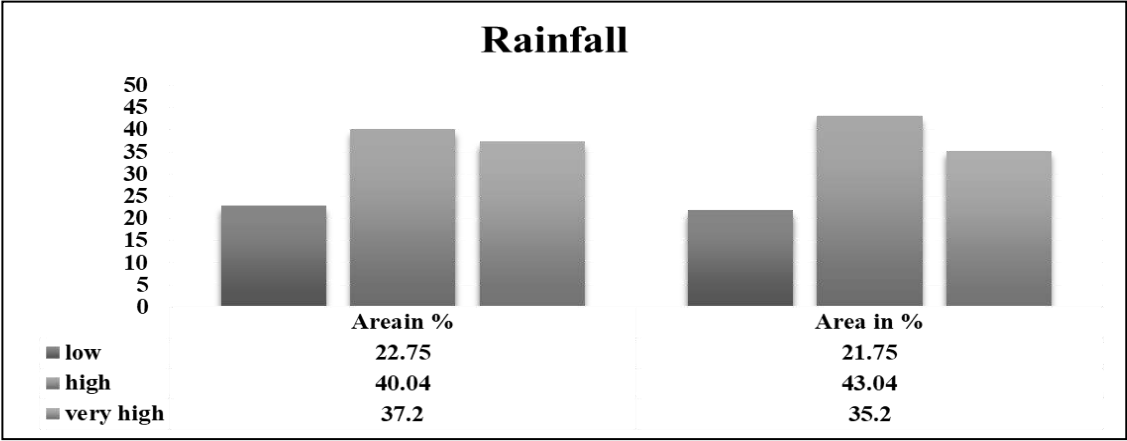
The rainfall in Pune District is unevenly distributed. In past, the high amount (more than 1000 mm) of rainfall was received in the western part (37.2 % area) whereas very low rainfall (less than 500 mm) was received in the eastern part (22.75 % area) and moderate rainfall (500 to 1000 mm) received in 40.04 % area of district. In the future the high

amount (more than 1000 mm) of rainfall in the western part 35.2 % area) is predicted, very low rainfall (less than 500 mm) is predicted in the eastern part (21.75 % area) and moderate rainfall is predicted in 43.4 % area of the district. The change in rainfall is projected from past to future whereas the low rainfall area is decreased (1%), the moderate rainfall area is increased (3%) and high rainfall area is decreased (2%).

