# A STUDY ON SUSTAINABLE TOURISM EXPANSION IN CHHATTISGARH

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## ABSTRACT

*The current study was carried out in the state of Chhattisgarh to determine the rate of tourism development, sustainability, and its awareness among visitors to the state. It also aims to create a model to identify the key factors that can influence the growth of sustainable tourism in the state of Chhattisgarh. new line the importance and influence of the tourist industry on a global and national scale cannot be understated. The primary issue that needs to be addressed at the national and state level in contemporary tourism is the renovation of existing destinations and the exploration of new possibilities to the level of expectation, comfort, and satisfaction that is person's travelling to and staying in places outside their usual environment for various purposes. newline the tourist sector contributes to a country's economic strength and has grown significantly over the past 20 years, but there are some serious risks that come along with this industry's extraordinary global expansion. Present-day India, and Chhattisgarh in particular, are rich in many respects, whether it be in terms of infrastructure, connectivity, flora and wildlife, preserved historic architecture or culture, the shrine places, etc., all of which are sure to draw domestic and international tourists. Chhattisgarh, a young state, is exploring the potential for this industry's growth, thus it's critical to consider sustainable solutions to reduce any adverse effects. A conceptual model was proposed and then both a qualitative and a quantitative approach also known as triangulation newline—was used after receiving input from a variety of stakeholders, including locals, businesses, tour operators, and the administration.*

***Keywords:*** *Sustainability, Exploration, Renovation and Awareness.*

## Introduction

Tourism is travelling for pleasure and recreation. A tourist is, therefore; someone who travels for self-satisfaction and pleasure. Sustainable development means meeting the needs of the present without compromising the ability of future generations to meet their own needs. Travel and tourism comprise the activity of persons travelling to and staying in places outside their usual environment for not more than one consecutive year for leisure, business, and other purposes. Sustainable tourism is, therefore, meeting the needs and improving the standard of living of the host population in the short and long term, continually attracting tourists, satisfying their demands, and protecting the environment from degradation. In some cases, the ardent pursuit of ecotourism is predicated on a number of beliefs, including: that there is an abundance of ecotourism resources, and that all that is necessary is some means of delivering those resources to tourists; that there is a ready-made bank of tourists, interested in visiting eco-sites to enjoy an eco-experience; that a commitment to ecotourism might provide a bonus or value-added component to an existing range of tourism products; that ecotourism could become the principal tourism attraction for a country/region/locality; that a commitment to ecotourism would be likely to result in low impact on the environment; that ecotourism would sustain high levels of local employment Tourism is travelling for pleasure and recreation. A tourist is, therefore; someone who travels for self-satisfaction and pleasure. Sustainable development means meeting the needs of the present without compromising the ability of future generations to meet their own needs. Travel and tourism comprise the activity of persons travelling to and staying in places outside their usual environment for not more than one consecutive year for leisure, business, and other purposes. Sustainable tourism is, therefore, meeting the needs and improving the standard of living of the host population in the short and long term, continually attracting tourists, satisfying their demands, and protecting the environment from degradation. In some cases, the ardent pursuit of ecotourism is predicated on a number of

beliefs, including: that there is an abundance of ecotourism resources, and that all that is necessary is some means of delivering those resources to tourists; that there is a ready-made bank of tourists, interested in visiting eco-sites to enjoy an eco-experience; that a commitment to ecotourism might provide a bonus or value-added component to an existing range of tourism products; that ecotourism could become the principal tourism attraction for a country/region/locality; that a commitment to ecotourism would be likely to result in low impact on the environment; that ecotourism would sustain high levels of local employment.

Tourism is leisure and recreational travel. So, someone who travels for pleasure and self-gratification is a tourist. In order to achieve sustainable growth, current demands must be met without jeopardizing future generations' capacity to meet their own demands. Travel and tourism are activities that involve people going to and staying in locations outside of their normal surroundings for up to one year in a row for pleasure, business, or other reasons. Hence, sustainable tourism involves attracting tourists consistently, addressing their requirements, raising the standard of living of the host people over the long term, and preventing environmental deterioration.

Some people's fervent pursuit of ecotourism is based on a variety of assumptions, such as the notions that there are plenty of ecotourism resources and that all that is needed is a way to make them accessible to tourists; that there is a ready-made pool of people interested in visiting eco-sites to have an eco-experience; and that a commitment to ecotourism might add value to an already existing range of services. Cooperation in the community may be able to secure local backing for the growth of ecotourism and promote environmental preservation. Locals have a direct impact on the environment, and embracing their attitudes, expertise, and management can help ecotourism grow. Eleven wildlife refuges and three national parks are included in Chhattisgarh Eco Tourism. The ecotourism hotspots in Chhattisgarh are Jagdalpur-Kanger Valley, Raipur-Turturia, and Bilaspur-Achanakmar. Chhattisgarh promotes eco-tourism through the protection and preservation of nearly extinct animal species and their environment, accounting for 44% of the state's entire geographic area.The top ecotourism locations in Chhattisgarh are Indrawati National Park, Kangerghati National Park, Barnawapur Sanctuary, Sita Nadi Sanctuary, Sanjay National Park, and Udanti Sanctuary.

**Review of Literature**

- Result indicates that transport expenditure and economic growth can reduce the ecological footprint, while urbanization, mobile use, and electricity consumption increase it both in the short and long run. In light of these outcomes, policy implications are recommended to expand the transport infrastructure expenditure and sustainable economic growth. Similarly, it urges the need for sustainable urbanization, eco-friendly mobile use, and renewable source-based electricity consumption in India. (Hussain, M. M et al., 2023)
- The study's model empirically demonstrated ICT competency, sustainability tourism marketing practices and political support by local authorities' construct which are essential explanatory variables of homestay brand equity. The model shows high levels of consistency between the theoretical design and the empirical results of its constructs, contributing as a new step in the tourism sustainability literature. (Janjua, Z et al.,2022).
- The aim of this study is to examine Corporate Governance (CG) practices in the Tourism Small and Medium-Sized Enterprises (TSMEs) in Bahrain. In addition, the research sought to clarify the challenges facing the implementation of CG in the tourism industry in Bahrain, as well as the appropriate mechanisms for ensuring the sustainability of CG. The theoretical framework is proposed based on CG agency theory and institutional theory, which helped in identifying the facts that related to the CG at multi-level working of the tourism sector in Bahrain.(Al Marzouqi et at., 2021)
- The COVID-19 pandemic is a result of planetary time-space compression and is forcing an expansion in human consciousness that will make humankind better able to

address global problems. There will still be considerable diversity on the planet, as now, but the pandemic will stimulate growing numbers of people, businesses and governments to adopt new ways of thinking, behaving and operating that are more closely aligned with the goals of sustainable development. (Galvani et al., 2020)

- This study examined the formation of residents' support for sustainable tourism development based on the social exchange theory and bottom-up spillover theory. A self-administered survey along with a structural analysis was used. Our result revealed that overall quality of life satisfaction influenced support for sustainable tourism development, and that material life domains and non-material life domains were two important determinants of overall QoL ( Eslami et at.,2019)
- Study analyzed that how advertisement and promotion activities will help in development of Chhattisgarh Tourism. This has been justified by the results of tourism brand image, tourism brand loyalty, tourism brand awareness and various tourism products' attributes. Shridhar, R., & Shrivastava, R. (2018)

**Research Methodology of the Study**

**Objective of the Research**

1. To comprehend the role that tourism has played in the growth of Chhattisgarh
2. To determine the elements that affect Chhattisgarh's growth of sustainable tourism.
3. To learn about plans for Chhattisgarh's tourism industry development.

**Research Plan**

The study was analysed using a descriptive method. By emphasizing the meanings, attitudes, and experiences of respondents, qualitative approaches promote the creation of theories that help researchers comprehend social events in "naturalistic" rather than experimental settings (Powell, Single, & Lloyd, 1996).

**Exploratory Survey**

An exploratory survey was conducted utilising the qualitative research approach of focus group discussions following a thorough desk research to establish general perceptions regarding the sustainable development of tourism destinations, the issues involved, and to seek actionable recommendations. A focus group is a collection of people, usually between 2 and 10, who have been chosen and brought together by researchers to talk about and offer their opinions on the research issue based on their own experiences. An average session lasts between one and two hours.

Twenty persons in total took part in the four focus group discussions that were held. Each focus group had four to nine participants, who varied in age, gender, and hierarchical position. All the four Focus Group Discussion Swear Conducted In Raipur the capital city, Chhattisgarh, India. Six people participated in the first Focus Group Discussion, which was held in July 2022. In the second, held in September 2022, there were four more participants. The third one was completed in December 2022 with four participants, and the last one, with five people, was completed in January 2023.

**Variables Identification**

On the basis of literature review the following variables have been identified:

**Independent Variables**

i. Government Initiative(GI) ;
ii. Stakeholder Enlightenment(SE);
iii. Social Upliftment(SU);
iv. Carrying Capacity Reduction(CCR);
v. Awareness(AW)
vi. Strengthening Economy(SEC);
vii. Ecological Degradation(ED)

**1. Demographics:**

1. Age
2. Experience
3. Education
4. Gender

**2. Dependent Variable**

Sustainable Development

The framework created for the discovery and investigation of every aspect influencing the sustainable growth of tourism in the state of Chhattisgarh. A review of the literature and a discussion of current research will be used to accomplish this. It also aims to offer suggestions and ideas for improving and developing tourism in the state.

The second phase was creating and using a

systematic, closed-ended questionnaire to gather information on visitors' opinions and perceptions of various locations, which was then reviewed for clarity and thoroughness. If possible, the questionnaire was created by adopting already-validated components. For a more precise fit between the research instrument and the study's setting, some items were self-developed.

The characteristics were assessed using a Likert scale with a maximum of five points (1 = Strongly Disagree and 5 = Strongly Agree). The General Information portion of the questionnaire was followed by one section. The section on organizational culture had four dimensions, each of which was further broken into its component indicators, for a total of twenty seven items.

**Primary Research:**

In this case, selecting the sampling strategy and gathering the data were crucial tasks. frames for sampling are included. The current investigation was conducted in two separate stages. Using an exploratory factor analysis technique, it was attempted to discover the elements that affect the sustainable growth of tourism during the first part of the study. The final stages concentrate on creating an empirical model for the Chhattisgarh state's tourism industry's sustainable growth.

**Data Collection Method**

Using the previously created questionnaire, the primary data was gathered. Because the survey research method is more effective than other methods at establishing generalizability, it was used to gather data. To gather the data, the poll was run both offline and online. To gather the information, questionnaires were hand delivered to the respondents. While some respondents filled out the questionnaire in the author's presence at their various workplaces, others took their time and returned them later. The goal of the survey was explained to the respondents, and assistance was also given if any of the items were unclear to them.

**Target Population:**

Visitors to numerous tourist spots in the state of Chhattisgarh make up the study's target audience. In order to produce the most reliable analytical results, the research makes use of both qualitative and analysis techniques, as well as a variety of research devices.

**Research Approach:**

The study's main goal was to identify the variables that contribute to the tourism industry's sustainable growth before utilising confirmatory factor analysis to create a model for the state. It implies that there would be a cause and effect relationship, hence the study was carried out using a causal research design.

**Data Source and Type:**

The information was gathered from both primary and secondary sources. The research study's foundation consisted of both primary and secondary data. Steps, rules, and methods of the inquiry included data sources, data collecting, data verification, data analysis, and result interpretation. They also included data on the population, the sample group, and key informants. Primary Sources of Data.

Data were directly gathered from visitors to certain tourism destinations in the state of Chhattisgarh, as well as from the general population and sample group in the study area. A survey will yield information about travellers' thoughts and attitudes (Likert scale-5 point).

**Additional Data Sources**

Academic literature, printed materials, and related research investigations provided the data, which was subsequently combined to produce concepts,

**Sample Unit**

The sample consisted of tourists, government representatives, host community of tourist places, tour operators of identified respective tourist destinations of Chhattisgarh.

**Sampling Design:**

The target audience is mixed of all sorts of demographics in the whole study location. Therefore, convenience sampling has been used for the study.

**Sample Size:** Though the tourist destinations are finite in the state of Chhattisgarh, yet the size is exclusively large. Further, the demographic proportion of the respondents is also unknown. Altogether 385 people have been identified.

## Data Analysis
## Demographic Profile
### Table1-Age wise Classification of Subject

| Age | Male(A) | | Female(B) | | A+B | |
|---|---|---|---|---|---|---|
| **Range** | **N** | **%** | **N** | **%** | **N** | **%** |
| **18-25** | 78 | 28.68 | 71 | 28.7 | 149 | 28.7 |
| **26-40** | 96 | 35.29 | 88 | 35.6 | 184 | 35.5 |
| **41-55** | 65 | 23.90 | 69 | 27.9 | 134 | 25.8 |
| **bove55** | 33 | 12.13 | 19 | 7.7 | 52 | 10.0 |
| **Total** | **272** | **100** | **247** | **100** | **519** | **100** |

**Age-Wise:** The 519 response obtained their age-wise distribution. Age group 18-25, total 149 responded accounts to 28.7% of the sample having mean age of 23.67 years of 2.42. σIn the age band 26-40, total 184 people responded which is 35.5% of the sample having mean age of 30.96 years and of 1.46. Age group of 41-55 years, 134 responses achieved which are 25.8% of the total sample with mean age 45 years with of 3.32. In the last age group above 55 years have meanage of 57.18 years with .98.

### Table-2: Incomeper Month of subjects

| Incomeper Month | Male(A) | | Female(B) | | A+B | |
|---|---|---|---|---|---|---|
| | **N** | **%** | **N** | **%** | **N** | **%** |
| **Below10000** | 52 | 19.12 | 75 | 30.4 | 127 | 24.5 |
| **10000-25000** | 103 | 37.87 | 79 | 32.0 | 182 | 35.1 |
| **25000-50000** | 38 | 13.97 | 41 | 16.6 | 79 | 15.2 |
| **50000-100000** | 79 | 29.04 | 52 | 21.1 | 131 | 25.2 |
| **Total** | **272** | **100** | **247** | **100** | **519** | **100** |

**Income Permonth:** The 519 response obtained, their monthly income distribution is shown in table, having mean income of Rs. 8,424 for less than Rs. 10,000per month which comprise of 36.7% of sample. In the income band 10,000-25,000, arehaving 45 respondents which accounts to 30.6% of the total sample. In the income bond 25000-50000, 20 people responded which accounts to 13.6% of the total sample and for income range of 50,000 to 100000, 28 people responded which accounts for 19% of total sample.

### Table- 3: Occupation Of Subjects

| Occupation | Male(A) | | Female(B) | | A+B | |
|---|---|---|---|---|---|---|
| | **N** | **%** | **N** | **%** | **N** | **%** |
| **Self-Business** | 84 | 30.9 | 54 | 21.9 | 138 | 26.6 |
| **Service** | 171 | 62.9 | 127 | 51.4 | 298 | 57.4 |
| **No-Job** | 17 | 6.3 | 66 | 26.7 | 83 | 16.0 |
| **Total** | **272** | **100** | **247** | **100** | **519** | **100** |

**Occupation:** Out of total response 26.5% (39) of the response is that they are retired and are currently have no job while 26.5% (39 out of 519) are having their own business and are busy with their business while 46.3% of the total respondents are in job or service

**Table- 4:Places visited by tourists**

| TouristPlace | Male(A) | | Female(B) | | A+B | |
|---|---|---|---|---|---|---|
| | N | % | N | % | N | % |
| Achanak Marg | 12 | 4.4% | 7 | 2.8% | 19 | 7.2% |
| BhoramdeoTemple | 24 | 8.8% | 16 | 6.5% | 40 | 15.3% |
| Champaranya | 22 | 8.1% | 17 | 6.9% | 39 | 15.0% |
| Dhamtari | 21 | 7.7% | 19 | 7.7% | 40 | 15.4% |
| Dongargarh | 86 | 31.6% | 62 | 25.1% | 148 | 56.7% |
| Ghatarani Jatmai | 23 | 8.5% | 13 | 5.3% | 36 | 13.7% |
| GirodhpuriDham | 32 | 11.8% | 12 | 4.9% | 44 | 16.6% |
| Jagdalpur Chitrakoot | 37 | 13.6% | 27 | 10.9% | 64 | 24.5% |
| Kawardha | 11 | 4.0% | 9 | 3.6% | 20 | 7.7% |
| Mainpat | 17 | 6.3% | 7 | 2.8% | 24 | 9.1% |
| Manghata | 5 | 1.8% | 0 | 0.0% | 5 | 1.8% |
| Rajim | 23 | 8.5% | 16 | 6.5% | 39 | 14.9% |
| Ratanpur | 26 | 9.6% | 14 | 5.7% | 40 | 15.2% |
| Shirpur | 37 | 13.6% | 31 | 12.6% | 68 | 26.2% |
| TirathgarhWaterFall | 62 | 22.8% | 22 | 8.9% | 84 | 31.7% |
| **Total** | **438** | **100** | **272** | **100** | **710** | **100** |

The above table describes the various proportions of tourists at different tourist destinations of state of Chhattisgarh. The collected data represents 15 different tourist destination of the state. The collected data shows difference in tourism of Male(A)s and Females(B) according to their preferences. The above table shows the percentage of visits to selected tourist destinations by the respondents..

**Tourism Destinations Profiling**

The total 272 Male (A) respondents have 438 visits to 15 destinations while 247 Female (B) respondents have 272 visits to different destinations in the state. Of the total 19 respondents total 710 visits for the 15 defined destinations in the state of Chhattisgarh. The frequency of visit shows that maximum tourist attractions Dongargarh with 56.7% of visits i.e. 148 while Tirathgarh Water Fall have 31.7% of visits which accounts to 84 visits. Destinations like AchanakMarg, Manghata, Kawardha have limited visits.

**Tourism Destinations Profiling**

With regard to the type of destination, Chhattisgarh's tourism industry is primarily driven by young people between the ages of 18 and 25.The respondents visited roughly 15 tourism spots in the state, including stumbling stones, deep forests, and jungle safaris, with Dongargarh emerging as one of the top picks because to its combination of natural beauty and pilgrimage. Jagdalpur Waterfalls came in second place. From the statistical analysis with 95% confidence interval, it was found that there was no significant difference in the opinion of tourists at different destinations in terms of facilities and convenience. It was discovered that the friendliness of the locals, the climatic conditions, and the recreational amenities of all places were favorable for tourism. The Kruskal-Wallis test was used to examine the responses for the 15 most popular tourist attractions in the state of Chattisgarh.

**Result and Interpretation of analysis**

According to the aforementioned study, it is important to give both the creation of new tourist sites and the appropriate management of already-existing tourist destinations similar weight. Infrastructure, lodging, shopping centers, and additional space for recreational amenities were the main areas of concern. The purpose of the aforementioned study was to identify weak areas of destination management in order to achieve competitive position, generate economic benefits, and sustain the destination. The study also demonstrates that there is a significant disparity in visitor satisfaction levels as a result of the lack of a tourism model that can be implemented at the local level to increase a destination's carrying capacity. As a developing state, tourism education must be offered so that a scientific

perspective on destination management can be used to provide visitors with the highest level of satisfaction.

**Findings**

**Findings of Object 1**

It is clear from a variety of articles that Chhattisgarh is actively working to promote its tourism sector, but there is still a long way to go before it becomes a popular travel destination on a national and international scale. The tourist sector in CG is in a transitional period as it attempts to distinguish itself from MP in terms of tourism and get over the obstacles it had to overcome earlier before becoming a separate state.

The current analysis has pinpointed a few elements that might be viewed as propellants for pushing the tourism sector towards sustainable development. The state contains a wealth of natural places, both studied and unexplored, but due to a lack of basic upkeep and policies, they have lost some of their through social upliftment avoidance of ecological degradation.

**Findings Objective 2**

Components have been developed by a variety of literature reviews from prior work and expert opinions through a pilot survey.

- Following the factor extraction process, 7 factors were identified, accounting for 63.22% of the expressed variation. The total variations reflected by the identified factors were calculated after they had been rotated.
- . By looking at the scree-plot with the eigen values, it can be seen that seven factors must be taken into account since, after seven factors, the plot naturally bends, and after point seven, the curve flattens, indicating the number of discovered variables to be taken into account.

**The Seven identified Factors are**

a. Factor-1: Government Initiatives is considered as first factor which consists of five statements accounting to 16.58% of the total variation having the calculated eigen values of 4.48.
b. Factor-2:Carrying Capacity Reduction considered as second factor which consists of six statements accounting to 10.0% of the total variation having the calculatedeigenvalueof2.7.
c. Factor-3: Social Upliftment considered as third factor which consists of three statements accounting to 9.47% of the total variation having the calculated eigenvalue of 2.55.
d. Factor-4: Stakeholder Enlightenment considered as fourth factor which consists of three statements accounting to 9.36% of the total variation having the calculated eigenvalues of 2.53.
e. Factor-5: Awareness considered as fifth factor which consists of three statements accounting to 6.55% of the total variation having the calculated eigen value of 1.77.
f. Factor-6: Strengthening Economy considered as sixth factor which consists of three statements accounting to 6.12% of the total variation having the calculated eigenvalue of 1.66.
g. Factor-7: Ecological Degradation considered as seventh factor which consists of four statements accounting to 5.11% of the total variation having the calculated eigenvalue of 1.38.

**Findings Objective 3**

The following methods and actions can be implemented with a focus on sustainable development, economic growth, job creation, enhancing the standard of life, and financial stability as its goals.-

- Focus on expansion plans with explored as well as unfamiliar, implicit places of tourisms in the emergence of CGas separate state.
- To increase the comfort levels, ambiance, and overall visitor experience of popular tourist destinations to worldwide standards.
- Given that the state is surrounded by 45% forested and 32% tribal population, the inclusion of forest products and tribal art in tourism packages will help to promote forest products and increase locals' ability to earn a living.
- Training of man power to create pool of skilled manpower for travel and hospitality industry.
- Trying to use alternate solar energy source at maximum destinations.

**Conclusion**

The above study concludes that the sustainability is explained through various stakeholders for this the conceptual model was

framed using 7 identified factors and confirmed using confirmatory analysis taking the required samples and analysed the model fit, sustainable tourism development is a strategic process and it requires efforts from all stake holders but primary responsibility is to device a frame work for this which includes Government initiatives (GI) which will govern according to the options of sustainability and will keep vision of tourism development in the state after the government's intervention the other stake holders (example Visitors & Host Community) must be made aware of the idea of sustainability in Chhattisgarh if efforts can be made as the education level is good the goal can be achieved.

**References:**


1. Shridhar, R., & Shrivastava, R. (2018). To Analyse the Role of Advertisement in the Development of Chhattisgarh Tourism. Asian Journal of Management, 9(1), 709-716.ce:
2. Eslami, S., Khalifah, Z., Mardani, A., Streimikiene, D., & Han, H. (2019). Community attachment, tourism impacts, quality of life and residents' support for sustainable tourism development. Journal of Travel & Tourism Marketing, 36(9), 1061-1079.
3. Al Marzouqi, A., Dahabreh, F., Mouzaek, E., Portal, R., & Salloum, S. (2021). The impact of adopting corporate governance strategic performance in the tourism sector: A case study in the Kingdom of Bahrain. Journal of Legal, Ethical and Regulatory Issues, 24(1).
4. Galvani, A., Lew, A. A., & Perez, M. S. (2020). COVID-19 is expanding global consciousness and the sustainability of travel and tourism. Tourism Geographies, 22(3), 567-576.
5. Janjua, Z. U. A., Krishnapillai, G., & Rehman, M. (2022). Importance of the sustainability tourism marketing practices: an insight from rural community-based homestays in Malaysia. Journal of Hospitality and Tourism Insights.
6. Hussain, M. M., Pal, S., & Villanthenkodath, M. A. (2023). Towards sustainable development: The impact of transport infrastructure expenditure on the ecological footprint in India. Innovation and Green Development, 2(2), 100037.
7. Alam, M., & Paramati, S. R. (2016). The impact of tourism on income inequality in developing economies: Does Kuznets curve hypothesis exist? Annals of Tourism Research, Volume 61 , 111-126.
8. Allen, D.G. and Shanock, L.R. (2013). Perceived Organizational Support and Embeddedness as Key Mechanisms Connecting Socialization Tactics to Commitment and Turnover among New Employees. Journal of Organizational Behaviour, 34, 350-369.
9. Amuquandoh, F. E., & Dei, L. A. (2007). Tourism development preferences among the residents of Lake Bosomtwe Basin, Ghana. GeoJournal, 70 (2/3), 173-183.
10. Anderson, J. C., & Gerbing, D. W. (1988). Structural Equation Modeling in Practice: A Review and Recommended Two-Step Approach. Psychological Bulletin, 103 (3), 411- 423.
11. Anderson, J. C., & Gerbing, D. W. (1988). Structural Equation Modeling in Practice: A Review and Recommended Two-Step Approach. Psychological Bulletin, 103 (3), 411- 423.
12. Duc, Tinh.Bui, (2009). Tourism Industry Responses to the Rise of Sustainable Tourism and Related Environmental Policy Initiatives: The Case of Hue City, Vietnam[Unpublished doctoral dissertation].Auckland University of Technology
13. Lundberg, Erik, (2014).Tourism Impacts and Sustainable Development [Unpublished doctoral dissertation].School of Business, Economics and Law at University of Gothenburg.
14. Huang, Wei (2011).Good Practice in Sustainable Tourism[Doctoral dissertation, Lund University]. IIIEE.
15. Tran, Huu. Thuy Giang (2016). An exploration of the potential for sustainable tourism development on selected Vietnamese islands [Unpublished doctoral dissertation]. Southern Cross University.

# A SURVEY OF CUSTOMER SATISFACTION & PREFERENCE TOWARDS FLIPKART : A SPECIAL REFERENCE WITH PALGHAR DISTRICT OF MAHARASHTRA

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## ABSTRACT

*Study is undertaken to find out customer satisfaction towards Flipkart, know Customer preference of Amazon & ratio of a customer using the online portal for shopping. Online shopping portals helps to buyers buy a product or services from different sellers. Consumers find a different retailors, product or services as per there convenience and order. Now days consumers buy or search different products or services through desktop computers, laptop or mobiles. Online stores enable to customers access vendors site and view product details like images, specifications, reviews and rating. Internet is reason for developing online shopping at primary stage this platform used only for advertising tool for companies and providing information about their products. Flipkart is one of India's leading online shopping platform and its headquartered in Bengaluru.Primary & Secondary Method used for data collection. The information was collected through 120 respondents of Palghar district of Maharashtra. The Present Study Peoples give more preference to flipkart for buying clothes & shoes and they provide fast & home delivery. They have no timing for go to shop or mall and purchase product. Hence they prefer to online portals for shopping.*

***Keywords :*** *Online Shopping, Flipkart, Customer Preference, Satisfaction*

## Introduction

Online shopping portals helps to buyers buy a product or services from different sellers. Consumers find a different retailors, product or services as per there convenience and order. Now days consumers buy or search different products or services through desktop computers, laptop or mobiles. Online stores enable to customers access vendors site and view product details like images, specifications, reviews and rating. Internet is reason for developing online shopping at primary stage this platform used only for advertising tool for companies and providing information about their products. Specifically, the growth of the Internet as a secure shopping channel has developed since 1994, with the first sales of Sting's album Ten Summoner's Tales.Wine, chocolates, and flowers soon followed and were among the pioneering retail categories which fueled the growth of online shopping. Sachin Bansal and Binny Bansal both founded of flipkart in oct, 2007. Flipkart is one of India's leading online shopping platform and its headquartered in Bengaluru. At a primary stage company started as an online bookstore. After, it also started selling of mobile phones. At current stage company offers almost 80 million products more than 80 categories. The company has the potential to serve eight million shipments per month.

## Business Structure

Flipkart operated their business with nine firms, some of them registered in Singapore and some in India. Co-Founder of Flipkart sold WS retail to Rajiv Kuchhal. Flipkart's Indian entities are owned by Flipkart Pvt. Ltd, which is registered in Singapore. The Singapore-registered entity owns eight Indian companies, including Flipkart Internet Pvt. Ltd, the company that runs the e-commerce marketplace Flipkart.com, Flipkart India Pvt. Ltd, the wholesale business, and Flipkart Logistics Pvt. Ltd, which runs Ekart (the internal logistics arm that can be used by other ecommerce players). Flipkart also started Flipkart Health+ (through an app) in 2021 that deals into providing medicines and health services through technology. This was started with the help of getting majority share in Sastasundar Marketplace Limited - an existing company that already was providing online pharmacy services

**SWOT Analysis**

**Strengths**

- Largest E-commerce company with GAV of $1 billion
- Market share is 39.5%
- Annual Revenue of 6.1 billion US Dollars
- The Company's series of acquisitions, including chakpak.com, weread.com, Letsbuy.co,
- High Brand Value
- Large Employees Base

**Weaknesses**

- Flipkart has a limited distribution channel
- The cost of acquisition is high due to stiff competition in the market and low customer retention
- Buyers hold the power; buyers have a large number of options from which to choose

**Opportunities**

- Business expansion
- Expanding product categories
- The changing mentality of Indian customers
- Establishing operations in other developing economies

**Threats**

- There is fierce competition from global players such as Amazon and eBay
- The government's regulations on issues such as foreign direct investment

**Review of Literature**

Mohammed Jamal Uddin ACMA and Tunaina Sulthana9 (2015): Found that 56% of the respondents are below 25 years of age, 21% of the respondents are engaged in formal employment, 27% of respondents have monthly income of more than Rs. 30,000 and 76% respondents buy for personal use in online shopping. He found that there is an l positive response towards online shopping.

Jadhav and Khanna, (2016): Found that, price of product, advertising, promotions mix, whether product is user friendly or not, impact on online shopping, well design online website encourages to buyers buy online.

Sultan and Henrichs (2000) in his study Found that the consumer's buying decision to and preference for adopting the Internet as his or her shopping medium was also positively related to income, household size, and innovativeness.

Rashant Singh (2014) in his study on Consumer's Buying Behaviour Towards Online Shopping, the main aim of study was to examine and analyze the consumers' buying behaviour pattern towards online shopping in Lucknow.

**Objectives**

1. To Access customer satisfaction towards Flipkart.
2. To know Customer preference of Amazon
3. To study the ratio of a customer using the online portal for shopping (Urban area VS Rural Area).

**Hypothesis**

H1: There is no significant relation between Age and Customer Preference

H2: There is no significant relation between Gender and customer Preference

H3: There is no significant relation between Gender and customer satisfaction

**Research Methodology:**

Research methodology is a way to systematically solve the research problems. It is conducted as studying how research is done systematically. Primary data used for research and its collected through questionnaire. Other information is collected through secondary sources

**The Research Design Used for the Study**

The nature of study is exploratory as well as comparative. It intends to explore the customer's perception on online shopping. A direct survey in the form of Google Form was used to collect the data for this study.

**Sample Size**

A research population is a well-designed collection of individuals or objects known to have similar characteristics. In the present study of population was users of online shopping. There were 120 respondents who live in Palghar district.

**Statistical Tools:** The data collected through questionnaires were analysed using simple graphs and Chi square techniques

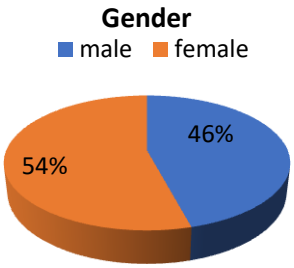
**Date Analysis and Interpretations:**

For the study of customer satisfaction through online the researcher used 15 questions out of which below questions use for analysis:

**1. Gender**

Table 1

| Gender | Frequency | % |
|---|---|---|
| Male | 55 | 45% |
| Female | 65 | 54% |
| Total | 120 | 100 |

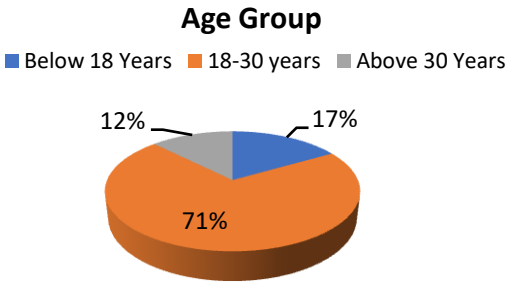



Out of total populations Males are 45.8% and female are54.2%, female are more than males.

**2. Age**

Table 2

| Age | Frequency | % |
|---|---|---|
| Below 18 Years | 20 | 17 |
| 18-30 years | 85 | 71 |
| Above 30 Years | 15 | 12 |
| Total | 120 | 100 |



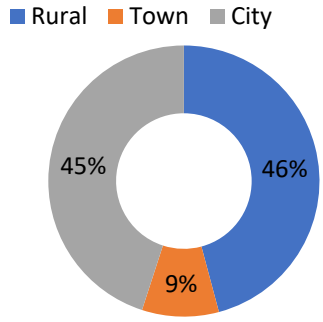

Below 18 years 16.7%, 18-30 years 70.8% and above 30 years12.5%.

**3.Location**

Table 3

| Location | Frequency | % |
|---|---|---|
| Rural | 55 | 46 |
| Town | 11 | 9 |
| City | 54 | 45 |
| Total | 120 | 100 |

Out of total respondents 45.8 % from rural area, 9.2% from town and 45% respondents belong from city.

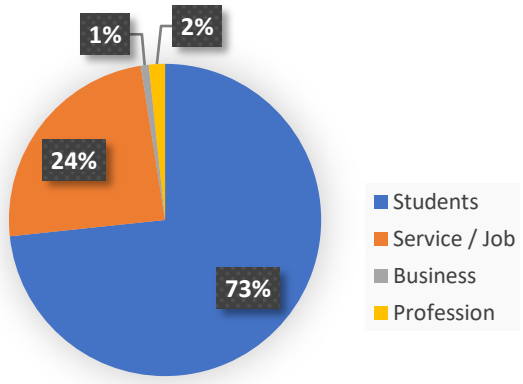



45.8 % from rural area, 9.2% from town and 45% respondents belong from city.

**4. Profession**

Table 4

| Profession | Frequency | % |
|---|---|---|
| Students | 88 | 73.33 |
| Service / Job | 29 | 24.17 |
| Business | 1 | 0.83 |
| Profession | 2 | 1.67 |
| Total | 120 | 100 |

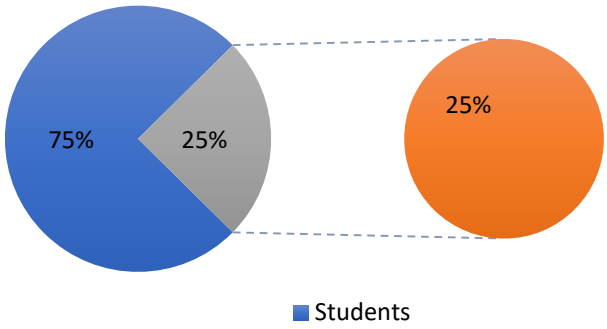



Out of total respondents Students are 73.3%, 24.2% are Service man, 0.8% are businessman and 1.7% are professionals.

**5.Do you prefer to Flipkart for Online Shopping?**

Table 5

| | Frequency | % |
|---|---|---|
| Yes | 98 | 81.67 |
| No | 22 | 18.33 |
| Total | 120 | 100 |

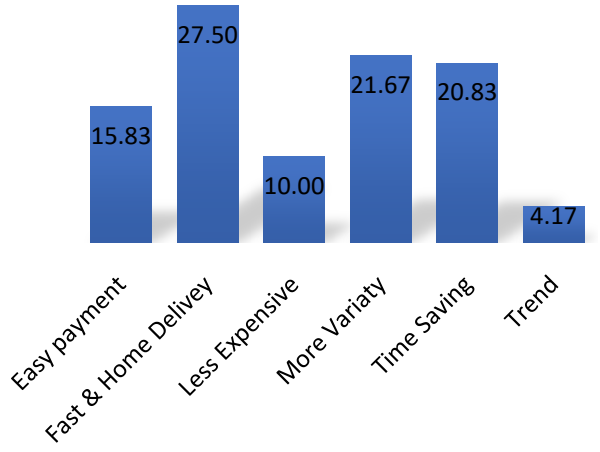



81.7 % Respondents prefer to Flipkart for online shopping and 18.30% do not prefer to flipkart.

**6.Why do you Prefer for Online Shopping through Flipkart?**

Table 6

| | Frequency | % |
|---|---|---|
| Easy payment | 19 | 15.83 |
| Fast & Home Delivery | 33 | 27.50 |
| Less Expensive | 12 | 10 |
| More Variety | 26 | 21.67 |
| Time Saving | 25 | 20.83 |
| Trend | 5 | 4.17 |
| Total | 120 | 100 |

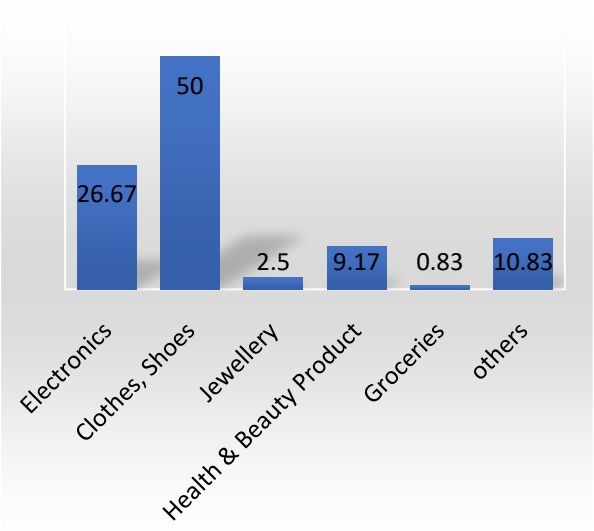



Reason for Online shopping through Flipakrt: Fast & home delivery 27.5 %, More variety 21.7%, Time saving 20.8 %, Easy Payment 15.8% & Less Expensive 10% Trend 4.17%.

**7. Which product do you buy online?**

Table 7

| | Frequency | % |
|---|---|---|
| Electronics | 32 | 26.67 |
| Clothes, Shoes | 60 | 50 |
| Jewellery | 3 | 2.50 |
| Health & Beauty Product | 11 | 9.17 |
| Groceries | 1 | 0.83 |
| others | 13 | 10.83 |
| Total | 120 | 100 |

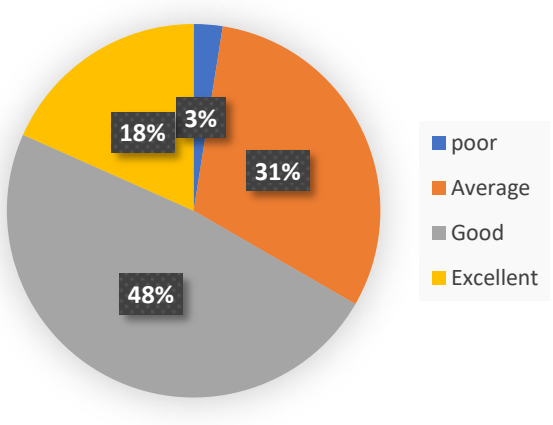



- 50% respondents purchase clothes & shoes & 26.7% Electronics, 10.83% others product, 9.17 % Health & beauty product, Jewellery are 2.5% and only 0.8% order groceries.

**8. Rating**

Table 8

| | Frequency | % |
|---|---|---|
| poor | 3 | |
| Average | 37 | |
| Good | 58 | |
| Excellent | 22 | |
| Total | 120 | |

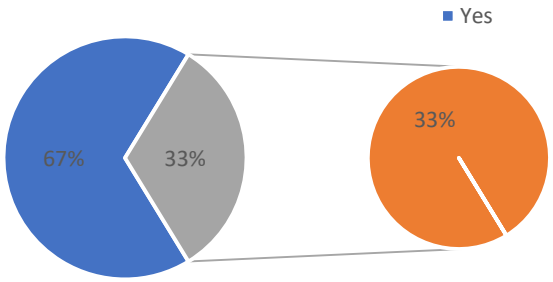



48% rating received to Good, 31% is to Average, 18% is to Excellent & 3% is to poor.

**9. Do you Satisfied with Online Shopping through Flipkart?**

Table 9

| | Frequency | % |
|---|---|---|
| Yes | 81 | 67 |
| No | 39 | 33 |
| Total | 120 | 100 |




**Hypothesis Testing:**

**Hypothesis 1**

H0: There is no significant relation between Age and Customer Preference

H1: There is significant relation between Age and Customer Preference

| Chi Square Value | Significance | Critical value at 2df |
|---|---|---|
| 0.57 | 5%` | 5.991 |

Test Statistic follows chi square distribution with 2df. Therefore, critical value at 5% level of significance is 5. 991.Since, computed value of test statistic is 0.57 which is lower than the critical values, hence we accept the null hypothesis at 5% level of significance and conclude that there is significant relation between age and customer preference.

**Hypothesis 2**

H0: There is no significant relation between Gender and customer Preference

H1: There is significant relation between Gender and customer Preference

| Chi Square Value | Significance | Critical value at 2df |
|---|---|---|
| 0.00143 | 5%` | 5.991 |

Test Statistic follows chi square distribution with 2df. Therefore, critical value at 5% level of significance is 5. 991.Since, computed value of test statistic is 0.00143 which is lower than the critical values, hence we accept the null hypothesis at 5% level of significance and conclude that there is significant relation between Gender and customer Preference.

**Hypothesis 3**

H0: There is no significant relation between Gender and customer satisfaction

H1: There is significant relation between Gender and customer satisfaction

| Chi Square Value | Significance | Critical value at 2df |
|---|---|---|
| 0.54 | 5%` | 5.991 |

Test Statistic follows chi square distribution with 2df. Therefore, critical value at 5% level of significance is 5. 991.Since, computed value of test statistic is 0.54 which is lower than the critical values, hence we accept the null hypothesis at 5% level of significance and conclude that there is significant relation between Gender and customer satisfaction

**Conclusion**

In current era lifestyle of are more change. They have no timing for go to shop or mall and purchase product. Hence they prefer to online portals for shopping. Online shopping portals give them more variety, home delivery of product, various sales promotions offer and its less expensive. Through Online mode peoples demand clothes & shoes, Electronics gadgets

and other items. Peoples give more preference to flipkart for buying clothes & shoes and they provide fast & home delivery. In current era lifestyle of are more change. They have no timing for go to shop or mall and purchase product. Hence they prefer to online portals for shopping. Online shopping portals give them more variety, home delivery of product, various sales promotions offer and its less expensive. Through Online mode peoples demand clothes & shoes, Electronics gadgets and other items. Peoples give more preference to flipkart for buying clothes & shoes and they provide fast & home delivery. After a study it is found day to day increase in number of customers. Most of the people buy electronic gadgets through flipkart. Most are peoples give preference to Flipkart for Online Shopping. Peoples order a product through flipkart because of fast & home delivery, customers give buy a product online rather than buy offline.

**References:**

1. Ms. S. Subhashree (2019). Consumer preference and satisfaction towards online shopping in udumalpet with special reference to Flip kart. Paripex-Indian Journal of research. Volume – 8, ISSUE – 10, DOI: 36106 /paripex,
2. Dr. Arpana D (March 2020). A Study on Changing buying habits of thecustomersusingECommercePlatformwithreferencetoFlipkart.UGCcare Journal. Vol – 40, ISSUE – 40, pg 2172
3. M. Maheshwari, A. Rahamathunisa (January 2020). A Study on CustomerSatisfaction towards Flipkart in Villupuram District. International Journalof Research in Engineering Science and Management. Volume 3, ISSUE-1, Pageno: 623 to 627.
4. Rajiv Kaushik, Ashutosh Nigam (Jan 2011). A study of Conversion Marketing in Retailing. International Journal of Computational Engineering and management, Vol 11, pg : 1 to 5,https://www.ijcem.org/papers12011/12011_25.pdf
5. https://www.bigcommerce.com/blog/ecommerce/
6. https://notesmatic.com/2017/11/pestel-analysis-e-commerce-industry/
7. https://en.wikipedia.org/wiki/Flipkart
8. https://www.mbaskool.com/brandguide/it-technology/12882-flipkart.html

# IMPACT OF CLIMATIC CHANGE ON SOYABEEN FARMING

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## ABSTRACT

*Crops are sensitive to the environment around them. At a macro level plant needs air, water and sunlight to grow. Unable to change their location, plants are at the mercy of the climate and ecosystem they are in. Humans can control several of the abiotic and biotic factors to favour high yields for crop plants in our agricultural systems, but a majority – such as temperature and rainfall – are beyond human control. Current farming practices are set to the climatic patterns that have prevailed for decades in the past, but we know now that global climate is changing. The negative effect of changing rainfall and temperature patterns on agriculture has already been observed and is predicted to grow worse. Agriculture faces increasing population pressure, declining land and water availability and declining soil fertility. Climate change is a new stressor for our cropping systems. As crops suffer, farmers and workers who depend on these crops, not only for sustenance but also for livelihood are increasingly at risk. Developing countries like India with large populations dependent on agriculture for their livelihoods are especially vulnerable to climate change, and must take steps to identify coming risks and possible mitigation strategies and so is true for Maharashtra too. In the present article an attempt is made to study how the crops at their different stages are finding difficulties in development as the climatic change factors affect adversely.*

## Introduction

Maharashtra is India's second largest state by population (11.24 crore / 111 million people), and third largest by area (308 lakh sq. km). It lies along the west coast of peninsular India and has the highest nominal Gross Domestic Product (GDP) of all Indian states. Roughly 55% of Maharashtra's population is rural, and the literacy rate is 82.3%, according to the 2011 census. Maharashtra's climate is generally characterized by hot summers, monsoon and then mild winters. The impact of high temperatures, rainfall, and humidity will make outdoor work difficult for the farmers. In addition, increased incidences of heat stress and humidity will affect farming operations like weeding and harvesting.

Maharashtra faces an increasing risk from climate change which is likely to impact the production of four major crops – Soybean, Cotton, Wheat, and Gram, grown in the State, according to a study by the Institute for Sustainable Communities (ISC).

## Review of Literature

The report titled "Climate Change Impacts on Maharashtra Agriculture" examined the week-wise 30-year averages of historical (covering the years 1989-2018) and predicted (protecting the years 2021- 2050) rainfall and temperature data for eight districts across Khandesh, Marathwada, and Vidarbha regions of the state.

"The analysis presented in this report maps climate modeling and projections (both historical and futuristic), with crop phenology (optimal conditions across each of the growing stages for a crop) coupled with community-based participatory assessments (on-ground farmer validation) at a granular 'weekly' scale to weave a comprehensive understanding of the likely impacts of climate change on each of the crops and the farmers," said Romit Sen, Associate Director – Water & Agriculture Program at ISC.

"Climate analysis predicts mismatch in rainfall and temperature patterns with crop phenology across the monsoon (kharif) and winter (rabi) season," added Sen, who led the research at ISC. The late onset of monsoon and intermittent dry and wet spells has impacted the germination of soybean and cotton. Excess rainfall during the mid-kharif season will increase fungal diseases, weeds, and pests. This is likely to impact the production of pods in soybean and boll formation in cotton. Additionally, water-logged soils and humid conditions will promote rot, leading to a loss of soil nutrients and fertilizers from the soil. The overall impact of excessive rainfall during the fruit formation and maturity stage for both the kharif crops studied – soybean, and cotton will affect the yield and quality of the produce. The biggest challenge for wheat cultivation in the years to come is high temperatures during grain

ripening. Grain weight decreases with a temperature rise, and temperatures during grain filling are predicted to increase. Gram cultivation will see a sudden increase in temperatures duringpod filling, causing pods to fill less.

"There is very little, or almost no rainfall predicted for the rabi season, thereby making the crops entirely dependent on irrigation. With groundwater being the primary water source for irrigation, the pressure on groundwater aquifers will increase. Reducing the impacts of changing climate on agriculture will require efforts in generating granular climate data, integrating those into informing farming decisions, improving the quality of inputs, enhancing knowledge on better cultivation practices, and adoption of better management practices for resource conservation, amongst others, said Vivek P. Adhia, Country Director-India, Institute for Sustainable Communities.

**Problem Statement**

The problem under study is "impact of climatic change on the different stages of Soyabeen farming".

**Objectives of the study**

1. To identify the different stages of soyabeen farming
2. To identify different climatic situations at the different stages of soyabeen farming
3. To analyse the impact of the climatic change on the farming at the respective stage
4. To give suggestions to overcome the evil impact of the climatic change on the soyabeen farming

**Null hypothesis**

It is hypothesized that the climatic changes have no significant relationship with the soyabeen farming, its development and its sustainability.

**Methodology**

Being the owner of the agriculture, the writer of the article has one's own observations as a farmer. Those are collaborated and the same have impact on the present writing to much extent.

**Observations**

Stage 1: Sowing and Emergence (June – July)

Rising temperatures in the summer months before planting lead to hardening of the soil. This increases the effort needed to prepare the land for sowing. The late arrivalof the monsoon leads to delayed sowing, which makes the crop more vulnerable to fungal diseases later on.

Even if the monsoon begins at the expected time, a gap of 15-20 days in the rain after sowing leads to no germination and requires sowing again.

The quality of seed is often poor due to the previous year's climatic challenges, and testing germination rates has become essential for preventing double sowing.

Stage 2: Vegetative Growth (July)

Vegetative growth is particularly sensitive to the amount of rainfall received. High rainfall during July leads to excessive vegetative growth and most of the crop never becomes stressed enough to flower or set pod. Excessive rainfall and flooding soon after germination leads to root rot.

Excessive rainfall and flooding in July present a challenge during weeding and in applying the second dose of fertilizers, as women cannot enter the field to perform these actions. This in turn leads to increased spraying of herbicide.

Stage 3: Flowering (August)

High rainfall during flowering causes increased fungal diseases, necessitating pesticide sprays. Excess rainfall leads to reduced flowering as the plant is not sufficiently stressed. Flooding damages plants due to root rot. Low rainfall during August and September also has an adverse effect on flowering. Low rainfall leads to an increase in Jassids and Soybean rust, as well as a decrease in flowering and flowers get dropped due to water stress.

Stage 4: Pod Formation and Filling (August end- September)

Low rainfall during podding and seed filling leads to reduced seed filling. Rising temperatures during September and October also lead to reduced seed filling. In Amravati, a rise in temperature has been noted, leading to low yields.

Stage 5: Maturity (October)

The most devastating loss for soybean, in farmers' experiences, occurs during harvesting. Untimely rainfall during October end/November damages the plants that have

reached maturity and are ready to harvest. Often, they germinate in response to the rainfall inside the pod itself, and intact pods develop a high incidence of fungal diseases. At this point, there is nothing the farmer can do to recover the yield. Post-threshing costs increase, yields are reduced and profit is reduced. The remaining seeds to be planted the next year are also damaged.

| Stages | Present Climate Risk | Impact | Adaptation | Future Climate Risks |
|---|---|---|---|---|
| Sowing and emergence | Late onset of monsoon Excess rainfall Inadequate rainfall | Double sowing Low germination | Germination testing Seed treatment | Excess rainfall in some places |
| Vegetative Growth | Excess rainfall and flooding | Difficulty in weeding Difficulty in fertilizer application Reduced plant yield and growth application | Increased herbicide spraying | Excess rainfall |
| Flowering | Excess rainfall and flooding | Increased fungal diseases and pests Low flowering | Increased pesticide spraying | Inadequate rainfall |
| Pod formation and filling | Excess rainfall | Increased fungal diseases and pests | Increased pesticide spraying | Inadequate rainfall |
| Maturity | Rainfall destroying harvest | Loss of grain in fi eld Loss of harvested grain | Early harvesting Using long duration varieties | Highly inadequate rainfall |

**Inferences:**

1. The sowing of soybean depends closely on the time of the onset of monsoon as well as the frequency and intensity of the monsoon. Sowing ideally takes place after 100 mm of medium intensity continuous rain has fallen, and successful germination depends on more medium intensity continuous rain after. The later the onset of monsoon, the further sowing dates are pushed, and the more vulnerable the crop becomes to fungal diseases which in turn causes low output. Erratic rainfall with several dry days in between heavier intensity rainfall will impact germination.
2. Soil structure has deteriorated over the years, the soil can no longer hold and absorb water as it used to. Instead, with excessive rainfall, flooding occurs. Young plants are still delicate, and root rot and other fungal diseases set in quickly in flood conditions. During vegetative growth, 25-30 days after emergence, hoeing, weeding and a second dose of fertilizer need to take place. These tasks are usually done by women, and they find it impossible to manually weed in flooded conditions. The crop does not receive adequate fertilization and a lot of herbicides is sprayed to compensate for the lack of weeding. Also, with an increase in rainfall at this time, there is excessive vegetative growth, leading to reduced yields. Drought stress is possible in the future, especially in Khandesh and Marathwada. Low rainfall during vegetative growth leads to an overall stunted plant, increased vulnerability to pest attacks and lowered yield. (This is as per the ISC Report as mentioned in the review of literature)
3. Flowering is a delicate stage for the plant where it is particularly sensitive to water stress. While historical analysis shows an average of excess rainfall, drought years commonly occur in our regions of study and have significant impacts on crops. In times of drought, flowers are shed by the plant as it cannot support flowering during the time. Since no pods develop from these dropped flowers, yield reduces thereby. In times of heavy rain, as the averages indicate, flowering soybean crops are highly vulnerable to pests and fungal disease. It is observed that spraying pesticides at the time of flowering can help control these diseases and infestations

sufficiently so that there is not a widespread loss of yield, but often these still have an impact on yield. Predicted rainfall is still high, and will possibly cause the same problems.

4. As mentioned above, while historical averages show an excess of rainfall during the pod formation and filling stages, frequent droughts have led farmers to observe that a lack of water during pod filling leads to decreased yields. Again, since the soil can no longer hold as much water as it once could, sufficient rainfall in the previous months does not translate to adequate soil moisture during this time. Soybeans within pods do not swell up as much, and are smaller, translating to an overall lower yield and lower price received for it. The predicted rainfall is shockingly low at this time, and will certainly lead to significant soybean yield losses if climate continues to follow this pattern. Crops raised at such low soil moisture are susceptible to Soybean rust, which is increasing in prevalence in our regions of study and affecting large proportions of planted soybean. In the case of excess rainfall, crops may not reach the pod formation stage at all. They continue with excess vegetative growth, never being stressed enough to flower and fruit. Some plants that do set pod never adequately dry out, and the pods fall victim to fungal diseases. Diseased pods have greater processing costs associated, and lead to a loss in profits. Increased spraying of pesticides is the path many farmers take to combat this.
5. It is seen that rain during the time of harvest was one of the greatest climate related challenges the farmer faced. For those, who cultivated shorter duration soybean, their yield was mostly lost in rainfall during the end of September and early October. Most farmers harvest soybean crops and lay them in the field, right next to where they are cut, to dry out. If it rains during this time, yields are devastated. Pods rot and fall victim to fungal diseases. Since the soybean pod is on the thinner side, many soybeans absorb water and begin to sprout through the pod. Such beans lose yield. If farmers are able to harvest and thresh pods before it rains, often they do not have the ability to store the beans in a waterproof fashion. These seeds also get fungal diseases, and profits are greatly reduced. The predicted rainfall during this stage is very low, and hopefully farmers will not have to face this problem in the future. Currently, farmers have adapted by growing less soybean in proportion to other crops, growing longer duration varieties and harvesting early if rain is forecasted.

**Suggestions:**

1. Better drainage systems and effective rainwater harvesting become crucial to set up as soon as possible.
2. Construction of wells or borewells or tube wells for timely watering to the plants for better output and avoid the fungal diseases, vegetative growth due to untimely and excessive rainfall.
3. Some adaptations that farmers doing modern farming have begun to adopt are seed treatments, planting at lower density with gap rows for greater accessibility and drainage, and improving overall drainage of their holdings.
4. Timely spraying to avoid fungal diseases and pest spurts.

