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ANALYZING THE ROLE OF INDIAN COURTS IN ENFORCING THE RIGHT TO FOOD AND ENVIRONMENTAL PROTECTION

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ABSTRACT

Indian right to food and environmental conservation have converged into an issue that has become essential towards achieving socioeconomic justice. Thus, this study is geared towards the analysis of the enforcement of the right to food under the Indian Constitution by Indian courts, besides how these rights overlap into the obligation to conserve the environment. Initially considered a right of a socio economic nature, this right has grown into a justiciable basic right under Article 21 (Right to Life) with much judicial intervention. Landmark cases, such as the PUCL case and the Right to Food Case, have played critical roles in expanding this right, highlighting the responsibility of the state in ensuring adequate food availability for all citizens, particularly vulnerable communities. It reveals an essential connection between food security and environmental sustainability and therefore concludes that there is a necessity for environmental conservation in relation to food security. Climate change, soil degradation, water shortages, and loss of biodiversity all have a direct impact on agricultural production and food supply. As a result, in their decisions on food security, courts have begun to recognize the importance of sustainable development and environmental conservation. Indian law recognizes the importance of environmental protection in supporting the resilience and sustainability of food systems. This research aims to deconstruct the impact of judicial activism in determining policies for both food security and environmental conservation through the analysis of key decisions and examination of wider socioeconomic and environmental implications. The study focuses on court interventions that have not only implemented the right to food but also encouraged the integration of environmental issues into the broad scope of social justice. Doing this highlights the importance of looking at human rights as an encompassing approach, where a right to food and environmental preservation is considered as one of the interconnected pillars of development.

KEYWORDS

right to food, judicial activism, environmental protection, food security, constitutional law

INTRODUCTION

The right to food has emerged as an important element of human dignity and welfare, becoming a constitutional necessity inextricably linked with socioeconomic justice. Although the "right to food" does not find an explicit expression in India's Constitution, it is considered to be part of a larger framework of fundamental rights and directive principles. The right to food is enshrined in Article 21

of the Constitution as a right to life and personal liberty. This article, which originally was considered a narrow guarantee against arbitrary deprivation of life and liberty, has been interpreted so broadly by Indian courts to include the right to live with dignity, which implicitly includes access to adequate nutrition and sustenance. The constitutional framework includes the Directive Principles of State Policy (DPSPs) under which Article 39(a) obligates the state to ensure citizens have adequate means of subsistence and that the economic system does not lead to wealth concentration. Article 47 further postulates that the state would enhance the nutritional and standards of living of its people, hence public health. These principles shall form the basis of the state duty to promote and protect the right to food in line with the objective of ensuring living dignified for all subjects. Historically, the right to food in India has been considered a socioeconomic right—an aspirational state obligation rather than one that is enforceable in court. However, this view has changed over time through the dynamic role of the Indian judiciary in broadly interpreting the right to life. Through judicial activism, the judiciary has made crucial contributions toward changing the right to food from being a policy objective to becoming a constitutional right in its most elementary form. Decisions like People's Union for Civil Liberties v. Union of India, popularly known as the PUCL case of 2001 and the Right to Food Case from 2001 to 2003 have made it well-known that the right to food is an inseparable component of the right to life and therefore justiciable. The Supreme Court of India has recognized in these decisions that the State has a constitutional duty not merely to ensure food security, but also to take proactive efforts to prevent hunger, malnutrition, and food deprivation, particularly among disadvantaged and vulnerable people. The landmark National Food Security Act of 2013 strengthened the right to food by establishing legal entitlement to subsidized food grains for a large percentage of the population. Thus, the Indian right to food reflects the larger evolution away from a policy-driven approach and toward a legal accountability-based approach. The right has evolved gradually from a socio-economic goal to a constitutional right with justiciable form that seeks political accountability between aspirational policies and enforceable legal rights. Significance of Environmental Protection in the Context of Food Security: Environmental protection and food security are closely intertwined, as environmental health has a direct impact on food supply, accessibility, and sustainability. Food security is defined as the state in which all persons have constant physical, social, and economic access to sufficient, safe, and nutritious food, which is required for an active and healthy lifestyle. Conversely, environmental protection is the protection and sustainable use of natural resources such as land, water, and air for a continued period of time. The convergence of environmental conservation and food security is based on the concept that the environment provides the necessary resources for food. Depletion or degradation of the resources jeopardizes the production of food and their quality, making

environmental conservation an indispensable component in ensuring long-term food security. Several environmental elements-such as soil fertility, availability of water, biodiversity, climate stability, and ecosystem health-are essential for the agricultural output and, therefore, for the food security.