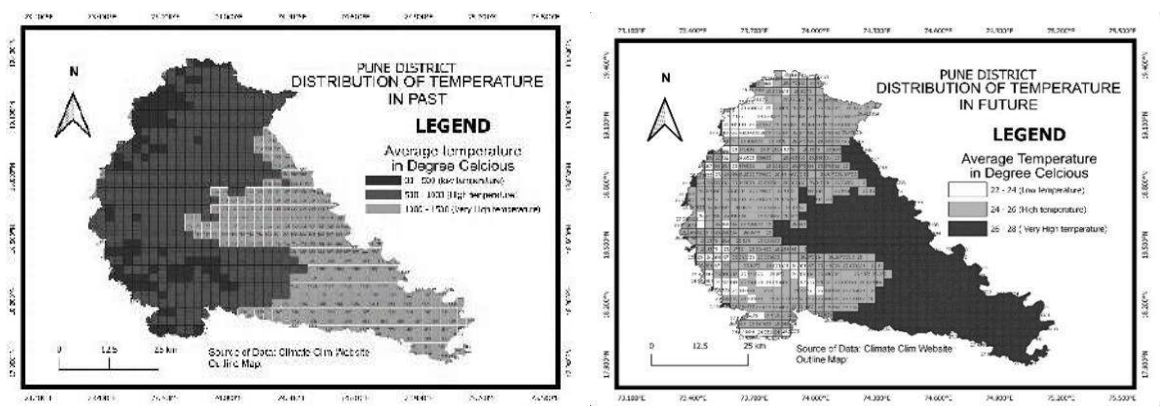


Pune: Production of Ginger

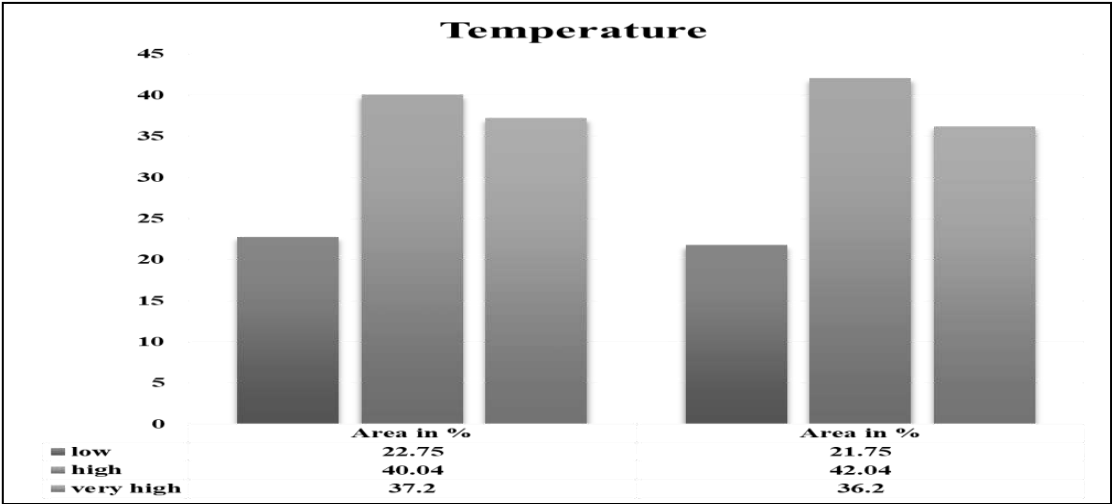




Past and Future Distribution of Rainfall



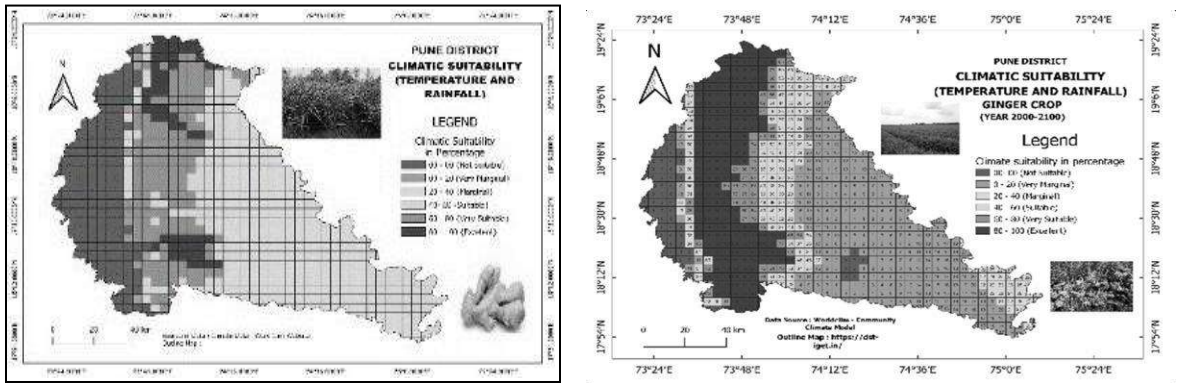
Past and Future Distribution Temperature



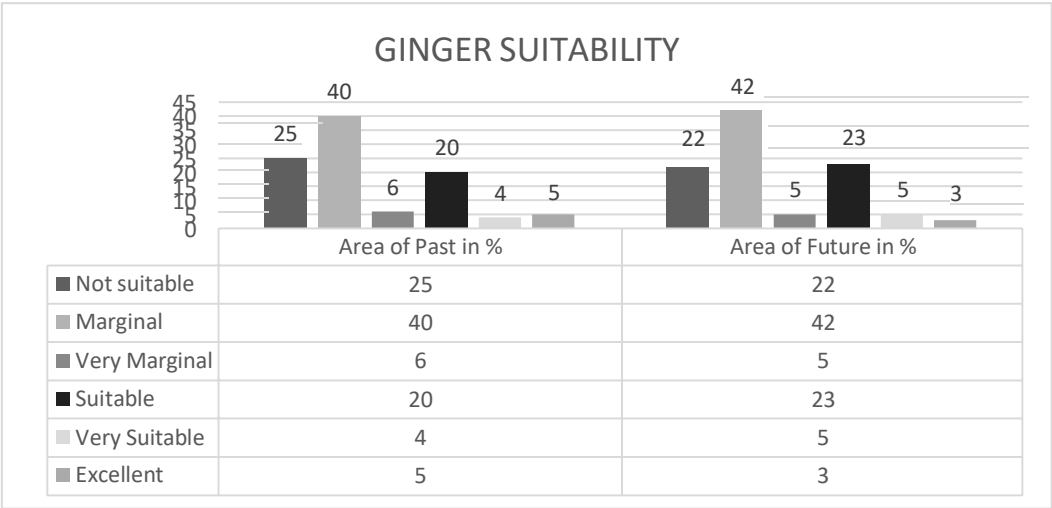
In past the high (more than 26 °C) temperature is experienced in eastern part (37.2% area), moderate (24 °C to 26 °C) in central part (40.4% area) where as low temperature (less than 24 °C) experienced in western part (22.75% area) of the district. In future the high (more than 26 °C) temperature is experienced in eastern part (36.2% area), moderate (24 °C to 26 °C – 42.04% area) where as low temperature (less than 24 °C) experienced in western part (21.75% area) of the district. The change in temperature is projected from past to future whereas the low temperature area is decreased (1%), moderate rainfall area is increased (2%) and high rainfall area is decreased (1%).