# STUDY OF SINGULARITIES IN HIGHER DIMENSIONAL SPACE-TIME IN GENERAL RELATIVITY

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## ABSTRACT

*In this research paper we study the singularities in higher-dimensional space-time, which is an active area of research in physics. The study of singularities in higher-dimensional space-time has important implications for our understanding of the universe and can potentially lead to the discovery of new phenomena. Singularities in higher-dimensional space-time can take on different properties than those in four dimensions and can be more complex. They can be topological defects known as "cosmic strings" or have a conical shape. Understanding the nature of singularities in higher-dimensional space-time has significant implications for our understanding of the universe's large-scale structure and can help us develop new theories of physics. This paper summarizes some of the significant works in this field, including types of singularity and nature of singularity. This abstract concludes by emphasizing the need for further research in this area to better understand the nature of singularities in higher-dimensional space-time.*

***Keywords:*** *Cosmic censorship, naked singularity, gravitational collapse.*
*PACS numbers: 04.20Dw, 04.20Cv, 04.70Bw*

## I Introduction

General relativity, also known as the general theory of relativity and Einstein's theory of gravity, is the geometric theory of gravitation published by Albert Einstein in 1915 and is the current description of gravitation in modern physics. General relativity generalizes special relativity and refines Newton's law of universal gravitation, providing a unified description of gravity as a geometric property of space and time or four-dimensional space-time.

Curve geometry plays a crucial role in various fields such as physics and engineering, including mechanics, transportation, astronomy, and computer science. Curvature and torsion, which are geometric invariants of space curves, are necessary for accurate descriptions of motion, deformation, and motion-trajectory analysis, which are essential for developing algorithms for autonomous vehicles and positive train control. The relationship between mechanics and differential geometry is evident, and curve frames have been extensively used in mechanics to describe the orientation of beam cross-sections and associate them with deformation modes. The Frenet frame, which has a clear geometric interpretation and a direct relationship to kinematic variables and inertia forces, is widely used in mechanics. However, the Frenet frame suffers from singularity at curvature-vanishing points, motivating researchers to seek alternative frames. This paper addresses this issue and proposes a simple procedure based on curve-coordinate derivatives or Frenet angles to solve the Frenet-frame singularity problem. The use of alternative curve frames that lack clear geometric interpretations may not be necessary if the objective is to solve the curvature-singularity problem[1-6].

General relativity is a theory of gravitation that explains the behavior of gravity as a curvature of space-time. The theory is based on the concept of space-time as a four-dimensional manifold, where the curvature of space-time is related to the distribution of mass and energy. The theory predicts the existence of singularities, which are points where the curvature becomes infinite, and the laws of physics break down. Singularities are believed to occur in black holes and in the early universe. In this paper, we will discuss the nature of singularities in general relativity.

## II Types of Singularities:

There are two types of singularities predicted by general relativity:

1. Curvature singularities
2. Conical singularities.

### Curvature Singularities:

Curvature singularities occur when the curvature of space-time becomes infinite at a point. These singularities are a fundamental

property of general relativity and are associated with the event horizon of a black hole or the big bang singularity. At a curvature singularity, the laws of physics break down, and it becomes impossible to predict the behavior of matter and energy. The best-known example of a curvature singularity is the singularity at the center of a black hole. In this case, the curvature of space-time becomes infinite at the singularity, and the laws of physics as we know them no longer apply. The existence of a black hole singularity was first predicted by Roger Penrose and Stephen Hawking in the 1960s.

**Conical Singularities:**

Conical singularities occur when there is a deficit angle in space-time. A deficit angle occurs when the space-time around a point is not flat, but instead has a conical shape. This can happen, for example, if there is a cosmic string or a spinning object in the vicinity. Conical singularities are not as well understood as curvature singularities, but they are believed to be less severe.

**III Nature of Singularities:**

The nature of singularities in general relativity is still not fully understood. One of the main challenges is that the laws of physics as we know them break down at singularities, making it difficult to study them directly. However, there have been several proposals for how to understand singularities, including the following:

1. **Cosmic Censorship Hypothesis:**

The Cosmic Censorship Hypothesis is a conjecture in physics proposed by Roger Penrose in the 1960s. It states that the singularities predicted by Einstein's theory of general relativity, such as those found at the center of black holes, are always hidden from view by an event horizon. In other words, the hypothesis suggests that the extreme gravitational forces near a singularity are always "clothed" by an event horizon, preventing them from being seen by outside observers. In other words CCH, states that singularities are always hidden behind an event horizon. In other words, no naked singularity can exist in nature. This hypothesis has not been proven, but it is a widely accepted idea in the field. The Cosmic Censorship Hypothesis is important because it helps to ensure the predictability and stability of the universe. Without it, the universe would be subject to unpredictable and catastrophic events caused by singularities. However, the hypothesis remains unproven and is the subject of ongoing research and debate in the field of theoretical physics.

2. **Quantum Gravity:**

Quantum gravity is a theory that attempts to reconcile general relativity with quantum mechanics. It is believed that at the singularity, the laws of physics must be described by quantum mechanics. However, it is not yet clear how this can be achieved.

3. **String Theory:**

String theory is a theoretical framework that attempts to unify all the fundamental forces of nature, including gravity, into a single theory. According to string theory, singularities can be resolved by considering the geometry of extra dimensions.

**IV Singularity in Higher Dimensional space-time**

General relativity describes the nature of gravity in our four-dimensional space-time. However, it is also possible to extend this theory to higher-dimensional space-time, where singularities can have different properties than those in four dimensions. Studying the properties of singularities in higher-dimensional space-time is an active area of research in physics and has important implications for our understanding of the universe[7,8].

In general relativity, singularity in higher dimensional space-time refers to a point or region where the curvature of space-time becomes infinite. These singularities are typically associated with the collapse of massive objects such as black holes, and they are characterized by the fact that the laws of physics as we know them break down at these points. In four-dimensional space-time, singularities are often represented as a point of infinite density at the center of a black hole. However, in higher dimensional space-time, singularities can take different forms. For example, in a five-dimensional space-time, a singularity might be a ring-shaped object rather than a point. The existence of singularities in higher dimensional space-time has significant

implications for our understanding of the nature of space, time, and the universe as a whole. In particular, it suggests that there may be limits to our ability to use the laws of physics to describe certain phenomena, and it raises questions about the ultimate fate of the universe.

**V Properties of Singularities in Higher Dimensions:**

In higher-dimensional space-time, singularities can take on different properties than those in four dimensions. One of the most significant differences is that in higher dimensions, there can be more than one type of singularity. For example, there can be curvature singularities, where the curvature of space-time becomes infinite, and conical singularities, where space-time has a conical shape. Another important property of singularities in higher-dimensional space-time is that they can be more complex than those in four dimensions. For example, in five dimensions, there can be singularities that are topological defects known as "cosmic strings." These cosmic strings can have a significant impact on the evolution of the universe and the formation of galaxies.

**Implications:**

The study of singularities in higher-dimensional space-time has important implications for our understanding of the universe. For example, understanding the properties of cosmic strings can help us understand the formation of galaxies and the large-scale structure of the universe. Additionally, understanding the nature of singularities in higher-dimensional space-time can help us develop new theories of physics and potentially lead to the discovery of new phenomena that we have yet to observe.

**VI Conclusion:**

Singularities are an essential feature of general relativity, and their nature remains a topic of active research. The study of singularities is crucial for our understanding of the behavior of gravity in extreme environments, such as black holes and the early universe. Although there is still much to learn, the study of singularities has led to significant advances in our understanding of the universe and the laws of physics that govern it.

The study of singularities in higher-dimensional space-time is an active area of research in physics. Singularities in higher dimensions can take on different properties than those in four dimensions, and they can be more complex. Understanding the nature of singularities in higher-dimensional space-time has important implications for our understanding of the universe and can potentially lead to the discovery of new phenomena. It is likely that new discoveries in this area of research will continue to shed light on the nature of singularities in higher-dimensional space-time in the future.

**References:**

1. Bishop, L. R., 1975, “There Is More Than One Way to Frame a Curve,” Amer. Math. Monthly, 82(3), pp. 246–251.
2. Bahaddin Bukcu, B., and Karacan, M. K., 2008, “Special Bishop Motion and Bishop Darboux Rotation Axis of the Space Curve,” J. Dyn. Syst. Geom. Theor., 6(1), pp. 27–34.
3. Bahaddin Bukcu, B., and Karacan, M. K., 2009, “The Slant Helices According to Bishop Frame,” World Acad. Sci. Eng. Technol., 35, pp. 1039–1042.
4. Andrew, J. H., and Ma, H., 1995, “Quaternion Frame Approach to Streamline Visualization,” IEEE Trans. Vis. Comput. Graph., 1(2), pp. 164–174.
5. Yung-chow Wong, Y. C., 1963, “A Global Formulation of the Condition for a Curve to Lie on a Sphere,” Monatsh. Fur Math., 67(4), pp. 363–365.
6. Yung-chow Wong, Y. C., 1972, “On an Explicit Characterization of Spherical Curves,” Proc. Am. Math. Soc., 34(1), pp. 239–242.
7. Hawking, S.W. and Ellis, G.F.R., The Large Scale Structure of Space-Time. Cambridge University Press, Cambridge, UK, 1973.
8. Emparan, R. and Reall, H.S., "Black Holes in Higher Dimensions," Living Reviews in Relativity, vol. 11, no. 6, 2008.
9. Gregory, R. and Laflamme, R., "Black strings and p-branes are unstable," Physical Review Letters, vol. 70, no. 16, pp. 2837-2840, 1993.

# A STUDY OF SOCIAL MEDIA AND ITS IMPACT ON FEMALE USERS OF YAVATMAL

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## ABSTRACT

*Social media has occupied an important position as a communication tool. People across the globe use social media to connect to other people organizations. Globally people have started to use social media such as Face book ,Twitter, Instagram and LinkedIn to share their experiences . As costumers, people share product reviews, information about a service, advice on food or health , warnings about products , tips on using certain products, and much more. People have a lot of connections on social media, therefore information is consumed by many people. This information becomes a source of influence on consumers and their buying behavior. Social media is a huge influence on consumers when they are attempting to build awareness about a particular product. When people face a problem, they start searching for a solution. But most of times people do not know which product or service will solve their problems.*

***Keywords** : Social media, Female consumer behavior*

## Introduction

The social media is constantly growing and because of this it is very important to understand social media and its impact for adopting useful changes and creating awareness for effective utilization of the sites social media refers to the means of interactions among people in which they create, share and exchange information and ideas in virtual communities and networks. In the same manner, female users are also experiencing the world using a relatively new form of communication female users are accessing face book, twitter and other sites to connect and share with those around them. They are sharing views, opinions, tips, tricks, helpful information for their academic, professional, personal, family and others point of view.

Thus the objective of this research is to explore the advantages and disadvantages of use of social networking sites by female users. The main purpose of the research is to expand on previous research, explore the relationship between the effects of social media interring with their lives through communication and miscommunication. This research study tries to identify the various impacts associated with the social media on female users of Yavatmal with the aim of enhancing awareness and benefits from the usage of these social media sites. In addition this study finds the benefits to various female users as per age, education, occupation and marital wise status also.

## Objectives of the study

The objectives of the study are as follows

1) To study the problem and prospects of social media on female users.
2) To analyze the impact of social media on female users.
3) To find out the extent of benefits and popularity of social media among the female users.
4) To suggest valuable recommendations for the use of social media by female users.

## Hypotheses

1) Time is saved by using social media.
2) Social media is good platform to share the feelings.
3) Social media is mostly used for entertainment purpose by female users.

## Research Methodology

The research study is related to the use of social media by female users in Yavatmal. It uses both primary and secondary data. Primary data was collected by questionnaire the data is generated through interview and personal discussions with the users. For study 400 female users are contacted.

## Research Findings

The analysis of the research study was based on female users of social media. The study 400 female respondents of Yavatmal and the opinions of these respondents as per their Age, Education, occupation and marital status has revealed some important conclusions

1) Age wise use of social media indicates that respondents from the age group 17-35 use social media mostly. They most prefer to use whatsapp, Facebook, and Youtube.
2) Education wise under graduates are mostly using social media for connecting with their friends and family, Graduates, Post Graduates and other respondents also shown their interest doing service, doing business, some of were taking education.
3) The respondents those are doing business mostly prefer social media for connecting with the society and to look forward for new business opportunities.
4) From the study, it can be concluded that unmarried respondents like to use social media most.
5) Married respondents also shown their interest in social media for keeping update health issues.
6) Married respondents who are employed use social media for their career development, increasing their job opportunities as well as they use for health , home décor and most important their child health and interest information .

**Suggestions**

1) Social media should provide security while connecting with anyone to learn and share thoughts
2) Social media should make easy to educate from others who experts.
3) Social media should help people to discover new fashion, trends , career knowledge.
4) Social media should help to promote business.
5) Social media should help to connect easily with family members and relatives .
6) Social media should provide privacy and security for female users.

**References**

1) Ashima Goyal, edited by Rehand Ghadially .Urban women in contemporary India.
2) V.S.Pandey and saurabh shukla, E-Commerce and mobile commerce technologies, S Chand and Company Pvt.Ltd
3) www.profileyavatmal.com
4) www.youtube.com
5) Matters-career Builder survey.
6) News 18.com
7) Sourav Jain (2015) Number of facebook users in India.

# REVIEW: FERRITE MATERIAL FOR PHOTODEGRADATION OF DIFFERENT DYE

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## ABSTRACT

*The use of synthetic colour harms all forms of life. Ferrites have come forward as excellent material for photodegradation of dyes. The photodegradation of different dyes is studied by using ferrite nanoparticles. For photodegradation study scientists used different dyes such as Remazol Turquoise Blue, Methylene blue, Rhodamine B, reactive blue 21, methyl orange dye, Reactive Red 120, Toluidine Blue, Malachite Green, Acid Oran Ge-II. Photocatalytic properties depend on the surface area, particle size, and concentration of dopant materials.*

***Keywords:*** *Synthetic dye, Synthesis of ferrite nanoparticles, Ferrite, Photodegradation of dye, solar light,Photocatalytic properties.*

## Introduction

The human population increasing which contributes to more air, water, and soil pollution day by day. Pollution directly affects human health, nature, animals, underwater creatures, and birds. Due to environmental pollution, serious issues are occurring nowadays [1]. Due to air pollution, asthma and other diseases of the lungs have increased rapidly. The soil pollution occurring due to heavy metals has a direct impact on agriculture; therefore, many types of stomach diseases are observed [2]. Water pollution is the most serious issue nowadays, which occurs due to the generation of huge amounts of wastewater from the textile and other chemical industries [3–5]. About 70% of diseases are caused due to polluted water; therefore, water purification is the best and prime option to restrict this problem.

Colours are used in large amounts in a multitude of industries to colour the products. Colour is the fundamental attraction of any fabric. WH Perkins, in 1856, discovered the use of synthetic colour. However, their harmful nature has become a cause of grave concern to conservationist. The use of synthetic colour harms all forms of life. Many colours are poisonous with doubtful mutagenic carcinogenic and carcinogenic effects that influence humans and aquatic biota. Today, more data on the environmental consequences of dyestuff application has become available, and the dye makers, gainer, and government themselves are taking substantial to cure the dye-containing wastewaters [6-20].The different methods used to remove the dye, started just with some physical treatments such as equalization and sedimentation to maintain the total suspended solids (TSS), total dissolved solids (TDS), and pH of the discharged water. Other treatments, such as the use of biodegradation or filter and other, the innovation of the activated sludge process (aerobic biodegradation), were applied to treat the dye wastewater. The different methods used to remove the dye. Inorganic materials used as adsorbents in dye removal: clays, metal oxides, nanoparticles, and minerals are used as adsorbents. Photocatalytic degradation of organic pollutants is becoming one of the useful promising green chemistry technologies. Also, today utilization and demand for photo-catalysts can be great for environment pollution monitoring [21-30]. The use of photocatalytic wastewater treatment has many advantages, among which can be mention to degrade pollutants completely.

Spinel ferrites are important photocatalysts used for environmentalremediation[31-32].Its stability, abundant availability, nontoxicity,and simple synthesis make it an economically andenvironmentally interesting choice for the removal of aqueousorganic contaminants in AOPs[33–35]. The spinel ferrites exhibita bandgap in the visible region. In view of the bandgap in thevisible region, several researchers have synthesized variousferrites, and researched their morphological and optical properties.

**Ferrite material-**
Ferrites are a kind of spinel that has the general formula of MFe2O4 (M = Fe, Zn, Ni, Co, etc.), based on their crystal structures and magnetic properties [36]. The M and Fe are the metallic cations that are found at two separate locations, namely tetrahedral (A-site) and octahedral (B-site), respectively, in the case of normal spinel and some M preferred B-site in the case of inverse spinel [37].

**Methods of Synthesis of Ferrite-**
Synthesis of ferrite nanoparticles, techniques such as chemical coprecipitation [38], hydrothermal synthesis [39-40], hydrolysis of metal carboxylate in organic solvent [41], sol-gel [42], freeze drying [39], spray drying [43], citrate precursor [44] and aerosolization [45] have been developed.

**Characterization of Ferrite**-Ferrite characterization is done by following techniques

1) The Fourier transform infrared (FT-IR) spectra
2) TG-DTA analysis
3) FE-SEM with EDX was used to study morphologies with the elemental composition
4) XRD analysis
5) TEM analysis
6) BET surface area analysis
7) VSM analysis(if magnetic in nature) etc.

**Methodology Photocatalytic degradation measurement:**
The prepared series of ferrite nanoparticles was used for the degradation of different dye under solar light. All the experiments were carried out using double-distilled water. The temperature of the experimental reaction was found to be 30 °C to 37 °C. 0.5 g of prepared nanoparticle sampleswas mixed in 250 ml of 10 mg/l of dye solution which was then kept in solar light. Earlier, the solution was stirred for 30 min, and then the solution shows completely adsorption– desorption equilibrium between the prepared samples and dye solution. Further, the 10 ml of hydrogen peroxide were added into the solution. At every given time interval, 3 ml dye solution was taken out for the measurement.

Before and after photocatalytic degradation, the dye solution was measured using the UV–Vis spectroscopy technique. The decolorization efficiency of dye was determined by the following equation [46].

$$\%D = C0 - Ct/C0 \times 100$$

Where,$C0$ is initial dye concentration, $Ct$is theconcentrationof the dye after a time interval.

**Dyes:**
For photodegradation study scientists used different dyes such as Remazol Turquoise Blue, Methylene blue, Rhodamine B, reactive blue 21, methyl orange dye, Reactive Red 120, Toluidine Blue, Malachite Green, Acid Oran Ge-II[47]etc.

**Factors affecting on Photocatalytic activity:**
Photocatalytic properties depend on the surface area, particle size, and concentration ofdopant materials and are most important factors that explain the photocatalytic activity [48-53]. Factor summarized are as follows-

1) Effect of ferrite concentration on degradation of dye.
2) Effect of surface area on the degradation of dye.
3) Effect of dyes at different times.
4) Effect of H2O2 as oxidant.
5) Role of active species and Mechanism of dye with ferrite nanoparticles
6) Recyclability of ferrite.

**Conclusion**
Researcher till date used plane as well as substituted ferrites for photodegradation of dyes in visible light. Many researchers are trying to use of mixed ferrite with different concentration of metals to improved photocatalytic activity. But still most effective catalyst with low concentration and high photodegradation of dye can be found. So that textile industrial waste containing different harmful dye can be eliminated from industrial waste water.

**References**

1. M.-H. Yu, H. Tsunoda, M. Tsunoda, Environmental Toxicology: Biological and Health Effects of Pollutants, crc press, 2011.

2. K. Rehman, et al., Prevalence of exposure of heavy metals and their impact on health consequences, J. Cell. Biochem. 119 (1) (2018) 157–184.
3. S. Khan, A. Malik, Environmental and health effects of textile industry wastewater. Environmental Deterioration and Human Health, Springer, 2014, pp. 55–71.
4. R. Eljamal, et al., Enhancing the characteristics and reactivity of nZVI: polymers effect and mechanisms, J. Mol. Liq. 315 (2020), 113714.
5. S. Takami, et al., Development of continuous system based on nanoscale zero valent iron particles for phosphorus removal, J. JSCE 7 (1) (2019) 30–42.
6. Kant, R. (2012). Textile dyeing industry an environmental hazard. Natural Science, 4(1), 22-26.
7. Keyhanian, F., Shariati, S., Faraji, M., & Hesabi, M. (2016). Magnetite nanoparticles with surface modification for removal of methyl violet from aqueous solutions. Arabian Journal of Chemistry, 9, S348-S354.
8. Gupta, V. (2009). Application of low-cost adsorbents for dye removal–A review. Journal of Environmental Management, 90(8), 2313-2342.
9. Atrak, K., Ramazani, A., & Taghavi Fardood, S. (2018). A novel sol–gel synthesis and characterization of MgFe2O4@γ–Al2O3 magnetic nanoparticles using tragacanth gel and its application as a magnetically separable photocatalyst for degradation of organic dyes under visible light. Journal of Materials Science: Materials in Electronics, 29(8), 6702–6710.
10. Atrak, K., Ramazani, A., & Taghavi Fardood, S. (2018). Green synthesis of amorphous and gamma aluminum oxide nanoparticles by tragacanth gel and comparison of their photocatalytic activity for the degradation oforganic dyes. Journal of Materials Science: Materials in Electronics, 29(10), 8347-8353.
11. Atrak, K., Ramazani, A., & Taghavi Fardood, S. (2019). Green synthesis of Zn0. 5Ni0. 5AlFeO4 magnetic nanoparticles and investigation of their photocatalytic activity for degradation of reactive blue 21 dye. Environmental Technology, doi: 10.1080/09593330.2019.1581841.
12. Atrak, K., Ramazani, A., & Taghavi Fardood, S. (2019). Eco-friendly synthesis of Mg0.5Ni0.5AlxFe2-xO4 magnetic nanoparticles and study of their photocatalytic activity for degradation of direct blue 129 dye. Journal of Photochemistry and Photobiology A: Chemistry, 382, 111942.
13. Moradi, S., Taghavi Fardood, S., & Ramazani, A. (2018). Green synthesis and characterization of magnetic NiFe2O4@ZnO nanocomposite and its application for photocatalytic degradation of organic dyes. Journal of Materials Science: Materials in Electronics, 29(16), 14151-14160.
14. Sorbiun, M., Shayegan Mehr, E., Ramazani, A., & Taghavi Fardood, S. (2018). Biosynthesis of Ag, ZnO and bimetallic Ag/ZnO alloy nanoparticles by aqueous extract of oak fruit hull (Jaft) and investigation of photocatalytic activity of ZnO and bimetallic Ag/ZnO for degradation of basic violet 3 dye. Journal of Materials Science: Materials in Electronics, 29(4), 2806-2814.
15. Taghavi Fardood, S., Moradnia, F., & Ramazani, A. (2019). Green synthesis and characterisation of ZnMn2O4 nanoparticles for photocatalytic degradation of Congo red dye and kinetic study. Micro & Nano Letters, 14(9), 986-991.
16. Taghavi Fardood, S., Ramazani, A., Asiabi, P. A., & Joo, S. W. (2018). A Novel Green Synthesis of Copper Oxide Nanoparticles Using a Henna Extract Powder. Journal of Structural Chemistry, 59(7), 1737-1743.
17. Saeidian, H., & Moradnia, F. (2017). Benign synthesis of N-aryl-3,10-dihydroacridin-1(2H)-one derivatives via ZnO nanoparticle-catalyzed Knoevenagel condensation/intramolecular enamination reaction. Iranian Chemical Communication, 5(Issue 3, pp. 237-363), 252-261.
18. Saeidian, H., Mirjafary, Z., Abdolmaleki, E., & Moradnia, F. (2013). An Expedient

Process for the Synthesis of 2-(N-Arylamino) benzaldehydes from 2-Hydroxybenzaldehydes via Smiles Rearrangement. Synlett, 24(16), 2127-2131.

19. Ramazani, A., Moradnia, F., Aghahosseini, H., & Abdolmaleki, I. (2017). Several Species of Nucleophiles in the Smiles Rearrangement. Current Organic Chemistry, 21(16), 1612-1625.
20. Ramazani, A., Ahmadi, Y., Fattahi, N., Ahankar, H., Pakzad, M., Aghahosseini, H., Joo, S. W. (2016). Synthesis Of 1, 3, 4-Oxadiazoles From The Reaction Of N-Isocyaniminotriphenylphosphorane (Nicitpp) With Cyclohexanone, A Primary Amine And An Aromatic Carboxylic Acid Via Intramolecular Aza-Wittig Reaction Of In-Situ Generated Iminophosphoranes. Phosphorus, Sulfur, and Silicon and the Related Elements, 191(7), 1057-1062.
21. Su, M., He, C., Sharma, V. K., Asi, M. A., Xia, D., Li, X.-z., Xiong, Y. (2012). Mesoporous zinc ferrite: synthesis, characterization, and photocatalytic activity with H2O2/visible light. Journal of Hazardous materials, 211, 95-103.
22. Javadi, F., Yazdi, M. E. T., Baghani, M., & Es-haghi, A. (2019). Biosynthesis, characterization of cerium oxide nanoparticles using Ceratonia siliqua and evaluation of antioxidant and cytotoxicity activities. Materials Research Express, 6(6), 065408.
23. Moradnia, F., Ramazani, A., Taghavi Fardood, S., & Gouranlou, F. (2019). A novel green synthesis and characterization of tetragonal-spinel MgMn2O4 nanoparticles by tragacanth gel and studies of its photocatalytic activity for degradation of reactive blue 21 dye under visible light. Materials Research Express, 6(7), 075057.
24. Ouni, L., Ramazani, A., & Taghavi Fardood, S. (2019). An overview of carbon nanotubes role in heavy metals removal from wastewater. Frontiers of Chemical Science and Engineering, 13(2), 274–295.
25. Ramazani, A., Farshadi, A., Mahyari, A., Sadri, F., Joo, S. W., Asiabi, P. A., Ahankar, H. (2016). Synthesis of electron-poor N-Vinylimidazole derivatives catalyzed by Silica nanoparticles under solvent-free conditions. International Journal of Nano Dimension, 7(1), 41-48.
26. Shayegan Mehr, E., Sorbiun, M., Ramazani, A., & Taghavi Fardood, S. (2018). Plant-mediated synthesis of zinc oxide and copper oxide nanoparticles by using ferulago angulata (schlecht) boiss extract and comparison of their photocatalytic degradation of Rhodamine B (RhB) under visible light irradiation. Journal of Materials Science: Materials in Electronics, 29(2), 1333-1340.
27. Sorbiun, M., Shayegan Mehr, E., Ramazani, A., & Taghavi Fardood, S. (2018). Green synthesis of zinc oxide and copper oxide nanoparticles using aqueous extract of oak fruit hull (jaft) and comparing their photocatalytic degradation of basic violet 3. International Journal of Environmental Research, 12(1), 29–37.
28. Taghavi Fardood, S., Golfar, Z., & Ramazani, A. (2017). Novel sol–gel synthesis and characterization of superparamagnetic magnesium ferrite nanoparticles using tragacanth gum as a magnetically separable photocatalyst for degradation of reactive blue 21 dye and kinetic study. Journal of Materials Science: Materials in Electronics, 28(22), 17002-17008.
29. Taghavi Fardood, S., & Ramazani, A. (2016). Green Synthesis and Characterization of Copper Oxide Nanoparticles Using Coffee Powder Extract. Journal of Nanostructures, 6(2), 167-171.
30. Taghavi Fardood, S., Moradnia, F., Mostafaei, M., Afshari, Z., Faramarzi, V., & Ganjkhanlu, S. (2019). Biosynthesis of MgFe2O4 magnetic nanoparticles and its application in photo-degradation of malachite green dye and kinetic study. Nanochemistry Research, 4(1), 86-93.
31. B. Sahoo, S. Kumar Sahu, S. Nayak, D. Dhara and P. Pramanik, Fabrication of magnetic mesoporous manganese ferrite nanocomposites as efficient catalyst for degradation of dye pollutants, Catal. Sci. Technol., 2012, 2, 1367–1374.

32. S. Chandrasekaran, C. Bowen, P. Zhang, Z. Li, Q. Yuan, X. Ren and L. Deng, Spinel photocatalysts for environmental remediation, hydrogen generation, CO2 reduction and photoelectrochemical water splitting, J. Mater. Chem. A, 2018, 6, 11078–11104.
33. S. Kapoor, A. Goyal, S. Bansal and S. Singhal, Emergence of bismuth substituted cobalt ferrite nanostructures as versatile candidates for the enhanced oxidative degradation of hazardous organic dyes, New J. Chem.,2018, 42, 14965–14977.
34. F. Chang, Z. Chen, J. Jing and J. Hou, The photocatalytic phenol degradation mechanism of Ag-modi□ed ZnO nanorods, J. Mater. Chem. C, 2020, 8, 3000–3009.
35. S. Balgude, Y. Sethi, A. Gaikwad, B. Kale, D. Amalnerkar and P. Adhyapak, Unique N doped Sn3O4 nanosheets as an efficient and stable photocatalyst for hydrogen generation under sunlight, Nanoscale, 2020, 12, 8502–8510.
36. S.A. Jadhav, et al., Magneto-structural and photocatalytic behavior of mixed Ni–Zn nano-spinel ferrites: visible light-enabled active photodegradation of rhodamine B, J. Mater. Sci. Mater. Electron. 31 (2020) 11352–11365.
37. D.D. Andhare, et al., Effect of Zn doping on structural, magnetic and optical properties of cobalt ferrite nanoparticles synthesized via. Co-precipitation method, Phys. B Condens. Matter 583 (2020), 412051.
38. M. Tsuji, T. Kodama, T. Yoshida, Y. Kitayama, Y. Tamaura, J. Catalysis 164 (1996), p.315.
39. X. Yi, Q. Yitai, L. Jing, C. Zuyao, Y. Li, Mater. Sci. Eng. B34 (1995), p. L1.
40. S. Komarneni, E. Fregeau, E. Breval, R. Roy, J. Am. Ceram. Soc. Commun. 71 (1988), p.C-26.
41. Y. Konishi, T. Kawamura, S. Asai, Ind. Eng. Chem. Res. 35 (1996), p. 320.
42. D. H. Chen, X. R. He, Mater. Res. Bull. 36 (2001), p. 1369-1377.
43. C. H. Marcilly, P. Country, B. Delmon, J. Am Ceram. Soc. 53 (1970), p. 56.
44. S. Prasad, N. S. Gajbhiye, J. Alloys Comp. 265 (1998), p. 87-92.
45. M. A. A. Elmasry, A. Gaber, E. M. H. Khater, Powder Technol. 90 (1997), p. 161.
46. N.D. Raskar, D.V. Dake, V.A. Mane, E. Stathatos, U. Deshpande, B. Dole, One step synthesis of vertically grown Mndoped ZnO nanorods for photocatalytic application. J. Mater. Sci. Mater. Electron. 30, 10886–10899 (2019).
47. Fatemeh Ajormal, Farzaneh Moradnia, Saeid Taghavi Fardood, Ali Ramazani. Zinc Ferrite Nanoparticles in Photo-Degradation of Dye: Mini-Review. Journal of Chemical Reviews, 2020, 2(2), 90-102.
48. Z. Ambrus, N. Balázs, T. Alapi, G. Wittmann, P. Sipos, A. Dombi, K. Mogyorósi, Synthesis, structure and photocatalytic properties of Fe (III)-doped TiO2 prepared from TiCl3. Appl. Catal. B 81, 27–37 (2008)
49. T. Takagahara, K. Takeda, Theory of the quantum confinement effect on excitons in quantum dots of indirect-gap materials. Phys. Rev. B 46, 15578 (1992)
50. H.J. Krug, L. Pohlmann, L. Kuhnert, Analysis of the modified complete Oregonator accounting for oxygen sensitivity and
51. photosensitivity of Belousov-Zhabotinskii systems. J. Phys. Chem. 94, 4862–4866 (1990)
52. K. Zipare, S. Bandgar, G. Shahane, Effect of Dy-substitution on structural and magnetic properties of MnZn ferrite nanoparticles. J. Rare Earths 36, 86–94 (2018)
53. G. Padmapriya, A. Manikandan, V. Krishnasamy, S.K. Jaganathan, S.A. Antony, Spinel NixZn1−xFe2O4 (0.0≤ x≤ 1.0) nanophotocatalysts: synthesis, characterization and photocatalytic degradation of methylene blue dye. J. Mol. Struct. 1119, 39–47 (2016).

# GROWTH OF ONLINE SHOPPING

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## Introduction

Online shopping or e-shopping is a form of electronic commerce which allows consumers to directly buy goods or services from a seller over the Internet using a web browser. India is witnessing an unprecedented economic boom in service as well as goods industry and this economic boom is visible all around us. Companies are facing a tough competition in this dynamic arena of business. They are always looking for new avenues so that they can increase contact with consumers and to achieve this aim they are letting no stone unturned. Due to increased awareness, employment and increased per capita income of Indian consumers there has been an exponential rise in consumer spending. Experiencing the convenience of avoiding travelling to shop and the time saved in bargain hunting are adding advantage and craze for online shopping. Almost all portals offer an easy return policy, so even apparel shopping is seen gaining momentum as buyers are no longer worried about being stuck with the wrong size or fit of clothing. Cash on delivery is also giving sense of security to Indian consumers. With the universal availability of Internet connectivity, consumers save time and efforts by shopping online. The increasing use of Internet by the younger generation in India provides an emerging prospect for online retailers. There is a common saying about the Indian retail consumers' "can't touch, won't buy" mentality. However, this is gradually changing with the rising trend of online shopping

## Current scenario of online shopping in India

The year 1991 noted a new chapter in the history of the online world where e-commerce became a hot choice amongst the commercial use of the internet. At that time nobody would have even thought that the buying and selling online or say the online trading will become a trend in the world and India will also share a good proportion of this success. Now consumer mentality and shopping patterns is changing very fast. Earlier online shopping was a simple medium for shopping with fewer options. The users can just place an order and pay cash on delivery. But, now with the changing face of online market this field has been renovated to a high extent and hence mesmerized many customers. Today, the online shopping has become a trend in India and the reason behind the adoption of this technique lies in the attractive online websites, user friendly interface, bulky online stores with new fashion, easy payment methods and cash-ondelivery, no bound on quantity & quality, one can choose the items based on size, color, price, etc. Despite being a developing country, India has shown a commendable increase in the ecommerce industry in the last couple of years, thereby hitting the market with a boom. Though the Indian online market is far behind the US and the UK, it has been growing at a fast page.

Further, the addition of discounts, coupons, offers, referral systems, 30days return guarantee, 1-7 days delivery time, etc. to the online shopping and the E-Market have added new flavors to the industry.

## SWOT analysis of online shopping in India:

Strengths Boundary less (global location)

1) Time saving
2) No time constraints
3) Direct communication with consumer
4) Simple and easier exchange of information
5) Lowers transaction cost
6) Easy arrangement of products
7) No physical company set up
8) Easy transactions
9) Niche products
10) Low operating cost
11) Time saving
12) Weaknesses and other

o Security o Fake websites o Fraud o Fewer discounts and bargaining o Long delivery timing o No idea about quality and physical condition Of The product o Limitation of

products o Lack of personal services o More shipping cost o Limited exposure o Limited advertising o Customer's Satisfaction

**Opportunities**

o Changing trends o New technologies o Global expansion o High availability (24 hour and seven days a week) o Wide business growth o Cut down on local competition o Advertising

**Threats**

o Competitors o Changes in environment, law and regulations o Innovation o Privacy concerns

o Fraud

o Risk

**Conclusions**

The future of E-Commerce is difficult to predict. There are various segments that would grow in the future like: Travel and Tourism, electronic appliances, hardware products and apparel. There are also some essential factors which will significantly contribute to the boom of the ECommerce industry in India i.e. replacement guarantee, M-Commerce services, location based services, multiple payment option, right content, shipment option, legal requirement of generating invoices for online transactions, quick Service, T & C should be clear & realistic, the product quality should be same as shown on the portal, dedicated 24/7 customer care centre should be there. Wholesalers can take advantage of E-Commerce who are capable of establishing contractors with reputed producers and linking their business with the on- line. Producers can also linking themselves with on-line, by giving better information about their products to the other links in the business chain and by a having a brand identity. On the behalf of above said reports and experts view showed that the future of e-commerce in India would be bright in the upcoming years if all essential factors would be implemented.

**References**

1. Kaur, E. H., & Kaur, D. (2015). E-Commerce in India - Challenges and Prospectus. International Journal of Engineering and Techniques , 1 (2), 36-40.

2. Mitra, A. (2013). E-Commerce in India- A Review. International Journal of Marketing, Financial Services & Management Research , 2, 126-132.

# CLIMATE CHANGE AND AGRICULTURE: UNDERSTANDING IMPACTS AND DEVELOPING STRATEGIES FOR RESILIENCE

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## ABSTRACT

*Climate change is one of the greatest challenges facing the agricultural sector today. Changing weather patterns, extreme weather events, and other climate change impacts can significantly affect crop yields, livestock production, and other aspects of agricultural systems. These impacts, in turn, can affect livelihoods, food security, and other social and economic outcomes, particularly in vulnerable populations. To address these challenges, researchers and policymakers have explored a variety of strategies for promoting climate resilience in agriculture. These strategies include promoting climate-resilient agriculture, improving access to markets and financial services, investing in social protection programs, and strengthening disaster risk reduction. By understanding the impacts of climate change on agriculture and developing strategies for resilience, we can work to promote more sustainable and equitable agricultural systems that support food security and livelihoods in the face of changing weather patterns. This paper reviews current research on the impacts of climate change on agriculture and explores strategies for promoting climate resilience in the agricultural sector. The objective of this paper is to provide policymakers, researchers, and other stakeholders with a better understanding of the challenges facing agriculture in the face of climate change and to identify effective strategies for addressing these challenges.*

## Introduction

In last five years in India we have experienced a range of extreme weather events over the past five years, including severe heat waves, floods, and cyclones. In 2019, India experienced its highest-ever recorded temperature of 48 degrees Celsius. The country has also experienced significant rainfall variability, with some regions experiencing drought while others face flooding. These extreme weather events are attributed to climate change, which is exacerbating natural variability in the climate.India has made significant strides in renewable energy over the past five years. In 2019, renewable energy accounted for 23% of the country's electricity generation capacity, up from 13% in 2015. The country has set a target of achieving 175 GW of renewable energy capacity by 2022, including 100 GW of solar, 60 GW of wind, 10 GW of bioenergy, and 5 GW of small hydro power.Sustainable Agriculture: India is home to the largest number of small and marginal farmers in the world. Over the past five years, the country has taken steps to promote sustainable agriculture practices, including organic farming and the use of natural pesticides and fertilizers. The government has launched several schemes to support sustainable agriculture, including the Paramparagat Krishi Vikas Yojana and the Pradhan Mantri Fasal Bima Yojana.Air Pollution: India continues to face significant air pollution challenges. In 2020, India was home to 22 of the world's 30 most polluted cities. The country has taken steps to address air pollution, including the implementation of the National Clean Air Programme and the introduction of Bharat Stage VI emission standards for vehicles.Forests and Biodiversity: India is home to a rich diversity of wildlife and ecosystems, including the Himalayas, mangroves, and tropical forests. The country has taken steps to protect its forests and biodiversity over the past five years, including the launch of the National Biodiversity Act and the National Afforestation Programme.Many of the papers reviewed the impacts of climate change on agriculture and identified strategies for adaptation and mitigation. For example, Azizi et al. (2021) analyzed global data and found that climate change is already having negative impacts on agriculture, including reduced crop yields and increased frequency of extreme weather events. They recommended a range of mitigation strategies, including reducing greenhouse gas emissions and increasing use of renewable energy sources.

Babu et al. (2015) specifically examined the impacts of climate change on agriculture in India, which is particularly vulnerable to

climate change due to its reliance on rain-fed agriculture. They identified a range of adaptation measures that could help farmers cope with changing weather patterns, including crop diversification, use of drought-resistant crops, and improved water management.

Other papers examined the role of agriculture in mitigating climate change. Smith et al. (2014) reviewed the potential for reducing greenhouse gas emissions from agriculture, forestry, and other land use activities, including reducing deforestation and increasing soil carbon sequestration. Jagadish et al. (2010) focused specifically on rice production and found that temperature increases associated with climate change could reduce yields, but that changes in planting times and varieties could mitigate these impacts.

Several papers also examined the importance of considering the social and economic dimensions of climate change and agriculture. For example, Eakin and Bojórquez-Tapia (2008) used a multicriteria decision analysis to explore the vulnerability of households to climate change impacts, highlighting the need to consider factors such as income and education levels in adaptation planning.

Overall, these papers highlight the urgent need for action to address the impacts of climate change on agriculture and to develop strategies for adaptation and mitigation. They also underscore the importance of taking a holistic approach that considers the social, economic, and environmental dimensions of these issues.

**Here are some of the Objectives of the study.**

1.Assessing the impacts of climate change on agriculture: This objective would involve examining the effects of changing weather patterns and extreme weather events on crop yields, livestock production, and other aspects of agricultural systems.

2.Identifying strategies for adaptation: This objective would focus on developing and testing measures that could help farmers cope with the impacts of climate change, such as crop diversification, improved irrigation practices, and use of drought-resistant crop varieties.

3.Identifying strategies for mitigation: This objective would focus on developing and testing measures that could reduce greenhouse gas emissions from agriculture, such as reducing fertilizer use, improving livestock management, and adopting conservation tillage practices.

4.Analysing the social and economic dimensions of climate change and agriculture: This objective would involve examining the ways in which climate change affects livelihoods, food security, and other social and economic outcomes, and exploring strategies for addressing these impacts.

5.Developing and testing integrated approaches: This objective would involve developing and testing integrated approaches that combine adaptation and mitigation strategies in ways that maximize benefits and minimize trade-offs.

**Literature Review On Climate Change Agriculture And Sustainability**

Here is a brief literature review on climate change and sustainability:

1."Climate Change, Sustainability, and the Humanities" by Michael Hamburger (2018): This article discusses the role of the humanities in addressing climate change and promoting sustainability. Hamburger argues that the humanities can help us understand the social and cultural dimensions of climate change, and can offer insights into the ethical and moral implications of our actions.

2."Climate Change, Sustainability, and the Need for a New Culture" by David Orr (2017): This article discusses the need for a cultural shift in order to address climate change and promote sustainability. Orr argues that our current culture is based on an unsustainable model of growth and consumption, and that we need to develop a new culture that values sustainability and resilience.

3."Climate Change, Sustainability, and the Green Economy" by Paul Hawken (2015): This article discusses the role of the green economy in addressing climate change and promoting sustainability. Hawken argues that the green economy offers opportunities for economic growth and job creation while also reducing greenhouse gas emissions and promoting sustainable practices.

4."Climate Change, Sustainability, and the Role of Education" by Arjen Wals (2014): This article discusses the role of education in

addressing climate change and promoting sustainability. Wals argues that education can help individuals and communities understand the complex issues related to climate change and sustainability and provide the skills and knowledge needed to promote sustainable practices.

5."Climate Change, Sustainability, and the Role of Business" by Stuart Hart (2013): This article discusses the role of business in addressing climate change and promoting sustainability. Hart argues that businesses can play a critical role in developing sustainable practices and technologies, and can help to create new markets for sustainable products and services.

6."Climate change impacts on agriculture and their mitigation: a global analysis" by Ghasem Azizi, Asghar Fallahpour, and Habibollah Fallahpour. 2021

This paper was published in the journal Environmental Science and Pollution Research in 2021. The authors conducted a global analysis of the impact of climate change on agriculture and proposed mitigation strategies to reduce the impact. They reviewed the scientific literature on the impact of climate change on agriculture and found that it can affect crop yields, water availability, and soil health. They proposed mitigation strategies such as the use of climate-resilient crops, sustainable agricultural practices, and efficient irrigation systems to reduce the impact.

7."Adaptation of Agriculture to Climate Change: The Need for Change" by Christos Zoumides, Kyriacos Kyriacou, and George Boustras.

This paper was published in the journal Sustainability in 2018. The authors examined the need for adaptation to climate change in agriculture and highlighted the importance of implementing sustainable agricultural practices. They reviewed the scientific literature on the impact of climate change on agriculture and proposed adaptation strategies such as the use of drought-resistant crops, conservation agriculture, and improved water management.

8."Climate Change and Agriculture in India: Impacts and Adaptation" by S. Suresh Babu, B.K. Anitha, and P. Raghavendra Rao.

This paper was published in the journal Mitigation and Adaptation Strategies for Global Change in 2015. The authors examined the impact of climate change on agriculture in India and proposed adaptation strategies to reduce the impact. They reviewed the scientific literature on the impact of climate change on agriculture in India and found that it can affect crop yields, water availability, and soil health. They proposed adaptation strategies such as the use of climate-resilient crops, improved water management, and sustainable agricultural practices.

9."Climate change impacts on agriculture in sub-Saharan Africa: a review of the scientific literature" by M. Adnan H. Khan and Jacob Ricker-Gilbert.

This paper was published in the journal Climatic Change in 2018. The authors reviewed the scientific literature on the impact of climate change on agriculture in sub-Saharan Africa and proposed adaptation strategies to reduce the impact. They found that climate change can affect crop yields, water availability, and soil health in sub-Saharan Africa. They proposed adaptation strategies such as the use of drought-resistant crops, improved water management, and sustainable agricultural practices.

10."Climate Change and Agriculture: A Review of Impacts and Adaptations" by Rattan Lal.

This paper was published in the journal Critical Reviews in Plant Sciences in 2018. The author provided a comprehensive review of the impact of climate change on agriculture globally and proposed adaptation strategies to reduce the impact. The author reviewed the scientific literature on the impact of climate change on agriculture and found that it can affect crop yields, water availability, and soil health. The author proposed adaptation strategies such as the use of climate-resilient crops, improved water management, and sustainable agricultural practices.

**Methodology**

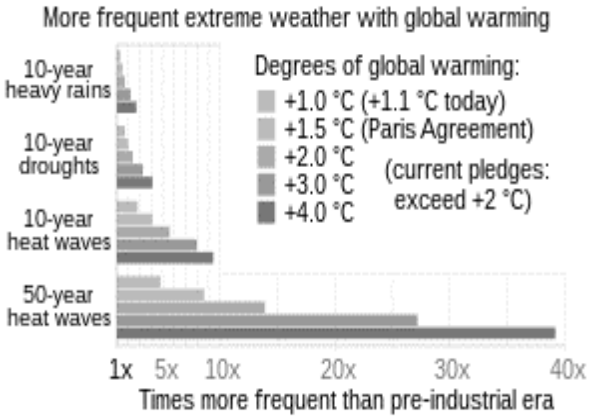
For analyzing the data and to support the objectives data has been collected from various secondary sources like reports and documents of the Government.Data has been presented on Extreme weather and Global Warming and

how it is impacting the GDP of India for coming 45 years. How climate change is affecting Agriculture and what would be the future of Agriculture in India is also presented for analysis.

**Analysis and Interpretation**

Climate change is causing an increase in the frequency and intensity of extreme weather events, such as heatwaves, floods, droughts, and hurricanes. These events can cause significant damage to infrastructure, homes, and natural ecosystems, leading to economic and social impacts.

**Figure 1: Extreme Weather with global warming**




Source https://dcecm.iitd.ac.in/Impact_of_climate_change_on_indian_economy.pdf

As global temperatures rise, ice sheets and glaciers are melting, causing sea levels to rise. This can lead to coastal flooding, erosion, and saltwater intrusion, which can affect coastal communities, habitats, and infrastructure. Climate change is causing changes in precipitation patterns, leading to more frequent and intense rainfall in some areas and drought in others. This can impact agriculture, water availability, and human health. Climate change is causing shifts in the distribution and abundance of plant and animal species, leading to biodiversity loss. This can affect the functioning of ecosystems, food security, and human well-being. It can impact human health directly, through extreme weather events and heat waves, and indirectly, through changes in the distribution of disease vectors such as mosquitoes and ticks. Air pollution, which is exacerbated by climate change, can also impact human health. Global warming is also resulting in a sharp fall in the country's GDP. If we compare the GDP of India with other countries for the coming 45 years it is falling down steeply.

Table 1. Impacts of Global Warming (3°C) on the World GDP (% Change/Year)

| Country | 2027 | 2037 | 2047 | 2067 | Long Run |
|---|---|---|---|---|---|
| Australia | -0.051 | -0.107 | -0.172 | -0.326 | -1.083 |
| New Zealand | 0.043 | 0.073 | 0.087 | 0.073 | -0.798 |
| Rest of Oceania | -0.452 | -0.924 | -1.422 | -2.470 | -5.171 |
| China | -0.205 | -0.438 | -0.692 | -1.247 | -2.918 |
| Hong Kong | -0.356 | -0.765 | -1.216 | -2.205 | -5.288 |
| Japan | -0.042 | -0.100 | -0.173 | -0.356 | -1.335 |
| South Korea | -0.025 | -0.071 | -0.136 | -0.313 | -1.498 |
| Mongolia | -0.214 | -0.415 | -0.631 | -1.105 | -2.710 |
| Taiwan | -0.535 | -1.121 | -1.740 | -3.034 | -5.978 |
| Rest of East Asia | -0.819 | -1.752 | -2.752 | -4.849 | -9.490 |
| Brunei Darussalam | -0.372 | -0.815 | -1.308 | -2.385 | -5.563 |
| Cambodia | -1.175 | -2.439 | -3.758 | -6.482 | -12.101 |
| Indonesia | -1.242 | -2.594 | -4.020 | -6.973 | -13.267 |
| Laos | -1.039 | -2.164 | -3.342 | -5.765 | -10.621 |
| Malaysia | -1.91 | -2.293 | -3.568 | -6.229 | -12.118 |
| Philippines | -1.206 | -2.592 | -4.093 | -7.275 | -14.798 |
| Singapore | -0.905 | -1.958 | -3.106 | -5.562 | -11.652 |
| Thaland | -0.766 | -1.605 | -2.500 | -4.401 | -9.243 |
| Vietnam | -0.802 | -1.636 | -2.500 | -4.276 | -7.959 |
| Rest of Southeast Asia | -1.342 | -2.767 | -4.237 | -7.234 | -12.924 |
| Bangladesh | -0.854 | -1.671 | -2.491 | -4.142 | -7.591 |
| **India** | **-1.023** | **-2.099** | **-3.222** | **-5.532** | **-10.351** |
| Nepal | -0.505 | -1.012 | -1.537 | -2.628 | -5.731 |

*(Source: Kompas et al. 2018)*

Source Kompas et al 2018

This can have a significant economic impacts, including damage to infrastructure, losses in productivity, and increased costs associated with adaptation and mitigation measures.

Overall, climate change is a significant global challenge that requires urgent action to mitigate its impacts and adapt to its effects.

**Challenges in Climate Change**

1.Political Will: Addressing climate change requires political will and leadership at both the national and international levels. However, many countries have different priorities, and there are challenges in reaching a global consensus on how to address climate change.

2.Economic Barriers: There are significant economic barriers to addressing climate change, including the high costs of renewable energy, the costs of transitioning to a low-carbon economy, and the potential impact on jobs and economic growth.

3.Technological Limitations: There are technological limitations in terms of the availability and scalability of clean energy technologies, as well as the development of new technologies to address climate change.

4.Lack of Awareness: There is a lack of awareness among the public about the impacts of climate change and the need to take action. Education and awareness-raising campaigns are essential to build public support for climate action.

5.Inequality: Climate change disproportionately affects vulnerable populations, including low-income communities, indigenous people, and those in developing countries. Addressing climate change requires a just transition that takes into account the needs and concerns of these groups.

6.International Cooperation: Addressing climate change requires international cooperation, as greenhouse gas emissions and their impacts are global in nature. However, there are challenges in reaching a consensus among countries on climate policy, as well as issues related to the distribution of costs and benefits.

Overall, addressing climate change is a complex and multifaceted challenge that requires sustained effort and international cooperation. While there are significant challenges, there are also opportunities for innovation and collaboration to create a more sustainable future.

| Year | Population (Million) | Per capita water availability ($m^3$/year) |
|---|---|---|
| 1951 | 361 | 5177 |
| 1955 | 395 | 4732 |
| 1991 | 846 | 2209 |
| 2001 | 1027 | 1820 |
| 2025 | 1394 | 1341 |
| 2050 | 1640 | 1140 |

*Source: Government of India, Ministry of Water Resources, 2009*

Fig 2:How is climate Change affecting Agriculture in India

1.Changes in Temperature: Climate change is leading to an increase in temperatures, which can affect crop growth and productivity. Higher temperatures can cause heat stress in crops, reducing yields and affecting crop quality.

2.Changes in Precipitation: Climate change is also leading to changes in precipitation patterns, including more frequent and intense rainfall in some areas and drought in others. This can affect crop yields and water availability, leading to crop failure and food insecurity.

3.Water Availability: Climate change is affecting water availability for agriculture, with changes in rainfall patterns and increased evaporation rates leading to water scarcity in some regions. This can impact irrigation systems and reduce crop yields.

4.Pests and Diseases: Climate change is leading to changes in the distribution and abundance of pests and diseases, affecting crop health and productivity. This can also lead to an increase in the use of pesticides, which can have negative environmental and health impacts.

5.Soil Health: Climate change is affecting soil health, including nutrient availability and soil moisture, which can impact crop growth and productivity.

Overall, climate change is having a significant impact on agriculture in India, with changes in

temperature, precipitation, water availability, pests, diseases, and soil health all affecting crop growth and productivity. Adapting to these changes and implementing sustainable agriculture practices is essential to ensure food security and livelihoods for farmers in India.

**How to Improve**

Improving agriculture in the face of climate change requires a multifaceted approach that involves implementing sustainable agriculture practices, improving water management, and building resilience to climate change. Here are some ways to improve agriculture in the face of climate change:

By examining the social and economic impacts of climate change on agriculture and exploring strategies for addressing these impacts, researchers and policymakers can help to promote more sustainable and equitable agricultural systems that support food security and livelihoods in the face of changing weather patterns.

1. Sustainable Agriculture Practices: Implementing sustainable agriculture practices such as conservation agriculture, crop diversification, and integrated pest management can help improve soil health, reduce greenhouse gas emissions, and increase resilience to climate change.
2. Improving Water Management: Improving water management, including rainwater harvesting and efficient irrigation systems, can help farmers adapt to changes in precipitation patterns and reduce the impact of droughts and water scarcity.
3. Promoting Climate-Resilient Crops: Promoting climate-resilient crops such as millets, sorghum, and pulses can help improve food security and reduce the impact of climate change on crop yields.
4. Promoting Agroforestry: Agroforestry practices such as planting trees on farms can help improve soil health, reduce greenhouse gas emissions, and provide additional sources of income for farmers.
5. Access to Information and Technology: Providing farmers with access to information and technology, including climate-resilient seeds and weather forecasts, can help them make informed decisions and adapt to changes in climate conditions.
6. Building Resilience to Climate Change: Building resilience to climate change, including diversifying income sources, improving access to credit and insurance, and strengthening social safety nets, can help farmers cope with the impacts of climate change and reduce their vulnerability.

Overall, improving agriculture in the face of climate change requires a comprehensive approach involving implementing sustainable agriculture practices, improving water management, promoting climate-resilient crops, promoting agroforestry, providing access to information and technology, and building resilience climate change.