AIMS AND OBJECTIVE

To explore how Indian courts have interpreted and enforced the right to food under the Constitution of India, focusing on landmark judgments. To analyse the intersection between the right to food and environmental protection, highlighting cases where both rights are intertwined. To assess the impact of judicial interventions in ensuring access to food and a sustainable environment for marginalized communities. To evaluate the role of Indian courts in shaping government policies related to food security and environmental protection.

Hypothesis:

The research hypothesizes that Indian courts have played a critical role in interpreting and enforcing the right to food under the Indian Constitution, with major decisions influencing the socio-legal landscape. It further contends that the right to food and environmental protection are frequently linked in judicial verdicts, with courts acknowledging the environmental elements that affect food security. By critically examining court interventions, the study concludes that such decisions have had a major impact on marginalized groups' access to food and sustainable living. Furthermore, the study anticipates that Indian courts have affected government policies on food security and environmental preservation, and it will critically assess the amount of judicial activism in enforcing these socioeconomic rights, focusing on their interconnection.

Rationale of Study:

The motivation for this research derives from the need to understand the changing role of Indian courts in protecting the right to food, a fundamental socioeconomic right, and how it intersects with environmental protection. The study's goal is to explore how courts have interpreted and enforced the right to food under the Indian Constitution by looking at major rulings. Furthermore, it attempts to examine the important link between food security and environmental sustainability, particularly when these rights overlap. This study will look at the impact of judicial interventions on marginalized populations, including their access to enough food and a sustainable environment. It also seeks to assess the impact of judicial rulings on government policy related to food security and environmental protection. Finally, the study will evaluate the level of judicial activism in enforcing these socioeconomic rights, particularly in terms of reconciling the right to food with environmental sustainability.

RESEARCH METHODOLOGY AND DATA BASE:

Methodology:

The research methodology for this study adopts a doctrinal approach, utilizing case law analysis to explore the role of Indian courts in interpreting and enforcing the right to food under the Constitution. The study will begin by reviewing landmark judgments such as PUCL case and State of Tamil Nadu v. K. Balu (2014), which have shaped the legal framework for food security. It will then examine how the right to food intersects with environmental protection, analysing cases where judicial decisions have simultaneously addressed both rights. The study will assess the impact of judicial interventions on marginalized communities, especially in ensuring access to food and a sustainable environment, through a critical evaluation of government policies influenced by court rulings. Lastly, the research will evaluate the extent of judicial activism in the enforcement of socio-economic rights, particularly the right to food, and its relationship to environmental sustainability, exploring the balance between judicial intervention and legislative action.

Data Base:

The right to food in India stems primarily from Article 21 of the Constitution, which provides the right to life and personal liberty. Numerous legal experts, notably B.G. Verghese (2001) and P. M. Bakshi (2002), have highlighted how the Supreme Court of India broadened the reach of Article 21 to include the right to food. The PUCL lawsuit (2001), in particular, was a watershed moment in recognizing the state's responsibility to secure food security as part of the fundamental right to life. Scholars such as V.R. Krishna Iyer (2001) and Upendra Baxi (2002) have underlined the need of judicial interpretation in transforming socioeconomic rights into justiciable rights, thus institutionalizing food security enforcement.

Furthermore, experts such as C.K. Dhananjay (2010) and N.M. Gopalan (2004) have emphasized how judicial activism in India resulted in a move from a purely aspirational policy goal to a legally binding right. Through decisions such as the Right to Food Case (2001-2003), the courts broadened the definition of the right to food to encompass both entitlement to food and the state's obligation to ensure proper nourishment.

The interaction of food security and environmental conservation is a major issue in the literature. Scholars such as T. K. Bansal (2009) and M.C. Mehta (2003) have investigated how environmental protection, particularly in light of climate change, water shortages, and land degradation, is critical for long-term food security. They contend that environmental degradation reduces agricultural output, making environmental conservation a critical component in guaranteeing long-term food security.M.C. Mehta, in particular, has examined instances such as the Tata Iron and Steel Company (TISCO) case and

the Ganga pollution cases, highlighting the link between pollution control, resource conservation, and food security.