ECOCROP MODEL (SUITABILITY; OF CLIMATE-TEMPERATURE AND RAINFALL) : GINGER CROP

Eco crop model is a software tool developed by the Food and Agriculture Organization (FAO) used in DIVA GIS. It identifies many plant species for various environments. It contains a database for the environmental requirements of crops. EcoCrop provides data sheets about individual plants with brief information. The eastern side of the western ghat is most suitable, the western ghat area is least suitable and the eastern part of the district is climatically average suitable for ginger crop.



Past and Future Climatic Suitability (Temperature and Rainfall)



In the past no suitable area is 25% where as in future will be 22%. In the past very marginal climatic suitable area is 40% whereas in the future will be 42%. In the past marginal climatic suitable area is 6% whereas in the future will be 5%. In the past suitable climatic area is 20% whereas in the future will be 23%. In the past very suitable area is 4% whereas in the future will be 5%. In the past excellent suitable area is 5% whereas in the future will be 3%. The area of no suitable is same by 0%, very marginal decreased by 7.55%, marginal suitable decreased by 47.14%, suitable decreased by -12.18%, very suitable decreased by -14.64% and excellent suitable increased by -6.83% from past to future. Changes of climate especially in temperature and rainfall is responsible to variations in climatic suitable area in Pune District for Ginger crop.

FINDINGS

- Ginger Crop Cultivation in Pune District is very low. Only 723-hectare area is under cultivation of ginger crop of total 1562018-hectare area.
- Assessment of temperature and rainfall distribution and change evaluates that there is variation in distribution of temperature and rainfall. Minimum temperature is recorded less than 22 °C which is found in the western part where as the maximum temperature is recorded as more than 26 °C which is found in the eastern part of the district. The district is facing the problem of rising in temperature from past to future that is the area under moderate temperature is increased by 2 % and the very low and very high-temperature area is decreased by 1%

approximately from past to future. Low and high rainfall area is decreased by 1% and 2 % respectively and moderate rainfall area is increased 3% from past to future climatic conditions.

- Mapping of climatic suitability and change using the Eco crop model remarkably projects that not suitable 25%, very marginal 40%, marginal 6%, suitable 20%, very suitable 4% and excellent 5% area in the past whereas not suitable 22%, marginal 42%, very marginal 5%, suitable 23%, very suitable 5% and excellent 3% area in future. The change in climatically suitable area is not suitable by 25%, marginal 40 %, very marginal 6%, suitable 20%, very suitable 4% and excellent 5% area for cultivation of ginger crop from past to future. The area for cultivation of ginger has increased from the past to the future.
- We can suggest that change in temperature and rainfall is favorable for ginger cultivation and thus farmers should cultivate more area under ginger crop for the precision agriculture and more production due to increase in climatic suitability.

CONCLUSION

- Ginger is crop cultivated in Pune district due to soil, climate and other suitable factors which are very helpful to farmer to cultivate it as a cash crop.
- Assessment of temperature and rainfall distribution and change evaluates that there is variation in distribution of temperature and rainfall. Minimum temperature is recorded below 22 °C and experienced in western part where as maximum temperature is recorded more than 26 °C which is found in eastern part of district. The area of low and high temperature is decreased and moderate temperature is increased from past to future. Minimum rainfall recorded below 500 mm and experienced in the eastern part where as maximum rainfall is recorded more than 1000 mm which is found in the western part of the district. The area of low and high rainfall is decreased and moderate rainfall is increased from past to future. The area experiencing high temperature receives less rainfall and low temperature receives high rainfall.
- Mapping of climatic suitability and change using the Eco crop model remarkably projects that the climatically suitable area is increased from past to future and it predicts that climate change has a positive impact on climatically suitable areas in the Pune district.
- We can suggest that change in temperature and rainfall is favorable for ginger cultivation and thus farmers should cultivate more area under ginger crop for precision agriculture.

SUGGESTIONS

Further Research can be carried out to assess the suitability of multiple factors for ginger cultivation as well as other crops. There are opportunities for further research on Climate change's impact on Ginger cultivation as well as other crops.

REFERENCES

Bhuvaneswari, K., and et al. (2014) Climate change impact assessment and developing adaptation strategies for rice crop in western zone of Tamil Nadu. *Journal of Agro-meteorology*, 16 (1): 38-43.

Directorate of Economics and Statistics. 2022. Planning Department, Government of Maharashtra, India. District socio-economic review, Pune. 77-111.