**Conclusion**

Ultimately, the objective of a study on agriculture and climate change would be to improve our understanding of the complex interactions between these two systems and to identify strategies for promoting sustainable and resilient agricultural systems in a changing climate. Climate change can affect soil quality through factors such as erosion, nutrient depletion, and changes in microbial communities. Examining these and other impacts of climate change on agriculture can help researchers and policymakers develop strategies for adapting to changing weather patterns and mitigating the effects of climate change on agricultural systems. Such strategies might include developing drought-resistant crop varieties, improving irrigation practices, and promoting sustainable farming practices that help to build soil health and resilience. Developing and testing measures that could help farmers cope with the impacts of climate change, such as crop diversification, improved irrigation practices, and use of drought-resistant crop varieties.

**Managerial Implication**

Developing and testing measures that could help farmers cope with the impacts of climate change is an important objective of many studies on agriculture and climate change. Some of the strategies that researchers have explored include:

1.Crop diversification: Planting a variety of crops can help farmers to reduce their risks in the face of changing weather patterns. For example, planting a mix of crops with different nutrient needs can help to maintain soil health and fertility over time, while planting drought-resistant crops alongside more water-intensive crops can help to manage water resources more effectively.

2.Improved irrigation practices: Efficient irrigation practices can help farmers to use water more effectively and reduce their vulnerability to droughts and other water-related impacts of climate change. Strategies such as drip irrigation, rainwater harvesting, and crop rotation can all help to reduce water use and increase crop yields.

3.Use of drought-resistant crop varieties: Planting crop varieties that are better adapted to drought conditions can help farmers to maintain productivity in the face of changing weather patterns. For example, researchers have developed drought-resistant varieties of maize, rice, and other crops that can thrive in dry conditions.

4.Use of cover crops: Planting cover crops can help to improve soil health and fertility, reduce erosion, and increase water retention in the soil. Cover crops can also help to reduce greenhouse gas emissions by sequestering carbon in the soil.

5.Improved weather forecasting: Improved weather forecasting can help farmers to plan their planting and harvesting schedules more effectively, reducing their exposure to extreme weather events such as droughts, floods, and storms.

By developing and testing these and other measures, researchers and policymakers can help to support farmers in coping with the impacts of climate change and promoting more sustainable and resilient agricultural systems

examining the ways in which climate change affects livelihoods, food security, and other social and economic outcomes, and exploring strategies for addressing these impacts

Examining the ways in which climate change affects livelihoods, food security, and other social and economic outcomes, and exploring strategies for addressing these impacts is an important objective of many studies on agriculture and climate change. Some of the ways in which climate change can affect livelihoods and food security include:

1.Reduced agricultural productivity: Changing weather patterns can lead to reduced agricultural productivity, which can in turn lead to food shortages and decreased incomes for farmers.

2.Increased food prices: Reduced agricultural productivity can lead to higher food prices, making it more difficult for low-income households to access nutritious foods.

3.Increased health risks: Climate change can increase the risk of food-borne illnesses and malnutrition, particularly among vulnerable populations such as children and pregnant women.

4.Impacts on rural communities: Climate change can disproportionately affect rural communities, which may be more dependent on agriculture for their livelihoods and may have fewer resources to cope with the impacts of changing weather patterns.

5.Impacts on gender and social equity: Climate change can exacerbate existing gender and social inequities, particularly in rural areas where women may be more vulnerable to the impacts of changing weather patterns.

**References**

1.Azizi, G., Fallahpour, A., & Fallahpour, H. (2021). Climate change impacts on agriculture and their mitigation: a global analysis. Environmental Science and Pollution Research, 28(1), 31-43.

2.Zoumides, C., Kyriacou, K., & Boustras, G. (2018). Adaptation of Agriculture to Climate Change: The Need for Change. Sustainability, 10(8), 2766.

3.Babu, S. S., Anitha, B. K., & Rao, P. R. (2015). Climate Change and Agriculture in India: Impacts and Adaptation. Mitigation and Adaptation Strategies for Global Change, 20(4), 547-568.

4.Khan, M. A. H., & Ricker-Gilbert, J. (2018). Climate change impacts on agriculture in sub-Saharan Africa: a review of the scientific literature. Climatic Change, 147(3-4), 557-573.

5.Lal, R. (2018). Climate Change and Agriculture: A Review of Impacts and Adaptations. Critical Reviews in Plant Sciences, 37(1), 21-32.

6.Rudra, R. P., & Raghavan, G. S. V. (2019). Assessing the impact of climate change on agricultural productivity: evidence from India. Climatic Change, 155(3), 389-409.
7.Smith, P., Bustamante, M., Ahammad, H., Clark, H., Dong, H., Elsiddig, E. A., … & Zhu, Z. (2014). Agriculture, Forestry and Other Land Use (AFOLU). In Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press.
8.Jagadish, S. V. K., Cairns, J. E., & Lafitte, R. (2010). Implications of temperature variation for rice yield and climate change mitigation strategies. Advances in Agronomy, 107, 361-393.
9.Reidsma, P., Tekelenburg, T., & van den Berg, M. (2010). Adaptation to climate change and climate variability in European agriculture: the importance of farm level responses. European Journal of Agronomy, 32(1), 91-102.
10.Rosenzweig, C., Elliott, J., Deryng, D., Ruane, A. C., Müller, C., Arneth, A., … & Jones, J. W. (2014). Assessing agricultural risks of climate change in the 21st century in a global gridded crop model intercomparison. Proceedings of the National Academy of Sciences, 111(9), 3268-3273.
11.Vermeulen, S. J., Campbell, B. M., & Ingram, J. S. (2012). Climate change and food systems. Annual Review of Environment and Resources, 37, 195-222.
12.Eakin, H., & Bojórquez-Tapia, L. A. (2008). Insights into the composition of household vulnerability from multicriteria decision analysis. Global Environmental Change, 18(1), 112-127.
13.Klein, R. J., Schipper, E. L., & Dessai, S. (2005). Integrating mitigation and adaptation into climate and development policy: three research questions. Environmental
14.Jickling, B., & Sterling, S. (Eds.). (2017). Post-sustainability and environmental education: Remaking education for the future. Springer.
15. Hawken, P. (2015). The ecology of commerce revised edition: A declaration of sustainability.
16. Wals, A. E., Brody, M., Dillon, J., & Stevenson, R. B. (2014). Convergence between science and environmental education. Science, 344(6184), 583-584.
17. Hart, S. L., & Prahalad, C. K. (2013). New Age of Sustainable Capitalism: Business Models to Drive Growth and Social Change (Collection), ePub, The. FT Press.
18.Https://Dcecm.Iitd.Ac.In/Impact_Of_Climate_Change_On_Indian_Economy.Pdf
19.Https://Www.Unep.Org/Resources/Emissions-Gap-Report-2022?Gclid=Cjwkcajw586hbhbreiwaqyenhvxlknx3so3c0fw-Khiiv3_X6mvkpt-EY5lcQyItjZUTd-Cbg55iebocv34qavd_Bwe
20. Pace Environmental Law Review, Vol. 36, Issue 1 (2018), pp. 49-94bLin, Albert C. (Cited 519 times); Burger, Michael (Cited 241 times) 36 Pace Envtl. L. Rev. 49 (2018-2019)

# CONTRIBUTION OF TOURISM INDIAN INDUSTRY IN INDIAN ECONOMY

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## ABSTRACT

*Tourism is the collection of activities, services and industries that delivers a travel experience,including transportation, accommodation, eating and drinking establishments, retail shops, entertainment business and other hospitality services provided for individuals or groups travelling away from home. In India, the growth of the tourism industry has a multiplier effect in the economic development of the country. Tourism not only adds to the country's GDP, but also generates a lot of employment and helps seeing the citizens living mirthfully. Therefore, tourism sector can be instrumental for the sustainable development of national wealth. It has the potential to stimulate other economic sectors through its backward and forward linkages and cross-sect oral synergies with sectors like agriculture, horticulture, poultry, handicrafts, transport, construction, floriculture etc. Tourism has been making a revolutionary and significant impact on the world economic scenario. It has become the fastest growing service industry in the country with great potentials for its further expansion and diversification, it has direct and indirect chain link with several sector of an economy. Tourism has both positive and negative far reaching impact on economic, social, political and environment face of India.*

***Keyword:*** *Environment, Employment, Economic Development, Tourism ,GDP*

## Introduction

Tourism may be a quickly developing industry of the world. It is picking up widespread acknowledgment as a strong motor for comprehensive socio financial improvement because of the business openings it made and the infrastructure improvement as a result of it. It has the planned to motivate other financial indicators through its forward and in reverse linkages. Too it has the capacity to generate more work due to its multiplier impact within the economy. Tourism in India has created gradually over the long time. Tourism being the interaction between the tourists and the host societies, not only the socio-economic conditions of host communities change, but also their value system improves clarified that tourism brings changes in individual and collective value systems, behavioural patterns, social structures, life style of people and their quality of life. Leavitt (2003) also mentioned that tourism influences the socio-economic conditions of a community by increasing racial and cultural tolerance, creating new employment opportunities, developing infrastructural facilities, and by contributing to its overall economic development.

## Economic Growth

Today, tourism in India has become an important part of the economy contributing substantially to the inclusive and sustainable development of the country. India has succeeded in becoming the most preferred destination amongst domestic and overseas travellers. Tourism exposes international travellers to India's philosophy of unity in diversity. Over years the tourism sector has been instrumental in generating foreign exchange, creating employment opportunities, and generating household income for Indians, as it has in many other developing economies. It has brought the opportunity of infrastructure development and helped in regional and economic development. Thus, the development of the tourism sector appears to have been as important as the development of other sectors of the Indian economy.

## Present Scenario of Impact of Tourism Industry on Indian Economy

As per recent scenario, amid the outbreak of the pandemic, "COVID-19", we all have seen a huge decline in the tourism industry and thus in the economy of the countries. Because of this outbreak all tourism industry has suffered a lot, recently Navarra started and that was a big time for an up liftmen in the tourism of states as devotees used to travel from one pilgrimage place to another which in turn increased tourism and thus improved economy but because of this pandemic no movement of people were allowed and even at this time no improvement in the tourism industry was seen and thus it all affected the economy of the country and as a result decreased the GDP.As a preventive measure to avoid outbreak of "COVID-19" all domestic and international

flights were cancelled which led to a huge loss in the airlines industry and all this had a negative effect on the economy of the country.

**Significance of the study**

The study will help us to find out the impact of tourism on economic development in India. The tourism sector has 9.2% contribution in GDP and the regulation of the Indian society. The impact that find out throughout the study that more beneficial and effective in nature of the tourism industry in India. Development and growth are definite term of two factor which regulates of the impact of tourism on economic development in India and more developmental factor in the Indian country.

**The Objective of the study**

1. To know the significant role of tourism sector for Indian economy.
2. To enhanced the tourism industry for the wealth and employment creation.
3. To spread the awareness for the role of economy growth by tourism sector.

**The Study area**

The research has been conducted on Indian level tourism sector based on the secondary data where the study on the impact of tourism on economic development in India. The mainmotive is to know the significant role of tourism sector for Indian economy and spread the awareness for the role of economy growth by tourism sector where every sector will enhance the tourism industry for the wealth and employment creation.

**Methodology**

The present study is based on the secondary data published by various agencies and organizations which is based on secondary data. The present study makes use of data and information provided by, UNWTO, Ministry of Tourism, Ministry of Statistics and Programme Implementation, Newspapers, Research paper and Articles, Magazines, Books, Economic journals and Internet etc.

**Positive Impacts**

**Creating Income and Employment:**

Tourism in India has emerged as an instrument of income and employment generation, poverty alleviation and sustainable human development. It contributes 6.23% to the national GDP and 8.78% of the total employment in India. Almost 20 million people are now working in the India's tourism industry.

**Source of Foreign Exchange Earnings:**

Tourism is an important source of foreign exchange earnings in India. This has favourable impact on the balance of payment of the country. The tourism industry in India generated about US$100 billion in 2008 and that is expected to increase to US$275.5 billion by 2018 ata 9.4% annual growth rate.

**Preservation of National Heritage and Environment:**

Tourism helps preserve several places which are of historical importance by declaring them as heritage sites. For instance, the Taj Mahal, the Quota Minar, Ajanta and Ellora temples, etc, would have been decayed and destroyed had it not been for the efforts taken by Tourism Department to preserve them. Likewise, tourism also helps in conserving the natural habitats of many endangered species.

**Developing Infrastructure:**

Tourism tends to encourage the development of multiple-use infrastructure that benefits the host community, including various means of transports, health care facilities, and sports centres, in addition to the hotels and high-end restaurants that cater to foreign visitors. The development of infrastructure has in turn induced the development of other directly productive activities.

**Promoting Peace and Stability:**

Honey and Gulping (2009) suggests that the tourism industry can also help promote peace and stability in developing country like India by providing jobs, generating income, diversifying the economy, protecting the environment, and promoting cross-cultural awareness. However, key challenges like adoption of regulatory frameworks, mechanisms to reduce crime and corruption, etc, must be addressed if peace-enhancing benefits from this industry are to be realized.

**Negative Impact**

**Undesirable Social and Cultural Change:**

Tourism sometimes led to the destruction of the social fabric of a community. The more tourists coming into a place, the more the perceived risk of that place losing its identity.

A good example is Goa. From the late 60's to the early 80's when the Hippy culture was at its height, Goa was a haven for such hippies. Here they came in thousands and changed thewhole culture of the state leading to a rise in the use of drugs, prostitution and human trafficking. This had a ripple effect on the country.

**Increase Tension and Hostility:**

Tourism can increase tension, hostility, and suspicion between the tourists and the local communities when there is no respect and understanding for each other's culture and way of life. This may further lead to violence and other crimes committed against the tourists. The recent crime committed against Russian tourist in Goa is a case in point.

**Creating a Sense of Antipathy:**

Tourism brought little benefit to the local community. In most all-inclusive package tours more than 80% of travellers' fees go to the airlines, hotels and other international companies, not to local businessmen and workers. Moreover, large hotel chain restaurants often import food to satisfy foreign visitors and rarely employ local staff for senior management positions, preventing local farmers and workers from reaping the benefit of their presence. This has often created a sense of antipathy towards the tourists and the government.

**Adverse Effects on Environment and Ecology:**

One of the most important adverse effects of tourism on the environment is increased pressure on the carrying capacity of the ecosystem in each tourist locality. Increased transport and construction activities led to large scale deforestation and destabilisation of natural landforms, while increased tourist flow led to increase in solid waste dumping as well as depletion of water and fuel resources. Flow of tourists to ecologically sensitive areas resulted in destruction of rare and endangered species due to trampling, killing, disturbance of breeding habitats. Noise pollution from vehicles and public address systems, water pollution, vehicular emissions, untreated sewage, etc. also have direct effects on bio-diversity, ambient environment and general profile of tourist spots.

**Conclusion**

Tourism industry in India is growing and it has vast potential for generating employment and earning large amount of foreign exchange. Eco-tourism needs to be promoted so that tourism in India helps in preserving and sustaining the diversity of the India's natural and cultural environments. Tourism in India should be developed in such a way that it accommodates and entertains visitors in a way that is minimally intrusive or destructive to the environment and sustains & supports the native cultures in the locations it is operating in. Moreover, since tourism is a multi-dimensional activity, and basically a service industry, it would be necessarythat all wings of the Central and State governments, private sector and voluntary organizations become active partners in the endeavour to attain sustainable growth in tourism if India is to become a world player in the tourism industry.

**References**

1. Mishra, P. K., Rout, H. B., & Mohapatra, S. S. (2011). Causality between tourism and economic growth: Empirical evidence from India. European Journal of Social Sciences, 18(4), 518-527.
2. Suhel, S., & Bashir, A. (2018). The role of tourism toward economic growth in the local economy. Economic Journal of Emerging Markets, 10(1), 32-39.
3. Ohlan, R. (2017). The relationship between tourism, financial development and economic growth in India. Future Business Journal, 3(1), 9-22.
4. Lin, V. S., Yang, Y., & Li, G. (2019). Where can tourism-led growth and economy driven tourism growth occur?. Journal of Travel Research, 58(5), 760-773.
5. Sharma, A., Johri, A., & Chauhan, A. (2012). FDI: An instrument of economic growth & development in tourism industry. International Journal of Scientific and Research Publications, 2(10), 1-6.
6. Raina, A. K., & Agarwal, S. K. (2004). The essence of tourism development: dynamics, philosophy, and strategies. Sarup & Sons. 3. Ivanov, S., & Webster, C. (2007). Measuring the impact of tourism on economic growth. Tourism Economics, 13(3), 379-388.

7. Mishra, P. K., & Rout, H. B. (2012). Economic impact of tourism: a case study of Jharkhand. International Journal of Economics and Managerial Thoughts, 3(2), 130-139.
8. Sharma, A., Johri, A., & Chauhan, A. (2012). FDI: An instrument of economic growth & development in tourism industry. International Journal of Scientific and Research Publications, 2(10), 1-6.
9. www.incredibleindia.org
10. http://en.wikipedia.org/wiki/Tourism

# GMO : ETHICAL ISSUES IN BIOTECHNOLOGY

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## ABSTRACT

*Biotechnology has been used since centuries by scientists to enhance production and quality of food and medicine. This is although a new field but has immense potential and is rapidly growing and being applied to living organisms. It has many benefits in one hand and in other many hidden risks which are still not known. Modern biotechnology is still considered as a new technology and the advancement in these areas have been so rapid, it has been the object of some doubts, fears, concerns as well as an intense and divisive debate worldwide on the potential risks to human health, the environment and society. Jacques Diouf, the FAO Director-General, in the foreword of the FAO Ethic Series (FAO 2001), mentioned that technological advances and organizational changes affecting food and agriculture systems over the past years have been both radical and rapid; their repercussions, however, will be felt for a long time to come and, in many cases, the consequences may be irreversible. The development of biotechnology has triggered many ethical and social reactions from the public opinion, the media and non-governmental organizations. The aim of this paper is to provide some insights into the ethical concerns, dilemmas and trade-offs that have been expressed concerning biotechnology in the last few years related to Genetically Modified Crops, whose procurement, production, storage and use by biotechnology has raised general attention.*

***Keywords:*** *Biotechnology, genetically modified organisms, natural genetic resources.*

## Introduction

Today Biotechnology has provided the knowledge and means to change the world around us by finding means to enhance production, improve quality, reduce diseases, new genetic combination, reduce cost, etc. The ethical implications of these recent and accelerated developments have generated intense public debate in various parts of the world whether such changes are required for the betterment of humanity and natural world or not.

Genetically Modified Food (GMF) means any food containing or derived from a genetically engineered organism[1].Genetically modified crops (GM crops) are plants used in agriculture, the DNA of which has been modified using genetic engineering techniques.

The majority of the Biotech-crops available on the global market have been genetically manipulated to express one of these basic traits: resistance to insects or viruses, tolerance to certain herbicides and nutritionally enhanced quality. Genetic Modification is also done to increase nutritional value, bioremediation and for other purposes like production of pharmaceutical agents, biofuels etc.

The emergence of agricultural biotechnology has created social and ethical contradictions. The widespread debate exists as to how biotechnology can be used for planting high quality high yield crops while protecting eco-system and human health.

## Method

The data has been collected from 30 research papers/articles from secondary sources like journals, news papers, magazines, articles , books etc.

## Discussion

In a study on "Genetically modified crops Issues and challenges in the context of India"[2] the issues of concern related to GM crops were:

Human health risk, Environmental safety concern, Access and IPR, Ethical concerns related to mixing of genes, Safety assessment and apprehension that target pest would grow resistant to BT toxin with time.

In another study "Farmer's resounding no to BT Brinjal"[3], it was concluded that GM technology would take care of only few selected insects. There will still be problem of destruction of crops from other insects who are not taken care by this technology. Other issues which were discussed include: rights of non-GM farmers against GM-farmers; cost recovery of BT seeds; Patent infringement; Litigation.

In "Ubergene Cometh"[4] the decline in fertility and milk yield of cattle due to GM cottonseed cattle feed was studied.

Biotech companies use terminator technology to link a terminator trait to the seeds that they sell to farmers, so that the farmers must buy new GM seeds every season because their crop yields only sterile seeds. This is yet another ethical problem with the way that companies control the farmers who use their technologies.[5]

There are many scientists who argue that genetic engineering in agriculture is the best way to solve many issues of poverty, food security, environmental harm, and the need for increasing competitiveness in sales, but others raise ethical issues regarding the health of the people who consume the genetically modified products, the possible harm to the environment, the depredation of the welfare of the farmers and their food security, and the general introduction of engineering into mainstream use in society.[6]

A few arguments that have been laid down against the allowing of patents for certain biotechnology inventions (specifically genetic material and life forms) include: [7]

Genetic alteration of life forms is immoral, and allowing patents for these inventions leads to the ownership and commercialization of life, and reduces life forms to 'products of manufacture';

- Human, animal and environmental safety might be compromised in the development and subsequent use of these inventions;
- Allowing patents for certain life forms and genetic material may lead to unauthorized exploitation of a country's natural resources;
- Allowing patents for certain life forms and genetic material may be insensitive to the beliefs of indigenous populations and may exploit their knowledge; and
- It also discourages disclosure of information and collaboration between researchers.

Gene Use Restriction Technologies (GuRTs) - coined "Terminator" technologies by the Canadian group RAFI (now the ETC Group) - aiming at creating sterile plants, "would deny the farmers their ancient right to save and exchange seeds from previous harvests" (The Corner House UK, 1999)[8]. This has lead to more classical economic arguments such as corporate control threatening farm livelihoods of the very poor. The "Terminator" argument has been very influential in countries such as India, where monopoly on a living organism is seen as unacceptable and where seeds saving, exchange and re-planting are identified as farmers' rights (De Castro et al., 2003)[9].

In Europe, GM food is considered to combine three major negative perceptions (Eurobarometer, 2005)[10]: many consider it is not useful, morally unacceptable and a risk for society.

Bio safety concerns for the release of GMOs in the environment have been a major issue in the European public mind while, by contrast, they are of little concern to Asian consumers from China, Indonesia and the Philippines (Hoban, 2004)[11].

GMOs are novel products which, when released, may cause ecosystems to get polluted unintentionally and may also result from out-crossing with wild populations. GMOs may get released in the environment and pose several risks such as transgene instability, transfer to weeds, persistence of transgene in the environment, loss of biodiversity, changes in soil ecology, generation of new live viruses etc. There is a concern among people that extensive use of GM crops / foods will lead to loss of our biodiversity. GM crops could compete or breed with wild species threatening biodiversity.

It has been demonstrated scientifically that GM crops transfer their genes to soil fungi and bacteria. The affected fungi and bacteria then behave in abnormal ways and diminish their function in breaking down organic material, which makes nutrients available to plants. The soil becomes progressively less fertile. After a few seasons of planting GM crops, the soil will not be able to host any other conventional crop. If farmers wish to switch back to conventional crops, it could take a whole season to rehabilitate the soil. Hence, the economic consequences are unfavorable besides the added cost of nutrients and fertilizers which are necessary to regenerate the soil.

**Ethical Issues Studied By Various Researchers Are: Environmental uncertainities**

| SN | EFFECT | NAME OF AUTHOR/YEAR |
|---|---|---|
| 1 | Reduce or Change nature's biodiversity | BABAS 1999[12]<br>Philips 1994[13]<br>Third World Network 1995[14] |
| 2 | Upset balance of nature | FAO 2001[15] |
| 3 | Create superweeds | Hails 2000[16]<br>Kaiser 1999[17] |
| 4 | Creation of disease causing bacteria and viruses | Hails 2000<br>Philips 1994<br>Ho 1998/1999[18] |
| 5 | Increased resistance to pesticides antibiotics | NAS 1987[19]<br>LARRDIS 2009<br>Latha Jishnu 2009 |
| 6 | GMO harming non-target organisms | Hails 2000<br>Goldberg & Tjaden 1990<br>Ho 1998/1999<br>Nayar Lola 2009 |
| 7 | Transfer of Transgenes through cross pollination | LARRDIS 2009 |

**Socio-economic uncertainties**

| SN | EFFECT | NAME OF AUTHOR/YEAR |
|---|---|---|
| 1 | Market monopoly by big companies | Thompson 1997[20]<br>BABAS 1999 |
| 2 | Impact on economies of developing countries | Thompson 1997<br>BABAS 1999 |
| 3 | Ethical concerns about scientific purity, the social function of science and public trusts in scientists | Thompson 1997<br>BABAS 1999 |
| 4 | Inadequate safety assessment to catch unpredictable and imprecise effect of GM crops | LARRDIS 2009 |

**Scientific uncertainities**

| SN | EFFECT | NAME OF AUTHOR/YEAR |
|---|---|---|
| 1 | possible risks of GMOs to human health and environment | Manual for Assessing Ecological & Human Health of Genetically Modified Organisms 1998<br>Fagan 2000[21]<br>Ho 2001<br>Hoban, 2004 |
| 2 | Inadequacies of scientific risk assessment as a mean of predicting and assessing the likely consequences of new technologies | Van Dommelen 1996 [22]<br>Wynne 1992[23]<br>Stirling 2000[24] |
| 3 | 'Theoretical harm' of GMOs release into the environment, if it did occur, would be very extensive, perhaps delayed, costly and difficult or impossible to remedy | Heinemann 1997[25]<br>Ho 1998/1999<br>Epstein 1998[26] |

**Consumer's right to Food and safety**

| SN | EFFECT | NAME OF AUTHOR/YEAR |
|---|---|---|
| 1 | Right of consumers to have their health protected from possible hazards derived from eating GM food – Toxicity, Allergenicity and Nutritional Value | BABAS 1999 |
| 2 | Information about foods offered as GM (Halal, Vegetarian, Kosher etc.) | Hajj Mustafa 2001[27]<br>Batalion 2000[30] |

**Patenting**

| SN | EFFECT | NAME OF AUTHOR/YEAR |
|---|---|---|
| 1 | patenting which allows big corporations to have monopoly of genetically modified plants and animals violates the sanctity of life | Uzogara 2000[28] |
| 2 | Seeds are now regarded as propriety products, moreover with the 'terminator gene' technology which renders the seeds sterile | Koch 1998[29] Latha Jishnu 2009 Halford, Nigel G. 2003 |
| 3 | Infringement, Litigation | Latha Jishnu 2009 De Castro et al., 2003 |

**Intrinsic concerns**

| SN | EFFECT | NAME OF AUTHOR/YEAR |
|---|---|---|
| 1 | Interference with nature- crossing of natural species | BABAS 1999 |
| 2 | Loss of Flora and Fauna | LARRDIS 2009 |
| 3 | Morally unacceptable and a risk for society | Eurobarometer, 2005 |

## Conclusion

Genetic Modified Crops should be investigated in one to one basis for their risks and benefits before commercialization. Both human health and environment safety are of primary concern. Scientists claim that GM foods will solve the problem of world hunger and malnutrition. Food scientists and technologists can support the introduction of GM technologies provided that issues of product safety, environmental concerns, ethics and information are satisfactorily addressed to so that the benefits that this technology can confer become available both to improve the quality of the food supply and to help feed the world's escalating population in the coming decades.

## References


1. Halford NG, Shewry PR. Genetically modified crops: methodology, benefits, regulation and public concerns. Br Med Bull. 2000;56(1):62–73.
2. Research Unit (LARRDIS). December 2009. Genetically modified crops: Issues and challenges in the context of India. Rajya Sabha Secretariat, New Delhi.
3. Latha, Jishnu. October 2009.Farmer's resounding no to BT Brinjal. The Business Standard.
4. Nayar, Lola. 10 August 2009. Ubergene Cometh. Outlook.
5. Halford, Nigel G. 2003. Genetically Modified Crops. London, UK: Imperial College Press.
6. Marx, Miriam Elizabeth. The benefits and Ethical issues behind using Genetically Modified Organisms in Agriculture. The Interdisciplinary Journal of Health, Ethics, and Policy.
7. Shelley A. Rowland, Patents and Biotechnology-Issues Around Patenting of Life Forms, at http://www.piperpat.co.nz/resource/life.html
8. The Corner House UK (1999), Food? Health? Hope? Genetic Engineering and World Hunger. The Corner House UK, Sturminster Newton, 1999.
9. De Castro, Leonardo, D., Sy, Peter, A., Alvarez, Andrew, Allen, A., Mendez, Regina, V., Rasko, James, Kevin (2003), Bioethics in the Asia-Pacific Region: issues and concerns. University of the Philippines. Paper prepared for the regional meeting on Ethics of Science and Technology, 5-7 Nov. 2003, Bangkok, UNESCO, Regional Unit for Social & Human Sciences in Asia and the Pacific (RUSHSAP)
10. Special Eurobarometer (2007) No.262, Energy Technologies: Knowledge, Perception, Measures, Jan.2007, European Commission, Brussels.
11. Hoban, T.J. (2004), Public Attitudes towards Agricultural Biotechnology, ESA Working Paper No. 04-09, May 2004, The Food and Agriculture Organization of the United Nations, Agricultural and Development Economics Division.

12. BABAS. 1999. Ethical aspects of Agricultural Biotechnology. Report of the EFB Task Group on Public Perceptions of Biotechnology. Cambridge Biomedical Consultants, The Hague.
13. Phillips, S.C. 1994. Genetically engineered foods: do they pose health and environmental hazards?, CQ Researcher 4(29): 673-696.
14. Third World Network. 1995. The need for greater regulation and control of genetic engineering. A Statement by Scientists Concerned about the Trends in the New Technology. Penang: Third World Network.
15. FAO. 2001. Genetically modified organisms, consumers, food safety and the environment. FAO Ethic Series, No. 2. FAO, Rome.
16. Hails, R.S. 2000.Genetically modified plants - the debate continues. Trends in

Ecology & Evolution 15 (1):14-18.

17. Kaiser, J.1996. Pests overhelm Bt cotton crop. Science 273: 423.
18. Ho, M.W. 1998/1999. Genetic engineering dream or nighmare? The Brave New World of Bad Science and Big Business. Gateway, Gill & MacMillan, Dublin.
19. NAS (National Academy of Science). 1987. Introduction of Recombinant DNA Engineered Organisms into the Environment - Key Issues. National Academy of Science: Washington D.C.
20. Thomas, S. 2001. Ethical and social considerations in commercial uses of food and fiber crops. Proceeding of the first International Symposium on Ecological and Societal Aspects of Transgenic Plantations. Strauss, S.H. & Bradshaw, H. D. (eds).College of Forestry, Oregon State University: 92- 98.
21. Fagan. [n.d.]. http://www.netlink.de/gen/fagan.html. [21 April 2000].
22. van Dommelen, A. 1999. Scientific controversy in biosafety assessment. In, van Dommelen, A. (ed). Hazard identification of agricultural biotechnology.International Books: 15-45.
23. Wynne, B. 2001. Managing scientific uncertainty in public policy. Background paper for Biotechnology and Global Governance: Crisis and Opportunity. April 26-28, 2001. Cambridge. http://www.wcfia.harvard.edu/conferences/ biotech/Backgroundpapers.html. [6 August 2002].
24. Stirling, A. 2000. Scientific Knowledge and the Precautionary Principle. European Commission: Brussels.
25. Heinemann, J.A .1997. Assessing the risk of interkingdom DNA transfer. In: Nordic seminar on antibiotic resistance marker genes and transgenic plants. Norwegian Biotechnology Advisory Board (ed), Oslo: 17-28.
26. Epstein. 1998. Ethical and spiritual issues in genetic engineering. Ahimsa Voices: a Quarterly Journal for the Promotion of Universal Values, 5(4), Oct.1998: 6-7.
27. Hajj Mustafa Ali al-Haydari. 2001. Genetic engineering. http://www.nuradeen.com/CurrentIssues/G eneticEngineering.htm. [2.6.2002].
28. Uzogara, S.G.. 2000. The impact of genetic modification of human foods in the 21st century: A review. Biotechnology Advances 18(13): 179-206.
29. Koch, K.1998. Food safety battle: organic vs. biotech. Congressional Quarterly Researcher 9 (33): 761-784.
30. Batalion, N. 2000. Harmful effects of genetically modified foods. http://www.cqs.com/50harm.htm. [27 March 2001].

# ROLE OF INFORMATION IN MODERN RESEARCH

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## Introduction

We all know this is an information Era. The demand for information increases with the demand of problems and their solutions. In an information system, information is stored and it is located and recovered when needed. The collection of information should be systematic so that it can be stored and recovered without difficulty. Scientific information comprises dissemination, organization, translation travel, scientific information, scientific conferences and symposia. A research scientist should keep himself fully posted with all the work that is being done in his field in other laboratories not only in his country but also on other Countries of the world otherwise he might be wasting his time in duplicating

**Keywords:** Information, Research Objectives of Research Paper:-

**1)** To study role of information in research.
**2)** To study a role of e-techniques in research.

Information is an important common denominator for all organizational planning and control. Information economics is the study of the allocation of certain scarce resources of an organization to achieve the best decisions for that organization.
The demand for information relates directly to the attitude towards progress. The strength of a nation lien in this healthy curiosity to see what more can be done. In an industrial economy motivation leads to progress, and self-satisfaction weakens men, industry and nations alike.

## Importance of information

Information helps in avoiding the duplication of research. Information stimulates the thought process of the users, particularly the scholars. Information helps the scientists, engineers, scholars etc. to get well informed with the current advancement in their subjects, and to keep them

## Types of information

There are four types of information:

- Factual. Factual information is information that solely deals with facts.
- Analytical. Analytical information is the interpretation of factual information.
- Subjective. Subjective information is information from only one point of view.
- Objective

## Information systems

Information is the basic requirement indecision making. The growth in size and complexity of companies has emphasized the need for improved information systems in recent years. Some aspects are Information system theory and design, man machine relationships, language data processing, artificial intelligence, mechanization of library process, non-numerical applications of digital computers, storage and retrieval, automatic publishing command and control, information display, and so on.
Network planning can be adapted to electronic data processing and this makes it possible for a computer to be used. A computer can perform the time analysis calculations and relate cost and man power data to the detailed plan linking these with management information to the calendar scale and predicting when action must occur and the resources must be available. The computer is to do the job less expensively and in a shorter time than is possible by human efforts. These are not only the indirect benefits, such as, making available real-time information which enables and pronates correct decisions being taken by management. The benefits of a computer are.

- Safety ;
- Economy ;
- Accuracy ;
- Capacity to handle large volumes of information ;
- Partial interpretation ;
- Legible, uniform results.

**The Problems of a computer are**

- The aura of mystery ;
- Discipline and accuracy ;
- Administrative problems ;
- Access to the proper computer with the proper programmes ;
- Cost of developing new or modifying programmes ;
- Difficulties in using a poorly designed programme. Physical storage of information is effected by the following means ;
- Ultra high speed ; diodes, read-only – storage ;
- High speed immediate access : magnetic core thin film ;
- Bulk immediate access : magnetic core ;
- On-line direct access : magnetic drum, disc, cartridge ;
- Off-line magnetic tape, removable disc or cartridge.

Computer – aided printing has recently made possible an integration of two functions of communication; primary publication and secondary retrieval. The introduction of automation to duplicate printed material quickly has proved of great use, but this appears to be only the beginning of further innovations.

The computer which was invested at the end of the second worldwar has worked wonders in the scientific and technological world. It may in future be the main information processor. Computer speeds may increase to a level of 1000 million operations per second in the next 10 years. The future computers may be small, powerful and inexpensive.

**Roll of Library**

There is an enormous amount of published information concerning science and technology. If all or even a significant part of this information is made use of, it can be of inestilnable value. The library and documentation department of the organization should be charged with the responsibility of locating and making available whatever knowledge and experience may advance its activities. A library and documentation service is sometimes called “Information Service”. The library service secures, assembles, and presents in usable form all the information that relates to specific subject areas.

A general library serves the general public, whereas a special library provides specific information. A special library should be able to produce information which may not even be published. A special library for science and technology maintains a regular and systematic information service for the immediate and foreseeable future needs of the enterprises. In the last few years, the rate of growth of scientific literature has been phenomenal. Traditional methods of filling and indexing have given place to mechanical devices, such as notched or punched cards sorted by electronic computers.

Scientific and technical libraries have been established by government agencies, research institutes, professional societies, trade associations, hospitals, and so on. An ideal library is planned and established as an integral part an organization. The library should be an independent department of the research organization and its head should rank with the heads of the other department. The chief of the library must be given strong support to enable the library to serve its purpose. The main functions of a scientific-technical library are:

- Collection of books, periodicals, and other publications;
- Special subject references. Files and indices;
- Supply of currently published information by personal notification, library bulletins, special service publications, etc.;
- Circulation of books and routing of periodicals;
- Filing and indexing of internal reports and technical correspondence;
- Reference services;
- Compilation of bibliographies and organization of reports;
- Editorial assistance with publications;
- Translation of foreign language publications;
- Personalized service

Laboratory research should be preceded by an adequate library research. Important discoveries are often made in the library and subsequently tested in the laboratory. A discovery is often a combination of old ideas

which come to a person in library.

A science-technology librarian has to handle a heterogeneous mass of specialized materials. He should be familiar with the experience of others in dealing with similar problems. The planning of a library service is a challenge. Book should be selected systematically so that the broad purpose and interest of the organization are served. The types of books that are included in a science-technology library are texts, monographs, handbooks, encyclopedic works, dictionaries, and treatises on scientific works.

**E-Research Techniques**

To-day a researcher being a human being has weak teeth feeble claws, no horns, cannot fly and cannot even run fast but nature has compensated all these shortcomings by giving us computer. It is because of computer that a researcher can calculate his results very fast. Computer in not only an extension of man's ability to computer but also help him in storing and retaining data for further research. Computer can even take logical decision on various aspects of research. In fact the computer has come up in such a big way that its presence is felt in every sphere of research like research in education, research in business, research in trade research in industry, research in medicine, research in banking research in different services, etc. Following are the capabilities of computer in the field of research

**1)** Speed and accuracy
**2)** Processing Capabilities to take logical decisions for research
**3)** Large and perfect memory relating to research data.
**4)** Versatility
**5)** Automation
**6)** Diligence

The above characteristics of computer machine make it an excellent device but it is not an intelligent device for research work till today computers. An Introduction the discovery of numbers which is considered as the greatest achievement of modern knowledge, led to the development of all kinds of modern calculating machine. Today nobody can imagine a world without numbers. It took thousands of years to get the present system of computer knowledge.

**References**

1. K. Prabhakaran, E-Research Methodology, Published by Mark Publisher Jaipur (2014)
2. G.K.Meena And GD Lamba, Essentials Research Methodology and Dissertation writing Published by Prashant Publication Nagar (2020)
3. https://en.wikipedia.org
4. https://informationr.net/infres
5. https://library.tctc.edu

# A REVIEW OF MERGERS AND ACQUISITIONS IN BANKING SECTOR IN INDIA

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## ABSTRACT

*Mergers and acquisitions (M&A) are some of the most common and widely researched topics in banking and finance sector. Corporate world is affected by the rapid technological advances and globalization. As a result, companies across the world have faced tough competition in the state of unrest. These days, Indian banks have faced a lot of challenges from declining of deposits, reduced growth of disbursed loans, mounting of NPAs, target to meet financial inclusion, need for infusion of credit by the government, and increasing operational cost. In addition, public banks have competition from private banks due to rapid business growth and the way they serve their customers. Several acquisitions and mergers worldwide, even in India, seem to be driven by strategies from merger and acquisition process in the banking sector. This study is aimed to review the status of recent mergers in banking. This study has conducted a review of recent literature on merger and acquisition which have tested the theories, impact of mergers and acquisitions on the performance of banks, and factors related to merger and acquisitions in Indian context. This study has also attempted to know the challenges behind M&A of banks. The finding of the study suggests that success of M&A relies on efficiency and productivity of employees to a great extent. Human resources of banks literally serve as important factor to run operations properly.*

***Keywords**: mergers and acquisitions, M&A, performance of banks, human resources, banking industry*

## 1. Introduction

With the changing scenario, a lot of strategies have been used by various sectors to be efficient and thrive ahead in digital arena. To improve efficiency in changing world, public sector banks should stand out and meet the credit needs of increasing economy, have capability to raise resources, and absorb shocks without having undue dependence on the foreign reserve. The concept of building the banking system of India was first originated in 1991 on the financial system in the first "Narsimham Committee Report". The aim of it was to boost the banking system in a way to meet the upcoming challenges in banking. The merger plan has been announced by the finance minister on August 2019 to merge ten state-owned banks into four with the help of government reforms and create stronger and fewer globalized lenders to boost the economy (Maity, n.d.). After implementing the reform, a lot of changes have been observed in perception and overall functionality of commercial banks. The banks need to handle large outflows and inflows of financial resources. Hence, a strong banking system is needed with the merger. It is vital to know the impact of merger on various efficiency and profitability parameters in this situation. This study reviews the existing scenario of merger in banking industry in India and challenges related to merger and acquisitions.

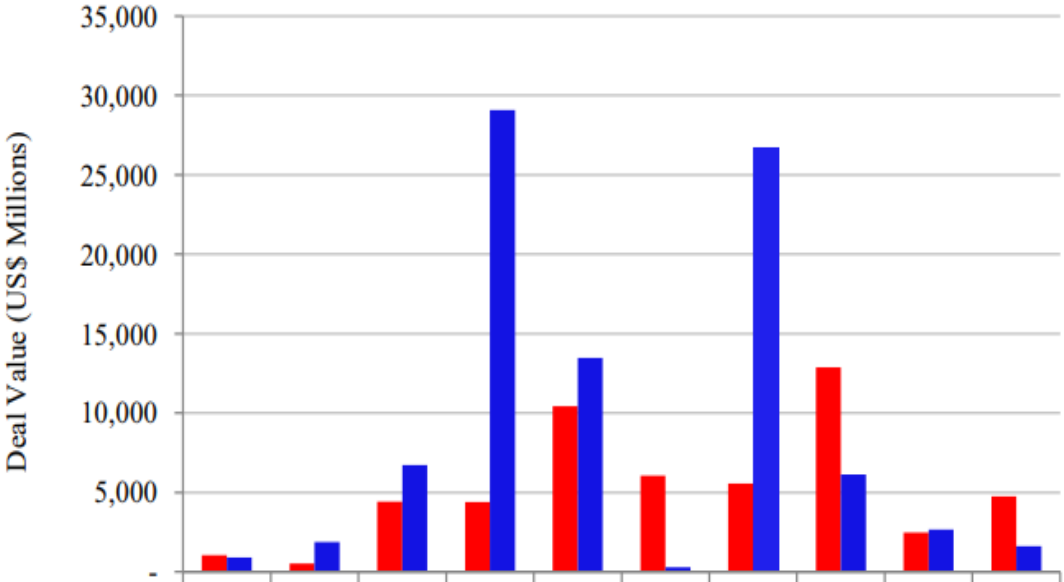
Economic policy reforms have been started across the world in the 1980s in which the concept of "financial liberalization, economic deregulation, and national integration" was taken from developed countries. Meanwhile, a lot of developing nations have witnessed a vast growth in capital flows and international trade, reserves of foreign exchange, technological advancement in local businesses, and so on. For example, a lot of leading Latin American, Asian, and African nations have focused on foreign investment, education, health, consumption, capital markets, institutional and entrepreneurship growth, and regulations (Cheng et al., 2007; Akbulut and Matsusaka, 2010).

On the other side, economic body of research has observed a significant growth for inward investment in the market from developed to developing markets while easing off the policies related to FDI. Hence, organizations have accessed huge markets with different

services and products (OECD, 2009; Alguacil et al., 2011). Hence, developing economies like "Indonesia, BRIC countries (Brazil, Russia, India, China), South Africa, etc.", have been vital contributors to the global economy of today. For example, the combined output of these markets has contributed to 38% of GDP in the world in 2010, which was almost doubled since 1990 (Dhanaraj& Khanna, 2011). Asian market was hit harder in 1997 by the extreme economic crisis, which had a lot of conflicts in securities industry (Tan &Hooy, 2003) along with the crash of IT bubbles in the year 2000. Local companies opted for several inorganic ways like alliances and acquisitions after facing the crisis (Reddy et al., 2013).

Takeovers, mergers, and other corporate activities in India were rare before 1991 or the period of "New Industrial Policy" reforms (Ray, 2022; Ahluwalia, 2002; Shaikh &Padhi, 2013; Singh et al., 2011). Regulatory shocks were the prominent causes for their occurrence (Agarwal &Bhattacharjea, 2006). The true wave of merger was started way back in 1994 where the regulatory bodies felt the need to form a new code of takeover (Reddy et al., 2013). This momentum has brought lucrative change in the corporate world from back-end to front-end plans, which also encouraged the activities related to consolidation. Indian companies have been encouraged by the global competition to pick M&As as a vital strategy to gain financial and operating synergies. For instance, 2000 to 2007 was the period of huge growth in outbound transactions related to mergers and acquisitions in India (Varma, 2011). Figure 1 highlights the foreign outbound and inbound trends and deals (in US$ millions) from 2004 to 2013 in India for 10 years.

**Figure 1** – Outbound and inbound acquisition trends in India (2004 to 2013)



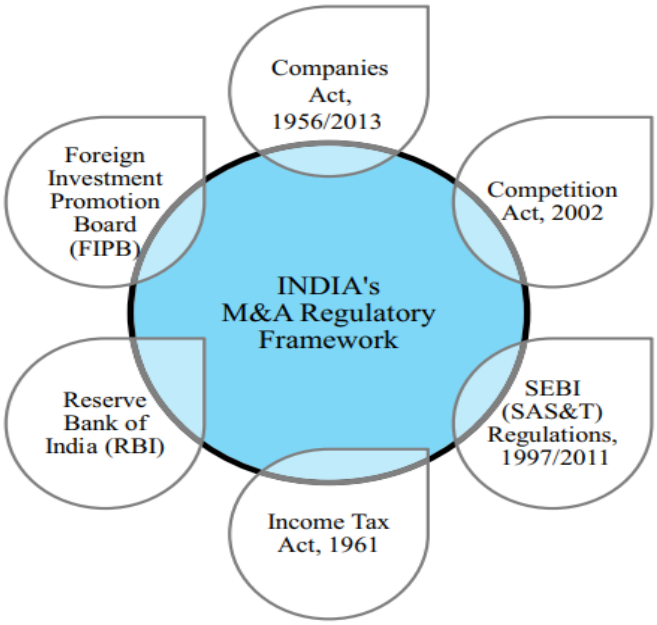

| | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 |
|---|---|---|---|---|---|---|---|---|---|---|
| Foreign Inbound deals | 1,034 | 526 | 4,424 | 4,405 | 1,042 | 6,049 | 5,550 | 12,886 | 2,474 | 4,763 |
| Foreign Outbound deals | 909 | 1,877 | 6,715 | 29,083 | 13,482 | 291 | 26,698 | 6,137 | 2,650 | 1,619 |

**Source** – UNCTAD

**2. Merger & Acquisition Laws in India**

Figure 2 illustrates merger and acquisition laws in India passed by six sovereign bodies, such as ", Companies Act, 1956/2013 (Registrar of Companies under the Ministry of Corporate Affairs); SEBI–SAS&T Regulations, 1997/2011 (Securities and Exchange Board of India); Competition Act, 2002 (Competition Commission of India); Income Tax Act, 1961 (Department of Revenue); Reserve Bank of India (RBI); and Foreign Investment Promotion Board (FIPB)."

**Figure 2** Merger & Acquisition Laws in India




**Source**– Reddy (2016)

### 2.1. "Companies Act, 1956/2013"

The original Companies Act, 1956 was officially passed by the Parliament. It is among the major merger and acquisition laws dealing with the procedures of amalgamations or mergers. The Act recommended 3 terms associated with inorganic strategies as per Sections 390 to 396, i.e., "compromise, reconstruction, and arrangement". The term "amalgamation" is used without clear definition (Ray, 2022). J.J. Irani ("Chairperson and Director of Tata Sons Ltd.") formed the Irani Committee, 2004 and made various suggestions in 2005 to improve the Act, along with urgent need to provide an individual controller, which is needed to approve mergers in the time-bound and specified way (Banerjee et al., 2014; Shroff &Ambast, 2013).

In addition, major changes have been made to update the "Companies Bill, 2012" with pre-merger approval and the process has been easier by acquiring smaller companies (Shroff &Ambast, 2013). In August 2013, the new "Companies Act" was enacted with huge changes and it has 470 clauses, 7 schedules, and 29 chapters. Hence, new provisions consist of accounting for unlisted companies, least thresholds for creditors and shareholders, valuation report, e-voting for unlisted and listed companies, listing provisions after amalgamation, foreign mergers and international integration, evolution of control concept, restriction on structures of firm of various layers, restricting insider trading, acceptability of contracts, and so on. (EY and ASSOCHAM, 2014; Companies Act, 2013).

### 2.2. "Competition Act, 2002"

This Act is aimed to regulate different kinds of restructuring of businesses like alliances, mergers, acquisitions, and so on. Sections 5 and 6 are related to those transactions. The Act has clearly mentioned in Section 6 that –

> "[…] no person or enterprise shall enter into a combination that cause or is likely to cause an appreciable adverse effect on competition within the relevant market in India and such a combination shall be void (Jain, 2012; Ray, 2022; Sansom and Christian, 2010)".

The issues related to competition and monopoly governed the "Monopolies and Restrictive Trade Practices (MRTP) Act," 1969 before this Act. It is observed that key issues of MRTP Act had not served any kind of express provision to apply "anti-competitive conduct" out of India in a study conducted by Jain (2012), but it caused an impact on local economy dearly.

**2.3. "Substantial Acquisition of Shares and Takeovers Regulations, 1997/2011"**

It is one of the most influential laws for substantial acquisition and takeover of shares in the country. Before enacting this law, "Clauses 40A and 40B" are usually applied under the SEBI agreement for takeover formalities. SEBI has controlled several deals related to takeover under the "SEBI (SAS&T) Regulations, 1994" after the reforms under "Section 30 of the SEBI Act, 1992" (Ray, 2022). The term "takeover" has no clear definition but it envisages that an acquirer takes the management or control of the specific firm over by acquiring huge acquisition of voting rights or shares (Ray, 2010). The "Takeover Code 1997" was amended around 23 times predominantly over 13 years (Reddy et al., 2011).

**2.4. "Income Tax Act, 1961"**

Taxes are vital source of revenue to the government for several administrative tasks and for the implementation of various economic policies and bear economic costs for social welfare (Ezeoha&Ogamba, 2010). Hence, a nation needs proper authority to conduct those activities. Tax authorities administer several regulations, rules, tax holidays, and incentives given in the Act under the "Department of Revenue" in the institutional environment of India. Tax incentives are provided for mergers of banks, amalgamations, and slump sale (Ray, 2010).

**2.5. "Foreign Investment Promotion Board"**

After the enaction of "Parliamentary guidelines" in the year 2003, the FIPB is gone to the "Department of Economic Affairs, Ministry of Finance". The Board works with RBI directly to promote the flows of foreign capital. This prominent government agency offers FDI with "single-window clearance" in India. This Act is aimed to promote external payment and trade and promote proper maintenance and development of foreign exchange economy in the country.

## 3. Recent Mergers of Indian Banks

The announcement of merger of ten public sector banks had been announced in August 2019 in four entities by the Finance Minister of India. This merger is aimed to improve the global competitiveness of banks in India. These days, there are total 12 public sector banks. Here are some of the recent mergers of banks in India (Desai, 2022) –

**3.1. Merger#1 – Punjab National Bank, Oriental Bank of Commerce and Union Bank of India**

After the merger of PNB, OBC and UBI, Punjab National Bank has become India's second largest PSB in terms of network of its branches. It now has 11,437 branches all over India, making total business of Rs. 17.95 lakh crore in India.

**3.2. Merger#2 – Canara Bank and Syndicate Bank**

After the merger of Syndicate Bank and Canara Bank, Canara Bank has become India's fourth largest PSB. Canara Bank makes around Rs. 15.20 lakh crore of total business from 10,342 branches all over India. These banks were also merged because of similar work culture to promote smooth transition.

**3.3. Merger#3 – Corporation Bank, Andhra Bank, and UBI**

Both Corporation Bank and Andhra Bank were merged with UBI. This way, Union Bank has gained the potential to improve the business by 2 to 4.5 times after merger. In addition, Union Bank of India became India's 5$^{th}$ largest PSB and made Rs. 14.59 lakh crore of total business from 9609 branches all over India.

**3.4. Merger#4 – Indian Bank and Allahabad Bank**

After the merger of Indian Bank with Allahabad Bank, Allahabad Bank ranks 7$^{th}$ among the largest PSBs in India. Allahabad Bank makes business of Rs. 8.08 lakh crore from total 6,104 branches. The size of the business has been doubled after the merger of these banks to improve global competitiveness.

## 4. Evolution of Merger and Acquisitions in India

Most of the mergers and acquisitions in India have been practiced for a longer period and merger is not a new concept in the business world (Belyh, 2019). It was initially conceptualized in the 18$^{th}$ century in the US and it was extensively used with increasing competition in corporate world. The evolution

of merger and acquisitions can be described in seven phases (Kumar & Yashpal, 2023) -

**Phase I – 1893 to 1904**

In the American business and industrial sector, the "great merger movement" was started and marked the beginning of mergers and acquisitions (M&A). This was the iconic period for horizontal consolidations where businesses in the same field or sector combine, usually as competitors or rivals. As the mergers led to the larger market shares, it has become very important for businesses to create supremacy and monopoly in the market.

**Phase II – 1919 to 1929**

With the dominance generated by flat merging in the Phase I, the federal government enacted laws and intervened to restrict or outlaw the so-called "anti-competitive practice." In terms of flat mergers which just increased income, vertical M&As were based more on improving the overall efficacy and cost-cutting. This wave was stopped by the "Great Depression" and market collapse in 1929.

**Phase III – 1955 to 1970**

With the arrival of Phase III, diversity and growth took the central position in choices related to business. These leading businesses switched to mergers and buyouts of conglomerates when they didn't get the suggestions from ascending or straight integrations. The wishes of US companies to reach frontier markets and expanding their income sources became the catalyst for this stage. Hence, holding enterprises and companies started to appear around. But it didn't last too long. As an impact of the collapse of stock market, this stage was finished due to energy crisis which took place in the beginning of 1970s.

**Phase IV – 1974 to 1989**

Congenerical and aggressive acquisitions were expanded frequently during the Phase IV with the entry of corporate predators in the market. The term "hostile takeover" refers to the merging or buyout which is conducted over the will and knowledge of stockholders, businesses, or the leadership of businesses. On the other side, "congeneric consolidations" happened with the merger of two businesses but they don't produce similar products or services. The irresistible conclusion of Phase IV took place in 1989 when banks were no longer able to retain their capital structures due to unsustainable loans.

**Phase V – 1993 to 2000**

Companies had a lot of desires for economies of scale with massive offers to be accepted in 1990s. At the end, a lot of global enterprises and companies were developed. They all were formed with a notion to grow larger and dominate the market. At the same time, global investors started making investments in the US and US-based companies started investing in foreign markets. A&Ms of foreign investors were known as "cross-border transactions" which gave huge stake in the target segment. However, this peak didn't sustain for a long time. It started with a bang but ended with insolvency declarations and other controversies.

**Phase VI – 2003 to 2008**

This phase took place just after the dotcom era and was promoted by venture capital, globalization, and activities of shareholders. The cross-border transactions which took place in previous stages are still evident and robust in this wave with undeniably major advantages. Government funding was available more easily with the expansion of VCs. The collapse of subprime mortgage industry in the US marked the end of this wave in 2007.