The National Green Tribunal (NGT) and the Supreme Court of India have increasingly recognized the importance of comprehensive policies that address both environmental and food security problems. S. K. Verma (2011) highlights the judiciary's involvement in crafting policies addressing soil conservation, water management, and biodiversity protection, all of which are critical to ensuring food security. Furthermore, researchers such as L. V. Krishnan (2014) and G. M. Chandra (2015) have investigated how environmental jurisprudence in India has evolved, with the court playing an important role in enforcing environmental regulations that have direct consequences for agricultural production and food security.

Intersection of Right to Food and Environmental Protection:

The necessity for sustainable agriculture techniques best illustrates the convergence of food security and environmental conservation. As the world's population rises, food production must increase without jeopardizing future generations' ability to generate food. Organic farming, agroforestry, water-efficient irrigation systems, and climate-resilient crops are examples of sustainable techniques that can assist ensure that food production does not harm the environment.

For example, organic farming avoids the use of chemical pesticides and fertilizers, which can pollute water systems and affect soil health. Agroforestry, or the process of incorporating trees into agricultural landscapes, not only protects biodiversity but also increases soil fertility and water retention, which directly benefits food production. Similarly, measures such as rainwater collecting and drip irrigation help to conserve water, ensuring a more sustainable water supply for agriculture. Furthermore, conserving the natural ecology is critical to ensuring food security. Forests, wetlands, and oceans provide vital resources including clean water, fertile soil, and biodiversity. Wetlands, for example, serve as natural water filters, while woods regulate climate patterns critical to crop production. Governments and environmental organizations can help to ensure long-term food security by protecting these ecosystems.

Constitutional and Legal Framework for Right to Food and Environment:

The legal and policy frameworks governing environmental protection and food security must be harmonized to solve the dual problems of assuring sustainable food production and safeguarding natural resources. In India, the National Food Security Act (2013) and the National Action Plan on Climate Change (NAPCC) emphasize the significance of incorporating environmental considerations into food security strategies.

For example, India's National Mission on Sustainable Agriculture, which operates under the NAPCC, promotes sustainable agricultural techniques that conserve water, retain soil fertility, and improve climate resilience. Similarly, the Pradhan Mantri Krishi Sinchayee Yojana (PMKSY) seeks to improve irrigation efficiency while reducing the environmental impact on water resources.

At the judicial level, Indian courts are increasingly acknowledging the link between food security and environmental preservation. In cases like the Bhopal Gas Tragedy and India's Right to Food Case, the judiciary has demonstrated how environmental deterioration can jeopardize food security. Courts have underlined the importance of the state balancing development and environmental conservation to ensure long-term food security for all residents, particularly the poor.

RESEARCH ANALYSIS

The hypothesis provides a multifaceted examination of the role of Indian courts in shaping the right to food and its relationship to environmental protection. According to the research, the court has played an important role in interpreting and upholding the right to food guaranteed by the Indian Constitution, particularly through historic cases. This shows that court rulings have had a substantial impact on the socio-legal system, changing the extent of socioeconomic rights in India. The idea holds that Indian courts have not only broadened the awareness of the right to food, but have also played a critical role in ensuring its protection, particularly for vulnerable people. In this context, it is obvious that judicial activism has been an important weapon for enforcing fundamental rights, as indicated by decisions requiring the state to take affirmative action.

Furthermore, the concept highlights the relationship between food security and environmental sustainability. This connection suggests that courts have paid attention to how environmental concerns like climate change, land degradation, and water shortages affect food supply and security. The study anticipated that Indian courts have frequently linked these concerns, understanding that the right to food cannot be fully realized without maintaining a sustainable environment. Courts have integrated food security and ecological considerations into their decisions by recognizing the larger environmental context.

Furthermore, the hypothesis investigates the effect of court interventions in enhancing food access and sustainable living for underprivileged groups. This component emphasizes the judiciary's crucial role in eliminating systemic inequities, particularly in rural and disadvantaged areas where access to food and clean water may be severely limited. Judicial decisions have been critical in pressuring governments to implement policies to combat hunger and environmental degradation, particularly for vulnerable populations such as women, children, and the poor.