"Crop Ecological Requirements Database (ECOCROP) | Land & Water | Food and Agriculture Organization of the United Nations". www.fao.org.

Gupta, and et al (2012) Identification and multi-environment validation of resistance to *Fusarium oxysporum* f. sp. *ciceris* in chickpea *Field Crops Res*135:82–88.

Sinha P, and et al. (2013). Yellow rust threatening wheat under extreme cold in north western India: GIS linked risk map for disease monitoring. *Indian Farming* Vol. 73 No. 9 (2023).

http://biogeo.ucdavis.edu/data/climate/worldclim/1_4/diva/diva_worldclim_2-5m.zip

<https://www.diva-gis.org/>

<https://www.fao.org/land-water/databases-and-software/cropwat/en/>

https://mahades.maharashtra.gov.in/files/publication/dsa/2021-22/DSA_2022_Pune.pdf

<https://onlinemaps.surveyofindia.gov.in/>

<https://vedas.sac.gov.in/krishi/dashboard/index.html>

THE MEDIA'S ROLE IN ENVIRONMENTAL CONSERVATION

Mr. Samgir Bhushan Sopan

Research Scholar, Deshbhakt Sambhajirao Garad Mahavidyalaya, Mohol, Solapur 413 213

samgirbhushan21@gmail.com

Abstract: *The paper discusses the role of media in promoting environmental preservation and influencing public behaviour. It explores how various media platforms, including print, radio, television, digital, and social media, work together to spread knowledge, create awareness, and advance environmental consciousness. Media can pique viewers' interest in environmental issues through compelling stories, visual storytelling, and interactive content. The study also examines how media framing and agenda-setting affect public conversation on environmental issues. Media can advocate for policy action and behavioural change while highlighting the importance of environmental difficulties. Investigative journalism is crucial in exposing environmental injustices, making governments and businesses accountable, and elevating the voices of underrepresented groups affected by environmental degradation. Documentaries, exposés, and investigative reports can reveal environmental crimes and elicit public indignation, prompting governmental changes and corporate responsibility initiatives. The research also explores how governments, advocacy groups, and environmental organizations can use media campaigns and initiatives to inspire public support and spur group action. Through online petitions, citizen science projects, and awareness-raising campaigns, media-driven initiatives enable people to make a significant impact in their communities and support environmental conservation efforts.*

Keywords: Sustainable, Innovations, Environment, Social Media and Awareness.

INTRODUCTION

Concerns in the state of our planet have increased to previously unheard-of heights in recent years. A few of the many severe environmental issues that mankind is currently experiencing include pollution, deforestation, climate change, and species extinction. The media has a critical role to play in influencing public opinion and promoting environmental conservation efforts as the globe struggles with these complicated problems. The media, which includes digital platforms and social media in addition to more established media like radio, television, and newspapers, has a big impact on how people think and act. The media may inspire people, communities, and politicians to take significant action in environmental protection by sharing knowledge, creating stories, and igniting conversations.

The purpose of this paper is to examine the media's complex involvement in environmental preservation. It will look at how the media presents environmental concerns, how different media platforms affect public knowledge and participation, and what opportunities and problems come with covering environmental conservation initiatives in the media. The paper will also examine how media narratives and content influence people's views, convictions, and actions towards environmental preservation. Viral social media campaigns and powerful films are only two examples of how the media can elicit empathy, incite anger, and spur people to take action in support of the environment.

The media's contribution to environmental conservation is not without controversy and complexity, though. Sensationalism, media bias, and the preference for some subjects over others are all raised. Furthermore, it is impossible to overlook the impact of political agendas and corporate interests on how environmental concerns are covered in the media. The media is nevertheless a potent ally in the struggle for environmental sustainability in spite of these obstacles. The media has the power to promote better knowledge and solidarity across a wide range of viewers by elevating the voices of scientists, activists, and marginalised people who are disproportionately impacted by environmental degradation. Understanding the important part that the media plays in influencing public opinion and promoting social change is essential as we face the pressing need for environmental action. We can fully utilise the power of the media to encourage environmental preservation and

build a more sustainable future for future generations by collaborating strategically and conducting well-informed analysis.