**Phase VII – 2011 onwards**

The real action of mergers and acquisitions took place in 2011 and marked the beginning of seventh wave. The BRICS nations assumed a leading position in mergers and acquisitions in this stage. The population of all these countries accounted to over 40% of total global population in 2015. With this emphasis on company and business activities due to this collaboration, it goes without saying that mergers and acquisitions have been increased significantly.

## 5. Emerging Challenges of Mergers & Acquisitions

When there are several benefits of mergers and acquisitions, there are also some challenges as another side of the coin (Desai, 2022). Some of these are -

### 5.1. Integration of Technology

Various banks can be considered as lopsided bodies relying on various technologies and geographical reaches. So, it is recommended to choose the merger partners on the basis of tech compatibilities over others. It often causes problem in geographical outreach as it is ignored. There are also events when merging partners use various versions of similar platform which should be upgraded for smooth integration. In addition, there is a specific level of customization made in every bank as per their needs. Hence, it takes a lot of time to integrate tech platforms of involved parties.

### 5.2. Human Resource Management

Bank mergers also need balancing human resources of their respective organizations. Mergers of banks take place only on documents, but their culture and people usually don't merge easily. Employees of all merged banks usually face various policies, guidelines, designations, and transfers. Banks cannot just overlook their problems as it may reduce their morale, efficiency, and also exodus of useful talents. So, a lot of aspects should be considered by the committees related to merger like IT, HR, and products. Though the best of both or multiple banks is provided to employees, there are still several challenges to face. Along with job security, various working styles, stress levels, issues related to career in terms of growth, pay, and internal transfers should be in sync.

### 5.3. Non-Performing Assets (NPAs)

The merger simply transfers non-performing assets to the merged body. Bad loans are usually piled up in target banks which should be analysed before merger. If the NPA is combined and increases to a great extent, it will take several years to ensure operational efficiency. In addition, the merger must recover bad loans too.

### 5.4. Employee Perception

Even after announcing such move, employees either feel despondent or aggressive. They might face some issues like job security, communication, and adaptability to change in technology.

### 5.5. Shareholders' interest

Stakeholders face three of the most common concerns, i.e., distraction from the growth journey, quality of book, and capability of merged business to raise capital.

### 5.6. Cultural differences

Unlike SBI and its holdings which share similar technology for years, their systems, their culture, and processes were similar and there was a flow of seniors from the parent to holdings and so forth. When two entities have varied cultural backgrounds, it faces threat to the governance.

### 5.7. Risk Management

The move related to mergers need a lot of efforts at the operating level. A lot of banks in India still consider risk management as a compliance function instead of considering it as a tool for business. Boards don't devote proper attention to calculate risks of new investment products.

### 5.8. Other Challenges

Compliance is very important in the parts of both banks in case of merger, which might not be feasible as their thinking and risk-taking perspectives are different. It may lead to rift and friction. It can cause downfall of business if merger doesn't go well. Bailing out poorly performing banks is one of the purposes of merger.

## 6. Discussions

A lot of banks rely on M&A contracts as a strategy to improve their capital, lending power, and scalability. Successful merging relies on readjustment of capital structure and integration of employees of both entities from the merging organizations. There is a need to give due attention to the HRM of merging banks or the merger could make a huge failure (Singh, 2022). A lot of employees had positive experiences after merger with 73% of employees were highly satisfied to promote effective merger. With positive relationships among employees, there would be high job satisfaction, along with helpful manager and open and transparent environment to promote free flow of interaction (Shrestha et al., 2021).

Shrestha et al. (2021) conducted a study on mergers and acquisitions and found that 65% of employees found poor communication and

post-merger integration as major challenges. However, according to 23% of employees, it is possible to reduce post-merger issues with proper growth opportunities and training. In order to ensure the comfort of employees with new work environment, several variables should be considered like sharing of information, job training, job security, and cultural blending.

According to Kaur & Kaur (2021), bank M&As cause instability, uncertainty, risk of job loss, and transfers, which are the major causes of increased anxiety, stress, and demoralization of employees and low productivity, which ultimately affects banks' profitability. Hence, they recommended proper attention to be given to reduce employee's anxiety and stress due to mergers and proper methods should be applied to provide rewards to encourage the team to improve the productivity and efficiency of employees.

### 6.1. Findings

This study was mainly aimed to discuss merger and acquisition laws in India and previous mergers of banks in Indian context. It is found that there are both positive and negative impacts of mergers and acquisitions on banks. Employee productivity is especially affected by mergers of banks, especially in terms of job security, stress, and anxiety. Hence, proper attention must be given to reward employees for their efficiency and improve their productivity. In addition, many banks rely on mergers and acquisitions to expand their reach and improve their lending power, capital, and scalability. Hence, mergers should be strategic and focused on capital structure. It is very important to give proper attention to HRM in terms of employee productivity.

There are also several challenges related to mergers and acquisitions of banks, such as integration of technology, cultural differences, employee perception, risk management, NPAs, shareholders' interest, and so on. Hence, future studies should focus on these challenges when focusing on this area to improve the overall financial health of the country and its banking system. It is found that shareholders' interest and employees' perception might change with these activities.

## 7. Conclusion and Future Research Directions

Mergers and acquisitions are known to exploit opportunities and gain synergies. However, there is a need to manage failures properly. Considering the merger of public sector banks seems to be a good idea on paper. With a lot of banks in India being in risky situations, the process of merger should take place between strong banks. Integration of a merger may take several years to complete due to challenges like cultural differences, different work environments, market risks, and so on. Governments should address the problem of governance and provide combined earnings of merged business to ensure the success of the merger.

When it comes to future research directions, it is evident that future studies have a lot of scope. Future studies may focus on the effect of mergers of different entities on job satisfaction. In addition, studies are also needed on the impact of mergers on promotions and job opportunities in banking sector. Researchers may also compare two or more banks' job satisfaction after and before merger. Employee efficiency can also be measured after bank merger. Studies should find the difference in employees' perception for mergers on the basis of demographic factors like experience, salary, gender, and job title of employees.

## References

1. Agarwal, M., &Bhattacharjea, A. (2006). Mergers in India. A response to regulatory shocks. *Emerging Markets Finance and Trade*, *42*(3), 46-65.
2. Ahluwalia, M. S. (2002). Economic reforms in India since 1991: Has gradualism worked?. *Journal of Economic perspectives*, *16*(3), 67-88.
3. Akbulut, M. E., &Matsusaka, J. G. (2010). 50+ years of diversification announcements. *Financial review*, *45*(2), 231-262.
4. Alguacil, M., Cuadros, A., & Orts, V. (2011). Inward FDI and growth: The role of macroeconomic and institutional environment. *Journal of Policy Modeling*, *33*(3), 481-496.

5. Banerjee, P., Banerjee, P., De, S., Jindra, J., & Mukhopadhyay, J. (2014). Acquisition pricing in India during 1995–2011: have Indian acquirers really beaten the odds?. *Journal of Banking & Finance*, *38*, 14-30.
6. Belyh, A. (2019). A Historical Analysis of M&A Waves (CLEVERISM). https://www.cleverism.com/historical-analysis-ma-waves-mergers-acquisition/.
7. Boon Tan, H., &WooiHooy, C. (2004). Bank merger and bank stock volatility: a post-announcement analysis. *Managerial Finance*, *30*(4), 29-47.
8. Cheng, H. F., Gutierrez, M., Mahajan, A., Shachmurove, Y., & Shahrokhi, M. (2007). A future global economy to be built by BRICs. *Global Finance Journal*, *18*(2), 143-156.
9. Companies Act (2013). Companies Act – 2013, Ministry of Corporate Affairs, Government of India. Available at: www.mca.gov.in/Ministry/pdf/Companies Act2013.pdf.
10. Desai, V. B. (2022). MERGER AND ACQUISITION OF BANKS IN INDIA. *Sustainable Development for Society, Industrial*, 57.
11. Dhanaraj, C., & Khanna, T. (2011). Transforming mental models on emerging markets. *Academy of Management Learning & Education*, *10*(4), 684-701.
12. EbehEzeoha, A., &Ogamba, E. (2010). Corporate tax shield or fraud? Insight from Nigeria. *International Journal of Law and Management*, *52*(1), 5-20.
13. EY and ASSOCHAM (2014). Mergers and acquisitions in the new era of Companies Act, 2013. Available at: www.ey.com/Publication/vwLUAssets/Assocham_White_paper_Companies_Act/$File/Assocham_White_paper_Companies_Act.pdf.
14. Jain, A. (2011). Extra-territorial jurisdiction of Competition Commission of India. *Journal of Financial Crime*, *19*(1), 112-119.
15. Kour, H., & Kaur, P. (2021). HR issues post merger of SBI and its associates: a study with special reference to Punjab state. *International Journal of Management, Technology and Engineering*, *8*(XII), 516-527.
16. Kumar, S., & Yashpal, M. (2023). Transition of Mergers & Acquisitions and Its Personnel Implications in Banking Sector: A Panoramic Review of Literature. *International journal of economic perspectives*, *17*(3), 202-213.
17. OECD (2009). *Globalization and emerging economies*. Policy Brief, Organisation for Economic Co-operation and Development. Available at: www.oecd.org/regional/searf2009/42576801.pdf.
18. Ray, K. G. (2022). *Mergers and acquisitions: Strategy, valuation and integration*. PHI Learning Pvt. Ltd.
19. Reddy, K. S. (2016). Regulatory framework of mergers and acquisitions: A review of Indian statutory compliances and policy recommendations. *International Journal of Law and Management*, *58*(2), 197-215.
20. Reddy, K. S., Nangia, V. K., & Agrawal, R. (2013). Indian economic-policy reforms, bank mergers, and lawful proposals: The ex-ante and ex-post 'lookup'. *Journal of Policy Modeling*, *35*(4), 601-622.
21. Reddy, K.S., Nangia, V. K., &Agarawal, R. (2011). Review, rewriting and impact of Indian takeover code. *International Journal of Law and Management*, *53*(4), 241-251.
22. Sansom, M., & Christian, P. (2010). India's New Competition Regime: The Elephant Who Became a Tiger. *Journal of European competition law & practice*, *1*(1), 62-65.
23. Shaikh, I., &Padhi, P. (2013). RBI's monetary policy and macroeconomic announcements: impact on S&P CNX Nifty VIX. *Transition Studies Review*, *19*, 445-460.
24. Shrestha, E., Devkota, N., Paudel, U. R., & Parajuli, S. (2021). Post-merger Employee Satisfaction in Commercial Banks of Nepal: Findings from Employee Satisfaction Index. *Journal of Business and Social Sciences Research*, *6*(1), 45-62.
25. Shroff, R., &Ambast, A. (2012). Ss. 5 and 6 of the Competition Act, 2002: demystifying the competition implications of mergers and acquisitions in

India. *Journal of Financial Crime*, *20*(1), 88-115.

26. Singh, A. (2022). A Study On Post-Merger Changes In The Level Of Employees'job Satisfaction In State Bank Of India (SBI). *International Journal of Creative Research Thoughts (IJCRT)*, *10*(1), 2320-2882.
27. Singh, J. P., Kumar, N., & Uzma, S. H. (2011). The changing landscape of corporate governance framework in India. *International Journal of Indian Culture and Business Management*, *4*(5), 506-522.
28. Varma, S. (2011). Born global acquirers from Indian IT: an exploratory case study. *International Journal of Emerging Markets*, *6*(4), 351-368.

# A CRITICAL EXAMINATION OF THE ROLE OF EDUCATIONAL COUNSELORS IN HELPING INDIAN HIGH SCHOOL STUDENTS MAKE INFORMED DECISIONS ABOUT THEIR POSTSECONDARY EDUCATION PLANS

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## ABSTRACT

*The study's goal is to analyze the function of guidance counselors in assisting Indian high school seniors in making well-informed choices regarding their future schooling. The study's overarching goals are to (1) identify and describe the roles of guidance counselors in Indian high schools and (2) evaluate the impact of these roles on students' choices about their post-secondary education. The study also looks at the factors that affect high school guidance counselors' ability to effectively counsel Indian students on their post-secondary choices and suggests methods to improve this counseling. Finally, this research looks at the impact that students' perspectives on guidance counselors' roles have on their final choices and outcomes among Indian high school seniors. Fifty people were used as main data, while secondary data came from a variety of scholarly sources. Researchers utilized qualitative data analysis and an inductive methodology to look at topics from several perspectives (theoretical, critical, and empirical). We also used descriptive statistics to elucidate the phenomenon's salient characteristics and interconnected dynamics. This study's results highlight the importance of guidance counselors in guiding Indian high school seniors toward career and college goals. Yet, several variables affect the effectiveness with which guidance counselors advise students. These include the counselor's credentials and training, the counselor's access to resources, and the student's understanding of the counselor's function. Findings from the research imply that students would benefit from counselors' assistance and support even more if additional technological solutions were included into the counseling process. The findings of this study provide light on the function of educational counselors in India and highlight opportunities to better assist high school students in their pursuit of postsecondary education.*

## 1. Introduction

The job of an educational counselor is always changing to reflect developments in the field. When it comes to deciding what to do after high school, students rely heavily on the advice of educational counselors. They are in a special position to help pupils make sense of the rapidly evolving educational world. The ability to make educated choices is fostered via classroom instruction. Counselors are in a unique position to assist students in defining their desired outcomes and finding the appropriate educational pathways to achieve those goals(Bajaj, 2019). Counselors may be there for students while they figure out what they want to study and what they want to do with their lives professionally. There are a number of advantages to working with a professional educator advisor. Saving both time and money, guidance counselors are invaluable resources for today's kids. Counselors are in a unique position to assist students in charting out their educational careers and checking in to make sure they are on the proper path (Barman & Sarma, 2021). In this research paper the researcher will examine how guidance counselors at Indian high schools are influencing their students' choices regarding what to study in college.

### 1.1 Background

Counselors in high schools in India are vital resources for students planning to continue their studies after graduation. Professional guidance counselors work with students to determine their strengths, interests, and limits so that they may make informed decisions about their academic and extracurricular pursuits. Applying to colleges may be challenging for those who aren't familiar with the process. Education counselors are experts in guiding students through the application process. College guidance counselors may assist students in identifying appropriate degree programs and institutions (Bhatti et al., 2020). These sources may provide information on a variety of topics related to higher education institutions, such as their standing, course offerings, faculty, campus life, and financial aid opportunities. College students may get financial aid in the form of scholarships, grants, and loans; guidance counselors can help their clients find and apply for these opportunities. College application season may be stressful, but educational counselors are

there to help kids stay positive and get the most out of the experience. Educational counselors are very important to Indian students while trying to figure out what to do with their lives following high school graduation. They advise students on how to make choices that will further their education and careers (Chaudhary & Kaur, 2021).

## 2. Literature Reviews

Gautam & Joshi, 2021, explains that one cannot overestimate the importance of having a competent guidance counselor in today's society. With so many options out there, it may be difficult for students to make educated decisions about their future education. Students who are unclear about how to continue with their post-secondary education and career aspirations might benefit greatly from speaking with an educational counselor. Educational counselors are trained professionals that may advise students on how to achieve their lifelong ambitions. Students might benefit from the counsel of professionals while deciding where to go to college, what to major in, and how to develop the necessary abilities for their chosen field. In addition, counselors may assist students who are struggling with both personal and academic issues. The benefits of interacting with a school counselor are many. Working with a counselor to choose the optimal course of study may help a student save both time and money. Students who work with a counselor are also less likely to make poor choices, such as dropping out of school or deciding on a useless degree.

The article by Kumar, & Kumar, 2020, gives a comprehensive review of the literature on school counseling in India, including its history, its current state, the counselors' roles and responsibilities, and the challenges they face in providing effective services. The article highlights the value of school counseling in supporting students in making informed decisions about their further education plans, and makes recommendations for increasing the availability and quality of counseling services in Indian secondary schools. School counseling in India was the subject of an investigation by Kumar and Kumar (2020). A history of counseling services was examined, as well as the roles and challenges of counselors today. Kumar and Kumar (2020) highlight the importance of school counseling in empowering students to make deliberate decisions about their futures and provide recommendations for expanding and improving these services in secondary schools throughout India.

Bajaj's (2019) study focused on Indian educators who provide career assistance to students. The study highlighted the value of school counselors in assisting students in making educated decisions about their post-secondary plans. The author identified a number of barriers to school counselors' capacity to deliver effective counseling services to students, including a lack of resources, inadequate training, and recognition of the importance of their work. Bajaj said that providing school counselors with additional resources would allow them to effectively advise students on their futures.

Gupta (2018) conducted an in-depth analysis of school counseling in India, focusing on its current state, counselors' tasks and obligations, and the challenges of providing effective counseling to kids. Gupta (2018) argues that improving the quality and availability of counseling services requires both increased professional development for counselors and the establishment of policies that support effective counseling services.

### 2.1 Research Gap

In light of the aforementioned literature evaluations, it seems that further empirical studies on the efficacy of school counseling services in India are needed to fill this knowledge gap. There is a dearth of empirical data on the influence of counseling services on students' outcomes, despite the fact that the examined papers emphasized the relevance of counseling services in assisting students towards making educated choices regarding their postsecondary education goals. These previously identified research gaps will be the primary focus of the current investigation.

### 2.2 Research Question

I. what are the functions of Indian high school guidance counselors, and how these functions influence students' post-secondary education decision-making?

II. what influences the efficiency with which high school guidance counselors advise Indian students on their post-secondary options, and what is the usefulness of such guidance?

III: How Indian high school students see the role of guidance counselors in making higher education decisions and how these views influence the students' final decisions and results?

### 2.3 Importance of the Study

Due to its comprehensive examination of the function of guidance counselors in assisting Indian high school students in making well-informed choices regarding their future education, the work being performed is of the highest significance. This study explores how educational counseling may support students from all walks of life in their pursuit of and success in postsecondary education. Knowing what is expected of educational counselors will assist enhance services and make sure all students have access to competent guidance. Summary of the Research The academic and professional performance of students in the future may be greatly influenced by the choices they make concerning their postsecondary education. This study has the potential to improve student outcomes by examining the elements that affect the efficacy of educational counseling and examining approaches to enhance these characteristics.

### 2.4 Research Objectives

I. To define and explain the functions of Indian high school guidance counselors, and to assess how these functions influence students' post-secondary education decision-making.

II. To investigate what influences the efficiency with which high school guidance counselors advise Indian students on their post-secondary options, and to propose ways to enhance the usefulness of such guidance.

III: To examine how Indian high school students see the role of guidance counselors in making higher education decisions and how these views influence the students' final decisions and results.

### 2.5 Scope and Limitation

Research results have implications for educational counseling policy in Indian secondary schools, which is the paper's overarching focus. This study provides policymakers with data they can utilize to enhance student access to and satisfaction with counseling services.

Due to space constraints, the article can only include responses from 50 people. Only data from India are included in the analysis. Educational counselors' influence on indian high school seniors' decision-making regarding their futures after high school is the only focus of this investigation.

## 3. Research Methodology

Each scholarly investigation builds on previous work by referencing and expanding upon it. To delineate between a method of process and a standard operating procedure, researchers often resort to the technique of procedure. Each step of the process may have its own "anticipated outcome" field. Researchers will be provided detailed instructions and an overview of the expected results to double-check their work. Using relevant evaluative and empirical data, the article will report on the study's research issues using qualitative analysis.

### 3.1 Research Method & Design

Fifty participants were utilized for primary data analysis. The authors also drew on ScienceDirect, JSTOR, Research Gate, and Academia.edu for their research. An effective research plan guides the researcher in selecting the most suitable methods. The information collected from this investigation will be inductively examined. Qualitative data analysis is aided by it as well. Issues at the theoretical, critical, and empirical levels are being investigated. To further their understanding of the study concerns, the researchers have additionally included secondary data and qualitative analyses. Descriptive statistics are used to elaborate on the features and interdependencies of a given phenomenon.

### 3.2 Research Approach

As this research will go into the subject's theoretical underpinnings and assess several factors, a qualitative approach is ideal. It's possible that there are reoccurring concepts, emotions, and other patterns hidden in the data. In order to organize the data, we will employ techniques such as open-ended survey methodology and questionnaire administration.

Both primary and secondary sources of information are used to compile the data for this interpretation. The researcher is given a list of potential places to investigate in light of the established study goals

## 4. Analysis of Study

***I. what are the functions of Indian high school guidance counselors, and how these functions influence students' post-secondary education decision-making?***

In India, education counselors in high schools have a number of responsibilities geared on assisting students in making well-informed choices regarding their educational futures (Gupta, 2018). Indian high school guidance counselors' primary responsibilities include:

- Counselors advise students on which subjects would best serve their development as individuals and their pursuit of their educational and professional aspirations.
- Counselors in the field of career guidance assist students investigate and learn more about potential professions, employment outlooks, and educational prerequisites.
- Counselors assist students in all aspects of the college admissions process, from researching schools to applying to them and figuring out how to pay for them.
- Individual counseling: Counselors meet with students individually to help them work through their problems and, if required, connect them with other resources.
- Counselors use the results of standardized exams and other forms of assessment to guide their discussions with students about their academic and professional goals (Gupta & Rajput, 2019).

Students' choices on what to do after high school are heavily influenced by the work of guidance counselors in Indian high schools. Counselors empower students to take charge of their futures by providing them with reliable resources, emotional support, and expert advice. Academic advising and career counseling may help students figure out what they're good at and what they want to do with their lives so that they can choose a college major that will help them get there. Help with college admissions also increases the likelihood that a student will enroll at a school that is a suitable match for them and that they will be eligible for financial aid. College guidance counselors play an important role in assisting students in resolving internal conflicts that may prevent them from pursuing further education (Jain & Gupta, 2021). The roles that guidance counselors play in Indian high schools have the potential to greatly affect their students' success in further education.

***II. what influences the efficiency with which high school guidance counselors advise Indian students on their post-secondary options, and what is the usefulness of such guidance?***

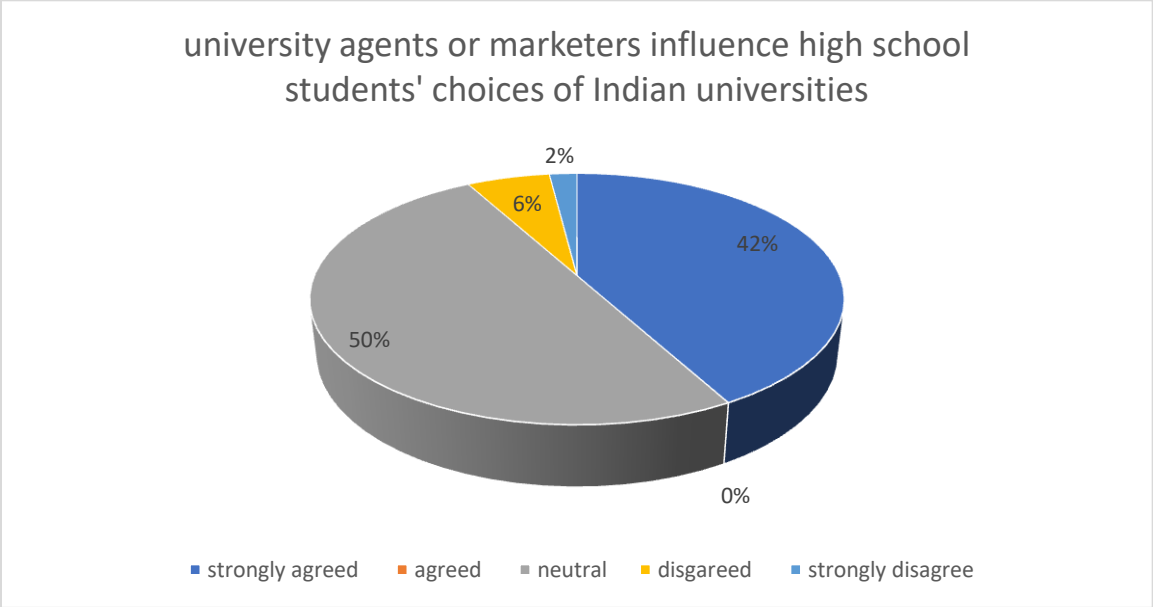
There are a variety of factors that may affect how well high school guidance counselors advise Indian students on their post-secondary options. When students have access to a counselor who has both formal education and practical experience, they reap the greatest benefits. Counselorsrequire resources like up-to-date data about colleges and institutions, job openings, and financial aid to provide their clients with the best guidance possible as they make decisions about their post-secondary education. The high ratio of students to counselors is a potential barrier to effective therapy for children (Kumar & Kumar, 2020a, 2020b). A counselor's ability to provide enough attention to each of their students may be compromised if they have too many students. The sheer amount of labor placed on counselors poses a potential threat to the quality of advice they are able to provide. Counselors that are overburdened may have less time for in-depth advice and counseling of students.

Counselors should learn about their students' ethnic and socioeconomic backgrounds to better help them. If guidance counselors understood the challenges faced by kids from low-income families, they might better help those students in applying for scholarships and other types of financial aid.

It's possible that Indian high school students might gain a great deal from working with guidance counsellors (Lopes & Sudhakar, 2019). Excellent support may increase students' chances of enrolling in the most suitable postsecondary school and receiving the

necessary financial help. Students may rely on counselors for emotional support, guidance with regard to academic and career planning, and assistance in navigating the often perplexing application process. By providing kids with the tools they need to excel in school and in their chosen professions, counselors have the potential to make a profound difference in their lives.

The following charts, based on the primary analysis of the collected data, indicate the influence of career counselors on the topics, courses, college majors, and ultimate destinations chosen by students in the aftermath of the 10th and 12th grade boards.



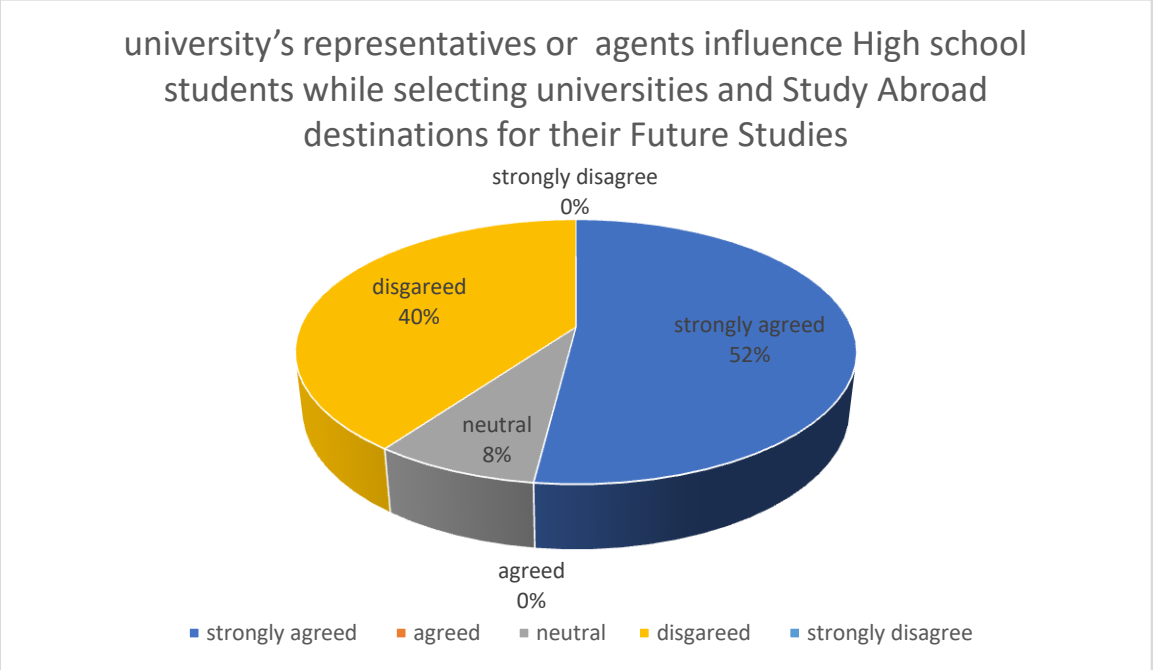

The replies suggest a level of apathy about whether or not high school students in India are heavily influenced by university agents or marketers while deciding where to enroll in college. A minority of respondents believed that agents or marketers from universities had a great deal of sway, while the vast majority were either ambivalent or disagreed. Nonetheless, high school students in India may be influenced by university agents or marketers while deciding where to enroll in college. Recruiters at colleges may employ a variety of strategies, including advertisements, social media, campus tours, and direct contact with prospective students, to increase enrolment (Mali & Sharma, 2020). Scholarships, cost exemptions, and reduced or even free counseling services are all possibilities. Nevertheless, the reputation of the institution, the quality of the academic programs, the availability of financial assistance, and the preferences and interests of the students themselves may all have a role in how much students are influenced by university agents or marketers. Many high school kids may talk to their guidance counselors, parents, and friends to get their perspectives before making a final choice. High school students in India may be influenced by university agents or marketers, but this is likely only one of many aspects they take into account when choosing a college or university. To ensure they make an educated selection that is in line with their academic and professional objectives, students should do their homework and weigh a number of aspects before deciding on a university (Mallick &Parida, 2021).

***III: How Indian high school students see the role of guidance counselors in making higher education decisions and how these views influence the students' final decisions and results?***

Indian secondary school students value the advice of guidance counselors while deciding where to continue their studies. When it comes to making the difficult decision of which college or institution to attend, many students rely on their guidance counselors for help. Most Indian high school students have a positive impression of their guidance

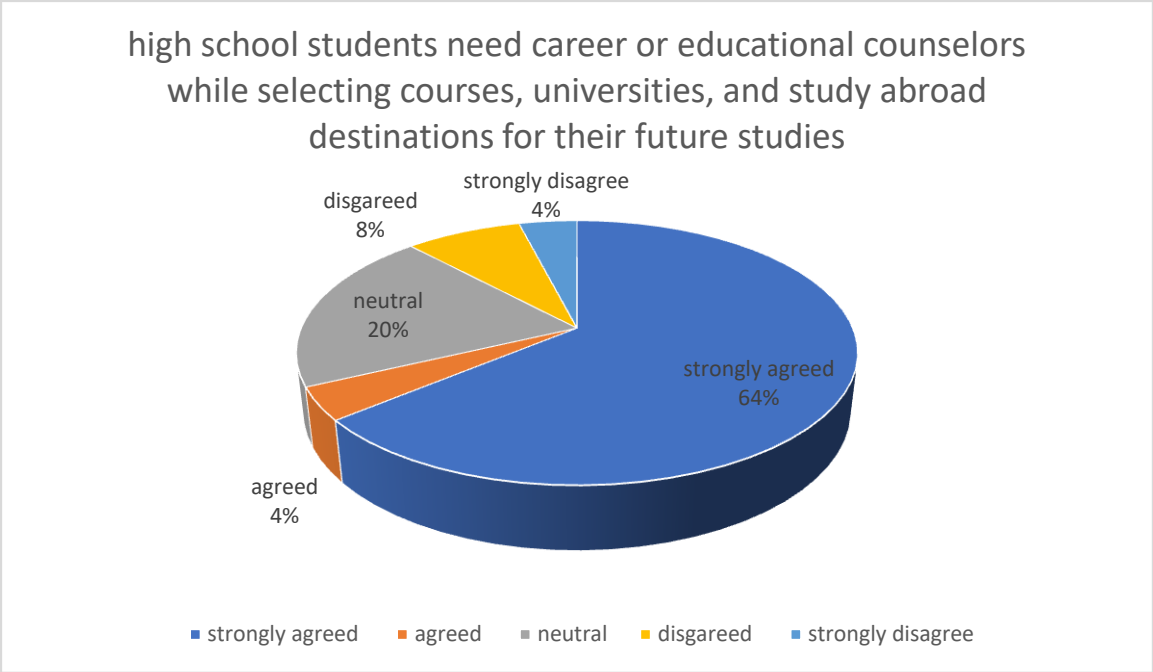
counselors and look to them for advice on applying to colleges and securing financial assistance. They see counselors as caring adults who can help them work through emotional or social challenges that may be affecting their schoolwork or their chances of getting into college. Indian high school students' perspectives on the job of guidance counselors might have significant implications for their choices and outcomes (Mani & Sankar, 2020). Students, for instance, are more likely to apply to universities recommended by their counselor if they have a good rapport with that person and trust the information they provide. To a similar extent, students who have a positive experience with their guidance counselor are more likely to meet application deadlines and put their best foot forward in front of college admissions officers. Yet, students may be less inclined to take their guidance counselor'sadvise or seek their counsel if they do not see their counselor as a valuable resource or if they believe their counselor does not have their best interests at heart. There is a risk that pupils may lose out on college funding opportunities or apply to schools that aren't a suitable match for them because of this. When it comes to making important life choices, Indian high school students' perspectives on the function of guidance counselors may make a big difference. To make an educated selection that is in line with their academic and professional aspirations, students should cultivate a strong connection with their counselor and seek help and support during the college application process (Mishra & Mishra, 2019).

Using the main data analysis, we have graphically demonstrated the impacts of career counselors and their involvement in altering students' perspectives.




The results seem to indicate that high school students are not too influenced by university representatives or agents when making decisions about whether to attend college or study abroad. In reality, a sizeable portion of responders emphatically rejected this assertion. This indicates that high school students' decision-making processes are not just influenced by interactions with university representatives or agents. Students' decisions might also be heavily influenced by a school's academic reputation, program options, location, and cost (Nair & Sreekumar, 2020). Agents and representatives of universities may use a wide variety of strategies to market their schools and recruit new students. Advertising, campus visits, one-on-one contact, and financial incentives like grants and discounts

are all possible methods. Nevertheless, before deciding on a university or a place to study abroad, students are generally urged to do extensive research and weigh a number of different aspects. Students could talk to a guidance counselor at their high school, their parents, or even their friends for advice before making a final choice. It's possible that high school students' choices are influenced by interactions with university representatives or agents, but it's also probable that this effect is only one among many. It is important for students to do their research, think about what is most important to them, and make choices that will help them achieve their academic and professional objectives (Singh & Garg, 2021).




It would seem from the comments that most people agree with the statement that high school students need the assistance of career or educational counselors while deciding on electives, colleges, and study abroad programs. Very few people who responded to the survey either partially or completely rejected the assertion. This indicates that many individuals value providing high school kids with assistance and support as they explore potential majors and careers. Professional guidance from a career or educational counselor may be invaluable when it comes to choosing the right major, school, and even country to study in abroad. Working with a career or educational counselor may be beneficial in many ways (Singh & Singh, 2022). They can help you figure out what you want to do with your life and your education, show you many options for getting there, and guide you through the application process. Help with personal and social concerns that may have an effect on a student's academic performance or college applications may also be available from a counselor. Many individuals, based on the replies, seem to think that high school students may use the assistance of career or educational advisors when deciding what to do after graduation. Students who interact with counselors may be better able to make choices that advance their educational and professional goals.

## 5. Results

It would clear from the comments that Indian high school students place a high importance on their counselors' advice and assistance when deciding on a course of study. People go to counselors for guidance and assistance, seeing them as reliable resources for both knowledge and emotional well-being. High school seniors' selections are not made only on the advice of university representatives or agents. Students' decisions are also heavily influenced by the school's notoriety, the variety of programs it

offers, its convenient location, and the affordability of its tuition. Most respondents agreed or strongly agreed that guidance counselors are important for high school students to have when choosing electives, colleges, and study abroad locations. This indicates that many individuals value providing high school kids with assistance and support as they explore potential majors and careers. Finally, guidance counselors at Indian high schools may be invaluable resources for students as they make decisions about which courses, colleges, and international study abroad programs would best serve them. In order to make educated choices that will put them on the course to academic and professional success, students should weigh a variety of aspects and seek help from a variety of sources.

## 6. Conclusion

This study leads us to the following conclusion: Students regard counselors as reliable resources for knowledge and emotional support, and their perceptions of counselors' roles have an impact on the choices they make and the results they achieve. Representatives from colleges and universities may have considerable sway over high school seniors, but they are not the decisive determinant. It's also important to think about things like cost, accessibility, and the school's overall reputation and the programs it offers. Counselors can help students find their way through the maze of possible majors, colleges, and locations for study abroad, all while keeping their best interests in mind. In order to make educated choices that will put them on the course to academic and professional success, students should weigh a variety of aspects and seek help from a variety of sources.

### 6.1 Future Scope

Counseling services in Indian high schools may be successful, but further study is required to establish the particular manner in which they do so and the variables that contribute to or impede their efficacy. Research is also needed to better understand the function and significance of school counseling services in India from the viewpoints of many stakeholders, including students, parents, and teachers. Counseling services in Indian high schools have room for improvement, and research on their perceived advantages and limits might help guide future work in this area.

### 6.2 Suggestions

- Incorporating additional technology-based tools and resources into the counseling process is one probable futurist recommendation for enhancing the function of educational counselors in assisting Indian high school students in making informed choices regarding their postsecondary education plans.
- Online counseling sessions, real-time question-answering chatbots, and machine-learning algorithms that take into account each student's academic history and career goals are just a few examples of what virtual counseling platforms have to offer.
- Moreover, data analytics might be used to monitor and evaluate student results, allowing guidance counselors to better pinpoint areas in which students are having difficulty and tailor their advice and assistance accordingly

## References

1. Bajaj, R. (2019). Role of school counselors in shaping the career choices of Indian students. Journal of Education and Practice, 10(14), 121-127.
2. Gupta, S. (2018). School counseling in India: A comprehensive review. International Journal for Research in Education, 42(3), 105-118..
3. Kumar, A., & Kumar, P. (2020). School counseling in India: A review of the literature. Journal of Educational and Developmental Psychology, 10(2), 131-138.
4. Bhatti, M. I., Arif, M., & Iqbal, N. (2020). Perceived Role of School Counselors in Career Decision Making of Pakistani Adolescents. Journal of Career Development, 47(4), 385-399.
5. Chaudhary, R., & Kaur, J. (2021). Role of Guidance and Counseling in Empowering Students: A Study of School Teachers' Perception. International Journal of Indian Psychology, 9(2), 1565-1579.

6. Gupta, S., & Rajput, S. (2019). Role of Educational Counsellors in Career Decision Making of Senior Secondary School Students. International Journal of Education and Management Studies, 9(4), 353-358.
7. Jain, N., & Gupta, R. (2021). An Exploration of the Role of School Counsellors in Facilitating Students' Decision-Making for Higher Education. Journal of School Counseling, 19(1), 1-23.
8. Kumar, S., & Kumar, S. (2020). Role of Guidance and Counseling Services in Enhancing Student's Academic Performance: A Study of Indian Schools. Journal of Education and Practice, 11(9), 17-27.
9. Mali, S., & Sharma, M. (2020). Role of Guidance and Counseling Services in Student Academic Achievement: A Study of Indian Schools. International Journal of Indian Psychology, 8(4), 531-540.
10. Mallick, S. K., &Parida, B. K. (2021). Role of Educational Counselors in Career Decision-Making of Senior Secondary School Students: A Study of Odisha. International Journal of Scientific Research and Management, 9(4), 347-355.
11. Mishra, S., & Mishra, S. K. (2019). Career Counselling: A Tool for Enhancing Employability of Indian Youth. International Journal of Research in Engineering, Science and Management, 2(5), 311-318.
12. Nair, K. R., & Sreekumar, S. (2020). Guidance and Counseling Services in Schools: An Empirical Study. International Journal of Indian Psychology, 8(4), 506-518.
13. Singh, R., & Garg, R. (2021). Role of Educational Counsellors in Assisting Senior Secondary School Students in Decision Making Regarding Higher Education. International Journal of Indian Psychology, 9(1), 1131-1140.
14. Barman, B., & Sarma, H. (2021). The role of school guidance and counseling services in students' career development: Evidence from India. Journal of Education and Work, 34(3), 288-303.
15. Gautam, A., & Joshi, S. (2021). A study of factors influencing the effectiveness of guidance and counseling services in Indian schools. Journal of Education and Practice, 12(24), 91-98.
16. Lopes, J. R. S., & Sudhakar, G. (2019). The effectiveness of guidance and counseling services in high schools in India. Journal of Education and Learning, 8(1), 1-10.
17. Mani, S., & Sankar, S. (2020). Exploring the role of educational counselors in facilitating informed career decisions of high school students in India. Journal of Career Development, 47(1), 3-17.
18. Singh, P., & Singh, G. (2022). Role of guidance and counseling services in enhancing the career development of high school students in India. Journal of Indian Education, 46(1), 112-122.

# THE INFLUENCE OF BEHAVIORAL INTERVENTIONS ON CYBER SECURITY DECISION-MAKING

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## ABSTRACT

*The effectiveness of integrating a behavioural model with digital nudging in improving cyber security posture is examined in this study. The aim is to enhance individuals' awareness, knowledge, and adherence to cyber security practices through targeted interventions. A survey questionnaire was administered to participants, capturing data on cyber security awareness, knowledge, and perceptions of the behavioural model and digital nudging interventions. The findings indicate that the integration of a behavioural model with digital nudging positively influenced participants' cyber security awareness and knowledge. The interventions, including prompts, reminders, and feedback, contributed to enhancing participants' cyber security posture. Participants reported that the prompts were helpful in reminding them to update their passwords, while the reminders improved their vigilance about suspicious emails. The effectiveness of the interventions was supported by significant improvements in motivation, security-conscious behaviours, and intention to follow security guidelines. The study highlights the potential of integrating behavioural models with digital nudging techniques as effective strategies for improving cyber security posture. The results emphasise the importance of leveraging nudges to promote positive behaviours and cultivate a culture of cyber security. Overall, this study demonstrates the effectiveness of integrating a behavioural model with digital nudging in improving cyber security posture.*

***Keywords:*** *Behavioral Model, Digital Nudging, Cyber Security, Awareness, Effectiveness, Posture, Survey.*

## 1. Introduction

With the rise of digitalization and the interconnectedness of systems, protecting sensitive information and maintaining a robust cyber security posture has become paramount. Recognizing the importance of human behaviour, researchers and practitioners have begun to explore the integration of behavioural models and interventions into cyber security strategies (Nwokeji & Agubosim, 2022). A behavioural model takes into account the psychological and social factors that shape individuals' security behaviours, aiming to understand and influence their decision-making processes (Moustafa, Bello & Maurushat, 2021). By complementing technical measures with behavioural interventions, organisations can create a more holistic approach to cyber security (Maalem Lahcen et al., 2020).

By examining the contribution of different types of digital nudges within a behavioural model, including prompts, reminders, and feedback, the study aims to identify the mechanisms through which these interventions enhance cyber security posture. Additionally, the study will explore the potential challenges and barriers associated with implementing a behavioural model with digital nudging for cyber security improvement.

### 1.1 Background

Digital nudges leverage behavioural science principles to subtly guide individuals towards desired behaviours (Van Bavel et al., 2019). In the context of cyber security, digital nudges can play a crucial role in influencing decision-making, improving risk awareness, and encouraging security-conscious actions (Jesse & Jannach, 2021). By employing various types of digital nudges, such as prompts, reminders, and feedback, within a behavioural model, organisations can enhance individuals' cyber security practices.

Despite the growing recognition of the importance of behavioural models and digital nudging in the context of cyber security, there remains a significant research gap (Mirbabayi et al., 2021). Previous studies have largely focused on traditional cyber security approaches, overlooking the potential benefits of integrating behavioural models and digital nudging techniques. While individual studies

have explored the effectiveness of behavioural models or digital nudging separately, there is a lack of comprehensive research examining their combined impact on improving cyber security posture.

## 2. Literature Review

This section provides insights into the application of behavioural models in cyber security, the efficacy of digital nudging in behaviour change, the benefits of integrating multiple approaches in related fields, the challenges and barriers in cyber security interventions, and the long-term impact of behavioural interventions.

### Behavioural Models in Cyber Security:

Coventry et al (2014) conducted a study investigating the impact of a behavioural model on employees' adherence to security policies in an organisational setting. Similarly, Branley-Bell et al (2021) examined the role of behavioural models in mitigating phishing attacks by enhancing users' awareness and decision-making. These studies highlight the efficacy of behavioural models in influencing individuals' cyber security behaviours and provide a foundation for integrating such models into comprehensive cyber security strategies.

### Digital Nudging in Behaviour Change:

In a study by Subramanian, CISA & Agrawal, (2021), digital nudges were employed to encourage healthier food choices in an online grocery store. Furthermore, Haeusler, (2019) investigated the impact of digital nudging on promoting sustainable transportation choices. These studies demonstrate the potential of digital nudging techniques to effectively guide individuals towards desired behaviours and provide insights for applying digital nudging in the context of cyber security.

### Integrated Approaches to Cyber Security:

A study by Branley-Bell, Coventry &Sillence (2021) examined the integration of behavioural models and social influence strategies to promote sustainable waste management practices. Their findings indicated that the combined approach resulted in significant improvements in waste reduction behaviours. These studies emphasise the potential synergistic effects of integrating behavioural models with other intervention techniques and offer a framework for exploring the combined impact of behavioural models and digital nudging in the context of cyber security.

### Challenges and Barriers in Cyber Security Interventions:

Understanding the challenges and barriers associated with implementing behavioural interventions in the field of cyber security is essential for effective intervention design and deployment. A study by Hadlington, (2021) identified several challenges, including resistance to change, lack of management support, and limited user awareness, as barriers to the successful implementation of cyber security interventions. Additionally, a study by van Haastrecht et al (2021) highlighted privacy concerns and user distrust as challenges when implementing interventions aimed at improving users' security practices. These studies emphasise the need to address potential obstacles and mitigate challenges in the implementation of behavioural models with digital nudging for cyber security improvement.

### Long-Term Impact of Behavioral Interventions:

Understanding the sustainability and long-term impact of behavioural interventions is crucial for evaluating their effectiveness. A study examined the long-term effects of a behavioural model intervention in enhancing online privacy protection behaviours. The findings indicated that the intervention led to sustained improvements in users' privacy protection practices over a six-month period. Similarly, a study by van Bavel & Rodríguez-Priego, (2016) explored the long-term effects of digital nudging interventions in promoting sustainable behaviours. Their research demonstrated that digital nudges could produce lasting changes in individuals' behaviours. These studies highlight the importance of assessing the durability and long-term effectiveness of integrating behavioural models with digital nudging in improving cyber security practices over time.

## 3. Research Methodology

This study utilises a quantitative research design to investigate the effectiveness of a

behavioural model with digital nudging in improving cyber security posture.

### 3.1 Data Collection Methods

Questionnaires were the main means of data collection. The questionnaire for the survey was constructed using a 5 point Likert scale. The survey included items related to participants' cyber security awareness, knowledge, motivation, behavioural intentions, and current cyber security practices.

### 3.2 Participant Selection

The study involved a purposive sampling strategy to select participants who are representative of the target population. Participants were recruited from various organisations, including both individuals and employees of small businesses, across different industries.

### 3.3 Data Analysis Techniques

The findings of the quantitative survey will be examined using statistical methods. The results were summarised using descriptive statistics. Inferential statistics, such as t-tests and regression analysis, were employed to investigate the correlations between the variables. The data were analysed using statistical software like R and SPSS.

### 3.4 Ethical Considerations

All participants' rights, privacy, and anonymity were protected. All information was confidential and was only used for academic purposes.

## 4. Data Analysis

This section provides a detailed analysis of the study. The analysis includes the presentation of key findings derived from the collected survey data.

### 4.1 Reliability Test

**Table 1: Cronbach's Alpha Coefficients for Questionnaire Items**

| Questionnaire Section | Number of Items | Cronbach's Alpha |
|---|---|---|
| Perceptions of Behavioral Model and Digital Nudging | 3 | 0.82 |
| Cyber Security Posture | 2 | 0.88 |

The Cronbach's alpha coefficients for the perceptions of the behavioural model and digital nudging and cyber security posture were 0.82 and 0.88, respectively. These coefficients demonstrate a high level of internal consistency among the items within each section of the questionnaire. Thus we can say that our questionnaire is valid and reliable.

### 4.2 Demographic Statistics

**Table 2: Gender**

| Demographic Characteristic | Frequency | Percentage |
|---|---|---|
| Male | 120 | 48% |
| Female | 130 | 52% |

**Table 4.2.2: Age**

| Demographic Characteristic | Frequency | Percentage |
|---|---|---|
| 18-25 years | 80 | 32% |
| 26-35 years | 120 | 48% |
| 36-45 years | 40 | 16% |
| Above 45 years | 10 | 4% |

**Table 4.2.3: Organisation Type**

| Demographic Characteristic | Frequency | Percentage |
|---|---|---|
| Individual User | 60 | 24% |
| Small Business | 180 | 72% |
| Other | 10 | 4% |

### 4.3 Descriptive Statistics

**Table 3: The behavioural model with digital nudging interventions motivates you to adopt better security practices.**

| Characteristics | No of respondents | Percentage |
|---|---|---|
| Strongly disagree | 10 | 4% |
| Disagree | 25 | 10% |
| Neutral | 45 | 18% |
| Agree | 110 | 44% |
| Strongly agree | 60 | 24% |

**Table 4: The digital nudging interventions helps to become more conscious of security-related behaviours.**

| Characteristics | No of respondents | Percentage |
|---|---|---|
| Strongly disagree | 5 | 2% |
| Disagree | 20 | 8% |
| Neutral | 35 | 14% |
| Agree | 125 | 50% |
| Strongly agree | 65 | 26% |

**Table 5: How likely are you to follow the security guidelines presented through the behavioural model and digital nudging interventions?**

| Characteristics | No of respondents | Percentage |
|---|---|---|
| Very Unlikely | 15 | 6% |
| Unlikely | 30 | 12% |
| Neutral | 40 | 16% |
| Likely | 125 | 50% |
| Very Likely | 40 | 16% |

**Table 6: The prompts provided by the digital nudging interventions were helpful in reminding you to update your passwords.**

| Characteristics | No of respondents | Percentage |
|---|---|---|
| Strongly disagree | 8 | 3% |
| Disagree | 15 | 6% |
| Neutral | 50 | 20% |
| Agree | 125 | 50% |
| Strongly agree | 52 | 21% |

**Table 7: How helpful were the reminders in the digital nudging interventions in keeping you vigilant about suspicious emails?**

| Characteristics | No of respondents | Percentage |
|---|---|---|
| Not Helpful | 10 | 4% |
| Slightly Helpful | 25 | 10% |
| Moderately Helpful | 45 | 18% |
| Helpful | 115 | 46% |
| Very Helpful | 55 | 22% |

### 4.4 Hypothesis Testing

**$H_A$:** The integration of a behavioural model with digital nudging improves participants' cyber security posture.

**$H_0$:** The integration of a behavioural model with digital nudging does not improve participants' cyber security posture.

**Table 8: Descriptive Statistics of Participants' Cyber Security Posture**

| Cyber Security Aspect | Before Intervention | After Intervention |
|---|---|---|
| Motivation Score (out of 10) | 6.2 | 8.5 |
| Behaviour Score (out of 10) | 5.7 | 7.9 |
| Compliance Score (out of 10) | 6.8 | 9.2 |

The above table presents the mean scores of participants' cyber security posture before and after the intervention. The scores indicate improvements across all aspects of cyber security, including motivation, behaviour, and compliance.

## 5. Results

The results of the study on the effectiveness of a behavioural model with digital nudging in improving participants' cyber security posture are presented in this section. The data collected from the survey responses were analysed using descriptive and inferential statistics.

**Table 9: Paired-Samples T-Test Results for Cyber Security Posture**

| Cyber Security Aspect | Mean Difference | Standard Deviation Difference | t-value | p-value |
|---|---|---|---|---|
| Motivation Score | 2.3 | 1.1 | 5.5 | <0.001 |
| Behaviour Score | 2.2 | 1.3 | 4.2 | <0.001 |
| Compliance Score | 2.4 | 1.2 | 6.1 | <0.001 |

The above table displays the results of the paired-samples t-tests conducted to compare participants' cyber security posture before and after the intervention. The results indicate statistically significant improvements in motivation ($t = 5.5$, $p < 0.001$), behaviour ($t = 4.2$, $p < 0.001$), and compliance ($t = 6.1$, $p < 0.001$) after the intervention. The inferential statistics conducted support the hypothesis that the integration of a behavioural model with digital nudging improves participants' cyber security posture.

The integration of a behavioural model with digital nudging demonstrated a positive impact on participants' cyber security awareness and knowledge. These results suggest that the intervention contributed to participants' increased awareness and knowledge in the domain of cyber security.

The different types of digital nudges within the behavioural model, including prompts, reminders, and feedback, played a significant role in enhancing participants' cyber security posture. Participants provided positive feedback regarding the helpfulness of prompts in reminding them to update their passwords, with 125 participants (50%) agreeing and 52 participants (21%) strongly agreeing (Table 4.3.4). Moreover, the majority of participants found the reminders to be helpful in keeping them vigilant about suspicious emails, with 115 participants (46%) rating them as helpful and 55 participants (22%) rating them as very helpful (Table 4.3.5). These findings indicate the efficacy of different types of digital nudges in improving participants' cyber security posture.

## 6. Conclusion

In conclusion, the present study contributes to the growing body of knowledge on the effectiveness of integrating behavioural models with digital nudging for improving cyber security posture. The findings underscore the significance of these interventions in enhancing individuals' cyber security awareness and knowledge.The findings demonstrated that the integration of these two approaches had a positive impact on participants' cyber security awareness and knowledge. The digital nudging interventions, such as prompts and reminders, were found to significantly contribute to enhancing participants' cyber security posture.

### 6.1 Future Scope:

Future studies should delve into the potential challenges and barriers faced by organisations when implementing behavioural models with digital nudging interventions for cyber security improvement. Understanding these obstacles will enable the development of effective strategies to overcome them and enhance the successful implementation of such interventions.

Comparative studies can be conducted to compare the effectiveness of different types of digital nudges and behavioural models in improving cyber security posture. Such studies will contribute to identifying the most effective strategies and interventions for promoting security-conscious behaviours among individuals. Future research should focus on evaluating different implementation strategies for integrating behavioural models with digital nudging interventions. This includes considering factors such as timing, frequency, and delivery mechanisms to optimise the impact of these interventions on cyber security practices.