Finally, the hypothesis argues that judicial activity in enforcing socioeconomic rights, particularly the right to food, has had a substantial impact on government policy relating to food security and environmental protection. The study anticipates that the judiciary's aggressive approach has had a direct impact on government measures, such as advocating for legal reform and policy improvements. By critically assessing the scope of judicial activism, the study will determine if these interventions have been appropriate and effective in furthering food security and environmental protection, while also taking into account the limits of judicial power in these areas.

Thus, the hypothesis provides a good platform for investigating the role of Indian courts in moulding the discourse on food security and environmental preservation, particularly in the context of underprivileged communities. It intends to investigate the level of judicial influence on policymaking and critically assess the balance between judicial activism and executive accountability in protecting these rights.

RESULT OF FINDINGS

While courts have been essential in articulating the right to food and environmental preservation, strong enforcement measures are required. The formation of specific monitoring bodies, such as the National Human Rights Commission (NHRC) or State-level Food Commissions, can help guarantee that judicial orders on food security and environmental preservation are followed at all levels of government.

To increase the impact of judicial decisions, greater public understanding of the right to food and environmental legislation is required. Programs that educate residents about their rights can empower them to keep the government accountable, resulting in improved access to food and participation in environmental conservation efforts.

Governments must develop policies that fully address the convergence between food security and environmental preservation. For example, boosting sustainable agriculture through subsidies for eco friendly agricultural practices, water conservation techniques, and climate-resilient crops can help protect food security in the face of environmental threats.

Policies aimed at development must consider both economic growth and environmental sustainability. The courts can continue to press the government to strike a balance between industrial and agricultural development and environmental preservation, ensuring that one does not impede the other.

Judges, particularly at lower levels, should get frequent training on environmental laws and their relationship to socioeconomic rights such as food security. This will aid in better understanding and managing the complexity of situations involving both environmental preservation and food security.

Public Interest Litigation has proven to be a successful strategy for enforcing socioeconomic rights, particularly among underprivileged communities. Courts should promote more PILs that address the confluence of food security and environmental protection, allowing affected people to voice their concerns and seek justice.

Satellite photography and data analytics are examples of technologies that can be used to monitor environmental conditions and agricultural production systems. Courts can push the government to employ these technologies to monitor progress on food security and environmental protection measures, so ensuring transparency and accountability.

By implementing these recommendations, India may strengthen its legislative framework for the right to food and environmental protection, creating a more sustainable and fair future for all citizens. The judiciary will continue to play an important role in directing and enforcing fundamental rights, but it is critical that the executive and legislative arms of government collaborate with the courts to address these complex concerns thoroughly.

CONCLUSION AND SUGGESTIONS

Environmental conservation and food security are not distinct concerns; they are inextricably linked. Sustainable environmental practices are critical for ensuring that food production meets future demand while remaining ecologically balanced. As climate change and environmental degradation continue to pose severe difficulties, governments, courts, and civil society all prioritize integrating food security and environmental protection. Recognizing this nexus allows for legal and policy actions to build a more resilient and sustainable food system that benefits both current and future generations.

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A STUDY OF URBAN ECOLOGY AND ENVIRONMENTAL CRISES IN ARVIND ADIGA'S SELECTION DAY

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ABSTRACT

This paper explores the themes of urban ecologies and environmental crises in Aravind Adiga's novel Selection Day, set in the rapidly urbanising city of Mumbai. While the novel primarily revolves around the coming-of-age story of two brothers striving for success in cricket, it also offers a critique of the environmental degradation that accompanies Mumbai's neoliberal growth. Through an analysis of pollution, waste management, land commodification, and water scarcity, this paper examines how Adiga portrays the impact of unchecked urbanisation on the city's ecological health and its marginalised residents. The novel highlights the intersection of social inequality and environmental injustice, illustrating how the urban poor disproportionately suffer from the consequences of ecological degradation. Drawing on critical studies of Adiga's work and urban environmentalism, this paper demonstrates how Selection Day critiques the commodification of nature and the ecological consequences of neoliberal policies in contemporary Indian cities. By examining the complex relationship between urbanisation and ecological collapse, this paper situates Selection Day as an important literary text that reflects on the environmental and social challenges facing 21st-century urban spaces.