Here are some examples of how people are using the Internet to raise environmental awareness:

- **Social Media Campaigns:** Individuals and organizations use platforms like Instagram, Twitter, Facebook, and Tik-Tok to share information, images, and videos related to environmental issues. Hashtags like Climate Action, Save The Planet, and Zero Waste help to amplify messages and reach a wider audience.
- **Online Petitions and Advocacy:** Websites such as Change.org and Avaaz.org allow people to create and sign petitions advocating for environmental causes. These petitions can target government officials, corporations, or other decision-makers, drawing attention to specific issues and mobilizing support for change.
- **Educational Websites and Blogs:** Websites and blogs dedicated to environmental education provide information on topics like climate change, biodiversity, sustainable living, and environmental conservation. These resources help to raise awareness, provide guidance on eco-friendly practices, and inspire action.
- **Virtual Events and Webinars:** Organizations host virtual events, webinars, and online conferences to educate the public about environmental issues and solutions. These events often feature expert speakers, interactive discussions, and Q&A sessions, allowing participants to learn and engage from the comfort of their own homes.
- **Online Documentaries and Films:** Streaming platforms like Netflix, Amazon Prime, and YouTube offer a plethora of documentaries and films focused on environmental topics. These documentaries raise awareness about pressing environmental issues, showcase inspiring conservation efforts, and encourage viewers to take action.
- **Crowdfunding Campaigns:** Platforms like Kickstarter and GoFundMe enable individuals and groups to raise funds for environmental projects and initiatives. From community gardens to wildlife conservation programs, these campaigns harness the power of online communities to support positive environmental change.
- **Virtual Reality (VR) Experiences:** Users may fully submerge themselves in virtual worlds that showcase environmental problems and potential solutions. Virtual reality

experiences that give people a first-hand look at environmental issues can be effective tools for promoting empathy and increasing awareness.

- **Online Forums and Discussion Groups:** Websites and forums like Reddit, Quora, and online community groups provide platforms for discussing environmental issues, sharing ideas, and connecting with like-minded individuals. These online communities facilitate knowledge sharing, collaboration, and collective action.

THE AWARENESS OF ENVIRONMENT IN THE MEDIA

The awareness of the environment in the media has significantly increased over the past few decades. There has been a noticeable shift in media coverage towards environmental issues, driven by various factors such as growing public concern, scientific findings, and advocacy efforts from environmental organizations.

- **News Coverage:** Environmental issues regularly feature in news headlines around the world. Topics like climate change, pollution, deforestation, and wildlife conservation often make the front pages of newspapers and lead news broadcasts. The media's role in disseminating information about environmental challenges and their impacts on communities and ecosystems is crucial in raising awareness and fostering public discourse.
- **Documentaries and Films:** Documentaries and films focusing on environmental themes have gained popularity and critical acclaim. Productions like Al Gore's "An Inconvenient Truth" and Leonardo DiCaprio's "Before the Flood" have reached wide audiences, contributing to increased awareness about climate change and its consequences. These visual mediums often have a profound effect on viewers, prompting them to reconsider their attitudes and behaviors towards the environment.
- **Online platforms and social media:** Nowadays, social media platforms have become essential for raising the public's awareness of environmental problems. Online social networking sites like Facebook, Instagram, YouTube, Twitter, and Twitter are often utilized for sharing campaigns, articles, videos, and user-generated material on environmental issues. Moreover, online forums and activism enable people to engage in environmental activities and meet others who share their interests.
- **Environmental Journalism:** Environmental journalism has emerged as a specialized field within media organizations. Journalists dedicated to covering environmental issues investigate and report on topics ranging from local environmental policies to global conservation efforts.

Through in-depth reporting and investigative journalism, they uncover environmental injustices, hold corporations and governments accountable, and provide insights into potential solutions to environmental challenges.

- **Marketing and Advertising:** Businesses are progressively integrating environmental messaging into their marketing and advertising strategies. Businesses use the media to convey their commitment to environmental stewardship, whether it is by showcasing corporate social responsibility programmes or promoting eco-friendly goods and sustainable practices. Greenwashing, or the act of giving incorrect information or creating a false image about an organization's environmental operations, is also under investigation.
- **Entertainment Industry:** The stories of video games, books, and television series occasionally touch on environmental topics. The entertainment industry has an impact on how the public views the environment, whether it is through upbeat tales of conservation and restoration or gloomy depictions of a future devastated by environmental degradation.

All things considered, there is no denying the media's contribution to environmental awareness-raising. Media coverage helps to shape public opinion, influence governmental choices, and mobilise collective efforts towards environmental sustainability via informing, educating, and motivating action. On the other hand, there are obstacles including false information, prejudice, and the requirement for impartial reporting that fairly depicts the complexity of environmental concerns.

The role of the media in improving public awareness of environmental issues:

- **Education and Information:** The media provides information and educates the public about environmental challenges, such as climate change, deforestation, pollution, and loss of biodiversity. Through news articles, documentaries, and educational programs, the media helps people understand the causes, impacts, and potential solutions to these issues.
- **Increasing Awareness:** Public awareness of environmental concerns is aided by media coverage. The media raises public awareness and knowledge of the significance of environmental conservation and sustainability by covering environmental events, initiatives, and scientific study.
- **Advocacy and Campaigning:** Media outlets often engage in advocacy and campaigning for environmental causes. They may highlight the work of environmental organizations, promote conservation efforts, and call for policy changes to address environmental problems. Through editorials, opinion pieces, and investigative journalism, the media can

influence public opinion and mobilize support for environmental action.