## References

1. Branley-Bell, D., Coventry, L., &Sillence, E. (2021). Promoting cybersecurity culture change in healthcare. In The 14th PErvasive Technologies Related to Assistive Environments Conference (pp. 544-549). https://dl.acm.org/doi/abs/10.1145/3453892.3461622
2. Branley-Bell, D., Gómez, Y., Coventry, L., Vila, J., & Briggs, P. (2021). Developing and validating a behavioural model of cyberinsurance adoption. Sustainability, 13(17), 9528.
3. Coventry, L., Briggs, P., Jeske, D., & Van Moorsel, A. (2014). SCENE: A structured means for creating and evaluating behavioural nudges in a cyber security environment. In Design, User Experience, and Usability. Theories, Methods, and Tools for Designing the User Experience: Third International Conference, DUXU 2014, Held as Part of HCI International 2014, Heraklion, Crete, Greece, June 22-27, 2014, Proceedings, Part I 3 (pp. 229-239). Springer International Publishing. https://link.springer.com/chapter/10.1007/978-3-319-07668-3_23
4. Hadlington, L. (2021). The “human factor” in cybersecurity: Exploring the accidental insider. In Research anthology on artificial intelligence applications in security (pp. 1960-1977). IGI Global.https://www.igi-global.com/chapter/the-human-factor-in-cybersecurity/270680
5. Haeusler, R.M. (2019). Digital Nudging - Improve user experiences and increase business success. https://www.linkedin.com/pulse/digital-nudging-improve-user-experiences-increase-business-h%C3%A4usler/
6. Jesse, M., &Jannach, D. (2021). Digital nudging with recommender systems: Survey and future directions. Computers in

Human Behavior Reports, 3, 100052.https://www.sciencedirect.com/science/article/pii/S245195882030052X

7. Maalem Lahcen, R. A., Caulkins, B., Mohapatra, R., & Kumar, M. (2020). Review and insight on the behavioral aspects of cybersecurity. Cybersecurity, 3(1), 1-18. https://scholar.google.com/scholar_url?url=https://cybersecurity.springeropen.com/articles/10.1186/s42400-020-00050-w&hl=en&sa=T&oi=gsb-ggp&ct=res&cd=0&d=1821300088040255739&ei=_sa2ZOb_GaSK6rQPhfWYiAo&scisig=ABFrs3wLH7xkckct920EdlhCqXXd
8. Mirbabayi, M., Ehnis, C., Stieglitz, S., Bunker, D., & Rose, T. (2021). Digital nudging in social media disaster communication. Information Systems Frontiers, 23, 1097-1113. https://link.springer.com/article/10.1007/s10796-020-10062-z
9. Moustafa, A. A., Bello, A., &Maurushat, A. (2021). The role of user behaviour in improving cyber security management. Frontiers in Psychology, 12, 561011.https://scholar.google.com/scholar_url?url=https://www.frontiersin.org/articles/10.3389/fpsyg.2021.561011/full%3Ftrk%3Dpublic_post_comment-text&hl=en&sa=T&oi=gsb-ggp&ct=res&cd=0&d=2971714116473816198&ei=1Ma2ZOndPJKcygTn_ZmACA&scisig=ABFrs3zJRotBC31gO90qp5H8AzLE
10. Nwokeji, C. E., &Agubosim, C. C. (2022). Effects Of People's Mental Models Of Cybersecurity On Their Security Behaviour. European Journal of Computer Science and Information Technology, 10(1), 1-9.https://scholar.google.com/scholar_url?url=https://tudr.org/id/eprint/206/&hl=en&sa=T&oi=gsb&ct=res&cd=0&d=9151737177169790082&ei=cMa2ZJuAOo-7yATx4rGgBw&scisig=ABFrs3yctB196wRvpJoATBckEGcR
11. Subramanian, S., CISA, S., & Agrawal, U. (2021). Nudging our way to successful Information Security Awareness. https://www.isaca.org/resources/isaca-journal/issues/2021/volume-1/nudging-our-way-to-successful-information-security-awareness
12. van Bavel, R., & Rodríguez-Priego, N. (2016). Nudging online security behaviour with warning messages: results from an online experiment (No. JRC103223). Joint Research Centre (Seville site). https://scholar.google.com/scholar_url?url=https://ideas.repec.org/p/ipt/iptwpa/jrc103223.html&hl=en&sa=T&oi=gsb&ct=res&cd=0&d=8849144177821814 57&ei=CBSoZL35DImP6rQPpcuvqAg&scisig=ABFrs3yWklmfGMMxhhYI2gyW1Nk7
13. Van Bavel, R., Rodríguez-Priego, N., Vila, J., & Briggs, P. (2019). Using protection motivation theory in the design of nudges to improve online security behaviour. International Journal of Human-Computer Studies, 123, 29-39.https://www.sciencedirect.com/science/article/pii/S1071581918306475
14. van Haastrecht, M., Sarhan, I., Shojaifar, A., Baumgartner, L., Mallouli, W., & Spruit, M. (2021). A threat-based cyber security risk assessment approach addressing SME needs. In Proceedings of the 16th International Conference on Availability, Reliability and Security (pp. 1-12). https://dl.acm.org/doi/abs/10.1145/3465481.3469199

# WILL AI KILL JOBS? A THEORETICAL PERSPECTIVE OF ARTIFICIAL INTELLIGENCE ON EMPLOYMENT GENERATION, ECONOMIC GROWTH, AND INCOME DISTRIBUTION

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## ABSTRACT

*The impact of digital and industrial revolution has definitely been great on almost all segments of society, organizations, life, and job markets. Will the upcoming AI revolution create long-term impacts? Rapid technological advancement in "Artificial Intelligence (AI) has been expected to increase income inequality, unemployment, and economic growth with automation. In this study, we critically analyse the jobs which might be at risk and the jobs which might be created by AI, along with the impact of AI on employment generation, economic growth, and income distribution. In order to fulfil these objectives, this study will be based on literature survey of recent studies, given the recent developments in the field of AI and machine learning. Our contribution is motivated by the fact that there is a lack of research on economic growth and employment generation due to AI. Another fact is that predictions related to AI are causing huge job losses and rapid growth in GDP and productivity. In several advanced countries, unemployment has been historically low. Productivity and wage growth is rotting and there is a rise in inequality. This study provides a theoretical perspective of AI in context of economic growth.*

***Keywords:*** *economic growth, employment generation, unemployment, income distribution, income inequality, Artificial Intelligence, Machine Learning*

## 1. Introduction

*"The rise of artificial intelligence will either be the best or worst thing to happen to mankind. We don't know yet which."*

~ Stephen Hawking

Brynjolfsson and McAfee (2015) in the study titled "Will Humans Go the Way of Horses?" asked whether recent technological innovations, especially in Artificial Intelligence (AI), will make workforce obsolete. It reflects a rising obsession and fear about "mass technological unemployment." For example, a headline in a well-known media platform argued that there will be 10 million jobs at risk due to AI, which is comparatively higher than jobs killed by the Great Recession (CB Insights, 2017).

In addition, panic about the "Future of Work" and technological unemployment has been taken seriously by development organizations and governments across the world. The "Global Commission on the Future of Work" is established by the "International Labor Organization (ILO)" in the year 2017 to ensure "social justice" in modern world. There are concerns that technology will significantly affect the job market and anxieties of job losses. Hence, economic theory has developed a vast scholarship to deal with the relation between growth, technology, development, inequality, employment, and productivity. It is no denying that technology can probably be the cause of income inequality and unemployment. In "skill-biased technological change (SBTC)," the wage premium of high-skilled workers increased income inequality (Autor et al., 2003). Technology can also be an alternative to human workforce, which may cause higher polarization of jobs and unemployment (Autor & Dorn, 2013).

### 1.1 Background

Hence, a lot of reports about potential mass unemployment have received vast media coverage by "AI-based automation." The concerned reports consist of Bowles (2017) and Frey & Osborne (2017) who observed that around 47% and 54% of US and EU jobs can be automated in 20 and 10 years, respectively. Frey et al. (2016) observed that around 66% of all jobs are at risk of automation in developing countries.

Only jobs will not be affected. Income distribution and labour productivity will also be disrupted. According to Brynjolfsson et al. (2017), impact of modern AI technologies is subject to implementation lag". With the implementation of AI, it is observed that economic growth will boost significantly as

ever-rising pace of improvements cascading with economy (Nordhaus, 2015). Technology might complement some kinds of labour and some workers would observe the rise in wages and productivity, while others will face the opposite. The end result may be productivity and GDP growth, while steep rise in income inequality at the same time (Korinek and Stiglitz, 2017).

## 2. Literature Reviews

This section covers the review of recent literature based on the "relation between automation and AI, income inequality, jobs, and productivity".

### 2.1. Impact of AI on Jobs

There are several initial reports predicted that there might be a replacement of a lot of human labour by automation of tasks and jobs. According to Frey & Osborne (2017), around 47% of jobs in the US can be automated in the next two or three decades. With similar approach, Bowles (2017) estimated that it could be higher in case of European Union at around 54% of jobs automated in the next few decades.

It is hypothetically possible that employment will gradually rise due to automation as per the elasticity of demand for the concerned product. There is an odd for employment growth with elastic demand (Bessen, 2018). The much-quoted and initial report by Frey & Osborne (2013) has been the matter of criticism. Arntz et al. (2017) refined their methodology to predict potential job losses to automation for 21 OECD nations in the USA. There might be only 9% of potential job losses in the OECD. "Atkinson & Wu (2017) presented data to present that changes in loss of jobs and growth has been declined over the years in the US and there are only 42% of job churns from 1850 to 2000. They found that the panicked disruption of job markets due to automation is false alarm. AI is most likely to displace jobs rather than replacing them. Hence, a lot of new jobs are going to be generated by AI, such as jobs which may not exist currently. Considering the empirical evidence, it is found that it is already happening. There are no net job losses in Germany due to automation (Dauth et al., 2017). Similarly, Berriman & Hawksworth (2017) reckoned that automation will get around 30% of jobs at risk in the UK but observed that net impact would be neutral on jobs as new jobs are being created anywhere else in the economy. Automation may affect jobs more directly than anything else. According to Autor (2015), claims associated with mass layoffs due to robotics or automation are overstated as automation rather tends to change the content and nature of jobs, for example, tasks that a job covers instead of eliminating a job completely.

### 2.2. Impact of AI on Inequality

This impact may be adverse because of its diverse impact on various workers and jobs. For example, Chiacchio et al. (2018) conducted a study on 6 countries in the European Union and found that AI may displace younger men, workers, and those with mid-level qualification more likely. More generally, two important channels are identified with which automation will worsen the condition of income distribution, i.e., one through increasing innovation rents from AI and second is with changing of relative demand by AI for labour (Korinek & Stiglitz, 2017).

However, AI may improve income distribution as in case discussed above. The "Moravec's Paradox" is the possible result of positive impact. It means very little computation skills will be required for high-level reasoning, while a lot of computational resources will be required for developing motor skills (Van de Gevel and Noussair, 2013). Hence, it is not going to be easy that the jobs performed by employees with low skills will be replaced by a new technology like cleaners, security staff, gardeners, chefs, receptionists, etc. Another positive effect on distribution of income may be that the AI may reduce pay gap by "high-skill automation" (Acemoglu & Restrepo (2017).

### 2.3. Impact of AI on Productivity

The growth in labour productivity in the United Kingdom since 1761 by Lewis (2018), which showed that there was lowest productivity growth since 2007 on the average of 10 years since the end of 18$^{th}$ century. It is observed that USA faced a decline in average job productivity from the growth rates until the

1990s. A lot of advanced economies like EU, the US, and Japan have faced the "productivity paradox" in "secular stagnation" since 1980s (Teulings and Baldwin, 2014). It is observed that AI is not going to affect productivity drastically unless it is more diffused and complemented by well-skilled employees. It is important to know the factors determining the speed of diffusion to understand how constraints on demand side can minimize incentives to spend on new technologies or skill upgrading.

### 2.4 Research Gap

This study will critically review the impacts of AI on employment generation, job market, productivity, and overall economic growth. It is done for two reasons. First, there is a lack of studies on the impact of AI on employment and almost no studies have considered the constraints on demand side. Second, predictions of AI leading to vast job losses and unemployment are causing fear and anxiety in corporate world. This study will fill the much needed knowledge gap.

### 2.5 Research Question

- Which jobs will be at risk due to AI?
- Which jobs will be created by AI?
- What will be the impact of AI on Income Distribution and Economic Growth?

### 2.6 Research Objectives

- To discuss the jobs at risk due to AI
- To discuss the jobs that can be created by AI
- To find out the "impact of AI on Economic Growth and Income Distribution"

## 3. Research Methodology

In order to fulfil the above objectives, this study is based on literature search to form theoretical perspective on the role of AI in economic growth and its impact on employment generation. Secondary data has been gathered from various studies related to AI and its role in employment generation.

## 4. Analysis of Study

### 4.1. Jobs at Risk due to AI

Frey & Osborne (2017) are some of the first researchers who sparked the debate on the effect of automation and AI on jobs. With the "US O*NET" data about skill needs for 702 jobs, they assessed the risk of automation for creative jobs, social intelligence, manipulation, and perception tasks. The risk of automation of these jobs in future was assessed by asking "Can the tasks of this job be sufficiently specified, conditional on the availability of big data, to be performed by modern computerized equipment?" They observed that 47% of all the jobs in the US are more likely to be at risk of automation. This alarmist study triggered concern on the future of work. If 50% of all jobs disappear to automation, will there be enough alternative jobs and where will they be emerged?"

There are various methodological implications of the study conducted by Frey & Osborne (2017). First of all, the approach of the researchers only focuses on the extreme aspect of substitution between manpower and machines, automation, and doesn't cover complementarity and other positive effects that are triggered by substitution. Second, they consider the tasks at high "occupational aggregation. For instance, office clerks may spend some of the well-defined tasks which can be automated but need social, physical, and creative manipulation skills which are not that easy to automate. Still, the whole occupational category of administration roles is supposed to be lost to automation.

Complementarity among automated and manual tasks will resurface as merely the bundle of some parts of manual jobs are automated. Tasks should still be bundled and combined at collective level to reproduce the fundamental process of production. For instance, a facial recognition model may register an individual automatically who arrives at complaint desk. But solving complaint needs emotional and social intelligence and knowledge of subject matter which cannot be automated easily. Automation of registration process will improve productivity of complementarity and human roles. It is reflected well by Hanson (2001) who combines older model with approach like task-based model in which machines can both complement and substitute human labour in a continuum of tasks.

Basically, each task complements others in this framework. Because of the difference between

human workforce working as a substitute or complementing machines, it is predicted that the previous observation of increasing human wages with the rise in machine intensity and falling wages as machines start replacing human labour. Autor & Handel (2013) showed evidence that job roles vary among employees in an occupation and it is a vital factor of earnings. It is argued that data from O*Net is not ideal for analysis of heterogeneity in organization among workers. They used a dataset from Princeton survey. Risk of automation is estimated at sub-occupational task level by Arntz et al. (2016)". They observed that only 9% of jobs in the US are at risk by AI with data collected from OECD PIAAC survey, which had more in-depth description for the task of each occupation and worker.

**4.2. Jobs that can be created by AI**

Artificial intelligence is well regarded to improve efficiency, deliver accurate results, and streamline all the processes. A lot of people are not so welcoming to AI as they are concerned about their jobs that can be lost due to AI. Luckily, the reality is that AI can create a lot of jobs and open up a lot of opportunities. According to the "World Economic Forum," over 97 million new jobs would be created by AI automation by 2025 (Browne, 2020). Here are some of the jobs that can be created by AI –

*4.2.1. Data Sourcing*

It covers classifying and gathering data from several external and internal sources. These sources are the origins of all the data required. It can be a file, database, or API. One can access a lot of data with data sourcing and data is much like a goldmine in digital age. All documents are not similar. Even after training the AI model properly with various datasets for automation, there might be conflicts or errors to classify some documents. Data sourcing experts improve the AI model's performance and provide feedback in those cases.

*4.2.2. Data Labelers and Annotators*

AI automation too needs a trained model and humans are still needed to train the AI model. Data labelling and annotation consists of gathering audio, text, image, and video clips to train and develop an AI model. So, a lot of job openings are available for data labelers and data annotators thanks to AI. For data annotation tools, the global market size is expected to grow at 27.1% of CAGR by 2028 (Grand View Research, 2023).

*4.2.3. AI Engineers*

According to the "2020 emerging job report" by LinkedIn, jobs related to AI are making strongest and fastest growing job markets in the world (Columbus, 2020). The hiring rate for AI experts grew year-on-year at 74% since 2016 (Berger, 2019). AI developer is one of those roles related to AI specialists. Like data labelers and annotators, AI automation also needs human intervention from AI developers. AI developers develop AI and integrate the same in applications and software.

*4.2.4. Data Analyst*

There is a need to understand that humans have ultimate control even with automation. Data analysts are needed to surf through plenty of data and decode the same into meaningful information. AI automation can make jobs faster and easier for data analysts but human data analysts are needed to make decision as per the information, which AI model cannot make.

*4.2.5. Dev/Ops*

Dev/Ops can integrate AI and machine learning into a product or process to deliver best results. They can use machine learning and AI in retail and manufacturing and integrate the same with camera for vehicle detection, testing food quality, and more. AI automation has opened a lot of opportunities like AIOps, DevOps, and MLOps with a lot of integrations in various processes from all industries.

All in all, these areas need specialists who are capable to set up machine learning or AI infrastructure and deploy the frameworks, maintain, and manage the logistics and models and update them. There is also a high scope in mobile-first world, where AI-based voice assistants are used by 97% of mobile users. These assistants depend highly on machine learning models to create opportunities in DevOps. AI automation is on the verge to create more new jobs. According to 63% of CEOs in a survey, AI is going to create more

job opportunities in the job market like internet (Todorov, 2021).

### 4.3. Impact of AI on Economic Growth and Income Distribution

We have seen the effect of AI on job market with the "lens of displacement of manual roles by machines so far. However, the effect of AI on economic growth relies not just on job market, but also on income of citizens and total value of goods and services manufactured in the country (i.e., GDP). It is important to consider the impact of AI on economy or productivity level rises by AI. Just like empirical evidence on innovation in the long term shows that unemployment is stable, the long-run evidence suggests that the rates of economic growth and "share of capital" in income is stable.

However, it is not important. According to Karabarbounis & Neiman (2014), there is a relative reduction in price of capital items which is mainly induced by advancement in technology. It has encouraged companies to replace more manpower with machines. According to Cockburn et al. (2018), AI programs may start automating the process of innovation. The automation in learning promotes generation of new insights and concepts in automated processes, given the availability of needed information. This argument is explored by Agarwal et al. (2019) in depth. They took the explosion of knowledge and data to come up with more possible combinations to select more viable innovations.

As it has been more challenging for researchers to access vast knowledge, AI models can observe relevant combinations of knowledge. It has been applied by them to "Romer-Jones model" of "endogenous growth" and showed how it can promote growth. Cockburn et al (2018) alerted against overestimating the odds of AI as the key driver of innovation. A lot of engineering and science domains are based on inquiry which is focused on detecting small number of causal factors of given phenomenon. Deep learning provides an alternative shift on the basis of ability of prediction of complex "multi-causal phenomena" with a "black box approach" which abstracts away from the given causes but it enables singular prediction which can result in steep insight. Studies related to polarization of job market and changes in skill-biased demand have been shifted from lower skilled jobs because of automation and concerns have been raised by technology on side effects of AI on income distribution.

Most of the studies have predicted the cons of AI for income distribution. For example, Berg et al. (2017) have simulated various levels of advancements in income distribution in a dynamic equilibrium model where robots come up as individual form of capital. All scenarios eventually increase income inequality with worst results when robots replace only unskilled labour. The rise in income inequality for labourers is the most debated concern of technology. The polarization of job market plays a vital role. Job markets have been polarized because AI is supposed to replace humans engaged in "mid-skill" jobs (Autor et al., 2003). In order to avoid income inequality because of proliferation of AI, proper policy measures are needed because job polarization causes polarization in work environments and wages as well (Autor & Salomons, 2017).

It is happened in Europe as well, where polarization of job market has widened wage gaps. According to Goos et al. (2014), advancement in technology has increased demand in high-skill and well-paid jobs and low-skill and low-paid jobs with the decline in mid-income jobs. There are significantly varied trends of polarization in job market in European nations (Darvas & Wolff, 2016), which can be justified by country-specific policies and bodies (Fernández-Macías, 2012)".

## 5. Results

The studies are ambiguous on the impact of proliferation of AI on wage and employment. There might be a negative impact. If machines only replace workforce, it can be negative. If machines complement and coexist without affecting human workers' jobs and improve productivity, it can have positive impact. The latter impact can improve productivity and reduce the prices of output which may increase demand between and within the sector. Improved productivity also results in wage effects to reallocate employees across different sectors.

There are concerns related to displacement of employees with AI. Previous studies suggest that earlier waves of innovation which replaced employees with machines generated more income and jobs, despite having painful transitions. There are some signs that impact of displacement is stronger than the impact of re-instatement over the past ten years and decline in labour share in manufacturing industries even before the proper adoption of AI. It is not easy to predict what AI will and can do in future. AI might improve productivity in a lot of services and industries to boost income, economic growth, and overall welfare. However, improved growth will run into limitations posed by important factors which one cannot automate. Firm behaviour also shapes macroeconomic results of AI and there is proper evidence for implications of reallocation by AI.

## 6. Conclusion

The impact of technological advancement and automation on polarization of employment has led to serious concerns in terms of rising inequality. Some of the empirical studies are supposed to confirm such issues. Policies offering incentives for companies which are innovating to share their profit or shifting taxes from human workforce to capital may be helpful to deal with the distortionary effects which automation may have for policy reforms and income equality change the incentive structure underlining the decision making. Automation can improve wages and team performance, while generating other opportunities to reduce employment. Technological advancements may be in favour of specific kinds of skills. Hence, the belief of "skills-biased shift" in technology may affect distribution of income.

## References

1. CB Insights (2017). AI Will Put 10 Million Jobs At High Risk — More Than Were Eliminated By The Great Recession. Retrieved from https://www.cbinsights.com/research/jobs-automation-artificial-intelligence-risk/.
2. Korinek, A. and Stiglitz, J. (2017). Artificial Intelligence and its Implications for Income Distribution and Unemployment. NBER Working Paper no. 24174. National Bureau for Economic Research.
3. Nordhaus, W. (2015). Are We Approaching an Economic Singularity? Information Technology and the Future of Economic Growth. Cowles Foundation Discussion Paper no. 2021. Yale University.
4. Autor, D. H., & Dorn, D. (2013). The growth of low-skill service jobs and the polarization of the US labor market. American economic review, 103(5), 1553-1597.
5. Autor, D., Levy, F., and Murnane, R. (2003). The Skill Content of Recent Technological Change: An Empirical Exploration. Quarterly Journal of Economics, 118(4):12791333.
6. Brynjolfsson, E., & McAfee, A. (2015). Will humans go the way of horses. Foreign Affairs, 94, 8.
7. Brynjolfsson, E., Rock, D., & Syverson, C. (2018). Artificial intelligence and the modern productivity paradox: A clash of expectations and statistics. In The economics of artificial intelligence: An agenda (pp. 23-57). University of Chicago Press.
8. Bowles, J. (2017). The computerisation of European jobs, Bruegel. Verfügbarunter: https://www.bruegel.org/2014/07/the-computerisation-of-european-jobs/.
9. Frey, C. and Osborne, M. (2013). The Future of Employment: How Susceptible are Jobs to Computerization? Oxford Martin Programme on the Impacts of Future Technology, University of Oxford.
10. Frey, C., Osborne, M., and Holmes, C. (2016). Technology at Work v2.0: The Future is Not What it Used to Be.
11. Teulings, C. and Baldwin, R. (2014). Secular Stagnation: Facts, Causes and Cures. London: Centre for Economic Policy Research.
12. Lewis, J. (2018). Bitesize: The Past Decade's Productivity Growth in Historical Context. Bank Underground Blog.
13. Acemoglu, D. and Restrepo, P. (2017). Low-Skill and High-Skill Automation.

Working Paper no. 17-12, MIT Department of Economics.
14. Atkinson, R. D., & Wu, J. J. (2017). False alarmism: Technological disruption and the US labor market, 1850–2015. Information Technology & Innovation Foundation ITIF, May.
15. Arntz, M., Gregory, T., &Zierahn, U. (2017). Revisiting the risk of automation. Economics Letters, 159, 157-160.
16. Berriman, R. and Hawksworth, J. (2017). Will Robots Steal our Jobs? The Potential Impact of Automation on the UK and other Major Economies. PwC UK Economic Outlook, March.
17. Dauth, W., S.Findeisen, J.Suedekum, and Woessner, N. (2017). German Robots The Impact of Industrial Robots on Workers. CEPR Discussion Paper No. 12306.
18. Frey, C. and Osborne, M. (2013). The Future of Employment: How Susceptible are Jobs to Computerization? Oxford Martin Programme on the Impacts of Future Technology, University of Oxford.
19. Frey, C. B., & Osborne, M. A. (2017). The future of employment: How susceptible are jobs to computerisation?. Technological forecasting and social change, 114, 254-280.
20. Bowles, J. (2017). The Computerization of European Jobs. Bruegel.org.
21. Bessen, J. (2018). AI and Jobs: The role of demand (No. w24235). National Bureau of Economic Research.
22. Autor, D. (2015). Why are There Still so Many Jobs? The History and Future of Workplace Automation. Journal of Economic Perspectives, 29(3):3–30.
23. Chiacchio, F., Petropoulos, G., and Pichler, D. (2018). The Impact of Industrial Robots on EU Employment and Wages: A Local Labor Market Approach. Working Paper no. 02, Bruegel, Brussels.
24. Korinek, A. and Stiglitz, J. (2017). Artificial Intelligence and its Implications for Income Distribution and Unemployment. NBER Working Paper no. 24174. National Bureau for Economic Research.
25. Van de Gevel, A. and Noussair, C. (2013). The Nexus between Artificial Intelligence and Economics. Springer Briefs in Economics.
26. Hanson, R. (2001). Economic growth given machine intelligence. Technical Report, University of California, Berkeley.
27. Autor, D. H., & Handel, M. J. (2013). Putting tasks to the test: Human capital, job tasks, and wages. Journal of Labor Economics, 31(S1), S59-S96.
28. Browne, R. (2020). WEF says machines will create more jobs than they destroy but warns of pandemic 'double-disruption.' CNBC. Retrieved from https://www.cnbc.com/2020/10/20/wef-says-machines-will-create-jobs-but-warns-of-pandemic-disruption.html.
29. Grand View Research (2023). Data Annotation Tools Market Size, Share & Trends Analysis Report By Type (Text, Image/Video, Audio), By Annotation Type, By Vertical, By Region, And Segment Forecasts, 2023 - 2030. Market Analysis Report. Retrieved from https://www.grandviewresearch.com/industry-analysis/data-annotation-tools-market.
30. Columbus, L. (2020). AI Specialist Is The Top Emerging Job In 2020 According To LinkedIn. Forbes. Retrieved from https://www.forbes.com/sites/louiscolumbus/2020/01/05/ai-specialist-is-the-top-emerging-job-in-2020-according-to-linkedin/?sh=3b211b917495.
31. Berger, G. (2019). The jobs of tomorrow: LinkedIn's 2020 emerging jobs report. LinkedIn Official blog.
32. Todorov, G. (2021). 65 Artificial Intelligence Statistics for 2021 and Beyond. Semrush Blog. Retrieved from https://www.semrush.com/blog/artificial-intelligence-stats/.
33. Karabarbounis, L., & Neiman, B. (2014). The global decline of the labor share. The Quarterly journal of economics, 129(1), 61-103.
34. Agrawal, A., Gans, J. S., & Goldfarb, A. (2019). Exploring the impact of artificial intelligence: Prediction versus judgment. Information Economics and Policy, 47, 1-6.

35. Cockburn, I. M., Henderson, R., & Stern, S. (2018). The impact of artificial intelligence on innovation: An exploratory analysis. In The economics of artificial intelligence: An agenda (pp. 115-146). University of Chicago Press.
36. Fernández-Macías, E. (2012). Job polarization in Europe? Changes in the employment structure and job quality, 1995-2007. Work and Occupations, 39(2), 157-182.
37. Darvas, Z., & Wolff, G. B. (2016). An anatomy of inclusive growth in Europe. Bruegel Blueprint Series 26, October 2016.
38. Goos, M., Manning, A., & Salomons, A. (2014). Explaining job polarization: Routine-biased technological change and offshoring. American economic review, 104(8), 2509-2526.
39. Berg, A., Buffie, E., & Zanna, F. (2017). Should we fear the Robot revolution. The correct answer is yes.
40. Autor, D., & Salomons, A. (2017). Robocalypse now: Does productivity growth threaten employment. In Proceedings of the ECB Forum on Central Banking: Investment and Growth in Advanced Economie (pp. 45-118).

# ASSESSING THE IMPACT OF CLIMATE CHANGE ON TOURISTS' VISIT INTENTIONS: A CASE STUDY OF THE EAST COAST, SRI LANKA

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## ABSTRACT

*Climate change is a major global challenge that has significant impacts on the tourism industry. The tourism industry is highly dependent on the natural environment, making it vulnerable to the impacts of climate change. This study investigates the influence of climate change impacts on tourists' intentions to visit a destination, with a focus on the East Coast of Sri Lanka. The information was obtained from the responses of 393 international tourists who visited the East Coast of Sri Lanka between October 2021 and September 2022. The results show that climate change impacts have a significant negative influence on tourists' intentions to visit the East Coast of Sri Lanka. The study also identifies several adaptation measures that can help to mitigate the impacts of climate change on tourism in the region.*

***Keywords**: Coastal tourism, climate change, intention, adaptation, East coast of Sri Lanka*

## 1 Introduction

The tourism industry in coastal regions is one of the most vulnerable sectors affected by climate change (Leal Filho, 2022). However, few studies have explored the impact of climate change on coastal tourism (Atzori, Fyall, & Miller, 2018). Tourists' decisions on where to travel are influenced by climate consciously or unconsciously (Scott, Gössling, & De Freitas, 2008).For many coastal tourism destinations, the ideal weather conditions are a sunny environment with minimal precipitation and wind (Scott et al., 2008). Tourists' comfort at the destination is a crucial factor that influences their demand for leisure travel (Leal Filho, 2022). Heavy rains, high temperatures, and disease outbreaks also affect tourists' comfort, and they may consider these factors when choosing their travel destination (Atzori et al., 2018). As climate change threatens the coastal regions, effective adaptation strategies should be implemented to maintain the quality of tourism services and reduce the seasonal fluctuations in tourism demand.

Numerous studies have examined tourists' preferences for weather and climate conditions, which are considered crucial factors for the tourism industry. In recent years, weather and climate conditions have become a key research theme in tourism-relatedresearch(Gössling, Scott, Hall, Ceron, & Dubois, 2012; Rutty & Scott, 2013, 2015, 2016; Scott et al., 2008; Scott & Lemieux, 2010a, 2010b). Various approaches have been used to analyse tourists' climate preferences and to determine optimal weather and climate conditions for tourism (Atzori et al., 2018; de Freitas, 2015; Demiroglu, Saygili-Araci, Pacal, Hall, & Kurnaz, 2020; Georgopoulou et al., 2019; Gómez-Martín, Matos-Pupo, Bada-Díaz, & Escalante-Pérez, 2020; Hewer, Scott, & Gough, 2015; Martínez-Ibarra, Gómez-Martín, Armesto-López, & Pardo-Martínez, 2019; Rutty & Scott, 2014, 2016; Rutty et al., 2020; Yu, Rutty, Scott, & Li, 2020). Atzori et al. (2018) have grouped such approaches into three: expert-based, revealed preferences, and stated preferences (Atzori et al., 2018).

Climate change is an issue that has significant implications for the tourism industry(Scott, Hall, & Gössling, 2012). Tourists' perceptions of climate change and its impact on their destination choice are crucial in making travel decisions(Gössling et al., 2012; Scott et al., 2008). Previous research has highlighted the importance of understanding the response of tourists to climate change variables and the impact of temperature rise on destination choice(Gössling & Hall, 2006). However, some studies have ignored tourists' perceptions

by relying solely on statistical models to forecast tourist behaviour under climate change scenarios.

Tourism businesses and destinations face challenges in adapting to changing climatic conditions due to their higher investment in fixed resources, such as hotels and other tourism facilities (Scott et al., 2008). The impact of climate change on tourism seasons affects the spatial and temporal distribution of tourist flows and spending, both nationally and internationally internationally (Rutty & Scott, 2016). As tourism is a discretionary activity, any increase in discomfort and dissatisfaction can lead to a decrease in the number of tourists. The interplay of various conditions at the destination level and visitors' preferences for climate variables can affect tourism demand at different levels (Atzori et al., 2018).

The East Coast of Sri Lanka is a popular coastal tourism destination that is facing the challenges of climate change. The impacts of climate change on the region include sea-level rise, increased frequency and severity of natural disasters, and changes in temperature and precipitation patterns (Wong et al., 2014). These impacts can have significant effects on the coastal tourism industry, which is one of the major sources of income for the local economy. The study by Atzori et al., (2018) revealed that tourists have the financial resources, knowledge, and time to avoid destinations experiencing the effects of climate change and choose another destination at a different time of year. Therefore, this study attempts to investigate the influence of climate change impacts on tourists' intentions to visit a destination, with a focus on the East Coast of Sri Lanka. The results of this study provide insights into the potential impacts of climate change on coastal tourism in the region and suggest adaptation measures that can help to mitigate these impacts.

## 2 The Study area

The Eastern Province of Sri Lanka occupies a significant portion of the island's total area, covering approximately 16% of the island's total land area. The region is characterized by a 420 km long coastline that accounts for 26% of the country's entire coastline and comprises a variety of ecosystems such as mangroves, salt marshes, dunes and beaches, seagrass beds, mudflats, corals, grasslands, and forests(Jayasingam, 2008). The region's tropical climate is hot and humid, and it falls under the dry zone of Sri Lanka. The mean annual temperature in the east coast varies between 26oC to 28oC, with minor seasonal variations, but it may exceed 30ºC up to 35ºC during prolonged drought(Jayasingam, 2008; Ministry of Environment, 2011). The average rainfall varies between 1000-1500mm, primarily received from the Northeast monsoon periods, from October to February, which accounts for nearly 60% of the annual precipitation. The region's ecosystems and climate make it a popular tourist destination, particularly for beach-related activities(Jayasingam, 2008).

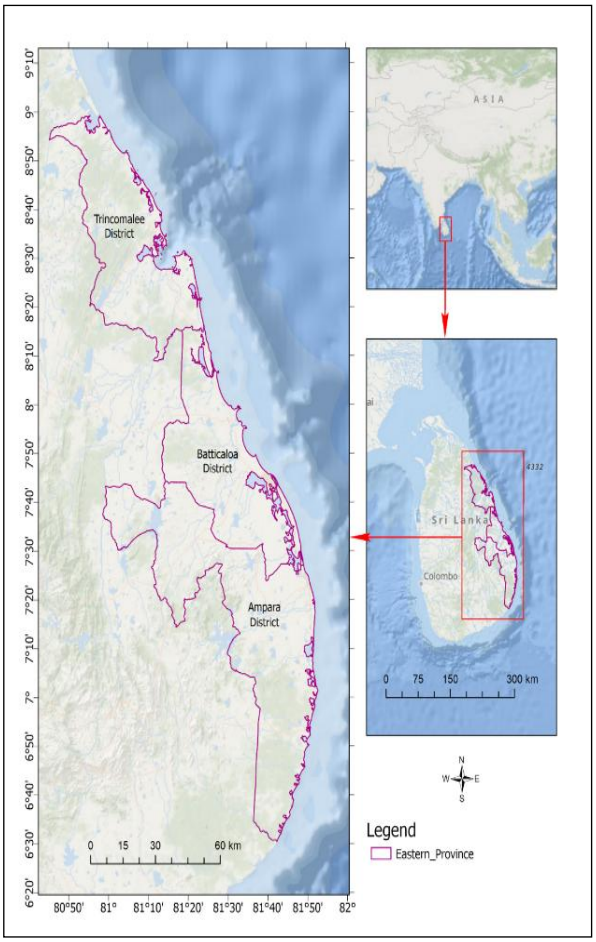


Figure 1: Location map of the study area: (a) Map of South Asia; (b) location of Sri Lanka; and (c) the extend of Eastern Province.

## 3 Materials and methods

The population of this research was international tourists who visited the East coast of Sri Lanka. A non-probability sampling

technique was used to select the participants in this research. Specifically, the simple random sampling technique was employed. The respondents' participation was entirely voluntary. The instruments of the data collation were designed in a way the respondents were not harmed, and the respondents' identities were kept confidential.

The data of this study were collected using a questionnaire survey. Generally, the larger the sample size, the more appropriate it is to use a questionnaire survey (Couper, 2017). Although the questionnaire had mostly closed-ended questions, there was an open-ended question at the end of the questionnaire to allow respondents to express themselves freely. The open-ended question was utilized to offer respondents the chance to express their diverse perceptions in relation to the visitation intention. The variables to be measured were chosen based on existing research on tourists' preferences for weather and climate conditions and their responses to the effects of climate change in coastal destinations. The questionnaire included 26 questions designed to collect preliminary information about tourists, investigate the reasons for choosing the destination, assess tourists' weather and climate preference, investigate tourists' response to the effects of climate change, and assess tourists' preference for adaptation measures.

First, a pilot study was carried out with 18 respondents from the East coast of Sri Lanka to get feedback on the questionnaire's consistency, understandability and structure. The pilot study participants were selected using the simple random sampling approach to validate the suitability of the random sampling method in the main study. Once the feedback and suggestions of respondents were adapted to the questionnaire, data collection for the actual study began. The data collection took place from October 2021 to July 2022, and 450 questionnaires were distributed to the respondents. However, a total of 429 responses were received at the end of the data collection period (10/2021-07/2022).

The initial database included 429 responses. The data collected from responses were subjected to the initial screening procedure. The divergence from normality was first observed, and then the data were screened to find missing data and outliers. There were no major outliers identified. As a result, missing and incomplete values were omitted from the data analysis. The data screening process resulted in the omission of 36 responses from the analysis due to missing and incomplete values. As a result, after the data preparation process was completed, 393 responses were taken for the analysis. SPSS 26.0 was used to process all of the gathered data.

## 4 Results

### 4.1 Respondents' profile

Out of 393 respondents, 33.1% were male and 66.9% were female. None of the respondents identified as transgender or preferred not to answer the question on gender. The majority of respondents were aged between 30-49 years (50.6%). The highest percentage of tourists (36.6%) fell into the income bracket of 1001-2000 US dollars. A total of 58.8% of respondents were married, while 30.5% were unmarried, 1.8% were divorced, and 8.9% selected 'other' for marital status. Most respondents had received a university-level education (70.5%) and were from the United Kingdom (26.0%) or China (17.3%). The most common length of stay was 8-14 days (39.9%).

### 4.2 Characteristics of respondents' visits

The purpose of the trip was mainly for leisure or holiday, accounting for 63.1% of the respondents, while 8.1% visited friends and relations. In terms of travel companionship, 42.5% of the respondents traveled with their spouse/partner, and 24.9% with family/relatives. The top two destinations visited were Nilaveli beach, accounting for 49.1% of the respondents, and Pasikkuda Beach, accounting for 30.5% of the respondents. The activities involved during the visit were sunbathing (100%), walking on the beach (80.4%), swimming (72.3%), whale & dolphin-watching (71.8%), and seafood (59.8%) (Table 1).

Table 1: Characteristics of the visit of the respondents

| Variables | | % |
|---|---|---|
| Purpose of Trip | Leisure/Holiday | 63.1% |
| | Visiting friends & relations | 8.1% |
| Travel companionship | Spouse/Partner | 42.5% |
| | Family/Relatives | 24.9% |
| Destination visited | Nilaveli beach | 49.1% |
| | Pasikkuda Beach | 30.5% |
| Activities involved | Sunbathing | 100.0% |
| | Walking on the Beach | 80.4% |
| | Swimming | 72.3% |
| | Whale & Dolphin-watching | 71.8% |
| | Seafood | 59.8% |

### 4.3 Tourists' perceptions of the impacts of climate change on coastal tourism

The results from the Table 2 suggest that tourists are most concerned about the impacts of high temperatures and droughts, with 36.9% strongly agreeing that they experienced high temperatures, and 32.3% strongly agreeing that they experienced droughts. On the other hand, tourists are less concerned about the impacts of floods, with only 5.9% strongly agreeing that they experienced floods while visiting the east coast of Sri Lanka. The mean scores for each impact ranged from 2.14 to 3.37 and the standard deviations ranged from 1.156 to 1.597, indicating that tourists had varying perceptions of the general impacts of climate change. Overall, the results suggest that tourists generally perceive high temperature and droughts as the most significant impacts of climate change, while floods are perceived as the least significant. However, there is still a considerable proportion of tourists who are uncertain or disagree with these statements. These findings have important implications for tourism management and policy-making. As tourists are a key stakeholder group in the tourism industry, understanding their perceptions of climate change impacts is essential for developing effective adaptation strategies and mitigating the negative effects of climate change on the tourism industry.

Table 2: Tourists' perception of the general impacts of climate change

| **General impacts of climate change** | **Strongly Disagree %** | **Disagree %** | **Moderate %** | **Agree %** | **Strongly Agree %** | **Mean** | **Std. Dev** |
|---|---|---|---|---|---|---|---|
| High temperature | 22.6 | 10.7 | 10.7 | 19.1 | 36.9 | 3.37 | 1.597 |
| Irregular rainfall | 23.4 | 35.6 | 14.8 | 14.2 | 12.0 | 2.56 | 1.312 |
| Strong winds | 22.6 | 36.6 | 9.7 | 14.8 | 16.3 | 2.65 | 1.399 |
| Droughts | 15.3 | 19.1 | 14.2 | 19.1 | 32.3 | 3.34 | 1.475 |
| Floods | 33.3 | 40.5 | 10.7 | 9.7 | 5.9 | 2.14 | 1.156 |

*Note:5-Strongly agree, 4-Agree, 3-Moderate, 2-Disagree, 1-Strongly disagree*

According to Table3, the majority of tourists agreed or strongly agreed that climate change have a direct impact on coastal tourism, with the highest agreement being for the degradation of beaches (58%). Other impacts with relatively high agreement were reduced outdoor activities (47%), bleaching of corals (47%), and reduced comfort (51%). Water restrictions (32%) and bad weather (31%) had lower agreement, while destruction of tourism infrastructure (23%) and loss of coastal habitats (25%) had the lowest agreement.

Overall, the mean value for tourists' view on the direct impacts of climate change on coastal tourism was 3.07 (SD = 1.205), indicating a moderate agreement. The standard deviations for each impact varied from 1.228 to 1.582, suggesting a wide range of responses. The findings suggest that tourists are aware of the potential impacts of climate change on coastal tourism, but their perception varies depending on the specific impact.

Table3: Tourists' view on the direct impacts of climate change on coastal tourism

| Direct impacts of climate change | Strongly Disagree % | Disagree % | Moderate % | Agree % | Strongly Agree % | Mean | Std. Dev |
|---|---|---|---|---|---|---|---|
| Reduced outdoor activities | 24.2 | 19.6 | 9.2 | 19.8 | 27.2 | 3.06 | 1.566 |
| Degradation of beaches | 15.3 | 13.5 | 13.2 | 21.4 | 36.6 | 3.51 | 1.474 |
| Bleaching of corals | 23.2 | 16.5 | 13.2 | 15.0 | 32.1 | 3.16 | 1.582 |
| Destruction of tourism infrastructure | 18.3 | 19.3 | 39.4 | 9.9 | 13.0 | 2.80 | 1.228 |
| Loss of coastal habitats | 19.3 | 16.0 | 39.7 | 9.9 | 15.0 | 2.85 | 1.271 |
| Bad weather | 17.0 | 14.5 | 37.7 | 11.5 | 19.3 | 3.02 | 1.311 |
| Water restrictions | 13.2 | 23.4 | 30.8 | 11.7 | 20.9 | 3.04 | 1.311 |
| Reduced beach activities | 19.8 | 15.5 | 41.7 | 7.9 | 15.0 | 2.83 | 1.266 |
| Reduced comfort | 11.5 | 12.5 | 25.2 | 26.7 | 24.2 | 3.40 | 1.290 |
| | | | | | | 3.07 | |

*Note: 5-Strongly agree, 4-Agree, 3-Moderate, 2-Disagree, 1-Strongly disagree*

### 4.4 Tourists' perceptions of important weather parameters relevant to coastal tourism

According to the **Table 4**, the most important weather factor for tourists is comfortable temperature, with 43.3% of tourists rating it as very important. The second most important factor is absence of strong wind, with 36.6% of tourists rating it as very important. Duration of sunlight availability is rated as the least important weather factor, with only 27.5% of tourists rating it as very important. The mean ratings for each weather factor range from 2.99 to 3.90 on a scale of 1 to 5, indicating that tourists generally consider all of the weather factors to be moderately to important for coastal tourism. The standard deviations range from 1.246 to 1.419, indicating some variability in tourists' ratings of the importance of each weather factor.

Table 4: Tourists' perceptions of the important weather factors relevant to coastal tourism

| Weather Factors | Unimportant % | Less important % | Moderate % | Important % | Very important % | Mean | Std. Dev |
|---|---|---|---|---|---|---|---|
| Absence of rain | 8.4 | 12.2 | 26.2 | 18.3 | 34.9 | 3.59 | 1.301 |
| Comfortable temperature | 6.9 | 9.2 | 14.0 | 26.7 | 43.3 | 3.90 | 1.246 |
| Duration of Sunlight availability | 12.2 | 15.0 | 34.4 | 10.9 | 27.5 | 3.26 | 1.335 |
| The temperature of the Water | 20.1 | 18.3 | 26.0 | 13.5 | 22.1 | 2.99 | 1.419 |
| Absence of cloud cover | 9.4 | 14.0 | 21.9 | 23.4 | 31.3 | 3.53 | 1.313 |
| Absence of strong wind | 10.9 | 10.2 | 22.9 | 19.3 | 36.6 | 3.61 | 1.355 |

*Note: 5-Very important, 4-Important, 3-Moderate, 2-Less important, 1-Unimportant*

### 4.5 Unsuitable weather conditions for coastal tourism

The Figure1shows the percentage of tourists who consider certain weather factors as unsuitable for coastal tourism, based on their perspective. These percentages indicate the proportion of respondents who perceive each weather factor as unsuitable for coastal tourism. The highest percentage (29.5%) of respondents consider heavy rainfall as unsuitable for coastal tourism, followed by high temperature (20.9%) and low temperature (12.7%). These findings provide valuable insights for coastal tourism managers and

policymakers to better understand tourists' preferences and concerns regarding weather conditions and to develop appropriate strategies to address them.

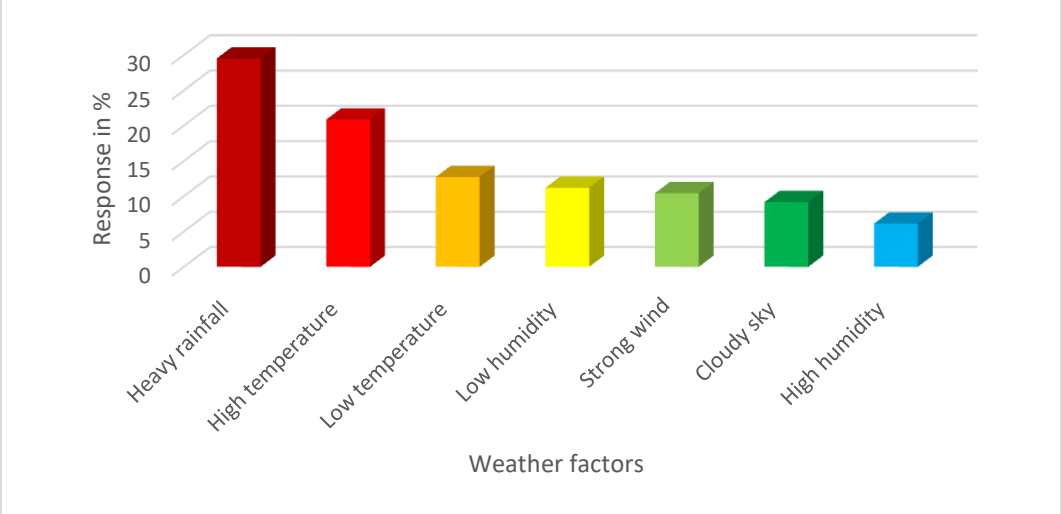


Figure1: Unsuitable weather factors for coastal tourism (tourists' perspective)

### 4.6 Tourists' preferences for climate change adaptation measures

Individual tourists will make the final decision on whether to travel to a place or not. Therefore, respondents were asked to mention the appropriate adaptation measures that would make them feel comfortable visiting the same destinations on the East coast of Sri Lanka in the event of changing climatic conditions.

This Figure2 shows tourists' preferences for climate change adaptation strategies that are appropriate for the destination level. The highest preference is for insurance cover with 88.30% of tourists showing a preference for this adaptation strategy. Beach nourishment, the early warning detection system, and the use of energy-efficient systems and water-saving devices are also highly preferred, with 84.48%, 81.68%, 81.68% and 79.39% of tourists preferring these strategies, respectively. Other preferred strategies include the declaration of marine sanctuaries (62.85%), the construction of sea walls defences and breakwaters (55.22%), coastal setbacks (57.51%), response plans for coral bleaching (52.42%), guest education (55.98%), creating evacuation plans (55.98%), insurance cover (88.30%), and diversification of markets (57.76%). The least preferred adaptation strategy is offering more indoor activities, with only 27.48% of tourists showing a preference for this strategy.

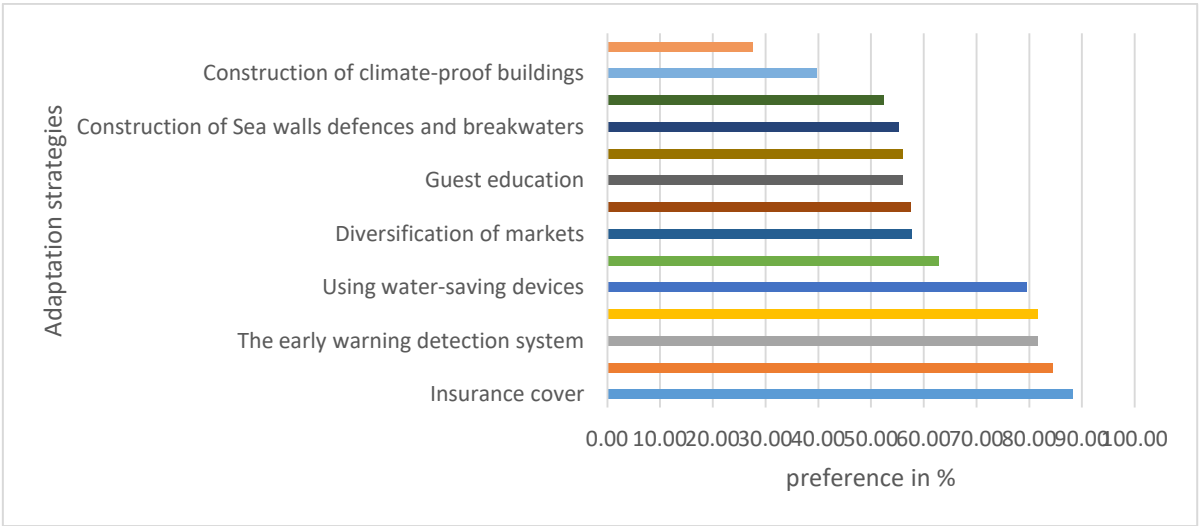


Figure2: Tourists' preference for climate change adaptation strategies that are

### 4.7 Tourists' intention to visit the east coast of Sri Lanka

An investigation was conducted to examine how the presence or absence of adaptation measures affects tourists' intentions to visit the east coast of Sri Lanka.Figure 3 showed that approximately 70% of tourists said they would return to the same destination (the east coast of Sri Lanka) if climate change adaptation strategies are available. At the same time, about 75% of the tourists indicated that they would prefer another destination if climate change adaptation strategies are unavailable. Despite the existence of climate change adaptation measures, approximately 25% of visitors responded that they would choose the same destination at different times. Further, about 15% of tourists mentioned that they would choose the same destination on alternative dates though climate change adaptation strategies are absent. About 7% of tourists said they would choose another destination even though climate change adaptation strategies are available. On the other hand, about 10% of tourists indicated that they would still visit the same destination, although climate change adaptation strategies are unavailable.

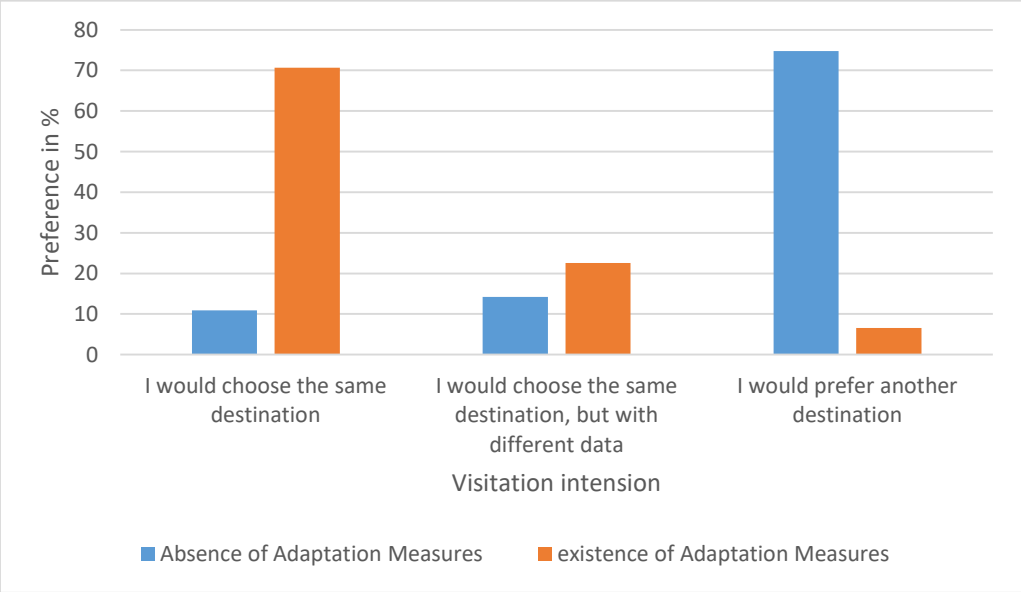


Figure 3: Tourists' visitation intentions to the presence or absence of adaptation measures

A study was conducted to examine how the various impacts of climate change affect tourists' intention to visit the east coast of Sri Lanka. The results (Figure 4) showed that the majority of respondents would prefer another destination if tropical diseases (72.8%), flooded streets (62.6%), or beach disappearance (64.6%) were present. Similarly, intensified storms (56.7%), uncomfortable hot temperature (76.3%), increased daily rainfall (73.3%), marine wildlife disappearance (47.1%), and coral bleaching (44.5%) also showed that most respondents would prefer another destination. Stronger winds showed the highest percentage of respondents (28%) choosing the same destination, while marine wildlife disappearance and coral bleaching showed the lowest percentage of respondents (18.8%) choosing the same destination.

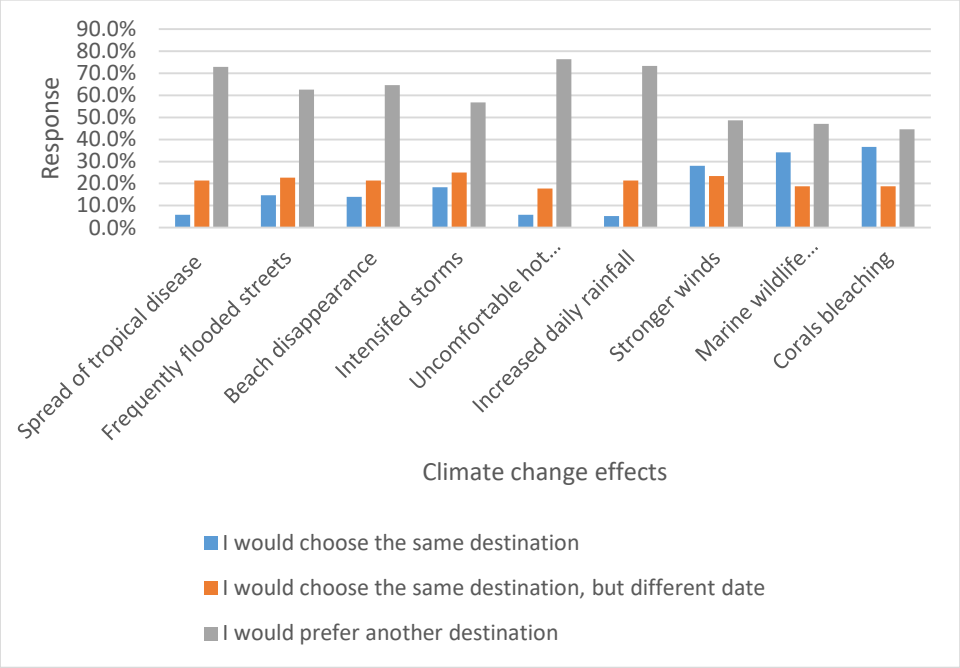


Figure 4: Tourists' visitation Intentions based on the effects of climate change

Tourists' overall intention to visit the east coast of Sri Lanka during their next visit, was tested. Approximately 80% of tourists said they would choose the east coast of Sri Lanka for their next visit, whereas 15% said they would choose the east coast at a different time of year. However, about 20% of visitors reported that they would choose another destination during their next visit (Figure 5).

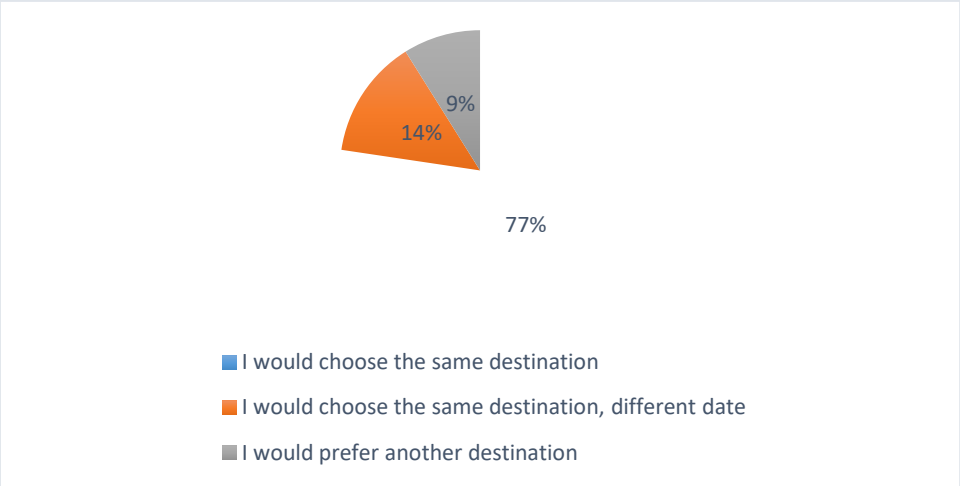


Figure 5: Visitation intention to the east coast during the next holiday

## 4.8 Motivations for choosing the eastern province as a tourists destination

Figure 6 lists all of the reasons why tourists want to visit the eastern province. Sub-tropical climate all year round was the most popular reason given by tourists for choosing the eastern province as a tourism destination, followed by comfortable climate and lack of tropical disease. Watching whales and dolphins, Low-cost destinations, and Safety and Security, all received high percentages (above 70%) (Figure 6). The destination's cultural heritage and coral diversity were ranked 7th and 8th. The majority of tourists believed that there were additional reasons for choosing the eastern province, while destination weather was an important factor in making the destination appealing. Sports were the least popular reason (about 20%).

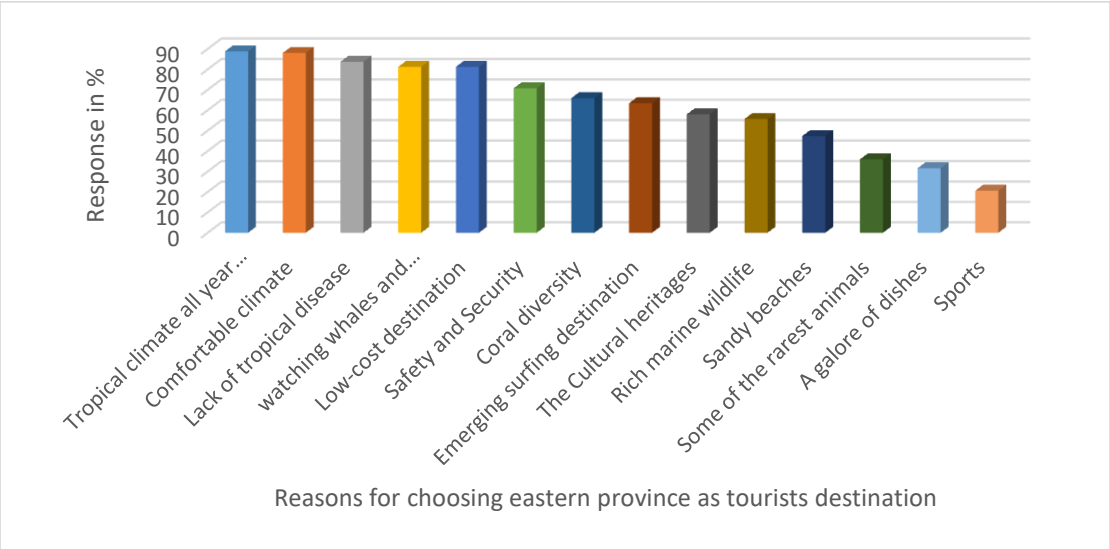


Figure 6: Motivation for choosing eastern province as a tourist's destination

The following hypothesis was tested to identify how the existence of adaption measures affects tourists' intentions to visit the destination.

**$H_0$:** There is no relationship between tourists' intentions to visit a destination and the presence of climate change adaptation measures at the destination.

A correlation analysis was conducted to examine the relationship between tourists' visitation intentions in the existence of adaptation measures at the destination and their willingness to return to the east coast of Sri Lanka during their next holiday. The Pearson correlation test is significant at $p < 0.001$. The null hypothesis is rejected, and the alternative hypothesis is accepted, namely that there was a significant relationship between tourists' intentions to visit a destination and the existence of climate change adaptation measures at the destination. The results showed a strong positive correlation between these two variables ($r = .670$, $p < .01$). This indicates that tourists' intention to visit the destination is significantly related to their response to weather conditions, which implies that the availability of adaptation measures at the destination plays an important role in attracting tourists (Table 5). The findings of this study suggest that destinations should prioritize the development and implementation of adaptation measures to improve their resilience to climate change impacts and enhance their attractiveness to tourists.

Table 5: Tourists visitation intention on the presence of adaptation measures at the destination

| Correlations | | | |
|---|---|---|---|
| | | Visitation Intentions in the existence of Adaptation Measures at the destination | willingness to return to the east coast of Sri Lanka during their next holiday |
| Visitation Intentions in the existence of Adaptation Measures at the destination | Pearson Correlation | 1 | .670** |
| | Sig. (2-tailed) | | .000 |
| | N | 393 | 393 |
| willingness to return to the east coast of Sri Lanka during their next holiday | Pearson Correlation | .670** | 1 |
| | Sig. (2-tailed) | .000 | |
| | N | 393 | 393 |
| **. Correlation is significant at the 0.01 level (2-tailed). | | | |

## 5 Discussion

The East coast area is widely acknowledged for its stunning beaches, coral reefs, and other natural attractions that attract numerous tourists. However, some visitors are expressing concerns about the potential consequences of climate change on these scenic spots. As more and more people become aware of the effects of climate change, they are beginning to question the long-term sustainability of these natural wonders. Some tourists worry that the beaches may disappear, or the coral reefs may deteriorate, causing irreversible damage to the ecosystem. This increasing concern for the environment is also leading to a rise in ecotourism, with more tourists seeking out sustainable tourism options that prioritize environmental conservation. The impact of climate change on tourist destination choice is a critical issue that requires further discussion and action to ensure that future generations can continue to enjoy these unique and beautiful locations.

Sri Lanka has a tropical climate, and tourists often visit the coastal areas for their warm weather and sunny skies. Tourists were more concerned about the high temperatures and drought in the east coast of Sri Lanka. The temperature has been rising due to climate change (World Bank Group, 2021), making it uncomfortable for tourists who are not used to the heat. For tourists who are not accustomed to high temperatures, more heat can be a major concern. High temperatures can cause discomfort, dehydration. This can be particularly problematic for elderly tourists, young children, and those with certain medical conditions. As a result, many tourists may seek out air-conditioned accommodations and indoor activities during the hottest parts of the day. Tourists who are visiting areas affected by drought may perceive the situation as a negative aspect of their trip, as it can limit the availability of certain activities and amenities. For example, water-based activities such as swimming, boating, and fishing may be restricted. Tourists' perceptions of high temperature and drought can have a significant impact on the demand for tourism services. Therefore, it is essential for the coastal tourism industry to develop sustainable and eco-friendly solutions to mitigate the impacts of climate change and ensure a pleasant trip experience for tourists.

Unpredictable rainfall, strong winds and floods are some of the concerns for tourists visiting the east coast areas. Tourists noted that unpredictable rainfall can disrupt their plans, leading to cancellations or delays in travel. Strong winds can lead to rough seas, making it unsafe for tourists to go out on boats or participate in water-based activities, which can be unpleasant for tourists and impact their outdoor experiences. While Sri Lanka has a monsoon season, which brings heavy rainfall, climate change has led to more intense rainfall, leading to flash flooding in some areas (De Silva & Kawasaki, 2018). Tourists expressed concern about the safety risks associated with floods, as well as the impact on their travel plans. Therefore, further research is needed to better understand how unpredictable weather may influence tourists' vulnerability perceptions and smooth function of coastal tourism.

Among several direct impacts of climate change, tourists highly rated the degradation of beaches, coral bleaching and reduced comfort as the direct impacts of climate change on the coastal tourism in the eastern province. As a result, tourists in the east coast of Sri Lanka may be more likely to seek out destinations that prioritize sustainable practices and take proactive steps to mitigate the impacts of climate change on their beaches and local communities. , Wong et al., (2014) found that degradation of beaches can result in the loss of natural habitats and erosion of shoreline in Sri Lanka, which can affect the local economy and livelihoods of those who depend on tourism all around Sri Lanka. Denstadli et al., (2011) argued that tourists' understanding of beach degradation and coral bleaching can have a significant impact on the demand for tourism services and the behavior of both tourists and tourism businesses. Tourists who perceive that beaches and coral reefs are degraded due to climate change may be less likely to choose destinations that are particularly vulnerable to the impacts of climate change (Denstadli et al., 2011). Additionally, tourists may be less likely to engage in certain activities on the beach, such as swimming, sunbathing, and water sports, if they perceive that the water quality is

poor or the beach is littered with debris (Denstadli et al., 2011).

The degradation of beaches and coral reefs, which are major attractions for tourists in the eastern province, could have a negative impact on the overall tourist experience that may negatively influence the tourists' intention to visit the east coast in future. These findings emphasize the importance of considering tourists' perceptions and attitudes towards climate change and its impacts on tourism in coastal areas. To address these concerns, it is important for tourism businesses in the east coast of Sri Lanka to take steps to implement sustainable practices, and prioritize the protection and preservation of natural resources such as beaches and coral reefs. By doing so, east coast destinations can help to ensure that tourists continue to view their area as an attractive and desirable place to visit, even in the face of climate change challenges.

Furthermore, tourists are becoming more aware of the need for sustainable tourism practices in the face of climate change. Tourists expressed their desire to see the tourism industry take more active steps towards sustainability, such as reducing waste and carbon emissions, protecting natural resources, and promoting responsible tourism practices in the east coast of Sri Lanka. They also expressed the hope that the tourism industry of the east coast would work collaboratively with local communities to mitigate the impacts of climate change on the environment and local communities.

Tourists' perception of weather plays a critical role in shaping their travel choices, especially in coastal tourism, as indicated by previous research (Atzori et al., 2018; Rutty & Scott, 2016). Among various weather factors, comfortable temperature is a crucial consideration for tourists, particularly when it comes to coastal destinations (Rutty & Scott, 2016). Scott et al. (2008) reported that tourists are aware of the significance of climate attributes when planning their trips, either consciously or subconsciously. The study identified four critical weather factors that tourists take into account, namely comfortable temperature, lack of rain, clear skies, and calm winds. This outcome was consistent with Mather, Viner, & Todd's (2005) finding that visitors' comfort level is the most critical factor affecting leisure travel demand. Uyarra et al. (2005) discovered that tourists consider the absence of rain to be a crucial determinant of their decision to visit a coastal destination. Overall, the findings suggest that comfortable temperatures, clear skies, and lack of rainfall are crucial weather factors that influence coastal tourists' decisions.

The findings of this study shed light on the significance of weather factors beyond just temperature and precipitation for coastal tourism. Specifically, the absence of cloud cover and strong winds were found to be important for tourists' beach vacation experiences. This observation is consistent with a previous study conducted by Fitchett, Fortune, &Hoogendoorn, (2020) in the Maldives, where tourists also placed great value on clear skies and low winds for their beach vacation. These results suggest that catering to tourists' perceptions of weather factors is crucial for tourism stakeholders to enhance their services and facilities, resulting in increased satisfaction and loyalty among tourists. Thus, it is important for tourism stakeholders to consider and incorporate these factors into their planning and management strategies, to better meet tourists' expectations and ultimately achieve a competitive edge in the market.

Tourists are an essential stakeholder in the tourism industry, and their preferences on climate change adaptation are critical for effective adaptation planning and decision-making. Understanding tourists' preferences can aid in developing adaptation strategies that align with their needs and expectations, increasing their resilience to climate change impacts and ensuring the sustainability of coastal tourism. León et al., (2021) also emphasize the importance of climate-related preparedness and adaptive capacities in enhancing the value of the tourist experience and promoting economic impact.

The study on tourists' preferences for adaptation strategies in Sri Lanka's east coast offers valuable insights into how tourism destinations can address the challenges posed by climate change. The study highlights the importance of mitigating the effects of climate change while simultaneously encouraging tourism. The strategies identified in the study,

such as insurance coverage, beach nourishment, early warning detection systems, energy-efficient systems, and water-saving devices, are effective in protecting tourists from the risks associated with climate change and ensuring their comfort and safety during their stay.Among the adaptation strategies, travel insurance emerged as the most favorable option for tourists. This is because it provides visitors with a sense of security, knowing that any losses incurred during their stay will be covered by the insurance. This assurance helps tourists to choose Sri Lanka's east coast as their destination, even in the face of potential natural disasters.

However, the study found that some adaptation strategies, such as building climate-proof buildings and providing more indoor activities, were not as popular among tourists. These strategies were seen as limiting visitors' outdoor mobility, which is a key aspect of their experience in Sri Lanka's east coast. Tourists prefer engaging in a variety of outdoor activities, such as water sports and beach activities, and these strategies may not be effective in motivating tourists to visit the destination.

The findings of the study suggest that a balance must be maintained between mitigating the effects of climate change and promoting tourism. The adaptation strategies that offer protection to tourists while also allowing them to engage in outdoor activities are more likely to be effective in attracting visitors to Sri Lanka's east coast. By implementing these strategies, tourism destinations can adapt to the challenges posed by climate change and continue to offer enjoyable and safe experiences to their visitors. Sri Lanka's east coast can potentially increase the number of visitors while mitigating the effects of climate change. However, further research is required to better understand the complex relationship between tourists' demographic factors and their adaptation preferences in coastal tourism.

The local level is where the effects of climate change are most strongly felt, with particular regions, ecosystems, and communities experiencing the consequences first (Kennedy, Stocker, & Burke, 2010). As a result, it is essential to encourage climate change adaptation at the local level. Although some tourism operators on Sri Lanka's east coast have adopted adaptation tactics, they do not always align with tourists' desires. While a few prominent companies have embraced these approaches, the majority of small and medium-sized enterprises have not, citing the high costs of implementation and maintenance. This highlights a significant challenge in addressing climate change in the coastal tourism industry: maintaining a balance between promoting environmentally sustainable practices and accommodating tourists' preferences while ensuring that businesses remain viable. Finding effective solutions that benefit all stakeholders, including the environment, local communities, and tourism businesses, will be critical to achieving long-term sustainability in the tourism sector.

The study revealed a noteworthy finding, indicating that having climate change adaptation measures in place within tourist destinations can have a substantial positive influence on tourists' willingness to visit. As climate change's effect on tourism continues to gain awareness among tourists, they are now seeking out destinations that have implemented measures to adapt and mitigate these impacts(León et al., 2021). The current study suggests that the presence of climate change adaptation measures can provide a competitive edge for tourist destinations, as it is likely to attract and retain tourists who are seeking destinations that prioritize sustainable tourism practices.

This finding highlights the importance for tourist destinations to take a proactive approach towards climate change adaptation and to communicate their efforts effectively to tourists. By doing so, they could benefit from increased tourism, improved reputation, and potentially long-term sustainability. It is crucial to note that this study's results are not conclusive and may be influenced by various factors, such as the type and scale of adaptation measures implemented and tourists' individual characteristics. Therefore, further research is necessary to gain a better understanding of the relationship between climate change adaptation measures and tourists' intentions to visit.

The study revealed that tourists tend to prefer visiting the east coast for their next trip when they know that preferred adaptation strategies

are available there. This finding is consistent with a study by Goosling et al. (2012) that found that long-haul tourists visiting the Rocky Mountains of Canada were less willing to visit if there were no climate change adaptation measures. The results suggest that the presence of climate change adaptation measures can positively influence tourists' destination choices and increase their intention to visit. However, it is important to note that the effectiveness of climate change adaptation measures in attracting tourists depends on their perception of the measures. According to Mushawemhuka et al. (2022), tourists who perceive the adaptation measures as effective and efficient are more likely to choose the destination for their next trip. Conversely, tourists who perceive the adaptation measures as ineffective and inefficient are less likely to visit the destination.

Tourists' intentions to return to the tourist destinations were closely connected to the conditions of environmental attributes that tourists preferred (Uyarra et al., 2005). This finding was consistent with what was found in this study, in which most of the tourists stated that they would not visit the East coast of Sri Lanka again if the tropical disease became more widespread, the temperature became uncomfortably, rainfall daily duration became uncomfortable, beaches largely disappear, and streets are frequently flooded.

The motivations for choosing the Eastern Province of Sri Lanka as a tourist destination are varied, with climate and wildlife viewing being significant factors. However, it is important to note that motivations may differ based on the demographic characteristics of tourists, such as age, gender, and country of origin. Therefore, tourism stakeholders in the region should consider targeting specific markets with tailored marketing strategies to maximize the appeal of the region.

When a destination cannot accommodate the tourists' climate preference for a particular activity, they exclude the destination in their travel decision. If tourists are unable to fulfil their expected activities, they will rate the weather factors as unacceptable. Further, Atzori et al., (2018) argued that travel decisions regarding the destination visited will be influenced by visitors' perceptions of whether the weather encountered was normal or abnormal. Understanding these variations in tourists' perceptions of important weather factors for coastal tourism based on the purpose of travel can help destination managers and marketers tailor their marketing strategies and communication efforts to effectively promote coastal tourism in the eastern province of Sri Lanka.

These findings have important implications for tourism managers and policymakers, as they suggest that investing in climate change adaptation measures can potentially attract more tourists to a destination. However, it is crucial to ensure that tourists perceive these measures as effective and efficient. This requires effective communication and marketing strategies that highlight the positive impacts of the measures on the tourist experience. Moreover, tourism managers and policymakers should continuously evaluate the effectiveness of the adaptation measures and make necessary improvements to ensure that they meet tourists' expectations and needs. By doing so, they can help to mitigate the negative impacts of climate change on coastal tourism while also contributing to the sustainability of the coastal tourism industry.Tourists' overall perception of the effects of climate change on coastal tourism in the east coast is favourable at the moment. As a result, tourist arrivals in the near future will be unaffected. Hence, tourism operators have enough time to plan and implement climate change adaptation strategies to protect the coastal tourism industry from future climate change impacts.

## 6 Conclusion

This study highlights the importance of considering climate change impacts in tourism planning and development, as it can significantly affect tourists' intentions to visit a destination. It also emphasizes the need for the tourism industry to adapt to the changing climate to ensure the sustainability of the sector and the conservation of natural and cultural resources. Overall, this study contributes to the growing body of literature on climate change and tourism by providing insights into how climate change affects tourists' intentions to visit a destination and the potential adaptation strategies that can be implemented to mitigate

its impacts. It is hoped that this study will inform policymakers, tourism stakeholders, and destination managers in Sri Lanka and other similar destinations facing similar challenges on the importance of incorporating climate change adaptation strategies in tourism planning and management to ensure the long-term sustainability of the sector.

## References


1. Atzori, R., Fyall, A., & Miller, G. (2018). Tourist responses to climate change: Potential impacts and adaptation in Florida's coastal destinations. Tourism Management, 69(May), 12–22. https://doi.org/10.1016/j.tourman.2018.05.005
3. Couper, M. P. (2017). New developments in survey data collection. Annual Review of Sociology, 43, 121–145. https://doi.org/10.1146/annurev-soc-060116-053613
4. de Freitas, C. R. (2015). Weather and place-based human behavior: recreational preferences and sensitivity. International Journal of Biometeorology, 59(1), 55–63. https://doi.org/10.1007/s00484-014-0824-6
5. De Silva, M. M. G. T., & Kawasaki, A. (2018). Socioeconomic Vulnerability to Disaster Risk: A Case Study of Flood and Drought Impact in a Rural Sri Lankan Community. Ecological Economics, 152(November 2017), 131–140. https://doi.org/10.1016/j.ecolecon.2018.05.010
6. Demiroglu, O. C., Saygili-Araci, F. S., Pacal, A., Hall, C. M., & Kurnaz, M. L. (2020). Future Holiday Climate Index (HCI) performance of urban and beach destinations in the Mediterranean. Atmosphere, 11(9). https://doi.org/10.3390/ATMOS11090911
7. Denstadli, J. M., Jacobsen, J. K. S., & Lohmann, M. (2011). Tourist perceptions of summer weather in Scandinavia. Annals of Tourism Research, 38(3), 920–940. https://doi.org/10.1016/j.annals.2011.01.005
8. Fitchett, J. M., Fortune, S. M., & Hoogendoorn, G. (2020). Tourists' reviews of weather in five Indian Ocean islands. Singapore Journal of Tropical Geography, 41(2), 171–189. https://doi.org/10.1111/sjtg.12318
9. Georgopoulou, E., Mirasgedis, S., Sarafidis, Y., Hontou, V., Gakis, N., & Lalas, D. P. (2019). Climatic preferences for beach tourism : an empirical study on Greek islands. Theor Appl Climatol, 137, 667–691. https://doi.org/10.1007/s00704-018-2612-4
10. Gómez-Martín, M. B., Matos-Pupo, F., Bada-Díaz, R., & Escalante-Pérez, D. (2020). Assessing Present and Future Climate Conditions for for Beach Tourism in Jardines del Rey (Cuba). Atmosphere, 11(1295), 1–18. https://doi.org/10.3390/atmos11121295
11. Gössling, S., & Hall, C. M. (2006). Uncertainties in predicting tourist flows under scenarios of climate change. Climatic Change, 79, 163–173. https://doi.org/10.1007/s10584-006-9081-y
12. Gössling, S., Scott, D., Hall, C. M., Ceron, J. P., & Dubois, G. (2012). Consumer behaviour and demand response of tourists to climate change. Annals of Tourism Research, 39(1), 36–58. https://doi.org/10.1016/j.annals.2011.11.002
13. Hewer, M. J., Scott, D., & Gough, W. A. (2015). Tourism climatology for camping: a case study of two Ontario parks (Canada). Theoretical and Applied Climatology, 121(3–4), 401–411. https://doi.org/10.1007/s00704-014-1228-6
14. Jayasingam, T. (2008). Eastern Province Biodiversity Profile and Conservation Action Plan. Biodiversity Secretariat, Ministry of Environment and Natural Resources, 1–44.
15. Kennedy, D., Stocker, L., & Burke, G. (2010). Australian local government action on climate change adaptation: Some critical reflections to assist decision-making. Local Environment, 15(9), 805–816. https://doi.org/10.1080/13549839.2010.514602
16. Leal Filho, W. (2022). Will climate change disrupt the tourism sector? International

Journal of Climate Change Strategies and Management, 14(2), 212–217. https://doi.org/10.1108/IJCCSM-08-2021-0088

17. León, C. J., Giannakis, E., Zittis, G., Serghides, D., Lam-González, Y. E., & García, C. (2021). Tourists' Preferences for Adaptation Measures to Build Climate Resilience at Coastal Destinations. Evidence from Cyprus. Tourism Planning and Development, 0(0), 1–27. https://doi.org/10.1080/21568316.2021.1958914
18. Martínez-Ibarra, E., Gómez-Martín, M. B., Armesto-López, X. A., & Pardo-Martínez, R. (2019). Climate preferences for tourism: Perceptions regarding ideal and unfavourable conditions for hiking in Spain. Atmosphere, 10(11). https://doi.org/10.3390/atmos10110646
19. Mather, S., Viner, D., & Todd, G. (2005). Climate and Policy Changes: Their Implication for International Tourism Flow. In C. M. Hall & J. Higham (Eds.), Tourism, Recreation and Climate Change (p. 336). New York, USA: Channel View Publications.
20. Ministry of Environment. (2011). Sri Lanka's Second National Commission on Climate Change. Colombo, Sri Lanka: Climate change Secretariat, Ministry of Environment. Retrieved from Climate change Secretariat, Ministry of Environment website: http://www.climatechange.lk/SNC/Final_Reports/SNC_Final_Report/SNC.pdf
21. Mushawemhuka, W., Fitchett, J. M., & Hoogendoorn, G. (2022). Stakeholder perceptions of climate change threats to the Zimbabwean nature-based tourism sector. Environmental Development, 44(6), 1–14. https://doi.org/10.1016/j.envdev.2022.100779
22. Rutty, M., & Scott, D. (2013). Differential climate preferences of international beach tourists. Climate Research, 57(3), 259–269. https://doi.org/10.3354/cr01183
23. Rutty, M., & Scott, D. (2014). Thermal range of coastal tourism resort microclimates. Tourism Geographies, 16(3), 346–363. https://doi.org/10.1080/14616688.2014.932833
24. Rutty, M., & Scott, D. (2015). Bioclimatic comfort and the thermal perceptions and preferences of beach tourists. International Journal of Biometeorology, 59(1), 37–45. https://doi.org/10.1007/s00484-014-0820-x
25. Rutty, M., & Scott, D. (2016). Comparison of climate preferences for domestic and international beach holidays: A case study of Canadian travelers. Atmosphere, 7(2), 19–22. https://doi.org/10.3390/atmos7020030
26. Rutty, M., Scott, D., Matthews, L., Burrowes, R., Trotman, A., Mahon, R., & Charles, A. (2020). An Inter (HCI:Beach) and the tourism climate index (TCI) to explain canadian tourism arrivals to the Caribbean. Atmosphere, 11(4). https://doi.org/10.3390/ATMOS11040412
27. Scott, D., Gössling, S., & De Freitas, C. R. (2008). Preferred climates for tourism: case studies from Canada, New Zealand and Sweden. Climate Research, 38(1), 61–73. https://doi.org/10.3354/cr00774
28. Scott, D., Hall, C. M., & Gössling, S. (2012). Tourism and Climate Change: Impacts, Adaptation and Mitigation. In Routledge (1st ed.). London, UK: Routledge. https://doi.org/https://doi.org/10.4324/9780203127490
29. Scott, D., & Lemieux, C. (2010a). Weather and climate information for tourism. Procedia Environmental Sciences, 1(1), 146–183. https://doi.org/10.1016/j.proenv.2010.09.011
30. Scott, D., & Lemieux, C. (2010b). Weather and climate information for tourism. Procedia Environmental Sciences, 1(1), 146–183. https://doi.org/10.1016/j.proenv.2010.09.011
31. Uyarra, M. C., Côté, I. M., Gill, J. A., Tinch, R. R. T., Viner, D., & Watkinson, A. R. (2005). Island-specific preferences of tourists for environmental features: Implications of climate change for tourism-dependent states. Environmental Conservation, 32(1), 11–19. https://doi.org/10.1017/S0376892904001808

32. Wong, P., Losada, I. J., Gattuso, J. P., Hinkel, J., Khattabi, A., McInnes, K. L., … Amez, S. (2014). Coastal systems and low-lying areas. In V. R. Barros, C. B. Field, D. J. Dokken, M. D. Mastrandrea, K. J. Mach, T. E. Bilir, … L. L. White (Eds.), Climate Change 2014 Impacts, Adaptation and Vulnerability: Part A: Global and Sectoral Aspects. New York, USA: Cambridge University Press. https://doi.org/10.1017/CBO9781107415379.010
33. World Bank Group. (2021). Climate risk country profile - Sri Lanka. In World Bank and Asian Development Bank. World Bank Group. Retrieved from World Bank Group website: https://climateknowledgeportal.worldbank.org/sites/default/files/2021-05/15507-WB_Sri Lanka Country Profile-WEB.pdf
34. Yu, D. D., Rutty, M., Scott, D., & Li, S. (2020). A comparison of the holiday climate index:beach and the tourism climate index across coastal destinations in China. International Journal of Biometeorology. https://doi.org/10.1007/s00484-020-01979-w

# DECENTRALIZED IDENTITY MANAGEMENT FOR EVALUATING THE ADOPTION AND IMPLICATIONS FOR ORGANIZATIONAL SECURITY ON THE BLOCKCHAIN

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## ABSTRACT

*Blockchain has been a very disruptive technology that can innovate various businesses. Ignoring the same may lead organizations to stand behind competition in itself. Along with its basic financial use in cryptocurrency, a lot of applications of blockchain are being proposed by many studies, especially e-voting and supply chain management (SCM). However, there has been a lack of attention on cybersecurity and information applications of blockchain, especially from the point of view of organizations. Identity Management (IDM) systems have been proposed as a potential solution to problems related to digital identity management. They are at nascent stage and further research should be conducted to find out whether identity system can be improved with blockchain. This study explores blockchain and its application for IDM in context of organizational security. It gives a comprehensive review on understanding the topic, such as knowing whether claims made on the potential of blockchain to address the challenges of identity management worth the hype. The overall trend shows theoretical knowledge on supporting some claims, but may not be friendly to the context of organizational security. The study reveals nascent yet promising state of blockchain, while questioning whether adoption of identity management is completely practical in organizations.*

***Keywords*** *– Blockchain, identity management, organizational security, decentralized identity management, IDM*

## 1. Introduction

Identity management turns out to be a serious concern in this day and age. Due to constant technological advancement, especially the 5G penetration and introduction of "Internet of Things (IoT)", there has been a rise in number of business entities in digital world. There is a high demand for digital identification of individuals, services, organizations, devices, and applications in a universal and efficient manner. This way, it is highly important to maintain security and privacy. Blockchain-based decentralized identity management (BDIDM) is much needed and proposed as a potential solution for organizational security. Some mistakenly consider blockchain as a common solution, a lot of discussions have been made lately on whether blockchain could benefit identity management systems (Panait et al., 2020).

### 1.1.Background

Identity Management (IDM) system combines technologies and policies which work on the same path to ensure that access to resources like systems, applications, data, specific services, and cloud platforms is provided only to authorized users in an organization. It protects against unauthorized access to resources and systems and triggers alarms when there is a security breach to steal data from within or outside the perimeter. A smart IDM system is aimed to provide security to system and data while reducing costs and saving efforts. There are still several problems in using typical IDM systems like fraud, theft, loss of data, and lack of control (Dunphy & Petitcolas, 2018). Companies face security and design issues with IDM processes while forcing to test new solutions. Most of the IDM systems are centralized with a single control over the whole network.

Blockchain and distributed ledger have generated a lot of hype and spurring across several industry sectors. Financial sector is supposed to have first-mover advantage when it comes to leverage blockchain technology. The emergence of blockchain technologies enable self-governing identities to ensure decentralization where each participating node is independent from others. Rather than following the guidelines of a centralized authority, there are common standards for distributed entities to connect and preserve their authenticity and ensure confidentiality of information. Identity authentication is needed to secure the environment due to network decentralization. Blockchain technology is relatively new and has properties like

immutability, transparency, tamper resistance, credibility, decentralization, and traceability for several purposes (Wang & Jiang, 2020). Individuals can own their identities with a global ID for various purposes by using blockchain-based decentralized identity management (BDIDM).

## 2. Literature Review

The emergence of blockchain-based "distributed ledger technology (DLT)" on a data structure has increased new approaches to identity management to upend significant approaches to consume and provide digital identities. These approaches propose to improve transparency, decentralization, and user control which cover information related to identity, due to previous challenge in designing IDM. Dunphy & Petitcolas (2018) introduced emerging landscape of "DLT-based IDM" and evaluate three proposals with analytic lens of seminal model – "ShoCard, uPort, and Sovrin" – to define the nature of successful schemes related to IDM.

There have been concerns raised on commercial, technical and ethical aspects of security and privacy of data due to recent scams related to abuse of private data from various social media platforms and data breaches. The new "General Data Protection Regulation (GDPR)" law by the European Union (EU) is among the major changes in privacy regulations and covers various regulatory steps for both data processors and controllers to protect and empower the privacy of EU citizens. Faber et al. (2019) proposed a conceptual framework and world-class architecture for "Blockchain-based Personal Data and Identity Management System (BPDIMS)", a GDPR-compliant and human-oriented identity management and personal data system as per blockchain technology. They described the use of BPDIMS architecture to provide high-level of trust, security, and transparency. They discussed how humanized approach of BPDIM while complying with GDPR moves control on personal data to empower them.

The IoT connects everything, be it organization, individuals, and companies to objects in the virtual and real world. Digital identity has been the keystone for online solutions and foundation to build security mechanisms like authorization and authentication. There is still lack of proper study on "Digital Identity Management (DIM)" for IoT. Zhu & Badr (2018) identify the needs of "building identity management" for IoT, which includes interoperability, scalability, security, mobility, and privacy. Then, they traced the problem of identity management to the origin of philosophy, analyzed the solutions of "internet digital identity management" in context of IoT and detect recent rise in sovereign identity solutions of blockchain. Finally, they pointed out the promising trends for future research to build IoT systems for identity management and elaborated problems of building comprehensive IDM for IoT.

In this day and age, there is a lack of identity protocol on the internet to identify organizations and people. Hence, service providers should maintain and build their own user databases. This solution is expensive to service providers, inefficient at a level that data is imitated among various providers, tiresome to the users who should remember various credentials, and hard to secure as given by recent private data breaches worldwide. In addition, there is a need to collect personal data for profiling, data mining, and exploitation without consent or knowledge of the user. The ideal solution recommended would be self-sovereign identity, a new kind of IDM which is managed and owned completely by each user. Lim et al. (2018) investigated various authentication and blockchain-based frameworks. A summary of world-class blockchain-based IDM and authentication solutions has been presented from 2014 to 2018. They concluded the study with open challenges and directions for future studies.

Cloud-based cellular networks use access to dynamic spectrum and network technologies to meet network demand and reduce spectrum crunch. There is a risk of profiling to furnish a carrier with personal data for user setup in cognitive networks in which users find secondary access with various carriers. However, there is a lack of network access in traditional cellular networks in cognitive space. Raju et al. (2017) proposed a privacy-based IDM system based on blockchain which puts

value to both attribution and anonymity and helps in end-to-end management. Network access is provided to the setup that may affect rebuilding identity of a subscriber.

### 2.1.Research Gap

Various claims are being made on the potential of blockchain for providing a way ahead to manage digital identity. Hence, it is important to explore the use of BDIDM in context of organizational security. There are so many studies claiming that blockchain can manage cybersecurity issues like "identity management" (Shetty et al., 2019), blockchain have no point of failure (Kshetri, 2017), blockchain preserves privacy of the user (Kshetri, 2017), blockchain provides power to the user data (Kuperberg, 2019), and centralized identity management is subject to various threats and problems like data breaches (Bernabe et al., 2019). This study explored the practicality of BDIDM from organizational point of view with proper background to know the topic. It consists of knowing whether claims on BDIDM to address the challenges are factual or just due to publicity.

### 2.2.Research Objectives

- To evaluate the implications of adopting Identity Management for Organizational Security
- To discuss the practicality of Blockchain-based Decentralized Identity Management (BDIDM) in addressing challenges of Identity Management

## 3. Research Methodology

This exploratory study is based on secondary data collected from various studies published on peer-reviewed journals and databases and searched through Google Scholar, Web of Science, Scopus, etc. Various studies have been published on blockchain and digital identity management. This study is based on keyword search and using abstract and study topics to choose relevant papers. Some of the search terms used are "blockchain", "decentralized identity management", "organizational security", "distributed ledger", etc.

## 4. Data Analysis

### 4.1.Implications of adopting Identity Management for Organizational Security

Identity Management (IDM) is a critical security measure which reduces security breaches in companies "(Whitman & Mattord, 2021). However, there are several challenges of IDM, such as, vulnerabilities in system architecture, authentication approaches, imbalance between privacy and security, weak credential and credential reuse, and pressure to achieve "secure IoT" and "secure cloud."

#### *4.1.1. Vulnerabilities in Authentication*

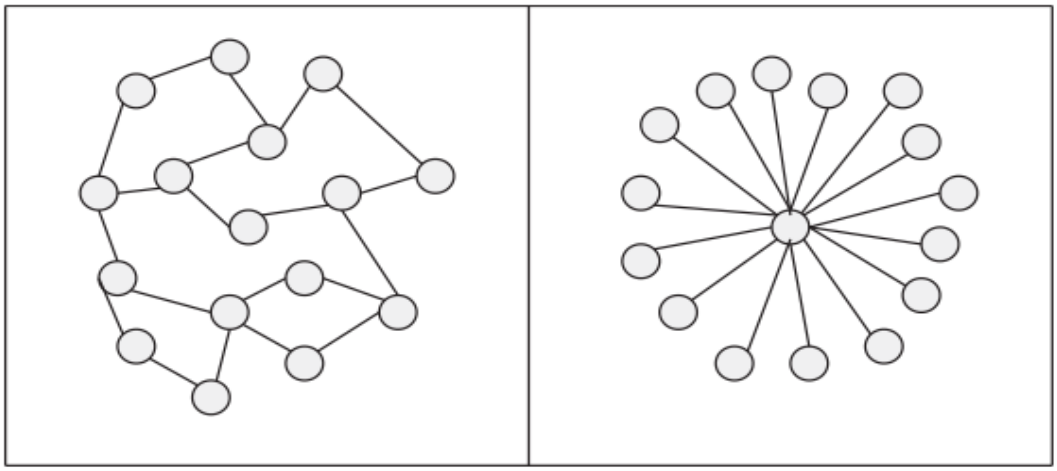
Authentication is a code of data security which challenges user to provide data which proves formally that they may log onto it and known by the system. Also known as "user credentials", that information may be available in different forms, i.e., from passwords to biometrics, and that can be used as authentication approach (Whitman & Mattord, 2021). Sadly, every authentication approach has some vulnerabilities and can be affected. Knowledge-oriented approaches like PIN and passwords can be compromised by guessing attacks like "rainbow table, dictionary, brute force, etc." (Whitman & Mattord, 2021). In addition, users may face problems in matching their passwords to various accounts (Marky et al., 2018). Magnetic or smart cards can be stolen or lost. Hard biometrics like fingerprints and iris scans are costly to use and invasive to privacy. Additionally, their effectiveness relies on their false-negative and false-positive rates (Kiran et al., 2018; Seitz et al., 2017)." There are also some soft biometrics approaches like handwriting and signatures, along with geolocation approaches like "Indoor Positioning Systems (IPS), Global Positioning Systems (GPS), etc." are secondary to verification of genuine user (Xiaofeng et al, 2019).

#### *4.1.2. IDM System Architecture vulnerabilities*

Centralized IDM embeds serious problem of "single point of failure (SPOF)" as they rely on centralized server for storage of identity information. Identity data is exposed due to compromised server and it may not be available for longer (Liu et al., 2019). Figure 1

(left) shows a distributed system with similar nodes having consumer and provider of services. In case of failure of one node, others can still take over. Right side shows client server or centralized server, where server offers services to consume for clients (Drescher, 2017). The entire system would be turned down by the failure of server "(Liu et al., 2019). Over 50% of nodes are compromised in a distributed system, such as blockchain to get the whole system down, which is not easy to achieve (Kshetri, 2017).

Figure 1 – Distributed and Centralized Architecture



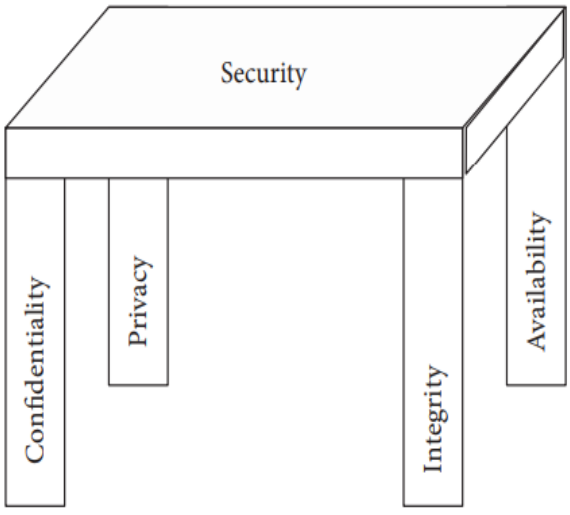
Source – Drescher (2017)

*4.1.3. Balance between Privacy and Security*

Existing data breaches in companies showed the need to access and identify management systems (Karanja & Rosso, 2017). Sometimes, companies overlook privacy as security managers face the problem of identity information. Companies have to comply with strategy seeking ownership of the user, which consists of direct contact and getting a lot of information as much as possible on potential consumers. There is a need to protect privacy for security managers while complying with regulations like "POPIA in South Africa." Users definitely need best services provided in easy ways and focused more on privacy infringements (Breuer et al., 2015). The "CIA triad" has been the standard for security in both government and industry since the mainframe growth, according to Whitman & Mattord (2021), which was formally and apparently introduced in 1998 by Donn Parker.

Confidentiality avoids unauthorized access to user data; Integrity avoids unauthorized alteration of information; and Availability ensures availability of information to the verified users in CIA triad (Whitman & Mattord, 2021). However, privacy is still needed for a digital system. It avoids unauthorized access to private data of clients, employees, and partners. Figure 2 shows a common application of CIA extended as Trust Service Framework (TSF)" proposed to help in accounting information by Romney et al. (2012). Just like each of four legs is important to keep the table standing, the TSF framework recommends both security and privacy for the CIA triad.

**Figure 2** – The CIA Triad with the TSF




Source – Romney et al. (2012)

*4.1.4. Weak Credentials and Data Reuse*

With the rise in internet penetration, a lot of online services force users to make lots of accounts with specific services for subscription, making it tiresome to match every account with different ids and passwords (Whitman & Mattord, 2021). Users are reusing same login credentials on various services (Shehu et al., 2019). Hence, once a service is compromised, it questions the security of other important services which are based on the same login id and password. Some users also use weak passwords which are easy to remember. However, imposers can also easily guess them. Brute force attacks are very common with high computation strength. A hacker named "Tinker" announced that a free password recovery tool can easily crack any 8-character password hash in Windows NTLM within 2.5 hours in 2019.

*4.1.5. Secure IoT and Cloud*

Identity Management systems were previously used for identification of an individual in an online system and authenticated them as valid user (Di Francesco Maesa & Mori, 2020). In this day and age, there is a need to authenticate and verify not just people, but also objects like smartphone, software, automobile, bots, appliances, etc., which marked the origin of IoT (Zhu & Badr, 2018). Identity management has become more complicated due to IoT and various smart devices which are interconnected to interact with humans and computers. IoT increases the risk of security breaches as security of those devices has been concerning (Whitman & Mattord, 2021). In addition, reliable and secure identity management has been a challenge for cloud computing (Charanya & Aramudhan, 2016).

### 4.2. Practicality of Blockchain-based Decentralized Identity Management (BDIDM) in addressing challenges of Identity Management

When it comes to anonymity, a blockchain has no centralized body that can block any account in case of misconduct or identity theft. However, it is also about obligation of each user to protect themselves against losing or forgetting any private key "(Kuperberg, 2019). Blockchain can introduce novel issues as users can manage all the cryptographic keys for the protection of identity (Di Francesco Maesa & Mori, 2020). Some researchers also have concerns on whether adopting blockchain solutions must be promoted and whether potential could be positive for change (Rot & Blaicke, 2019). Blockchain presents various options for a significant change in the growth of next-gen online protection strategies. First of all, since blockchain ensures integrity as it is very challenging to tamper the blockchain because of using cryptographic structure and lack of resilience. In addition, as Blockchains assume the adversaries in network, it is very costly for adversaries to make a compromise and it is also resilient to "single point of failure" (Shetty et al., 2019).

Those encouraging BDIDM posited that self-identity management can help to preserve privacy as uses can directly control their personal data. According to Di Francesco Maesa & Mori (2020), self-management can bring practical benefit of low cost for both organizations and users due to potential cost of private data leak and identity theft of centralized solutions and external and organizational services as they would not be required to protect and store private data anymore nor imitate it among the services with privacy issues and costs (Di Francesco Maesa & Mori, 2020).

Some studies have focused on adoption of blockchain, especially in its application on "supply chain management (SCM)" (Kamble et al., 2019; Queiroz and Fosso Wamba, 2019). This study focuses on organizational perspective of adoption of blockchain like the ones by Karamchandani et al. (2020) and Clohessy & Acton (2019). All those studies used one or combination of frameworks like "The Theory of Planned Behavior (TPB), Technology Acceptance Model (TAM), Unified Theory of Acceptance and Use of Technology (UTAUT), and "Technology Readiness Index (TRI)."

This study observes three factors affecting the adoption of BDIDM for organizational security, i.e., "Technology, Organization, and Environment (TOE)". This study redefines "TOE-BDIDM" framework, which was originally proposed by Baker (2012) as illustrated in Figure 3. The revised model

adopts TOE in context of blockchain and information security. For instance, the items "awareness" and "readiness" have been added as blockchain is relatively new concept (Demir et al., 2020; Upadhya, 2020). Standardization and governance of blockchain would also affect decision in adopting BDIDM in companies (Butijn et al, 2020).

*4.2.1. Technology*

This context covers technologies used by organization and the ones available in the market but still not adopted yet. Technologies which have been used affect adoption decision of an organization by evaluating the boundaries of scope and extent of using technological change. Technological innovations which are available but still not adopted affect the decision-making in adoption by the organization by setting limits on possibility and showing how organizations can adapt and evolve with the use of technology (Baker, 2012). Current technologies like centralized control to access may play a vital role in adoption of BDIDM as they may not support distributed architecture (Marsalek et al., 2019). However, some vendors are offering BDIDM products like KYV-Chain, IBM, Microsoft, UniquID, Oracle, etc.

*4.2.2. Organization*

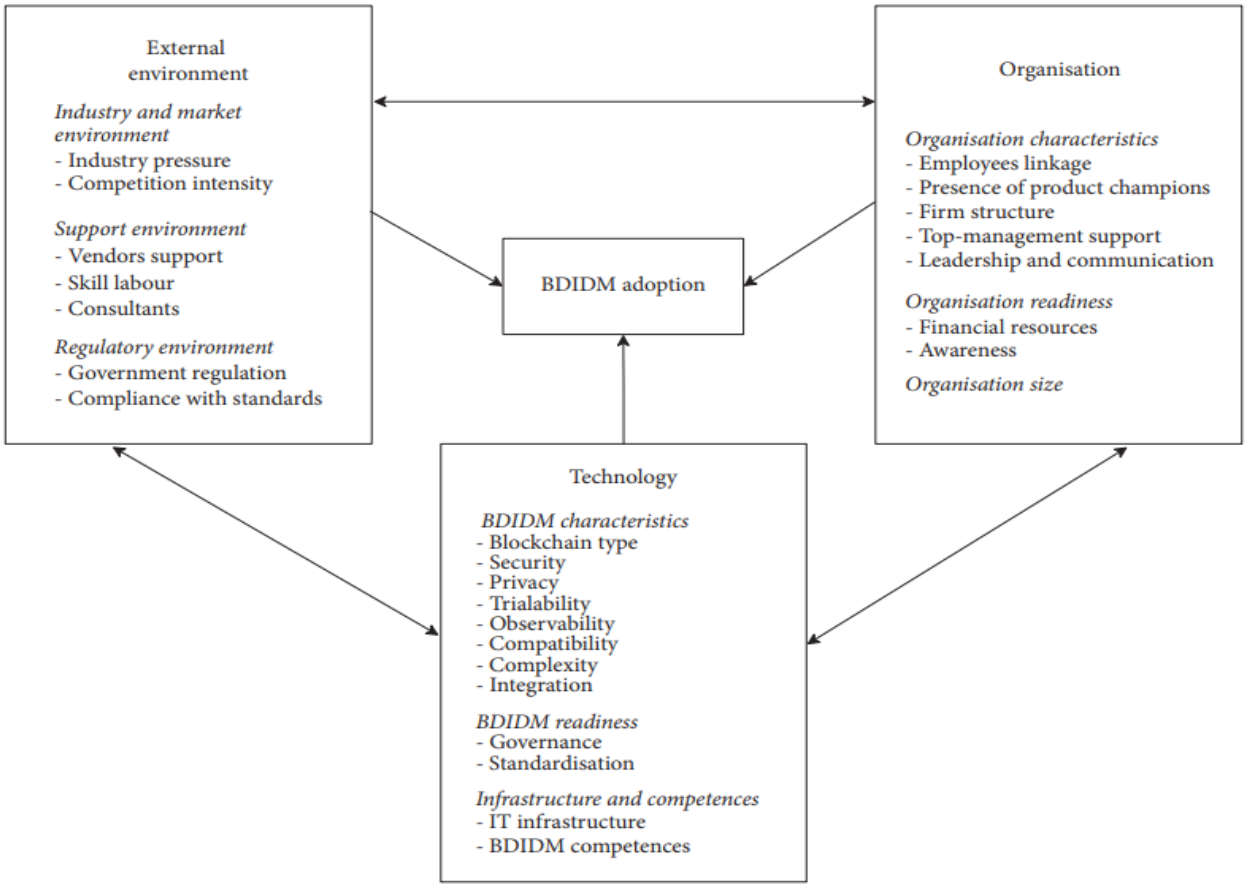
This context includes resources and characteristics of a firm to affect adoption in various ways. Innovation can be promoted by formal mechanisms associating various organizational units and internal boundaries. Companies with decentralized and organic structure may be ideal for the stage of adoption of BDIDM. People with formal reporting, well-defined roles, and centralized decision-making for employees may be ideal for the stage of implementation (Baker, 2012). Organizational communication is the second process which can either limit or promote adoption. Top management support is important to prepare a corporate culture which admires change. The role of innovation is defined in the overall strategy of an organization, indicating value of subordinates, building skilled team, and rewarding programs which can cast an attractive firm vision (Baker, 2012). As organizations are supposed to be hostile in privacy, company's readiness and top management are the key enablers for adopting blockchain (Clohessy & Acton, 2019).

Third is the size of an organization, given minor needs as there is a lack of several empirical studies confirming their association with adoption of innovation (Baker, 2012). Financial cost is known to have a huge impact. It may be associated with adoption of BDIDM as it is known to be quite costly for implementation (Demir et al., 2020) both in terms of human competencies and finance. However, some studies related to blockchain showed that large firms might be more likely to use BDIDM instead of small and medium enterprises (Clohessy & Acton, 2019). In addition, awareness, reluctance, and cultural adaption may also affect adopting blockchain-based distributed identity management (Upadhyay, 2020)."

*4.2.3. Environment*

The context of external environment is based on overall structure of the industry, which includes dominant firms, competition, etc. irrespective of existence of regulatory environment and tech service providers. For example, adoption of innovation can be affected by industry lifecycle. Companies serving in industries which are growing rapidly may innovate faster than those in industries which are declining or have been matured enough. In the same way, availability of labor, skills, and consultants may affect adoption due to support infrastructure (Baker, 2012). In the field of identity management like legal obligations to protect user data for organizations, standards like ISO, and NIST (Hufstetler et al., 2017), cyber-threat landscape could pose a serious impact to adoption of BDIDM in companies (Grassi et al., 2017). However, there is still lack of policies and regulatory guidelines to standardize blockchain in organizations (Duy et al., 2018).

Figure 3 – The Proposed TOE-BDIDM Framework




Source – Mulaji & Roodt (2021)

## 5. Discussion and Conclusion

This study was based on literature search for providing backdrop of blockchain-based distributed identity management. This study was based on practicality of blockchain for decentralized identity management for organizational security. This study found that identity management is based on managing aspects of authentication and identification of information. In identification, each entity is labelled with identifier. In authentication, authorized users are verified. IDM is important as system should allow access just to authorized users.

Blockchain is a rapidly growing phenomena, which includes distributed record of information about user identity. Blockchain consists of consensus protocol to manage interactions with participants and data security can be assured with cryptography. It is possible to implement blockchain in three important ways – "public permissioned, private permissioned, and public permissionless." Blockchain is the technology to implement distributed identity management. A lot of claims made about blockchain has some theoretical foundation. It verifies that those claims are factual, such as its potential to manage problems related to identity management in organizations.

## References

1. Panait, A. E., Olimid, R. F., & Stefanescu, A. (2020). Identity Management on Blockchain--Privacy and Security Aspects. arXiv preprint arXiv:2004.13107.
2. Wang, H., & Jiang, Y. (2020). A novel blockchain identity authentication scheme implemented in fog computing. Wireless Communications and Mobile Computing, 2020, 1-7.
3. Dunphy, P., & Petitcolas, F. A. (2018). A first look at identity management schemes on the blockchain. IEEE security & privacy, 16(4), 20-29.
4. Faber, B., Michelet, G., Weidmann, N., Mukkamala, R. R., & Vatrapu, R. (2019). BPDIMS: A blockchain-based personal

data and identity management system. In The 52nd Hawaii International Conference on System Sciences. HISS 2019: HISS 2019 (pp. 6855-6864). Hawaii International Conference on System Sciences (HICSS).

5. Zhu, X., & Badr, Y. (2018). Identity management systems for the internet of things: a survey towards blockchain solutions. Sensors, 18(12), 4215.
6. Lim, S. Y., Fotsing, P. T., Almasri, A., Musa, O., Kiah, M. L. M., Ang, T. F., & Ismail, R. (2018). Blockchain technology the identity management and authentication service disruptor: a survey. International Journal on Advanced Science, Engineering and Information Technology, 8(4-2), 1735-1745.
7. Raju, S., Boddepalli, S., Gampa, S., Yan, Q., & Deogun, J. S. (2017, May). Identity management using blockchain for cognitive cellular networks. In 2017 IEEE International Conference on Communications (ICC) (pp. 1-6). IEEE.
8. Shetty, S., Kamhoua, C. A., & Njilla, L. L. (Eds.). (2019). Blockchain for distributed systems security. John Wiley & Sons.
9. Kshetri, N. (2017). Blockchain's roles in strengthening cybersecurity and protecting privacy. Telecommunications policy, 41(10), 1027-1038.
10. Kuperberg, M. (2019). Blockchain-based identity management: A survey from the enterprise and ecosystem perspective. IEEE Transactions on Engineering Management, 67(4), 1008-1027.
11. Bernabe, J. B., Canovas, J. L., Hernandez-Ramos, J. L., Moreno, R. T., & Skarmeta, A. (2019). Privacy-preserving solutions for blockchain: Review and challenges. IEEE Access, 7, 164908-164940.
12. Charanya, R., & Aramudhan, M. (2016, February). Survey on access control issues in cloud computing. In 2016 International Conference on Emerging Trends in Engineering, Technology and Science (ICETETS) (pp. 1-4). IEEE.
13. Whitman, M. E., & Mattord, H. J. (2021). Principles of information security. Cengage Learning, Boston, Massachusetts, US.
14. Marky, K., Mayer, P., Gerber, N., & Zimmermann, V. (2018, October). Assistance in daily password generation tasks. In Proceedings of the 2018 ACM International Joint Conference and 2018 International Symposium on Pervasive and Ubiquitous Computing and Wearable Computers (pp. 786-793).
15. Kiran, M. A., Yogeshwari, P., Bhavani, K. V., & Ramya, T. (2018, August). Biometric authentication: a holistic review. In 2018 2nd International Conference on I-SMAC (IoT in Social, Mobile, Analytics and Cloud)(I-SMAC) I-SMAC (IoT in Social, Mobile, Analytics and Cloud)(I-SMAC), 2018 2nd International Conference on (pp. 428-433). IEEE.
16. Seitz, T., Mathis, F., & Hussmann, H. (2017, November). The bird is the word: A usability evaluation of emojis inside text passwords. In Proceedings of the 29th Australian Conference on Computer-Human Interaction (pp. 10-20).
17. Xiaofeng, L., Shengfei, Z., & Shengwei, Y. (2019). Continuous authentication by free-text keystroke based on CNN plus RNN. Procedia computer science, 147, 314-318.
18. Liu, Y., Sun, G., & Schuckers, S. (2019, June). Enabling secure and privacy preserving identity management via smart contract. In 2019 IEEE conference on communications and network security (CNS) (pp. 1-8). IEEE.
19. Drescher, D. (2017). Planning the blockchain: the basic concepts of managing ownership with the blockchain. Blockchain Basics: A Non-Technical Introduction in 25 Steps, 57-62.
20. Karanja, E., & Rosso, M. A. (2017). The chief information security officer: An exploratory study. Journal of International Technology and Information Management, 26(2), 23-47.
21. Breuer, J., Ranaivoson, H., Buchinger, U., & Ballon, P. (2015, July). Who manages the manager? Identity management and user ownership in the age of data. In 2015 13th Annual Conference on Privacy, Security and Trust (PST) (pp. 22-27). IEEE.