- **Influencing Policy:** Media coverage can shape public opinion and influence policy makers to take action on environmental issues. By bringing attention to environmental problems and highlighting public concern, the media can pressure governments and decision-makers to implement regulations, laws, and policies to protect the environment and promote sustainable development.
- **Encouraging Behavioral Change:** Media campaigns and messaging can encourage individuals to adopt environmentally friendly behaviors and lifestyles. Through advertising, social media, and public service announcements, the media promotes recycling, energy conservation, sustainable transportation, and other eco-friendly practices.
- **Highlighting Success Stories:** The media also plays a role in showcasing success stories and inspiring examples of environmental conservation and sustainability. By highlighting innovative solutions, community initiatives, and conservation projects, the media motivates people to act and contribute to positive environmental change.
- **Encouraging Discussion and Debate:** Public conversation and discussion on environmental concerns can take place via media channels. Through panel discussions, interviews, and online forums, the media makes a variety of viewpoints available, fosters thoughtful debate, and motivates cooperation in the search for answers to environmental problems.

All things considered, raising public awareness of environmental challenges, encouraging public support for conservation activities, and accelerating positive change towards a more sustainable future depend heavily on the media's role in doing so.

CONCLUSION

The media possesses the ability to inspire individuals and communities to actively safeguard the environment. Through holding governments and corporations responsible for their actions, promoting sustainable behaviours, and amplifying the voices of environmental advocates, the media plays a crucial role in the worldwide endeavour to combat climate change, protect biodiversity, and establish a sustainable future for future generations. Nevertheless, it is imperative for the media to uphold precision, impartiality, and honesty in its coverage in order to effectively fulfil its duty in environmental preservation.

REFERENCES

- Asur, S. and B.A. Huberman (2010), Predicting the Future with social media.: p. 492-499.
- Bennett WL. (2002). News: The Politics of Illusion. New York: Longman
- Bhattacharjee, A., Social science research: principles, methods, and practices.
- Boykoff M, Mansfield M. (2008). Ye Olde Hot Aire”: reporting on human contributions to climate change in the UK tabloid press. Environ. Res. Lett. 3:1–8
- Boykoff M. (2008). The cultural politics of climate change discourse in UK tabloids. Polit. Geogr. 27:549– 69
- Cheng, E., et al. The role of experts in social media—Are the tertiary educated engaged? In Technology and Society (ISTAS), 2010 IEEE International Symposium on. 2010. IEEE.
- Gómez, J.M. and B. Scholtz, Information Technology in Environmental Engineering: Proceedings of the 7th International Conference on Information Technologies in Environmental Engineering (ITEE 2015). 2016: Springer.
- Hansen, A. (2011) „Communication, media and environment: Towards connecting research on the production, content and social implications of environmental communication“, International Communication Gazette, Vol 43, Nos. 1 & 2, pp.7-26.
- <http://journals.sagepub.com/doi/abs/10.1088/0963-6625/5/3/006?journalCode=pusa>
- <http://search.proquest.com.vlib.interchange.at/pqdtglobal/docview/305083058/abstract/4B1F4A8F28704DCEPQ/1?accountid=172684>
- <http://search.proquest.com.vlib.interchange.at/pqdtglobal/docview/194157537/abstract/4B1F4A8F28704DCEPQ/2?accountid=172684>
- <http://search.proquest.com.vlib.interchange.at/pqdtglobal/docview/304303048/abstract/4B1F4A8F28704DCEPQ/11?accountid=1726842012>.
- http://www.earthisland.org/journal/index.php/elist/eListRead/mainstream_environmental_c
- [o_erage_the_sound_of_silence](http://www.earthisland.org/journal/index.php/elist/eListRead/mainstream_environmental_c)
- <http://www.sciencedirect.com/science/article/pii/S0959378008000964>
- <http://search.proquest.com/docview/301524729?accountid=172684>
- John, I. The social media as a platform for creating environmental awareness in the
- Kaplan, A.M. and M. Haenlein, Users of the world, unite! The challenges and opportunities of Social Media. Business Horizons, (2010). 53(1): p. 59-68.
- Katajisto, L. Implementing social media in technical communication. in Professional Communication Conference (IPCC), (2010) IEEE International. (2010). IEEE.

McChesney RW. (1999). Rich Media, Poor Democracy: Communication Politics in Dubious Times. Urbana/Chicago: Univ. Ill. Press

McCombs M. (2005). A look at agenda-setting: past, present and future. *Journalism Studies* 6: 543- 557.