22. Romney, M., Steinbart, P., Mula, J., McNamara, R., & Tonkin, T. (2012). Accounting Information Systems Australasian Edition. Pearson Higher Education AU.
23. Shehu, A. S., Pinto, A., & Correia, M. E. (2019, June). Privacy preservation and mandate representation in identity management systems. In 2019 14th Iberian Conference on Information Systems and Technologies (CISTI) (pp. 1-6). IEEE.
24. Di Francesco Maesa, D., & Mori, P. (2020). Blockchain 3.0 applications survey. Journal of Parallel and Distributed Computing, 138, pp. 99–114.
25. Mulaji, S. S., & Roodt, S. S. (2021). The practicality of adopting blockchain-based distributed identity management in organisations: a meta-synthesis. Security and Communication Networks, 2021, 1-19.
26. Hufstetler, W. A., Ramos, M. J. H., & Wang, S. (2017, October). NFC unlock: Secure two-factor computer authentication using NFC. In 2017 IEEE 14th International Conference on Mobile Ad Hoc and Sensor Systems (MASS) (pp. 507-510). IEEE.
27. Duy, P. T., Hien, D. T. T., Hien, D. H., & Pham, V. H. (2018, December). A survey on opportunities and challenges of Blockchain technology adoption for revolutionary innovation. In Proceedings of the 9th International Symposium on Information and Communication Technology (pp. 200-207).
28. Grassi, P., Fenton, J., Lefkovitz, N., Danker, J., Choong, Y. Y., Greene, K., & Theofanos, M. (2017). Digital identity guidelines: Enrollment and identity proofing (No. NIST Special Publication (SP) 800-63A (Withdrawn)). National Institute of Standards and Technology.
29. Rot, A., & Blaicke, B. (2019, June). Blockchain's future role in cybersecurity. analysis of defensive and offensive potential leveraging blockchain-based platforms. In 2019 9th International Conference on Advanced Computer Information Technologies (ACIT) (pp. 447-451). IEEE.
30. Kamble, S., Gunasekaran, A., & Arha, H. (2019). Understanding the Blockchain technology adoption in supply chains-Indian context. International Journal of Production Research, 57(7), 2009-2033.
31. Queiroz, M. M., & Wamba, S. F. (2019). Blockchain adoption challenges in supply chain: An empirical investigation of the main drivers in India and the USA. International Journal of Information Management, 46, 70-82.
32. Clohessy, T., & Acton, T. (2019). Investigating the influence of organizational factors on blockchain adoption: An innovation theory perspective. Industrial Management & Data Systems, 119(7), 1457-1491.
33. Karamchandani, A., Srivastava, S. K., & Srivastava, R. K. (2020). Perception-based model for analyzing the impact of enterprise blockchain adoption on SCM in the Indian service industry. International Journal of Information Management, 52, 102019.
34. Baker, J. (2012). The technology–organization–environment framework. Information Systems Theory: Explaining and Predicting Our Digital Society, Vol. 1, 231-245.
35. Butijn, B. J., Tamburri, D. A., & Heuvel, W. J. V. D. (2020). Blockchains: a systematic multivocal literature review. ACM Computing Surveys (CSUR), 53(3), 1-37.
36. Demir, M., Turetken, O., & Mashatan, A. (2020). An enterprise transformation guide for the inevitable blockchain disruption. Computer, 53(6), 34-43.
37. Upadhyay, N. (2020). Demystifying blockchain: A critical analysis of challenges, applications and opportunities. International Journal of Information Management, 54, 102120.
38. Marsalek, A., Kollmann, C., Zefferer, T., & Teufl, P. (2019, May). Unleashing the full potential of blockchain technology for security-sensitive business applications. In 2019 IEEE International Conference on Blockchain and Cryptocurrency (ICBC) (pp. 394-402). IEEE.

# ADOPTING "INTERNET OF MANUFACTURING THINGS (IOMT)" FOR DATA-DRIVEN INNOVATIONS - A SYSTEMATIC REVIEW

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## ABSTRACT

*Present-day manufacturing industry has been investing in latest technologies like big data, "Internet of Things (IoT), cybersecurity, and cloud computing" to deal with intricacy of the system, boost performance of production, improve visibility of data, and stand out in competition in the international market. These technological advancements are enabling new smart manufacturing generation rapidly, i.e., digital system to integrate manufacturing companies in real-world with digital enterprises. Making the most of digital systems relies on developing latest approaches for data-driven innovations related to "Internet of Manufacturing Things (IoMT)". This study is aimed to discuss opportunities and challenges in adopting IoMT for innovations. This study will hopefully help researchers to perform more detailed investigations and engage in multi-disciplinary efforts for advancing technologies related to IoMT.*

***Keywords**: IoMT, Internet of Manufacturing Things, cyber-physical system, manufacturing companies, cybersecurity, cloud computing, IoT, Internet of Things*

## 1. Introduction

Modern manufacturing companies are known to adopt advanced features like personalization, adaptation, quality, responsiveness, reliability and quality at unexpected scales to stand out in competition in global markets. Latest products have been indispensable and important part of daily lives. For instance, automobiles and phones are more than just travel and communication devices. They are getting entrenched with services so that they can be personal devices.

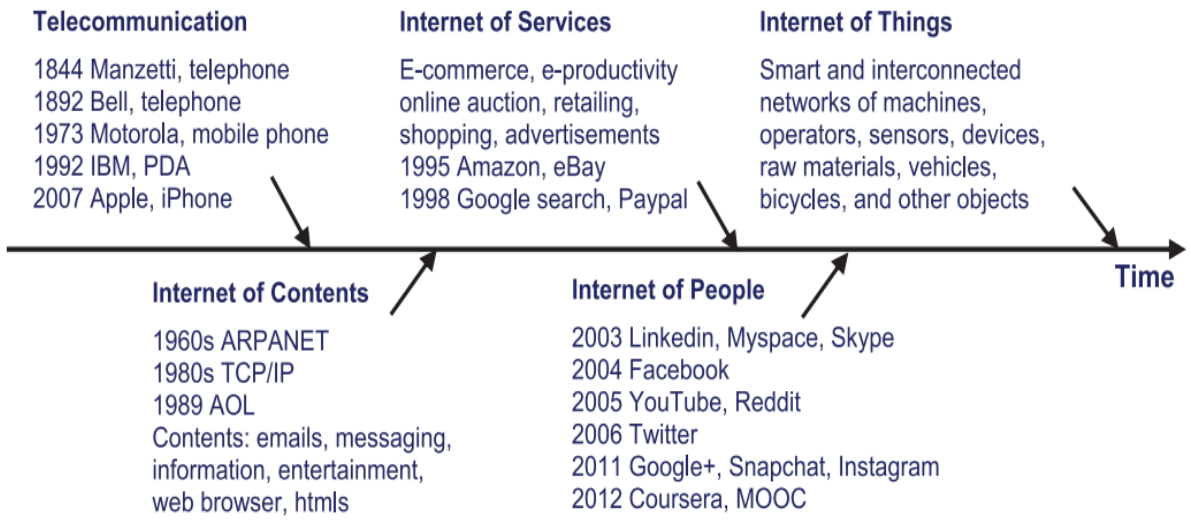
Products are getting self-aware. Hence, manufacturing systems have become very complex to deploy modern sensors to improve visibility and controllability of information system. Interestingly, "industry 4.0 is the major driving factor for manufacturing units to adopt next gen cyber-physical systems in order to achieve smart manufacturing." To a great extent, the level of "smartness" relies on data-based innovations which provide all information to ensure availability of information needed for operations across the organization (Kusiak, 2017).

## 2. The Evolution

Before discussing the impact of "Internet of Things (IoT)" for manufacturing, it is important to discuss the evolution of internet which has covered every aspect of lifestyle. In 2015, over 47% of global population was estimated to be using internet, according to the "Telecommunication Development Bureau (2017)." Figure 1 illustrates the timeline from the beginning of internet to the era of IoT.

In 1844, Innocenzo Manzetti conceptualized "speaking telegraph" for telecommunication in the pre-internet era. In 1892, Alexander Bell made the first phone call from New York to Chicago. In 1960, the ARPANET project was funded by the "US Department of Defense" and developed the first "prototype of digital computer networks to make fault-tolerant communications." Rapid developments have been observed from the 1960s to 1990s in the internet like information, email, web browsing, entertainment, and HTML. Since 1990s, internet started to provide a lot of services to business and individual users like retailing, auctions, ads, shopping, financial transactions, and online search. Since 2000s, social media has made billions of people interconnected, such as Facebook, LinkedIn, and Twitter.

Figure 1 –Journey of Internet from Telecommunication to IoT




Source – Yang et al. (2019)

In this day and age, the digital world has quickly made a transition from browsing the web to Internet of Things (IoT). A lot of smart devices are being connected to the web. International Data Corp (2018) predicted 212 billion devices to be connected online by the year 2020. With enhanced connectivity, manufacturing sector is not left behind when looking forward to "smart factory" technology which involves the use of cyber-physical systems to ensure the availability of all information related to manufacturing process, where required, when needed, and in the required form in the whole supply chain in order to complete lifecycle in various small, medium and large organizations (Smart Manufacturing Leadership Coalition, 2018).

## 3. Challenges and Opportunities in adopting "Internet of Manufacturing Things (IoMT)"

As manufacturing industry has never been so smarter, a lot of operations are being conducted by large number of machines. It is observed that a lot of machines may perform same or different roles and some machines strongly depend on other machines' output just like a product range under pipeline. These strong connections may also vary as per various tasks to be performed. The connection between several machines has never been so important to improve the performance of future and current systems (Aitzhan & Svetinovic, 2016). The "Internet of Manufacturing Things (IoMT)" uses various sensors to track overall condition of machines deployed in an organization. Machine signatures and other sensory outputs enable decision making for the process. However, there are some challenges to make the most of IoMT for smart manufacturing –

### Challenge #1 – Tracking each machine's status

Manufacturers don't only need to check whether machines are busy or not, but they also need to check their health status and whether each machine is working properly. This information matters a lot as it helps the manufacturers to find out whether they can rely on a machine for performing certain task. They can simply use sensors to perform both sensing and analyzing as per signals from the sensed information (Bukkapatnam et al., 2009). These sensors can get power supply from either batteries or direct supply. However, with the rise in machines, given their potential lifespan of 10 to 20 years, it is not easy to provide battery support or wired supply in some cases. For instance, wires affect sensors' portability. For instance, sensors' portability can be reduced by wires. It is also time-consuming and challenging to replace batteries of each sensor from time to time. Batteries are also not efficient or safe in extreme situations.

**Challenge #2 – Assigning task to each machine**

After tracking status of each machine, another question that arises is whether each machine must comply with rigorous schedule. The sudden malfunction and dynamic changes in tasks for the machines may make it challenging to optimize schedule for total operation time and energy. Dynamic distribution of tasks to machines as per sensed status is important for proper operation.

**Challenge #3 – Communication between machines**

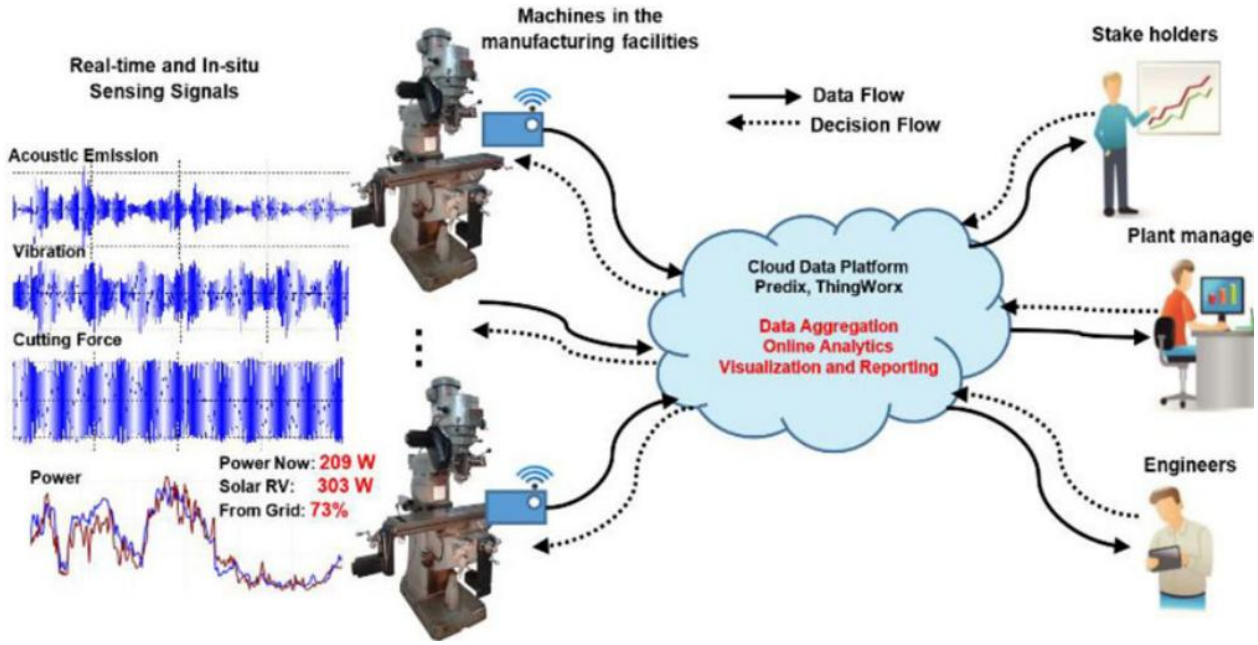
These days, "some tasks are performed by machines from various sources, even from other countries. It shows the risks of problems in reliability of communication and its impact on collaboration from other sources. In addition, it is not easy to control machines which are closed from the outside even with the two-way flow of data." For example, an operator can send a code to run a machine, but they cannot control the machines directly (Monostori et al., 2016).

When these challenges are addressed, new opportunities can be opened for applied and fundamental research in "sustainable manufacturing, manufacturing, Cognitive Supply Chain, and Industrial Internet of Things (IIoT)." After discussing all those challenges, here are some of the opportunities related to IoMT -

**Opportunity #1 – Integrating Old Systems into Smart Manufacturing**

Even with the rise in startup culture and latest manufacturing techniques, there are still several manufacturers still using legacy machines and staying untouched by the wave of digitalization. Even though old assets are precious for those manufacturers and are still working well for production, they don't have in-process and real-time control systems and sensors. Hence, small manufacturers stand behind the competition globally as they don't have visibility of information and ability to deal with complexity of modern environments. Building connectivity with old machines is the major problem here. Figure 2 illustrates how old machines can be retrofitted with IoMT sensing to provide unexpected opportunity in modern manufacturing. It is very important to develop advanced IoT sensors to constantly gather "in-situ" data from the machines, transfer the same to the cloud, and interact with stakeholders and other machines.

Figure 2 – Integrating Old Machines with IoMT for adopting smart manufacturing




Source – Yang et al. (2019)

**Opportunity #2 – Automated sensing of machine status**

It is vital to use a supply system which is powered on its own to sense machine's status. With self-powered sensors, no battery or wired connection will be required for power supply. With added data transition and wireless connectivity, a sensor system can be used in a lot of machines effectively to reduce maintenance expenses and improve portability. The sensor node can be powered by end-to-end implementation of features or processing raw data (Nee et al., 2012).

**Opportunity #3 – Task distribution and scheduling**

It is possible to study the "task scheduling or distribution methodology" among several machines for several services or tasks with the help of sensed data.

**Opportunity #4 – Synergy between machines**

It also becomes vital to enhance the connectivity between a range of machines to collaborate remotely. There might be a short-term blockage in communication among machines in various places because of unreliable channels and physical distance.

## 4. Conclusion

To stand out in competition, manufacturing companies are looking ahead to create new services and products by adopting modern sensor technologies to improve access to information and control systems. Even though data, sensors, and IT systems are available already in factories, they are not integrated well to the IoT level. Industry 4.0 is recently aimed to boost manufacturing with cyber-physical systems to perform smart manufacturing. IoT sensors collect a huge amount of data in real world. Technological advancements are required to realize the complete potential of IoMT.

## References

1. Kusiak, A. (2017). Smart manufacturing. International Journal of Production Research, 56(1–2), 508–517.
2. Telecommunication Development Bureau (2017). International Telecommunication Union (ITU) ICT Facts and Figures. Available at http://www.itu.int/en/ITU-D/Statistics/Pages/facts/default.aspx.
3. International Data Corporation (2018). Available at http://www.idc.com/.
4. Smart Manufacturing Leadership Coalition (2018). Available at https://smartmanufacturingcoalition.org/.
5. Yang, H., Kumara, S., Bukkapatnam, S. T., & Tsung, F. (2019). The internet of things for smart manufacturing: A review. IISE transactions, 51(11), 1190-1216.
6. Aitzhan, N. Z., & Svetinovic, D. (2016). Security and privacy in decentralized energy trading through multi-signatures, blockchain and anonymous messaging streams. IEEE Transactions on Dependable and Secure Computing, 15(5), 840-852.
7. Bukkapatnam, S. T., Yang, H., & Madhavi, F. (2009). Towards prediction of nonlinear and nonstationary evolution of customer preferences using local markov models. In Product Research: The Art and Science Behind Successful Product Launches (pp. 271-287). Springer Netherlands.
8. Monostori, L., Kádár, B., Bauernhansl, T., Kondoh, S., Kumara, S., Reinhart, G., ... & Ueda, K. (2016). Cyber-physical systems in manufacturing. Cirp Annals, 65(2), 621-641.
9. Nee, A. Y., Ong, S. K., Chryssolouris, G., & Mourtzis, D. (2012). Augmented reality applications in design and manufacturing. CIRP annals, 61(2), 657-679.

# SYSTEMATIC LITERATURE REVIEW ON DEEP LEARNING METHOD FOR NEONATAL HEALTH

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## ABSTRACT

*Neonatal diseases are some of the major causes of premature mortality and morbidity across the world. There is a rise in knowledge and awareness of pathophysiology of diseases and various strategies to reduce disease burden. However, there is lack of accuracy and improvements in treatment outcomes. There are various factors responsible for limited success, such as similarity of symptoms which leads to misdiagnosis and lack of early detection and timely intervention. The challenge is more severe in developed countries like India. One of the major problems is low access to treatment and diagnosis because of lack of neonatal health experts. A lot of neonatal health experts have to diagnose this kind of disease only through interviews because of lack of medical facilities. They may have lack of complete understanding of all variables responsible for neonatal disease from the interview. Due to these reasons, diagnosis can be inconclusive and may cause misdiagnosis. Deep learning (DL) and machine learning (ML) have a lot of potential to predict neonatal health complications with historical data. When it comes to implementation, these cutting-edge technologies showed promising real-time models to predict neonatal sepsis at the onset and reduce mortality rate. This review paper contemplates various procedures to predict neonatal sepsis using ML and DL techniques. Researchers started the survey process by using search terms and keywords like "machine learning", "deep learning", "neonatal sepsis", "artificial intelligence", "neonatal health" etc. Literature search was conducted from Web of Science, Scopus, and PubMed databases from 2013 to 2022. This literature survey discusses the role of deep learning models that would help clinicians and researchers to make decisions and provide treatment at the onset.*

***Keywords**: deep learning, machine learning, sepsis, neonatal sepsis, neonatal health, artificial intelligence, deep learning models*

## I. Introduction

Neonatal is a stage which includes cycle for 28 days after childbirth. This concept is widely used in the fields of healthcare and medical, especially for newborn care. Neonatal care is a specialty which covers well-being and overall health of babies during their first month of birth. It is important for newborns or babies born with medical conditions which need proper attention. Neonatal nurses and neonatologists are the experts who provide critical medical care, manage any health conditions during the early stage, and track development of baby. Newborns are too fragile and they have specific healthcare needs. Due to these reasons, there is a need to develop specialized therapies and multifaceted approaches to manage various medical challenges [1].

Deep learning is widely applied in healthcare [2]. Apart from diagnosing a specific disease, deep learning is used in prognosing occurrence of potential diseases. It is a paradigm shift underpinned by a lot of datasets that are available in public domain like MRI, Ultrasound, fingerprint, ECHOs, DHCP, CXR, X-Ray, and photoacoustic datasets that are designed for neonatal care [3]. Deep learning techniques like computer vision and "convolutional neural networks (CNNs)" can be helpful dealing with the problems of skewed and small datasets which usually characterize tasks related to "neonatal image recognition." These tasks depend on 2 stages – scene of stage or automated image segmentation and identifying the result of interest. Some of the common examples are estimating gestational age of babies with newborn images [4], analysing clinical procedure footages like resuscitation of newborn [5], and assessing pain [6].

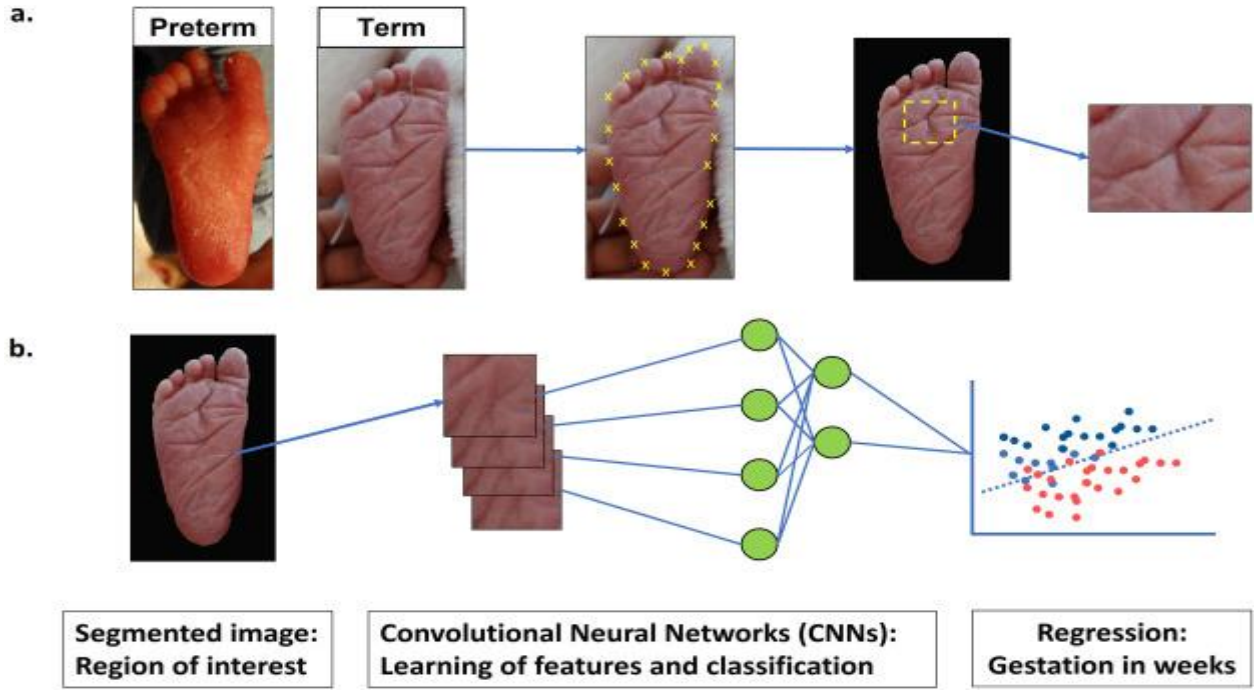



Fig. 1. (a) Plantar surface imagery of post-term and preterm baby and (b) Images analyzed with "deep machine learning" passing from various layers with CNNs to be categorized into any of 5 classes like "extremely preterm, very preterm, moderate preterm, term and post-term" [7]

When it comes to determine gestational age, prenatal ultrasound performed in early dates is the gold standard [4]. However, there is a problem of availability, especially in healthcare settings where resources are limited. Images of a face, foot, and ear of a newborn are captured with an automated "postnatal gestational age estimation tool." Those pictures have been processed through a "segmentation stage" with the use of "fully convolutional networks (FCNs)" (Fig. 1). The system was first trained to identify the target body part from the picture and filter the background. FCN is used to label the pixels of target body part, create binary masks, and compare the same to masks when pictures were annotated manually. The CNNs are used to learn characteristics and classify images into gestational categories for each part of the body. Same methods can be used to help in diagnosing neonatal health conditions like syndromes when connecting them with rest of the information [7].

## II. Related Works

There is a lot of potential of machine learning frameworks given increasing complications among high-risk neonates getting ICU treatments. Various studies have used machine learning models for forecasting of neonatal disorders and mortality. Some of the relevant studies to predict neonatal disease have been explored. "Supervised machine learning" models are used to diagnose neonatal illnesses and some of them are explored for proper application to evaluate neonatal data. Shirwaikar et al. [8] have critically discussed and analysed performance metrics and methods of techniques on neonatal data for suggesting different ways to boost performance. Ensemble technique is widely used with better prediction capability than decision trees, neural networks, and SVM.

Sheikhtaheri et al. [9] improved prediction efficiency of neonatal mortality and relevant risks using machine learning techniques. They collected dataset in two stages from Iran. They identified the factors causing mortality in infants like diseases before testing, training, and determining the effectiveness of various models like RF, ANN, SVM, Ensembles, and CHART. They achieved 94% accuracy with SVM.

Chowdhury et al. [10] used an "Artificial Neural Network (ANN)" model to train a multilayer perception to detect a design pattern to predict neonatal diseases. Their approach was compared with various models used earlier to predict neonatal illnesses like quick

propagation and conjugate gradient descent. They used 94 cases in proposed model of various signs and symptoms to test and achieve 75% accuracy.

Safdari et al. [11] came up with an advanced fuzzy logic system to predict neonatal mortality risk. They structured questionnaires and shared the same with neonatologists to acquire knowledge. They combined fuzzy and computational models as per the inference system to predict the risks of death. They developed model using MATLAB and C# for graphical interface and achieved 90% of accuracy.

## III. Methods

### *A. Selection Criteria*

This section covers studies selected after applying inclusion and exclusion criteria. Exclusion criteria includes papers without machine learning and deep learning models, statistical analysis, performance statistics, meta-analyses, and random clinical trials.

Inclusion criteria for this study includes studies with ML and DL algorithms used for detecting neonatal health conditions, case control groups, AI algorithms used for predictive model and feature selection, and papers published in peer-reviewed and English journals. Table 1 lists items covered in inclusion and exclusion criteria.

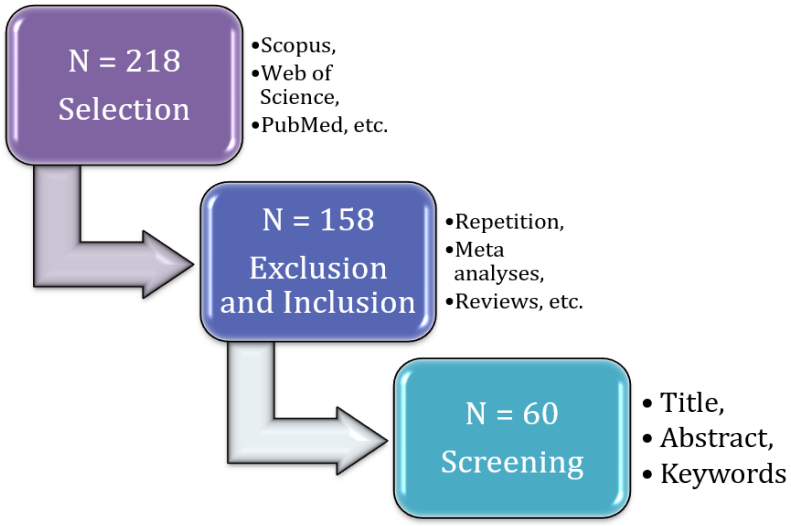
**Table 1 –** Inclusion and Exclusion Criteria

| Criteria Name | Inclusion | Exclusion |
|---|---|---|
| Year of publication | 2013 to 2023 | Studies published before 2013 |
| Language | English | Languages other than English |
| Types of studies | Papers with ML and DL algorithms for neonatal health | Review papers, books, etc. |
| Publications | Papers published in peer-reviewed journals and databases like IEEE, Scopus, Elsevier, Science Direct, etc. | Papers in any other publication not mentioned in inclusion criteria |

### *B. Data Selection*

This study follows "Preferred Reporting Items for Systematic Review and Meta Analysis (PRISMA)" guidelines (Figure 1) by selecting studies by title, abstract, and keywords. Researchers have screened complete text and excluded studies as per their findings, strategies, and characteristics. They also referred to consultations for final selection of papers. They chose 218 papers from Web of Science, Scopus, and PubMed databases from 2013 to 2022 after verification and excluded 158 papers due to reviews, meta analyses, and repetitions.

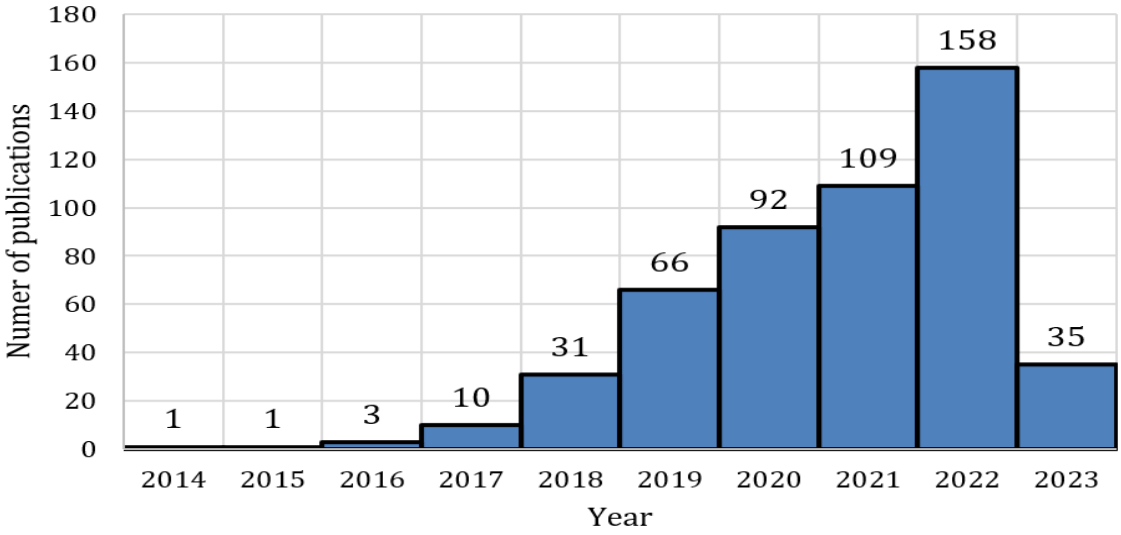
**Figure 1** – Flowchart of study selection as per PRISMA Guidelines



### *C. Analysing Google Trends*

In order to perform keyword search, Google Trends has been used to perform global search and ensure the relevance of keywords selected for the study. Figure 2 displays graphical representation of trends in image search, web search, and news search from 2013 to 2022. The web search patterns are displayed for terms like "deep learning" and "machine learning," followed by "neonatal" and "newborn." This pattern is also followed in news search where deep learning is leading. Searches like "neonatal" and "newborn" are relatively lower than "deep learning" in terms of scale. The scope for news searches is significantly limited as compared to web searches.

Figure 2 – Annual Trends of number of publications




### *D. Keyword search*

A comprehensive literature search has been conducted to gather relevant data and evidence from a huge range of bibliographic databases like IEEE, Scopus, Web of Science, PubMed, etc. There are similarities in databases' search engines, there are still some significant changes. By applying "title-abstract-keyword" filter, a full search has been conducted.

## IV. Overview Of Deep Learning Models

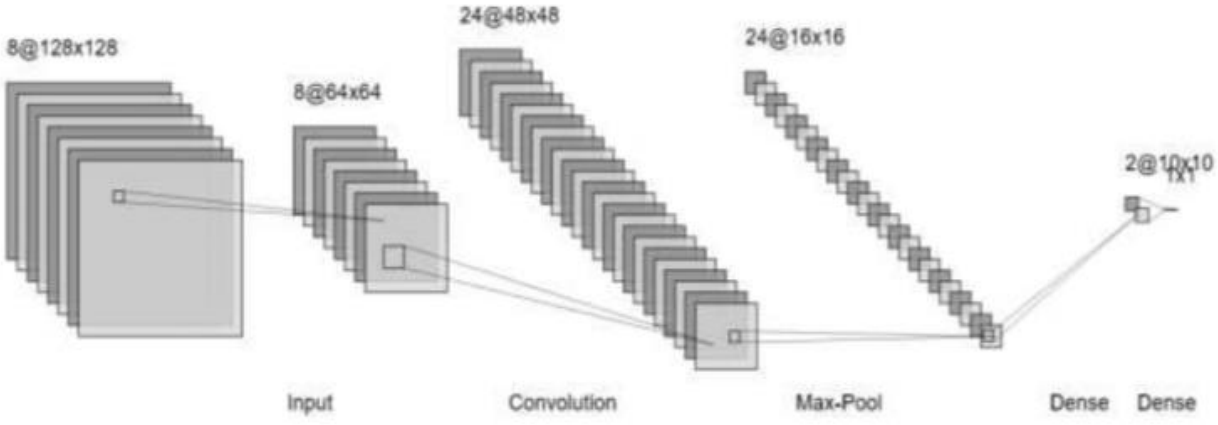
This study focuses on two of the most important deep learning models to classify subjects on the basis of whether they are affected by neonatal disease, i.e., CNN and LSTM/RNN. Alvi et al. [12] developed various ML classifiers for comparison. They discussed the approaches for training and building each deep learning model. Models not using neural network structures like "Tree-based classifiers, K-nearest neighbors, and support vector machines will not be covered as these models didn't need special attention during the phase of implementation and development. For testing and training data and have a fair distribution, a "Train/Test split is performed on Lopez-Martinez dataset with a ratio of 07:03. Hence, they used 70% of dataset for training the models and the rest 167 samples (30%) of dataset for validation and accuracy testing.

### *A. Convolutional Neural Network (CNN)*

CNN or "Convolutional Neural Network" is a unique form of feed-forward and multi-layer NN which is used widely in tasks associated with segmentation, image classification, computer vision, and object detection. Along with having connected layers like "Artificial Neural Network (ANN)," CNN also have pooling and convolutional layers. The CNN layers can gather the feature map and analyse the input with a range of filters. Then, max pooling layer gets this feature map to reduce the feature map size generated from the previous layer. It is vital to reduce the feature map size as it controls the dimensionality of map to its vital details and control the time for processing. It increases convergence to improve the performance of generalization [15]. A standard CNN is developed with one

convolutional layer and max pooling layer along with dense and fully connected layer. Figure 3 illustrates shows overall visualization of CNN model. Even though input data is similar to other models, input is fed in a different way as compared to CNN.

Figure 3 – Visualization of CNN structure [12]

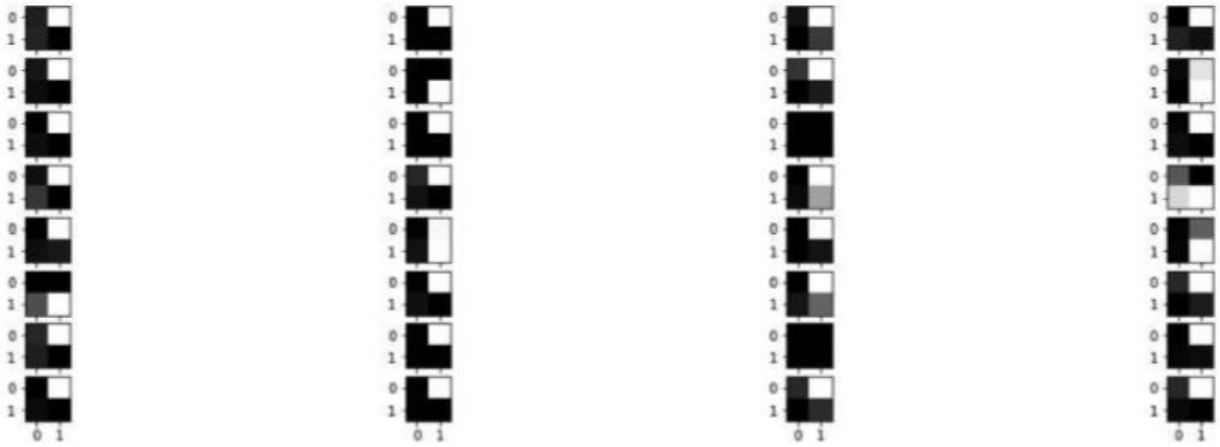



After passing the data through max pooling and convolutional processes, the outputs of condensed feature map pass on to a set of completely connected layers. With these layers, the maps are flattened to compare the potential of features. It keeps up until we achieved best performance. Another vital step is to flatten the feature maps as layers are well connected in convolutional model. These layers represent "artificial neural network (ANN)." Since ANN approaches take arrays on one dimension as input, there is a need to flatten 3D matrix of pixels in a 1D array. Hence, flatten generates input for the dense and well-connected model layer.

A max pooling layer of 2x2 is used and output map is flattened into ANN layer of 100 nodes. The output layer consists of 2 classification nodes with "softmax" activation to have potential for classification. Dropout can avoid over-fitting in CNN as the model can overfit small data for training [16]. Three optimization functions are used for CNN model – "(1) Adam Optimizer; (2) Stochastic Gradient Descend (SGD); and (3) Ada-delta Optimizer" [13]. However, SDG provided worst outcome for CNN model while Ada-delta showed best outcome.

Adadelta optimization is stochastic descent and gradient approach as per the rate of adaptive learning for each dimension. It fixes the problem of continual decay of rates across training and there is a need to fix the need to select global rate of learning manually [17]. Proper activation and loss functions evaluate the model accuracy. Hence, various functions have been tested to choose the best suited model. Figure 4 visualized the pooling filters in CNN.

Figure 4 – Max Pooling Filters in CNN [12]



*B. LSTM/RNN*

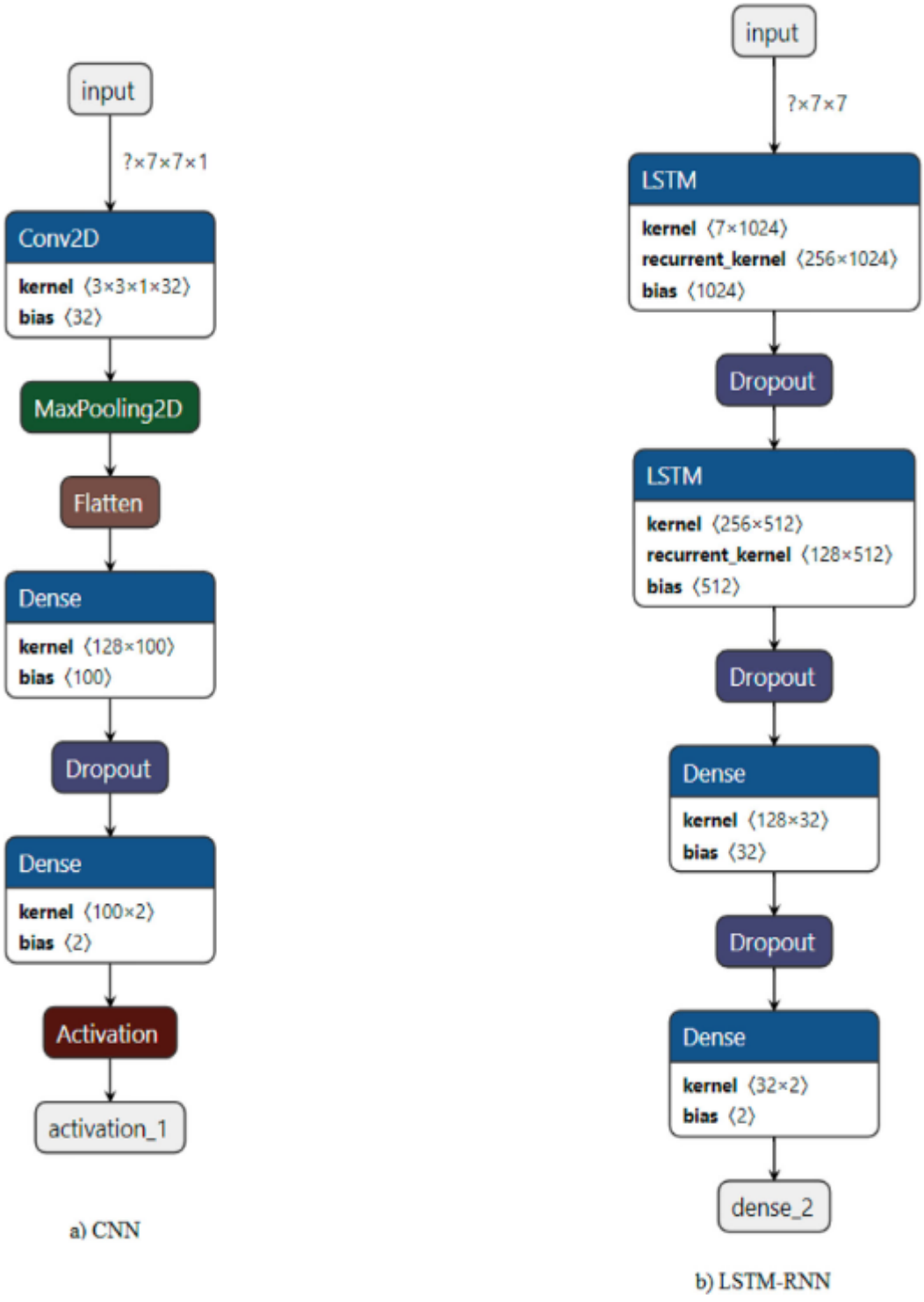
"Recurring Neural Network (RNN)" is a multi-layer network to analyze time series and sequential input like speech, text, videos, and other forms of data for prediction and classification. RNN is special model unlike CNN or ANN and it is not limited to a feed-forward movement. The portions of input are evaluated and it is compared with portions both after and before it. It can be performed by RNN with feedback loops and weighted memory loops. The benefit of RNN is that they are more than just about input length and predict sense with temporal context.

An output is achieved in RNN after each input on an individual layer. It can appear as "many-to-one, one-to-one, one-to-many, or many-to-many" input. After the RNN, neural net determines the features of input in sequence. It gives an out to evaluation in feedback loop. It enables model for analysis of existing feature in context of earlier characteristics. When RNN is trained, it is taught to assign an ideal weight to each feature of input. Later on, the RNN can evaluate the needed information to be sent to the feedback loop back regarding gradient. It is called as "Back-propagation Through Time (BPTT)" as it makes the "short-term memory" form. The simple RNN is known to have vanishing problem of gradient which means weights of network often get a small change. It may avoid the model in the worst-case scenario to keep the model from training anymore. The "Long Short Term Memory" model can be used to fix this problem which uses output and input gate, cell, and forget gate, to fix the problem of vanishing gradient [18].

Alvi et al. [12] designed an RNN with two LSTM units of 256 for first unit and 128 for another unit. Two layers are ideal for a lot of scenarios, even though the best layer numbers vary as per the case. More layers can be beneficial for more complicated scenarios. However, the model can be harder to train. These LSTM units can be followed with fully-connected feed-forward layer having 32 nodes. The dense layer and two LSTM layers consist of ReLU activation. The LSTM layers consist of added function of recurrent activation to activate the forget, input, and output gate. The sigmoid function is used to perform recurrent activation. In addition, each layer is followed by 0.2 dropout to avoid data overfitting. There are two nodes of the output with "softmax" activation like neural networks.

Adam is used as an optimizer in the RNN by Alvi et al. [12] with 0.001 of learning rate and 1e-6 of decay rate. Categorical cross-entropy is used to estimate the loss. Data is added into RNN like the way input data is entered into the CNN. Then, they passed the input as 2D matrix rather than 3D. It is because RNN is not being used as image classifier. There is no need for data to be converted into images to be fed to the network. Hence, colour channel is not needed. Figure 5 illustrates the model for (a) LSTM/RNN with hyper-parameters and (b) CNN model.

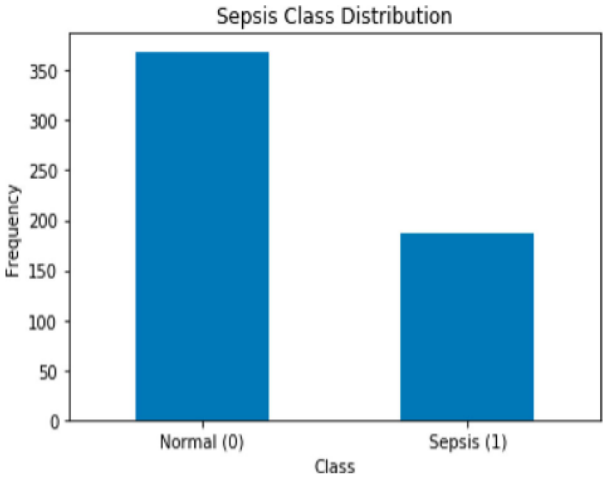
Figure 5 – Model structure for CNN and LSTM/RNN [12]




*C. Lopez-Martinez*

López-Martínez et al. [14] released their dataset to train ANN. They took 555 samples in the dataset with two different categories. 66% (n = 369) of total samples is neonatal sepsis negative and 186 samples (34%) is sepsis positive. The dataset is imbalanced with 1:2 of "positive to negative case ratio". Crecer's Hospital Centre in Cartagena, Colombia collected these sample data from 2016 to 2017. Neonates below 72 hours old were diagnosed with sepsis as per blood culture tests and clinical tests. Control samples were neonates who were clinically healthy before and after 72 hours for the dataset. Figure 6 illustrates the dataset's class distribution.

Figure 6 – Class distribution of neonatal sepsis [14]




The dataset presents 46 individual variables. Alvi et al. [13] performed feature selection on dataset to choose 27 variables with toughest impact on the dependent variable when it comes to classification. However, all 46 individual variables were used in this study to check how well recurrent and convolutional neural networks manage the same. Hence, strength score of variables is not required unlike in the last section. In addition, since the data is passed as matrix of neural network, it is more desired to have enough features for forming square matrix as compared to 3x9 matrix formation with 27 features. The matrix is known to be more skewed for one dimension and it is not required. In addition, "Random Oversampling and Under-sampling" is performed to manage the dataset. After Oversampling, there is a rise with 738 samples with both classes resulting in 369 events. On the other hand, there were 372 samples in under sampling, with 186 samples were lost from the control class.

There is a possibility to plot all 46 variables in 2D plane with dimensionality reduction [19, 20]. Figure 7 illustrates 27 variables used by Alvi et al. [13] while Figure 8 illustrates 46 variables were used by Alvi et al. [12]. It is clearly visible that Figure 7 has regions which are well-established for both categories. The same cannot be claimed on Figure 7, which lacks in clearly defined areas for each category. It shows how it can be easier for feature selection for classifiers to differentiate various cases. However, since LSTM/RNN and CNN can use all 46 variables, feature selection is not required.

Figure 7 – Visualization of full variable set [12]

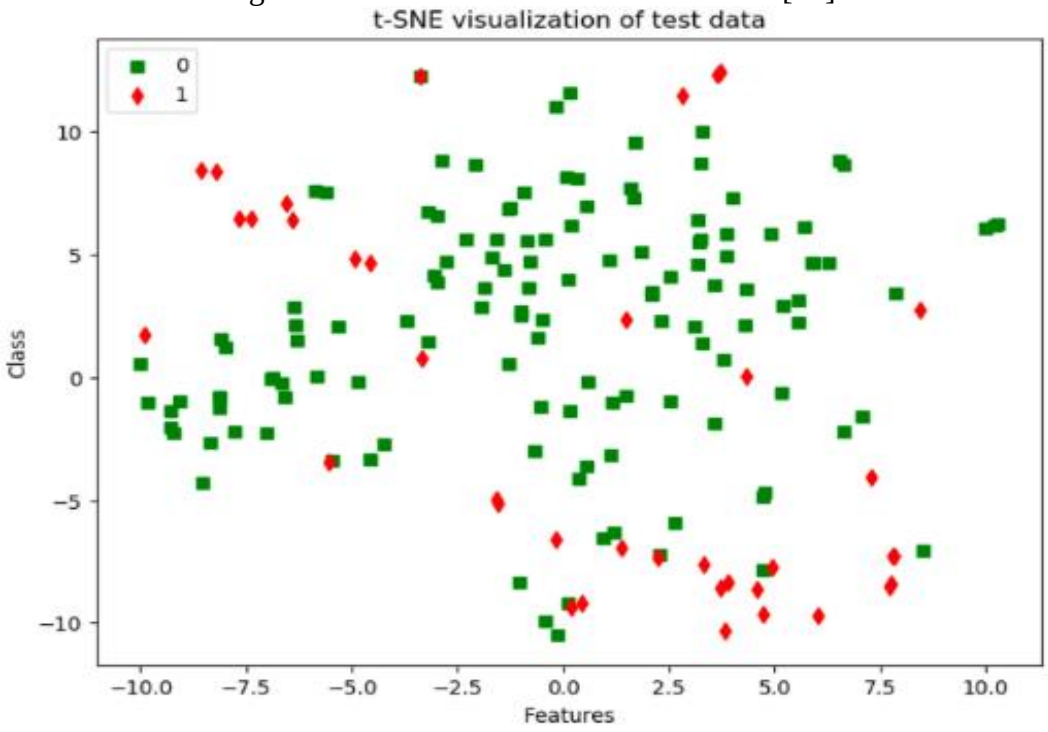
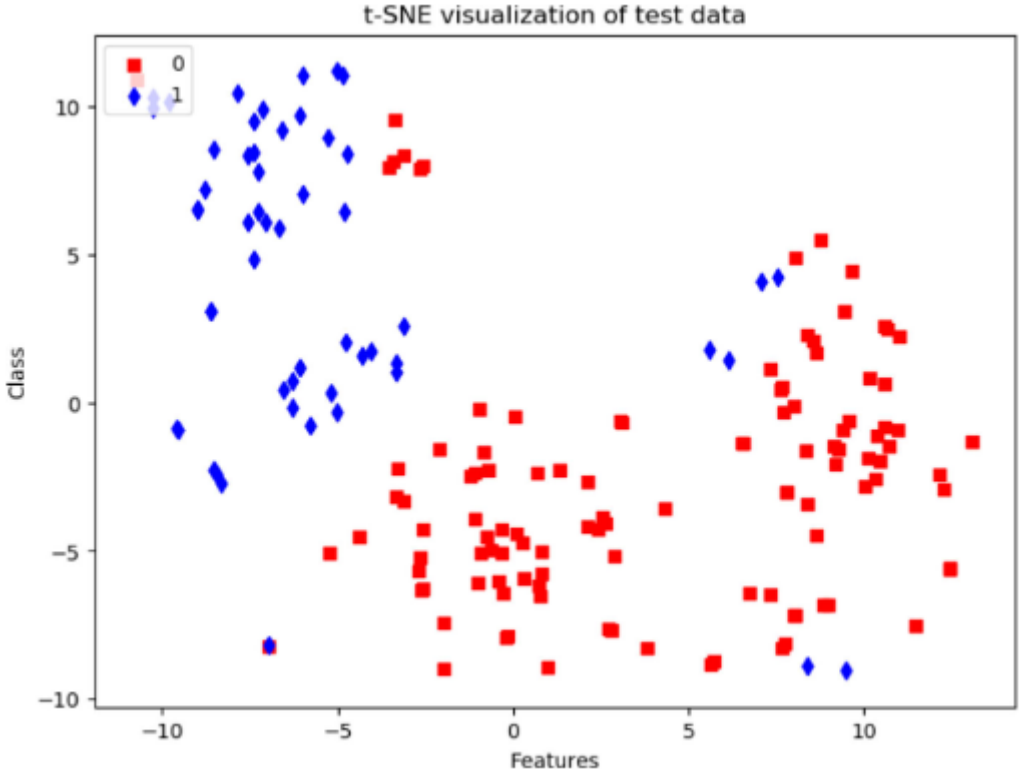


Figure 8 – Visualization of feature-selection set [13]




Feature selection is not required to be performed on the dataset for RNN and CNN models. However, since data input is passed as matrix, suitable number of columns is needed where there should be multiple of "N and M" to have "NxM" matrix where "N>0 and M>0". Hence, there is a need to change the dataset to transform the same into "NxM matrix."

## V. Discussion

Neonatal health is a major concern for both mother and unborn. Neonatal sepsis is a serious factor to the mortality in babies under 5 years old, out of which, a huge part of death happens during the neonatal health [21]. Neural networks are complex and traditionally used scenarios, which consist of image classification, computer vision, sequential data, and time-series data. RNN and CNN are the neural networks still not tested for static tabular information, which is associated with K-NN, LR, SVM, and Random Forest." There is a lack of mainstream research or work as per the use of recurrent and convolutional nets for classification of tabular information. Hence, added motivation is added to develop RNN and CNN to test and train on static data and find out if strong classifiers can outperform the traditional ones.

In a lot of Deep Learning and Machine Learning situations, getting the right data is the major challenge. Earlier studies on neonatal sepsis use tabular information mainly. Hence, it is very rare to use non-time series data for classifiers for sequential information. When scores of both models to be analysed along with the ANN model for earlier work, higher evaluation score has been achieved by neural network models like CNN, ANN, and LSTM-RNN as compared to model-sponsored in previous works. SVM, LR, and tree classifiers are used for comparison with neural networks. Although these non-neural models outperformed a lot of classifiers and achieved around 95% of AUC scores, they still failed to compete with NNs. This significant improvement can be achieved in model evaluations with powerful tools like LSTM-RNN and CNN. Despite the "0.7:0.3" ratio, the error loss is similar between the test and train set.

These models have zero or minimal overfitting. Meanwhile, LSTM/RNN and CNN models can perform just like in Masino dataset. It means these models are not restricted to one dataset

only. They can perform when they have different data too. These neural networks also consist of same scores for specificity, sensitivity, and accuracy. Hence, these models can be used for prediction of both negative and positive cases equally. The Lopez-Martinez neural model was better to detect negative cases as compared to detecting positive cases.

## VI. Conclusion

It is possible to use strong features of these LSTM and convolutional network cells to use all the available data and is not restricted to only time-series or sequential data because models are data-intensive. However, this study has also found some limitations of the network. Neural networks consume a lot of data due to their structures and they grow with the rise in data, it is important to include more complex sets with greater features. Another technique that can be used is reinforced learning to find out how better performance can be achieved on tabular data. To conclude, transfer learning can be used with CNN and RNN models to predict the early onset of neonatal diseases.

## References


1. K. G. Williams, K. T. Patel, J. M. Stausmire, C. Bridges, M. W. Mathis, and J. L. Barkin, “The Neonatal Intensive Care Unit: Environmental Stressors and Supports,” International Journal of Environmental Research and Public Health, vol. 15, no. 1, Jan. 2018, doi: 10.3390/ijerph15010060.
2. R. Miotto, F. Wang, S. Wang, X. Jiang, and J. T. Dudley, “Deep learning for healthcare: review, opportunities and challenges,” Briefings in Bioinformatics, vol. 19, no. 6, p. 1236, Nov. 2018, doi: 10.1093/bib/bbx044
3. P. Sj and H. N. Prakash, “A Features Fusion Approach for Neonatal and Pediatrics Brain Tumor Image Analysis Using Genetic and Deep Learning Techniques,” International Journal of Online and Biomedical Engineering (iJOE), vol. 17, no. 11, Art. no. 11, Nov. 2021, doi: 10.3991/ijoe.v17i11.25193.
4. Campbell S, Warsof SL, Little D, Cooper DJ. Routine ultrasound screening for the prediction of gestational age. Obstet Gynecol 1985;65:613–20.
5. Smith MV TJ, Sharkey D, Crowe J. Clinical scene segmentation with tiny datasets. In: 2019 IEEE/CVF international conference on computer vision workshop (ICCVW). Clinical Scene Segmentation with Tiny Datasets; 2019. p. 1637–45.
6. Egede J, Valstar M, Torres MT, Sharkey D. Automatic neonatal pain estimation: An acute pain in neonates database. In2019 8th international conference on affective computing and intelligent interaction (ACII) 2019 Sep 3 (pp. 1-7). IEEE.
7. Torres M, Valstar Mi, Henry C, Ward C, Sharkey D. Postnatal gestational age estimation of newborns using Small Sample Deep Learning. Image Vis Comput 2019;83–84:87–99.
8. R. D. Shirwaikar, N. Mago, D. A. U, and K. Makkithaya, "Supervised learning techniques for analysis of neonatal data," in Proceedings of the 2nd International Conference on Applied and Teoretical Computing and Communication Technology (iCATccT), Bangalore, India, July 2016, pp. 25–31.
9. A. Sheikhtaheri, R. Zarkesh, R. Moradi, and F. Kermani, "Prediction of neonatal deaths in NICUs: development and validation of machine learning models," BMC Medical Informatics and Decision Making, vol. 21, no. 1, p. 131, 2021.
10. D. R. Chowdhury, M. Chatterjee, and R. K. Samanta, "An artificial neural network model for neonatal disease diagnosis," International Journal of Artificial Intelligence and Expert Systems, vol. 2, no. 3, pp. 96–106, 2011.
11. R. Safdari, M. Kadivar, M. Langarizadeh, A. F. Nejad, and F. Kermani, "Developing a fuzzy expert system to predict the risk of neonatal death," Acta Informatica Medica, vol. 24, no. 1, p. 34, 2016.
12. R. H. Alvi, M. H. Rahman, A. A. S. Khan, and R. M. Rahman, "Deep learning approach on tabular data to predict early-onset neonatal sepsis," Journal of Information and Telecommunication, vol. 5, no. 2, pp. 226–246, 2021.

13. R. H. Alvi, M. Habibur Rahman, A. Al Shaeed Khan, and R. M. Rahman, "Predicting early neonatal sepsis using neural networks and other classifiers," in 10th IEEE Conference on Intelligence Systems, Sofia, Bulgaria, 28–30 Aug 2020.
14. F. López-Martínez, E. R. Núñez-Valdez, J. Lorduy Gomez, and V. García-Díaz, "A neural network approach to predict early neonatal sepsis," Computers & Electrical Engineering, vol. 76, pp. 379–388, 2019.
15. J. Nagi et al., "Max-pooling convolutional neural networks for vision-based hand gesture recognition," in 2011 IEEE International Conference on Signal and Image Processing Applications (ICSIPA), 16–18 November 2011.
16. H. Wu and X. Gu, "Max-pooling dropout for regularization of convolutional neural networks," in Proceedings of the 22nd International Conference Neural Information Processing, 2015, pp. 46–53.
17. Adadelta, 2020. [Online]. Available: https://keras.io/api/optimizers/adadelta.
18. H. Sak, A. Senior, and F. Beaufays, "Long short–term memory recurrent neural network architectures for large scale acoustic modelling," in 15th Annual Conference of the International Speech Communication Association (INTERSPEECH), Singapore, September 14–18, 2014.
19. L. Van Der Maaten, E. Postma, and J. Van den Herik, "Dimensionality reduction: A comparative review," Journal of Machine Learning Research, vol. 10, pp. 66–71, 2009.
20. L. Van Der Maaten and G. Hinton, "Visualizing data using t–SNE," Journal of Machine Learning Research, vol. 9, pp. 2579–2605, 2008.
21. icddr,b - Maternal and neonatal health, 2020. [Online]. Available: https://www.icddrb.org/news-and-events/press-corner/media-resources/maternal-and-neonatal-health

ABSTRACT

# REVIEW ON ROLE OF NANOTECHNOLOGY IN AQUACULTURE

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## ABSTRACT

An aquaculture is considered one of the most important food production systems both in terms of economic impact and food security, and the ongoing development of this industry is a key factor in the strategy to guarantee global nutritional safety. Nowadays, different types of nanotechnology-based systems have been employed to increase its production, efficiency and sustainability. Recent efforts have been made in the fields of health management, enhancement of fish and shellfish development by dietary supplementation with nutraceuticals, but also in the processing and preservation of seafood and water treatment, among others. Therefore, nanotechnology has a significant role to play in the improvement of the efficiency and the environmental impact of this industry. In this concern the present review on role of nanotechnology in aquaculture highlighting the current applications and future prospects.

***Keywords****: aquaculture, fishery, nanotechnology, applications, prospects.*

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ABSTRACT

# A COMPERATIVE STUDY OF PHYSICO-CHEMICAL PARAMETERS OF THE FRESHWATER DAMS FROM BULDANA DISTRICT OF MAHARASHTRA, INDIA

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## ABSTRACT

*The investigational study was aimed to observe the physico-chemical status of two dams viz, Puldhag dam on Vishwaganga river near Motala and Yedgaon dam on Painganga river, near Buldana in Buldana district. The study was carried out for a year from June 2021 to May 2022. Physico-chemical parameters such as Temprature, hardness, pH, Turbidity, electric conductivity, dissolve oxygen and free carbon dioxide were verified by using standard methods during study period. This research work highlights the present condition of both dam water regarding the physico-chemical characters throughout the year.*

***Keywords:*** *Physico-chemical parameters, freshwater, Paldhag dams, Yedgaon dam, Buldana.*

# HOLISTIC APPROACHES TO ENHANCING PHYSICAL HEALTH: INTEGRATING MIND, BODY AND SPIRIT

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## ABSTRACT

*This research paper explores the concept of holistic health and its implications for physical well-being. Holistic health emphasizes the interconnectedness of mind, body, and spirit in achieving overall wellness. Through an extensive review of literature and empirical evidence, this paper examines the various components of holistic approaches, including mindfulness practices, physical activity, nutrition, and spiritual well-being. Additionally, it investigates the potential benefits of integrating these components for enhancing physical health outcomes. By understanding and implementing holistic approaches, individuals can foster a balanced and integrated approach to health promotion and disease prevention.*

***Keywords:*** *Holistic health, physical health, mind-body-spirit, wellness, integrative medicine, mindfulness, nutrition, physical activity, spiritual well-being*

## Introduction

In contemporary discourse surrounding health and wellness, the concept of holistic health has gained significant traction, emphasizing the interconnectedness of various aspects of well-being, including the mind, body, and spirit. Holistic health represents a comprehensive approach to health promotion and disease prevention, recognizing that individual health is influenced by multiple factors beyond just physical symptoms or biological processes. In this introduction, we will define holistic health, explore its historical background and development, and discuss the rationale for integrating mind, body, and spirit in health promotion efforts.

## 1. Definition of Holistic Health

Holistic health, also known as wholistic health, is a philosophy that views health as a dynamic state of balance and harmony within the whole person—mind, body, and spirit—rather than simply the absence of disease or illness. It acknowledges the interconnectedness of various dimensions of health, including physical, mental, emotional, social, and spiritual aspects, and seeks to address health concerns by considering the individual as a whole entity. Holistic health approaches often prioritize prevention, self-care, and empowerment, aiming to promote optimal well-being across all domains of life.

## 2. Historical Background and Development of Holistic Approaches

The roots of holistic health can be traced back to ancient healing traditions and indigenous cultures, where healing practices were often deeply intertwined with spiritual beliefs and rituals. Traditional systems of medicine, such as Ayurveda in India, Traditional Chinese Medicine (TCM), and Native American healing practices, recognized the interconnectedness of mind, body, and spirit in maintaining health and treating illness.

In the Western world, the modern holistic health movement emerged in the late 20th century as a response to the limitations of conventional biomedical models of healthcare, which often focused exclusively on treating physical symptoms and diseases. Influenced by pioneers such as Dr. Andrew Weil, Deepak Chopra, and Jon Kabat-Zinn, holistic approaches gained popularity, advocating for a more integrative and patient-centered approach to health and healing.

## 3. Rationale for Integrating Mind, Body, and Spirit in Health Promotion

The rationale for integrating mind, body, and spirit in health promotion efforts stems from the recognition that these dimensions are inherently interconnected and mutually influential. Research in fields such as psychoneuroimmunology (PNI) and

psychosomatic medicine has provided evidence of the intricate connections between psychological states, physiological processes, and immune function, highlighting the impact of mental and emotional well-being on physical health outcomes.

Furthermore, spiritual well-being, broadly defined as a sense of meaning, purpose, and connection to something greater than oneself, has been associated with positive health outcomes, including greater resilience, improved coping skills, and enhanced quality of life. Integrating spiritual practices, such as meditation, prayer, or mindfulness, into health promotion efforts can foster a sense of inner peace and harmony, which may contribute to overall well-being.

In summary, holistic health approaches recognize the inherent interconnectedness of mind, body, and spirit in shaping health and wellness. By embracing this holistic perspective, health promotion efforts can address the multifaceted nature of human health and empower individuals to cultivate balance, resilience, and vitality across all dimensions of their lives.

### 2.1 Mindfulness Practices

Mindfulness practices encompass a range of techniques aimed at cultivating present-moment awareness, non-judgmental acceptance, and compassionate presence. Rooted in ancient contemplative traditions, mindfulness has gained widespread recognition in contemporary healthcare settings for its potential to enhance overall well-being and mitigate the effects of stress and illness. This section provides an overview of mindfulness meditation, explores its effects on physical health, and discusses its applications in the management of chronic conditions.

**Overview of Mindfulness Meditation:**

Mindfulness meditation is a form of mental training that involves intentionally paying attention to present-moment experiences with an attitude of openness, curiosity, and acceptance. The practice typically involves focusing attention on sensations of the breath, bodily sensations, thoughts, emotions, or external stimuli, while gently redirecting attention back to the present moment when the mind wanders. Mindfulness meditation can be practiced formally through seated meditation sessions or informally by bringing mindful awareness to everyday activities such as walking, eating, or washing dishes.

**Effects of Mindfulness on Physical Health:**

Numerous studies have demonstrated the beneficial effects of mindfulness on physical health outcomes. Research indicates that regular mindfulness practice is associated with reduced physiological markers of stress, including lower levels of cortisol (the stress hormone), decreased heart rate, and improved immune function. Mindfulness has also been shown to lower blood pressure, alleviate symptoms of chronic pain, and enhance sleep quality, thereby promoting overall physical well-being. Additionally, mindfulness-based interventions have been linked to positive changes in health behaviors, such as increased physical activity, healthier eating habits, and decreased substance abuse.

**Mindfulness-Based Interventions for Chronic Conditions:**

Mindfulness-based interventions (MBIs) have emerged as promising adjunctive treatments for a variety of chronic health conditions, offering a holistic approach to symptom management and disease prevention. One of the most well-known MBIs is Mindfulness-Based Stress Reduction (MBSR), developed by Dr. Jon Kabat-Zinn in the late 1970s. MBSR integrates mindfulness meditation, body awareness, and gentle movement practices to help individuals cope with stress, pain, and illness. Since its inception, MBSR and other mindfulness-based programs have been adapted and applied to a wide range of health conditions, including chronic pain, cardiovascular disease, cancer, depression, anxiety disorders, and substance use disorders.

Research suggests that participation in MBIs can lead to significant improvements in physical health outcomes, such as reduced pain severity, enhanced immune function, and better disease management. Moreover, mindfulness training has been shown to increase patients' sense of self-efficacy, resilience, and quality of life, empowering them to actively participate in their own healing process. By cultivating greater awareness and acceptance of their present-moment experiences, individuals with

chronic conditions can develop more adaptive coping strategies, reduce psychological distress, and foster a greater sense of well-being.

In summary, mindfulness practices offer a powerful tool for promoting physical health and well-being by reducing stress, enhancing self-regulation, and fostering resilience in the face of illness. By integrating mindfulness into healthcare settings and offering accessible, evidence-based mindfulness-based interventions, clinicians can support patients in cultivating greater awareness, acceptance, and compassion toward themselves and their bodies, ultimately leading to improved health outcomes and enhanced quality of life

### 2.2 Physical Activity

Physical activity is a fundamental component of holistic health, playing a crucial role in maintaining and enhancing physical well-being. This section explores the importance of exercise for physical health, discusses various types of physical activity and their benefits, and provides strategies for incorporating movement into daily life.

**Importance of Exercise for Physical Health:**

Regular exercise is associated with numerous health benefits across the lifespan. Engaging in physical activity has been shown to strengthen muscles and bones, improve cardiovascular health, enhance immune function, and promote healthy weight management. Additionally, exercise can reduce the risk of chronic diseases such as heart disease, type 2 diabetes, certain cancers, and osteoporosis. Beyond its physical benefits, regular exercise is also linked to improved mental health outcomes, including reduced symptoms of anxiety, depression, and stress. Overall, incorporating exercise into one's lifestyle is essential for maintaining optimal physical health and well-being.

**Types of Physical Activity and Their Benefits**:

Physical activity encompasses a wide range of movements and exercises, each offering unique benefits for the body and mind. Aerobic exercise, such as walking, jogging, swimming, and cycling, is particularly effective for improving cardiovascular fitness, increasing endurance, and burning calories. Strength training, involving exercises with resistance such as weightlifting or bodyweight exercises, helps build muscle mass, improve strength, and enhance metabolic function. Flexibility and balance exercises, such as yoga, Pilates, or tai chi, promote mobility, stability, and joint health, reducing the risk of falls and injuries, especially among older adults. Engaging in a variety of physical activities can provide a comprehensive approach to fitness, addressing different aspects of physical health and promoting overall well-being.

**Incorporating Movement into Daily Life:**

In today's sedentary society, finding opportunities to incorporate movement into daily life is crucial for maintaining an active lifestyle. Simple changes such as taking the stairs instead of the elevator, walking or biking for short errands, or standing up and stretching regularly during prolonged periods of sitting can make a significant difference in overall activity levels. Setting achievable goals, scheduling regular exercise sessions, and finding activities that are enjoyable and sustainable are key strategies for establishing lifelong habits of physical activity. Additionally, integrating movement into daily routines, such as gardening, dancing, or playing with pets or children, can make exercise more enjoyable and accessible to people of all ages and fitness levels.

In summary, physical activity is a cornerstone of holistic health, contributing to physical fitness, mental well-being, and overall quality of life. By understanding the importance of exercise, exploring different types of physical activity, and incorporating movement into daily routines, individuals can reap the numerous benefits of an active lifestyle, promoting longevity, vitality, and optimal health across the lifespan.

### 2.3 Nutrition

Nutrition plays a pivotal role in holistic health, influencing physical well-being, mental clarity, and emotional balance. This section examines the nutritional principles for holistic health, explores the impact of diet on physical well-being, and discusses the role of whole foods and plant-based diets in promoting overall health.

**Nutritional Principles for Holistic Health:**
Holistic nutrition emphasizes the importance of consuming a balanced and varied diet that nourishes the body, mind, and spirit. Key principles of holistic nutrition include prioritizing whole, minimally processed foods; eating a diverse range of nutrient-dense foods; staying hydrated; and listening to the body's hunger and fullness cues. Additionally, mindful eating practices, such as savoring meals, paying attention to portion sizes, and practicing gratitude for food, are central to promoting a healthy relationship with food and fostering overall well-being.

**Impact of Diet on Physical Well-being:**
Diet plays a significant role in shaping physical health outcomes, influencing energy levels, immune function, metabolism, and disease risk. Consuming a diet rich in fruits, vegetables, whole grains, lean proteins, and healthy fats provides essential nutrients, antioxidants, and phytochemicals that support cellular function, tissue repair, and overall vitality. Conversely, diets high in processed foods, added sugars, unhealthy fats, and artificial additives have been linked to an increased risk of obesity, heart disease, type 2 diabetes, and other chronic conditions. By adopting a balanced and nutrient-rich diet, individuals can optimize their physical health and reduce the risk of diet-related diseases.

**Role of Whole Foods and Plant-Based Diets:**
Whole foods, defined as minimally processed or unprocessed foods in their natural state, are the foundation of a health-promoting diet. Whole foods are rich in vitamins, minerals, fiber, and phytonutrients, providing essential nutrients and promoting optimal health. Plant-based diets, which prioritize plant foods such as fruits, vegetables, legumes, nuts, seeds, and whole grains, have been associated with numerous health benefits, including lower rates of obesity, hypertension, cardiovascular disease, and certain cancers. Plant-based diets are also environmentally sustainable and compassionate, supporting the well-being of both individuals and the planet. By incorporating more whole plant foods into their diets and reducing reliance on animal products and processed foods, individuals can improve their health and contribute to a more sustainable food system.

The nutrition plays a critical role in holistic health, influencing physical well-being, mental clarity, and emotional balance. By following principles of holistic nutrition, prioritizing whole foods, and adopting plant-based diets, individuals can optimize their health, prevent chronic diseases, and promote overall well-being. Making mindful and sustainable food choices is an essential aspect of holistic living, supporting health at the individual, community, and planetary levels.

### 3.1 Mind-Body Medicine

Mind-body medicine is a holistic approach that recognizes the interconnectedness of mental, emotional, physical, and spiritual aspects of health and seeks to promote healing by addressing the whole person. This section provides an overview of mind-body interventions, highlights examples of mind-body techniques such as yoga and Tai Chi, and presents evidence for the effectiveness of these approaches in improving overall well-being.

**Overview of Mind-Body Interventions:**
Mind-body interventions encompass a diverse array of practices and techniques that aim to harness the power of the mind to influence physical health outcomes. These interventions typically involve the cultivation of awareness, relaxation, and self-regulation skills to promote healing and reduce symptoms of stress-related disorders. Common elements of mind-body interventions include mindfulness meditation, breathwork, guided imagery, progressive muscle relaxation, and biofeedback.

**Examples of Mind-Body Techniques:**
Yoga: Yoga is a mind-body practice that originated in ancient India and involves physical postures (asanas), breath control (pranayama), and meditation techniques. Yoga is known for its ability to improve flexibility, strength, and balance while promoting relaxation and stress reduction. Research has shown that regular yoga practice can lead to numerous physical and mental health benefits, including reduced pain, improved sleep, enhanced mood, and better overall quality of life.

Tai Chi: Tai Chi is a traditional Chinese martial art that combines slow, flowing movements with deep breathing and mindfulness. Often referred to as "moving meditation," Tai Chi promotes relaxation, balance, and inner harmony. Studies have demonstrated that Tai Chi practice can improve cardiovascular fitness, muscle strength, flexibility, and cognitive function. Additionally, Tai Chi has been shown to reduce falls and improve balance in older adults, making it a valuable intervention for fall prevention and rehabilitation.

**Evidence for the Effectiveness of Mind-Body Approaches:**

A growing body of research supports the effectiveness of mind-body interventions in improving physical and psychological health outcomes. Meta-analyses and systematic reviews have found evidence for the efficacy of mindfulness-based interventions in reducing symptoms of depression, anxiety, chronic pain, and other stress-related conditions. Moreover, studies have shown that mind-body practices can modulate the body's stress response, leading to reductions in inflammation, blood pressure, and cortisol levels.

In clinical settings, mind-body interventions have been integrated into treatment protocols for various chronic conditions, including cardiovascular disease, cancer, chronic pain, and autoimmune disorders. These interventions are often used as complementary approaches alongside conventional medical treatments to enhance symptom management, improve quality of life, and promote overall well-being.

In summary, mind-body medicine offers a holistic approach to health and healing by recognizing the interconnectedness of the mind, body, and spirit. Through practices such as yoga, Tai Chi, and mindfulness meditation, individuals can cultivate greater self-awareness, resilience, and inner peace, leading to improved physical, emotional, and spiritual well-being. As research continues to elucidate the mechanisms underlying mind-body interventions, these approaches hold promise for transforming healthcare and empowering individuals to take an active role in their own health and healing journey.

## 4. Benefits of Holistic Approaches to Physical Health

Holistic approaches to physical health encompass a wide range of interventions and practices that address the interconnectedness of mind, body, and spirit. By adopting a holistic perspective, individuals can experience numerous benefits that contribute to improved overall well-being and enhanced quality of life. This section explores the specific advantages of holistic approaches in managing chronic conditions, promoting well-being, reducing the risk of lifestyle-related diseases, and fostering self-care and self-awareness.

### 4.1 Improved Management of Chronic Conditions:

One of the primary benefits of holistic approaches to physical health is their effectiveness in managing chronic conditions. Rather than focusing solely on treating symptoms, holistic interventions target underlying imbalances and root causes of illness, leading to more comprehensive and sustainable outcomes. For example, mindfulness-based interventions have been shown to reduce symptoms of chronic pain, depression, anxiety, and insomnia by enhancing self-regulation skills, promoting relaxation, and improving coping mechanisms. Similarly, integrative approaches such as acupuncture, chiropractic care, and herbal medicine can complement conventional treatments for chronic conditions like arthritis, fibromyalgia, and autoimmune disorders, leading to better symptom control and enhanced quality of life.

### 4.2 Enhanced Overall Well-being and Quality of Life:

Holistic approaches emphasize the importance of addressing the physical, emotional, and spiritual dimensions of health to achieve a sense of balance and wholeness. By integrating mind-body-spirit practices such as yoga, meditation, and expressive arts therapy, individuals can cultivate greater self-awareness, resilience, and inner peace, leading to improved overall well-being and quality of life. Research has shown that regular engagement in holistic practices is associated with reductions in stress, anxiety, and depression, as well as improvements in mood, self-esteem, and emotional regulation.

Moreover, holistic approaches promote positive lifestyle changes, such as healthier eating habits, regular physical activity, and adequate sleep, which contribute to long-term well-being and vitality.

**4.3 Reduced Risk of Lifestyle-related Diseases:**

Many chronic diseases, such as heart disease, diabetes, obesity, and certain cancers, are strongly influenced by lifestyle factors such as diet, physical activity, stress, and sleep quality. Holistic approaches to physical health focus on optimizing these lifestyle factors to prevent disease and promote longevity. For instance, adopting a whole foods, plant-based diet rich in fruits, vegetables, whole grains, and lean proteins can reduce the risk of heart disease, hypertension, and metabolic disorders. Regular physical activity, including aerobic exercise, strength training, and flexibility exercises, helps maintain healthy weight, improve cardiovascular fitness, and enhance immune function. Mindfulness practices and stress management techniques, such as meditation, deep breathing, and progressive muscle relaxation, support the body's natural healing mechanisms and reduce the risk of stress-related health conditions.

**4.4 Promotion of Self-care and Self-awareness:**

Holistic approaches empower individuals to take an active role in their own health and well-being by promoting self-care and self-awareness. Through practices such as mindfulness meditation, journaling, and reflective exercises, individuals can cultivate greater self-awareness, self-compassion, and acceptance of their thoughts, feelings, and bodily sensations. By tuning into their inner wisdom and intuition, individuals can make informed choices about their health behaviors, preferences, and priorities, leading to more balanced and fulfilling lives. Additionally, holistic approaches emphasize the importance of nurturing supportive relationships, fostering a sense of community, and accessing resources for social and emotional support, which contribute to resilience and overall well-being.

In summary, holistic approaches to physical health offer numerous benefits for individuals seeking to optimize their health and well-being. By addressing the interconnectedness of mind, body, and spirit, holistic interventions promote improved management of chronic conditions, enhanced overall well-being and quality of life, reduced risk of lifestyle-related diseases, and the promotion of self-care and self-awareness. By integrating holistic practices into their daily routines, individuals can cultivate a sense of balance, resilience, and vitality, leading to a healthier and more fulfilling life.

## 5. Challenges and Considerations

Despite the numerous benefits offered by holistic approaches to physical health, several challenges and considerations must be addressed to promote their widespread adoption and integration into healthcare systems. This section examines key challenges related to cultural and societal influences on holistic health practices, access to holistic care and resources, and the integration of holistic approaches into existing healthcare systems.

**5.1 Cultural and Societal Influences on Holistic Health Practices:**

One significant challenge in promoting holistic health practices is the cultural and societal influences that shape individuals' beliefs, attitudes, and behaviors towards health and healing. Cultural differences in concepts of health, illness, and treatment modalities can impact the acceptability and effectiveness of holistic approaches within diverse populations. For example, some cultural groups may have strong preferences for traditional healing methods, spiritual rituals, or herbal remedies, which may not align with mainstream biomedical models of care. Additionally, cultural stigma surrounding mental health issues or alternative therapies may deter individuals from seeking holistic interventions or disclosing their preferences to healthcare providers. Addressing cultural and societal barriers requires culturally sensitive and inclusive approaches that respect diverse perspectives, beliefs, and healing traditions.

**5.2 Access to Holistic Care and Resources:**

Access to holistic care and resources presents another significant challenge, particularly for underserved populations and marginalized communities. Holistic health services, such as acupuncture, chiropractic care, massage therapy, and mindfulness programs, may be

expensive, inaccessible, or not covered by health insurance, limiting their availability to those with financial means. Furthermore, holistic practitioners and wellness centers may be concentrated in urban areas or affluent neighborhoods, leaving rural or low-income communities underserved. Addressing disparities in access to holistic care requires policies and initiatives that promote equitable distribution of resources, expand insurance coverage for integrative therapies, and increase funding for community-based wellness programs. Additionally, efforts to train and diversify the holistic healthcare workforce can help address cultural and linguistic barriers and improve access to care for underserved populations**.**

**5.3 Integration of Holistic Approaches into Existing Healthcare Systems:**

Integrating holistic approaches into existing healthcare systems poses challenges related to professional training, interdisciplinary collaboration, reimbursement policies, and evidence-based practice. Many healthcare providers receive limited education and training in holistic modalities during their medical or nursing training, leading to skepticism or reluctance to incorporate these approaches into clinical practice. Additionally, traditional healthcare delivery models may prioritize biomedical interventions over holistic or preventive strategies, creating barriers to interdisciplinary collaboration and patient-centered care. Reimbursement policies and insurance coverage for holistic services may also vary widely, with some modalities lacking recognition or reimbursement by third-party payers.

Addressing these challenges requires a multi-faceted approach that involves education and training for healthcare providers, advocacy for policy changes, and research to generate evidence supporting the effectiveness and cost-effectiveness of holistic approaches. Interdisciplinary collaboration between conventional and holistic practitioners can foster a more integrative and holistic model of care that meets the diverse needs of patients and promotes shared decision-making. Moreover, efforts to integrate holistic approaches into medical curricula, clinical guidelines, and quality improvement initiatives can help mainstream these practices within healthcare systems and improve access to holistic care for all individuals.

In summary, addressing the challenges and considerations related to cultural and societal influences, access to care, and integration into healthcare systems is essential for promoting the widespread adoption and acceptance of holistic approaches to physical health. By recognizing and addressing these barriers, policymakers, healthcare providers, and community stakeholders can work together to create a more inclusive, equitable, and integrative healthcare system that supports the holistic well-being of all individuals.

**Conclusion**

In summary, the adoption and integration of holistic approaches to physical health offer significant potential for enhancing overall well-being and quality of life. By recognizing the interconnectedness of mind, body, and spirit, holistic interventions address the root causes of illness, promote self-care and self-awareness, and empower individuals to take an active role in their own health and healing journey. Despite challenges related to cultural influences, access to care, and integration into existing healthcare systems, efforts to mainstream holistic practices are underway, driven by growing evidence of their effectiveness and demand for more patient-centered, integrative care models. By addressing these challenges and promoting inclusivity, equity, and collaboration, policymakers, healthcare providers, and community stakeholders can create a more holistic and integrative healthcare system that supports the diverse needs and preferences of individuals, ultimately leading to improved health outcomes and greater overall well-being.

**References**

1. Kabat-Zinn, J. (2003). Mindfulness-based interventions in context: Past, present, and future. Clinical Psychology: Science and Practice, 10(2), 144-156.
2. Astin, J. A., Shapiro, S. L., Eisenberg, D. M., & Forys, K. L. (2003). Mind-body medicine: State of the science, implications for practice. The Journal of the American Board of Family Practice, 16(2), 131-147.

3. Sarris, J., O'Neil, A., Coulson, C. E., Schweitzer, I., & Berk, M. (2014). Lifestyle medicine for depression: A review of holistic therapies. European Archives of Psychiatry and Clinical Neuroscience, 264(8), 651-660.
4. Ross, A., Thomas, S., Mazzei, J., & Maldarelli, M. (2010). The impact of a transcendental meditation program on academic stress and well-being in college students. College Student Journal, 44(2), 494-506.
5. Cramer, H., Lauche, R., Langhorst, J., & Dobos, G. (2013). Yoga for depression: A systematic review and meta-analysis. Depression and Anxiety, 30(11), 1068-1083.
6. Wang, C., Schmid, C. H., Rones, R., Kalish, R., Yinh, J., Goldenberg, D. L., ... & McAlindon, T. (2010). A randomized trial of tai chi for fibromyalgia. New England Journal of Medicine, 363(8), 743-754.
7. Michalsen, A., Grossman, P., Acil, A., Langhorst, J., Lüdtke, R., Esch, T., ... & Dobos, G. J. (2005). Rapid stress reduction and anxiolysis among distressed women as a consequence of a three-month intensive yoga program. Medical Science Monitor: International Medical Journal of Experimental and Clinical Research, 11(12), CR555-CR561.
8. National Center for Complementary and Integrative Health. (2021). Meditation: In-depth. Retrieved from https://www.nccih.nih.gov/health/meditation-in-depth.
9. Simkin-Silverman, L. R., Wing, R. R., Boraz, M. A., Kuller, L. H., & Simkin-Silverman, L. R. (2000). Lifestyle intervention can prevent weight gain during menopause: Results from a 5-year randomized clinical trial. Annals of Behavioral Medicine, 23(4), 313-321.
10. World Health Organization. (2013). WHO traditional medicine strategy 2014–2023. Geneva: World Health Organization.

# AVI-FAUNAL BIODIVERSITY OF PALDHAG LAKE IN BULDANA DISTRICT OF MAHARASHTRA, INDIA

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## ABSTRACT

*The avi-faunal biodiversity of Paldhag lake is an important aspect of study as the birds are most diverse and predominant form of life on the earth. The aim of the present study was to understand the avi-faunal biodiversity of the Paldhag lake and to create awareness about their conservation in the study. The present study was carried out on Paldhag lake. It is situated in the Buldana taluka of Buldana District, between June 2020 to May 2022 with major objective to assess avifaunal species diversity, their ecological status, feeding habit and migrating nature. Various species of birds were observed in the area of Paldhag lake during morning and evening time. This study resulted in a total number of 63 species of birds belongs to 22 families and 10 orders. out of the total 63 documented species, 24 species (38.09%) were common (C), 6 (19.52%) species were very common (VC) , and 24 species (34.09%) were uncommon (UC) and The remaining 09 (14.28%) species were rarely (R) sighted in the study area. Carnivorous birds 32 (50.79%) were dominantly found over omnivorous 14 (22.22%), insectivorous 9 (14.28%), herbivorous 2 (3.17%), frugivorous 1 (1.58%) and piscivorous 5 (7.3%). The highest bird diversity and evenness was observed during winter season than in summer and monsoon season. 31 (49.20%) bird species are resident showing local or seasonal movements. About 30 (47.61%) are migratory species and about 2 (3.17%) species are resident migratory. Data were analysed through shanon-winer diversity index which showed that Water body (3.918) had the highest bird diversity. This paper provides some basic information about birds found in this study area which may helpful for future conservation planning to sustain both migratory and resident avifauna.*

***Keywords:*** *Avifauna, Species, Habitat, Diversity, Paldhag Lake, Buldana region.*

## Introduction

Birds are one of the most beautiful, widely admired, entertaining and most studied group of animal on earth since they are excellent indicators of health of an ecosystem. They also pollinators, environment health indicators They are the best monitors of an environmental change helping in understanding the quality of habitats and fulfill many ecological functions in their habitats. Since birds are among the best monitors of environmental changes, they have been used to evaluate the environment throughout the history as ‘bio monitors’ and; the changes in their population, behavior pattern and reproductive ability have most often been used to examine the long term effects of habitat fragmentation (Harish and Hosetti 2009).

Population studies have been traditionally used to monitor long term changes in avian population and to assess both habitat quality and the responses of birds to both natural and human caused environmental changes ( Wiens, 1989). Number of environmental factors are known to influence the population of birds directly, such as availability of food, nesting materials, location of nesting sites, developmental activities, presence of predators, presence of competitors etc,. are the major ones that influence the breeding and foraging of birds and simultaneously their population. The avian habitat is roughly divided into forest, scrub and wetlands, all though many species require a mixed type of habitat (Ramchandra, 2013).

Birds occur on land, sea and freshwater, and in virtually every habitat, from the lowest deserts to the highest mountains (Rahbek and Graves, 2001).The Indian subcontinent is very rich in biodiversity. It contains about 1300 species of bird or over 13% of the world’s birds (Grimmett *et al.,* 1998). The recent studies of freshwater biodiversity and wetlands shows that avi-fauna are major shares in them.

The birds which are ecologically depends on wetland. They are known as ‘Water birds’. The status of many waterbird populations is poor, with major declines reported for many taxa worldwide, habitat loss and degradation being the chief driver for these declines (kumar *et al*., 2006).Agriculture provides a concentrated and highly predictable source of food to birds. The food in general is of different kinds: grain, seeds, fruits, and green vegetation of the crop

plants, grasses, insects and rodents etc. (O'Connor and Shrubb, 1986).In the Indian context, a large number of birds are mainly insectivorous (Singh *et al*., 2018).

The relationship between various environments and bird diversity has been a critical issue. A large number of studies have explored the variety of bird diversity in residential area and rural areas ( Fontana,et al., 2011) Agricultural fields (Beukema *et al.*, 2007) and forest area (Macarthur, 1964) Some studies indicated that a higher ecological diversity not only benefits species survival but is also an important indicator of human well-being (Fuller *et al*., 2007). But this avifauna is in danger due to the changing Environment, Apparently the Indian bird population has been dwindling due to direct/indirect impact from increasing human population (Balachandran *et al*., 2005), in the last decades, human have more than even been changing the World's ecosystems to meet the growing demands for food, fresh water, timbers, fiber, fuel and minerals (MEA, 2005).

Our study is an attempt to prepare a baseline data on avifaunal species diversity, their ecological status, habitat distribution, feeding habit and migrating nature in Paldhag lake of Buldana District, maharashtra. Total 63 avian species, belonging to 22 families and 10 orders were recorded between June 2020 to May 2022 .

despite of intense human activity. As proper knowledge about avifauna diversity, their ecological behaviour and distribution is a fundamental tool for their future management and conservation. The study was under taken to understand the avi-faunal biodiversity of the Paldhag lake. This study will create awareness about the conservation of birds in nature in the society, will also help to increase the local awareness towards biodiversity issues and prove to be helpful in conservation efforts.

## Materials and Methods

### Study Region

The area selected for study is Buldana; Buldana Region is in Maharashtra state. located in the Amravati division of Maharashtra, India. It is situated at the western border of Vidarbha region and is 500 km away from the state capital Mumbai. Buldana is located between The Latitudes – 19.51°to21.17°N and Longitudes- 75.57°to 76.59°E.

Buldana Region having a total Area of 9,640km2(3, 720sq mi).

Total forest Area – 1165 (sq.km).

Forest dept. Area – 1165 (sq.km).

Protected Area – Amba- Barva WLS, Dnyanganga WLS, Lonar WLS

There is ample availability of water thus having the dense forests, fertile lands supporting a variety of grasslands. The climatic condition of this district is characterized by a hot summer, well distributed rainfall during the south-west monsoon season, the average annual rainfall is 796.6 mm (31.37"), the rainfall in the district mostly occurs during the main rainy season, June to September constitutes about 85 per cent of the annual rainfall. And there generally dry weather during the rest of the year. There are distinct temperature variations daily as well as seasonally throughout the district. During summer, the mean daily maximum temperature was 42.3°c and minimum was 27.4°c and it decreased towards winter with a mean daily maximum temperature of 27.6° c and minimum of 15.1°c.

### Paldhag Dam

Locally this is also known as " Paldhag Talav " or " Paldhag Lake". Project was constructed as part of irrigation projects by the Government of Maharashtra ln the year 1974 and impounds Wishwaganga River. Nearest city to dam is Motala and the Dam is situated in Buldana Taluka of Buldana District of Maharashtra . The dam is earth fill gravity dam. The purpose of the dam and project is Irrigation. The length of the Dam is 841 m ( 2759.19 Feet ). while the height of the dam above lowest foundation is 24.06 m (78.93 Feet). Information on Spillway is not available. Spillway length is not known. However measured length of the spillway is 126 m (412 Feet). Spillway appears to be of other type and is not gated. Catchment area of Paldhag Reservoir is not known. Maximum / Gross storage capacity of Paldhag Reservoir is 9.09 MCM. Live storage capacity is 7.51 MCM.

**Materials**

The following materials were used for bird surveys and observations:

GPS locator, multimedia software of bird identification, measuring tape, Digital camera, voice recorder, binocular and reference books on birds, survey data sheet, pencil, eraser and field books like book of Indian birds by Salim Ali and Birds of the Indian subcontinent by Grimmett, Inskipp and Inskip were used as field guides and for preparing check list and record data of birds and vegetation. Most of the information were taken from Major research project of my research guide Dr.Mrs. Vandana R. Kakde.

**Methods**

The present study of Avifaunal diversity in different habitats was conducted for a period of twenty four months during June 2020 to May 2022 in the selected Habitats of Buldana district. Areas having considerable bird activity were selected for birding. These sites were chosen for their variety of habitat types, which include agro forests, plantation farms, shrub forests, evergreen forest, grasslands, wetlands, woodland etc. The selected sites were thoroughly and periodically monitored throughout the study period for the monitoring of birds. A checklist was prepared and regularly updated after the survey each area. The photographs and the field visit reports were used for updating the checklist regularly.

**Data Analysis**

Birds were identified with the help of local bird watchers, farmers in the fields and wildlife professionals. The identification was further confirmed by authentic scientific literature on birds and field books. Birds which couldn't be identified on spot were either photographed or key identification characters were noted and identified using felid guides namely, The book of Indian sub-continent by Dr. Salim Ali. Birds of the Indian subcontinent by Grimmett, Inskipp and Inskipp.

The birds were categorized according to their respective status as Residents (R), Migratory (M), Resident migratory or Local Migratory (RM). Very Common (VC), Common (C), Rare (R), Very Rare (VR) was determined by analyzing the regularly updated checklist. The bird species were assigned to their respective Orders and Families

Diversity Indices: Species diversity indices are very important for biodiversity management and policy making. Different diversity indices on collected data was used in present research work like Shannon-Weiner Index (Shannon and Weiner, 1948). Species evenness and richness is important component of diversity (Hill, 1973).

**Results and Discussion**

The Paldhag lake is located in the Buldana, Maharashtra, India. It has vast biodiversity of flora and fauna. This study contributes to the knowledge of Avifauna and provides the most recent status of Avifauna in Paldhag lake of Buldana region. During the study period 2020-2022, 10 orders, 22 families contributes, A total of 63 species. From study area. Among the documented species of birds,14 species belongs to order Pelecaniformes, 14 species belongs to Charadriformes and 10 secies belongs to Anseriformes, 09 species belongs to Passeriformes, 4 species belongs to Ciconiformes, and Coraciformes each, 3 species belongs to Accipitriformes, and Gruiformes each, 1 species belongs to Podicipediformes and Phoenicopteriformes each.

Out of 63 Birds reported in the present study 58 are Least Concern, 03 are Near Threaten and 02 are Vulnerable Birds. It was noted that many species used two or many habitats.The present study showed that the higher bird diversity was seen in winter season than in summer and monsoon season. This might be due to increment in local movement of birds for searching food resources and defoliation of plants that helps them for easy detection of birds.

The study of food habits of birds of the region showed that 32 (50.79%) are Carnivores (feeding on Fishes, Reptiles, Insects, Cocoons, Amphibians, Small Birds etc) ,followed by 14 (22.22%) species of birds are Omnivorous (feeding on insects, nectar, grains, seeds, fruits, reptiles, fishes etc), 2 (3.17%) are Herbivorous (feeding on grains, seeds, sea plants, weeds Nectar and etc), and 9 (14.28%) species are mainly Insectivorous, 1 (1.58%) are Fruigivorous and 5(7.93 %) are Piscivorous.

Carnivorous species have dominated the region over Herbivorous, piscivorous, Insectivorous and frugivorous and thus a balance of prey predator popultions is observed. Omnivorous rank second to carnivorous in their population size.

Among the total of 63 species of birds, 31 (49.20%) bird species are resident showing local or seasonal movements. About 30 (47.61%) are migratory species and about 2 (3.17%) species are resident migratory. 2 (3.17%) species namely Indian River Tern (*Sterna aurantia*), White necked Stork (*Ciconia episcopus*) are listed as Vulnerable; 3 (4..76%) species namely Painted Stork ( *Mycteria leucocephala*), White-Eyed Pochard (*Aythya nyroca*), and Grey headed bulbul (*Brachypodius priocephalus***)** are listed as Near threatened, and all the remaining species are 58 (92.06%) placed in the least concern category in the Red List of IUCN (2017).

The Shannon-Weiner Diversity Index (H') value revealed that Paldhag lake (3.918) had the high bird diversity.The Margalef Richness Index Value (R) revealed that Paldhag lake had high species richness. The richness index value indicated that the Lake (4.173) supported the high number of bird species richness. Paldhag lake significantly decreased the Evenness Index by 0.422.

The study revealed that the study area was suitable area for various birds' species. The study area shows good avifaunal diversity which can help in establishing baseline data of birds of Buldana Region.

## Conclusion

A total of 63 species of birds belonging to 10 Orders and 22 Families have been recorded in the study area. The order Pelecaniformes and Charadriformes with 14 species each dominating in the study area. Lake had a positive effect on species richness. The environments reflected a higher food availability to promote bird species richness (Nilsson, 1979). the higher food availability in the water habitat had the highest effect on bird species richness and the seasonal change in primary productivity altered bird species richness (Leveau *et al*.,2018).

The Lake present in Buldana region are also an ideal residence for innumerable water birds with different needs. The presence of migratory birds, local migratory and resident species of birds equally utilizing this area as their abode for continuing various lifecycle activities indicates the importance of water bodies as a year round habitat for water birds.

In the present state it was observed that there may be ecologically unmanaged development, full protection to all the existing habitats should be given with special attention during the migratory period. Since the water bodies are shared resource, a common property to all the occupants including animals and human being alike, it is imperative to protect or conserve the entire ecosystem. Therefore, Buldana region is an important place and provides heterogeneous habitats for the bird's species conservation. Some habitat types and characteristics have been studied and have shown positive results for higher bird diversity (Salim Ali 2002). The nesting, feeding, and roosting areas of birds have faced a lot of disturbance from the human beings also affecting their population. So, an effective way to save these birds is to save their habitats.

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## References

1. Ali, S. (1941): The book of Indian birds. 1st Edition. The Bombay Natural History Society, Bombay.
2. Ali, S. (2002): The book of Indian Birds, 13th edition, Bombay Natural History Society and Oxford University Press, Bombay.
3. Balachandran, S., Rahmani, A.R. and P. Sathiyaselvam (2005):Habitat evaluation of Chilka Lake with special reference to birds as bioindicators. Final Report (2001-2005), Bombay Natural History Society, Mumbai.
4. Beukema, H., Danielsen, F., Vincent, G., Hardiwinoto, S. and J. Van Andel (2007): Plant and bird diversity in rubber agroforests in the lowlands of Sumatra, Indonesia. *Agrofor. Syst*, 70: 217–242.

5. Bird Life International (2014): Important Bird and Biodiversity Areas: A global network for conserving nature and benefiting people. Cambridge, UK.
6. Fontana, S., Sattler, T., Bontadina, F. and M. Moretti (2011): How to manage the urban green to improve bird diversity and community structure. *Landsc. Urban Plan,* 101: 278–285.
7. Fuller, R. A., Irvine, K. N., Devine-Wright, P., Warren, P. H. and K. J. Gaston (2007): Psychological benefits of greenspace increase with biodiversity. *Biol. Lett*, 3: 390–394.
8. Grimmett, R., Inskipp, C. and T. Inskipp (1999): Birds of India: Pakistan, Nepal, Bangladesh, Bhutan, Sri Lanka, and the Maldives. Princeton University Press. *ISBN* 0-691-04910-6.
9. Grimmett, R., Inskipp, C. andT. Inskipp (1999): Birds of the Indian Subcontinent (Available in both encyclopaedic and handbook form).
10. Harisha, M. N. and B. B. Hosetti (2009) : Diversity and distribution of avifauna of Lakkavalli range forest, Bhadra wildlife sanctuary, western ghat, India. *Ecoprint*, 16: 21–27.
11. Inskipp, C. and T. Inskipp (1985): *Birds of Bhutan*. Oxford University Press, New Delhi.
12. Kakde, V.R. (2012): Major Research Project entitled " Birds In Buldana Region".
13. Kumar, A., Tak, P.C. and J.P. Sati (2006): Residential, population and conservation status of Indian wetland birds. In Boere, G.C., Galbraith, C.A. and Stroud, D.A. (Eds.) Waterbirds around the world. The Stationery Office, Edinburgh, UK. 1-308.
14. Leveau, L. M., Isla, F. I. and M. I. Bellocq (2018): Predicting the seasonal dynamics of bird communities along an urban-rural gradient using NDVI. *Landsc. Urban Plan,* 177: 103–113.
15. MacArthur, R. H. (1964): Environmental factors affecting bird species diversity. *Am. Nat* 98: 387–397.
16. Millennium Ecosystem Assessment (2005): Ecosystems and Human Well-being: Biodiversity Synthesis. World Resources Institute, Washington, DC.
17. Nilsson, S. G. (1979): Density and species richness of some forest bird communities in South Sweden. *Oikos*, 33: 392–401.
18. O'Connor, R.J. and M. Shrubb, (1986): Farming and Birds. Cambridge University Press, Cambridge.
19. Rahbek, C. and G. R. Graves (2001): Multiscale assessment of patterns of avian species richness. Proceedings of the National Academy of Sciences USA 98:4534– 4539.
20. Ramachandra, A.M. (2013): "Diversity and richness of bird species in newly formed habitats of Chandoli National Park in Western Ghats, Maharashtra State, India". *Biodiversity Journal 4* (1): 235-242.
21. Shannon, C.E. and N. Wiener (1948): Mathematical Theory of communication. The University of Illinois, Urbana. Pp 117.
22. Singh, R. Jaiswal, A., Singh, J., Singh, N., Bhaskar, SK, et al., (2018): Study of Bird Diversity in Gorakhpur University Campus. *J Biodivers Endanger Species* 6:002.
23. Weins, J.A. (1989): Status of Scaling in Ecology. Functional Ecology 3: 385-392.

| Sr. No. | ORDER | FAMILY | COMMON NAME | SCIENTIFIC NAME | OCCURRENCE | ABUND-ANCE | FOOD | STATUS |
|---|---|---|---|---|---|---|---|---|
| 1. | Podicipeformes | Podicipitidae | Indian little Grebe | *Tachybaptus ruficollis* | Re | C | I | LC |
| 2. | Pelecaniformes | Phalacrocoracidae | Little Cormorant | *Microcarbo niger* | RM | R | Pi | LC |
| | | | Indian Shang | *Phalacrocorax fuscicollis* | Re | C | Pi | LC |
| | | Ardeidae | Chestnut Bittern | *Ixobrychus cinnamomeus* | Re | UC | I/Ca | LC |
| | | | Yellow Bittern | *Ixobrychus sinensis* | Re | UC | Ca | LC |
| | | | Grey Heron | *Ardea cinerea* | Re | UC | Ca | LC |
| | | | Purple Heron | *Ardea purpurea* | Re | C | Ca | LC |
| | | | Pond Heron | *Ardeola grayii* | Re | C | Ca | LC |
| | | | Cattle Egret | *Bubulcus ibis* | Re | C | Ca | LC |
| | | | Little Egret | *Egretta garzetta* | Re | C | Ca | LC |
| | | | Night Heron | *Nycticorax nycticorax* | Re | C | Ca | LC |
| | | Threskiornithidae | White Ibis | *Threskiornis aethiopicus* | M | R | Ca | LC |
| | | | Glossy Ibis | *Plegadis falcinellus* | Re | UC | Ca | LC |
| | | | Black Ibis | *Pseudibis papillosa* | Re | UC | O | LC |
| | | | Spoonbill | *Platalea leucorodia* | M | UC | Ca | LC |
| 3. | Ciconiformes | Ciconidae | Painted Stork | *Mycteria leucocephla* | M | UC | Pi | NT |
| | | | Openbill stork | *Anastomus oscitans* | Re | C | Pi | LC |
| | | | White necked Stork | *Ciconia episcopus* | Re | R | Ca | NT-VU |
| | | | Black Stork | *Ciconia nigra* | M | UC | Ca | LC |
| 4. | Phoenicopteriformes | Phoenicopteridae | Flamingo | *Phoenicopterus roseus* | RM | UC | Ca | LC |
| 5. | Accipitriformes | Accipitridae | Buzzard | *Buteo buteo* | Re | UC | O | LC |
| | | | Indian Crested Hawk-Eagle | *Nisaetus cirrhatus* | M | VC | Ca | LC |
| | | | Marsh Harrier | *Circus aeruginosus* | M | C | Ca | LC |
| 6. | Charadriiformes | Jcanidae | Pheasant-Tailed Jacana | *Hydrophasianus Chirurgus* | Re | C | Ca | LC |
| | | Charadriidae | Red Wattled Lapwing | *Vanellus indicus* | Re | C | Ca | LC |
| | | | Grey Plover | *Pluvialis squatarola* | M | VC | Ca | LC |
| | | | Greater Sand Plover | *Charadrius leschenaultii* | M | VC | Ca | LC |
| | | | Little Ringed Plover | *Charadrius dubius* | M | VC | Ca | LC |
| | | | Kentish Plover | *Charadrius alexandrinus* | M | UC | I | LC |
| | | Scolopacidae | Redshank | *Tringa totanus* | M | UC | Ca | LC |
| | | | Greenshank | *Tringa nebularia* | M | UC | Ca | LC |
| | | | Marsh Sandpiper | Tringa stagnatilis | M | C | Ca | LC |
| | | | Green Sandpiper | *Tringa ochropus* | M | C | Ca | LC |
| | | | Wood Sandpiper | *Tringa glareola* | M | UC | Ca | LC |
| | | Recurvirostridae | Indian Black winged Stilt | *Himantopus himantopus* | M | C | Ca | LC |
| | | Laridae | Indian River Tern | *Sterna aurantia* | M | UC | Ca | VU |
| | | | Indian Lesser Crested Tern | *Thalasseus bengalensis* | M | UC | Ca | LC |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 7. | Coraciformes | Alcedinidae | Pied Kingfisher | *Ceryle Rudis* | Re | C | Ca | LC |
| | | | Common Kingfisher | *Alcedo atthis* | Re | C | Ca | LC |
| | | | White breasted Kingfisher | *Halcyon Smyrnensis* | M | C | Ca | LC |
| | | Meropidae | Little Green Bee-Eater | *Merops Orientalis* | Re | C | I | LC |
| 8. | Anseriformes | Anatidae | Lesser Whistling Teal | *Dendrocygna Javanica* | M | UC | O | LC |
| | | | Brahminy Duck | *Tadorna Ferruginea* | Re | R | O | LC |
| | | | Pintail Duck | *Anas acuta* | M | UC | O | LC |
| | | | Common Teal | *Anas crecca* | Re | UC | O | LC |
| | | | Indian Spot-billed Duck | *Anas poecilorhyncha* | M | VC | H | LC |
| | | | Gadwall | *Anas strepera* | M | UC | O | LC |
| | | | Garganey | *Anas querqueduala* | M | UC | O | LC |
| | | | White -Eyed Pochard | *Aythya nyroca* | Re | R | O | NT |
| | | | Cotton Teal | *Nettapus coromandelianus* | M | UC | O/Pi | LC |
| 9. | Gruiformes | Rallidae | Comb Duck | *Sarkidiornis Melanotos* | Re | R | H | LC |
| | | | Indian Moorhen | *Gallinula Chloropus* | Re | R | O | LC |
| | | | Indian Purple Moorhen | *Porphyrio poliocephalus* | Re | UC | O | LC |
| | | | Coot | *Fulica atra* | M | C | O | LC |
| | | strildidae | White-throated Munia | *Euodice malabarica* | Re | VC | O | LC |
| 10. | Passeriformes | Alaudidae | Ashy-crowned sparrow-Lark | *Eremopterix grisea* | Re | C | O | LC |
| | | Hirundinidae | Barn Swallow | *Hirundo rustica* | M | C | I | LC |
| | | | Wire -tailed Swallow | Hirundo smithii | Re | C | I | LC |
| | | Laniidae | Bay-backed Shrike | *Lanius vittatus* | Re | UC | Ca | LC |
| | | Pycnonotidae | Grey-headed Bulbul | *Brachypodius priocephalus* | Re | C | Fr | NT |
| | | Motacillidae | White-browed Wagtail | *Motacilla maderaspatensis* | M | C | I | LC |
| | | | White Wagtail | *Motacilla alba* | M | R | I | LC |
| | | | Grey Wagtail | *Motacilla cinerea* | M | R | I | LC |

**Table-1: Avi-faunal diversity of Paldhag lake.**

**Occurrence - Resident (Re), Migratory (M) and Resident Migratory (RM)**
**threatened status - Least Concern (LC), Near Threaten (NT) and Vulnerable (VU)**
**food habit - Ca-Carnivorous, I-Insectivorous, Pi-Picivorous (Fish eater), H-Herbivorous, F-Frugivorous (Fruit eater), G-Grainivorous, O-Omnivorous and-Nectar eater.**
**Abundance - common (C), Very common (VC), Uncommon (UC) and Rare (R).**