Saneh (2018): Role of media in conserving environment- Assistant Professor in Geography C.R.M. Jat College Hisar (HR) © 2018 IJRAR December 2018, Volume 5, Issue 4
www.ijrar.org (E-ISSN 2348-1269, P- ISSN 2349-5138)

Scholtz, B., C. Burger, and M. Zita (2016), A social media Environmental Awareness Campaign to Promote Sustainable Practices in Educational Environments.: p. 355-369. 2018 IJRAR December 2018, Volume 5, Issue 4 www.ijrar.org (E-ISSN 2348-1269, P- ISSN 2349-5138) IJRAR1944401 International Journal of Research and Analytical Reviews (IJRAR) www.ijrar.org 160

Statista. Leading social networks worldwide as of April 2016, ranked by number of active users (in millions) 2016 [cited 2016 April]; Available from: <http://www.statista.com/statistics/272014/global-social-networks-ranked-by-number-of-users/>.

Teddlie, C. and F. Yu, Mixed methods sampling a typology with examples.

Verma, S.K., ENVIRONMENTAL AWARENESS: A NEED OF NATURE. *Journal of Global Resources* Volume, 2016: p. 182-185. *Journal of mixed methods research*, 2007. 1(1): p. 77-100. Niger Delta region. 2012

YouTube. Statistics. Momentum 2016 [cited 2016 April]; Available from: <https://www.youtube.com/yt/press/en-GB/statistics.html>.

EDITORS

Chief Editor: Prof. Dr. Moushumi Datta



Prof. Dr. Moushumi Datta has an illustrious career with several administrative and academic responsibilities. The author has two Ph.D. degrees and a total of 10 research projects (5 Minor, 2 Major and 1 Industrial). Dr. Datta has authored more than 100 research papers, 2 reference books and 8 text and co-edited books. A recognised Ph.D. guide in Geography, University of Mumbai, 2 students have been awarded Ph.D. and 4 are registered under her able guidance. Dr. Datta has been a resource person for more than 100 lectures related to Geography, research, NAAC and many other academic aspects. The author has received four patents (3 from Government of India and 1 from Government of Australia) and filed 2 patents (1 Utility Patent and 1 Journal Patent). 1 copyright based on Mangroves is also accepted by Government of Maharashtra. Prof. Dr. Moushumi Datta has received several awards vis-à-vis her academic, administrative and research accomplishments from various national and international bodies. The most recent awards include 'Award for Excellence in Research' by The Asian Education Leadership Symposium and Awards in association with Hypedge Media Pvt. Ltd. and I Can Foundation, 'Best Principal Award' by InSc Institute of Scholars and Leadership Excellence Award by Research Foundation of India (RFI-CARE).

Editors:



Dipesh Karmarkar, Ph.D. in Historical Geography, is an Associate Professor and Head of the Department of Geography at Smt. C. H. M. College (Ulhasnagar), University of Mumbai. He ranked among the top 10% of teachers globally in the International Teachers' Olympiad in 2023. He has published three books,

twenty papers in journals, proceedings, edited books, nineteen textbooks and more than twenty Marathi articles in periodicals. His recent article "Mahim Before Bombay: The Story of a Lost Port" published in the volume "Gateways to the Sea: Historic Ports and Docks of Mumbai Region" has received appreciation from the academicians. This volume has been compiled by the Maritime Mumbai Museum Society and published by the Government of India. He has contributed geographical entries to the Marathi Vishwakosh and academic blogs. He is a Ph.D. Research Guide, a Member of the Board of Studies in Geography at the University of Mumbai and a Governing Body Member of the Bombay Geographical Association.



Dr. Sumant E. Autade is presently working as Associate Professor in Geography at Swami Vivekanand Night College in Dombivli, affiliated to University of Mumbai. He has teaching experience of 18 years at under-graduate and 4 years teaching experience at post graduate level. His research interests are in application of remotely sensed data in natural hazard assessment, particularly landslides. He has published his research work in various national and international journals. To his credit, Dr. Autade has 24 research papers published in reputed National and International journals, 2 newspaper articles, 2 articles in “*Marathi Bhasha Vishwakosh*”, 7 book chapters in edited books and 2 general articles in magazines. Dr. Autade, to his credit has 325 citations, H-index - 4 and i-10 index 3 (Google scholar). Dr. Autade has participated and presented papers in several national and international conferences. He has delivered over 20 talks as guest speaker in different academic conventions at various institutions. He has completed 3 minor and 1 major research projects funded by University of Mumbai and ICSSR. He has successfully participated in two certificate courses on Remote Sensing and GIS at Indian Institute of Remote Sensing, Dehradun. He has also completed 12-week online certificate course on Geographical Information System organized by IIT Chennai.



Dr. Ramesh H. Gavit, Ph. D., NET in Geography, is working as an associate professor in the Department of Geography, University of Mumbai, Mumbai. His teaching experience at undergraduate and post graduate level is of eighteen years. Dr. Gavit is a research guide. With 20 national and international publications to his credit, presently two research students are doing Ph. D. under his guidance. In all 25 post graduate students have completed their dissertation under the able supervision of Dr. Gavit. He has

published two research articles in edited volumes and delivered nine invited talks. Dr. Gavit has one patent design to his credit titled Device to Analyze and Generate Hotel Planning. He is a member of BoS in Geography at University of Mumbai and S. P. College, Pune and also worked as a convener of NEP 20 Geography syllabus framing. Dr. Gavit is a treasurer of Bombay Geographical Association (BGA) and secretary of All India Adivasi Employees Federation Branch University of Mumbai (AIAEF) from 2022. Dr. Gavit is a recipient of Best Geography Teacher Award 2023 given by the Deccan Geographical Society of India.



Dr. Nitinkumar M. Patil, Ph. D. in Geography (Climatology), with more than thirty years' experience of teaching at both undergraduate and post graduate level is presently working as a faculty at the S.I.A. College of Higher Education, Dombivli (E), affiliated to the University of Mumbai. His areas of interest are Environmental Management, Agricultural science, Agro-climatology Population Studies, Settlement Geography and Tourism. There are

fifty-four national and international level research publications to his Credit. Dr. Patil has authored four books of geography and environmental science, completed twenty-two UGC-HRDC, PMMMNMTT and University organized training programs, presented thirty-three research papers on various national and international platforms, delivered more than twenty-five invited talks and organized seven conferences, seminars and workshops at state and national level. He has worked as a head, department of geography, member of the College Development Committee, Students' Welfare Officer, NSS Coordinator, member of the NAAC steering committee and subject expert in the university level committees constituted for the selection of assistant professor to be appointed in the colleges and committees constituted for the promotion of college teacher under Career Advancement Scheme (CAS). Dr. Patil has completed two minor research projects funded by UGC, New Delhi and Soliton NetLink Pvt. Ltd. Dombivli. He is a recipient of the 'Shikshak Ratna Award' given at national level by Samta Sahitya Academy at Goa in May 2017 and has also obtained the 'Best Oral Presentation Award' in the international conference organized by BASE-Biology association, Agriculture SciTech and Agricultural association in collaboration with college of medicine, University of Hail, Saudi Arabia in June 2021. Dr. Patil is a life member of The Deccan Geographical Society, India, Maharashtra Bhoogolshastra Parishad, Pune and Bombay Geographical Association, Mumbai.

THE BOMBAY GEOGRAPHICAL ASSOCIATION

Governing Body Members 2023 onwards

President	:	Smt. Bharti Unni
Vice Presidents	:	Prin. M. T. Telang; Shri. Prakash G. Shinde; Shri. Vilasrao R. Chawan; Shri. B. D. Patil; Smt. Premlata Singhi; Prin. Dr. Debajit Sarkar; Shri. Suresh Shetkar; Prin. Dr. Prakash Dongre.
Secretary	:	Prin. Dr. Moushumi Datta;
Jt. Secretary	:	Dr. Sanjukta Sattar; Asst. Secretary: Shri. Dhyaneshwar Bombe
Treasurer	:	Dr. Ramesh Gavitt; Asst. Treasurer: Shri. Sachidanand Honna
Executive Members	:	Dr. Dipesh Karmarkar; Dr. Pandurang Choudhari; Dr. Minal Parab; Dr. Ravindra Gawade; Prin. Dr. Anita Awati; Prin. Dr. Priti Mahajan; Dr. Baban Singare; Dr. Deepali Bhide; Dr. Shweta Ranade; Dr. Sanjyot Pritam Deuskar; Mr. Nikhil Gawai; Ms. Aastha Smarth Kapur; Shri. Bhagwan Gangawane; Dr. Sheetal Zalte; Dr. Jayeeta Datta; Dr. Samruddhi Chawan; Dr. Neetu Sharma; Dr. Amrita Agrawal
Advisory Committee	:	Shri. S. Ebenezer; Dr. Savitsmita Vilasrao Chawan; Prin. Dr. H. M. Pednekar
Auditor	:	C. A. Manoj Pal

We are blessed with the rich legacy of BGA built strongly by well-known geographers, academicians, administrators, and philanthropists who have been the founder pillars as Presidents during their tenure in sequence as Prin. C. B. Joshi; Shri. Iyer; Dr. C. D. Deshpande; Shri. N. M. Joshi; Shri. Vakil; Prof. B. Arunachalam; Prof. Dr. K. Sita; Prof. Dr. V. S. Phadke; Shri. V. G. Amrite; Shri. S. Ebenezer; and Prof. Dr. Savitsmita V. Chawan.