KEYWORDS

Urbanisation, Environmental, Ecology, Mumbai, City, Marginalisation

INTRODUCTION

Environmental challenges have often been dealt by literary artists of the twenty first century. There has been recurrent themes of ecological destruction, pollution, climate change, loss of biodiversity, environmental catastrophes in their literary works. These problems affect all of us regardless of nationality. Literary artists have often reflected these problems in their scintillating works whether in form of novel, stories, poems etc to make people aware and inspire action. Aravind Adiga's novel Selection Day, set in the rapidly urbanising city of Mumbai. While the novel primarily revolves around the coming-of-age story of two brothers striving for success in cricket, it also offers a critique of the environmental degradation that accompanies Mumbai's neoliberal growth. Through an analysis of pollution, waste management, land commodification, and water scarcity, this paper examines how Adiga portrays the impact of unchecked urbanisation on the city's ecological health and its marginalised residents.

Understanding Urban Ecology and Environmental Crises

"Urban ecology is the study of the relationships of human and nonhuman organisms in urban areas, the interactions of these organisms with the native and built physical environment, and the effects of these relationships on the fluxes of energy, materials, and information within individual urban systems and between urban and non urban systems" (Pickett and Cadanasso).

Adiga explores this relationship in the urban Mumbai. How each factor affects other forming a chain reaction of environmental crises and subsequent survival efforts of the residents of the humungous city. Similarly, the second concept we come across Adiga's Selection Day is Environmental crises which the Mumbai city has been facing since its rapid population explosion and unbridled development.

Relationship between Environment / Climate and Human Psyche

There is a deep complex relationship between humans and nature. And when one dimension goes haywire, it affects another. Ensuing environmental crises can never nurture humans. Similarly, troubled human psyche cannot nourish environment. When there is an iota of change in both the aspects, it becomes evident in the relationship. According to Clayton and Brook, environmental crises caused by human actions. It is the collective impact of human behaviours that are contributing for climate change and environmental deterioration (Clayton and Brook, 2005). According to the research findings of Agyeman, Devine-Wright and Prange, (2009) has supported the fact that communities are already being forced to relocate because of current or anticipated climate changes and such forced relocations can involve a severing of emotional ties to place, as well as disrupting existing social networks. On basis of these findings, Becker and others also propounds that not only the environmental sustainability stands as an ecological crisis, but also it includes the viability of socially shaped relationship between people and nature (Becker et al., 1999). The environmental problems in the shape of global warming, air pollution, noise and loss of diversity brings back the fundamental root cause as human behaviour (Vlek and Steg, 2007). It is this complex intricate relationship portrayed in Selection Day. Adiga masterfully crafts his story on the theme of effect of urban ecologies and environmental crises on human psyche and existence.

Selection Day: A Masterpiece by Arvind Adiga

Selection Day is a novel by Aravind Adiga, published in 2016. In -the novel, Adiga depicts the city of Mumbai as Dickensian. The city has its own dark side where existence is a struggle in a crowded metropolis and the dreams and frustrations of its citizens abounds.

The story is about two teenager boys, Manju and Radha Kumar who are forced to play cricket by their oppressive father while living in slums. Their father thinks both the boys are destined for greatness in cricket. Elder brother Radha seems to be better player than younger brother Manju. As they near to

their final selection day, both the brothers face dilemma, search for identity, personal ambitions, family pressures and struggling in a society fife with inequalities.

Manju explores his own sexual identity and challenges every conformed path expected to be treaded by him. In the end, Manju gives up cricket and liberate himself from his domineering father. He decides to carve his own personality and live a separate life from that of his family.

Depicting Mumbai as an Urban Ecology in Selection Day.

Arvind Adiga uses Mumbai metropolis as a backdrop of his story. He depicts the city of Mumbai as a hustling bustling metropolis which coalesce all kinds of people from all walks of life. However Adiga does not depict a romanticised view of the urban landscape. Instead he shows harsh reality of the "survival of the fittest". Due to neoliberal economic policies, Mumbai is marred by unbridled economic growth which seems to have given rise fragile urban ecology. The city has been exploited by the rich to benefit them while the poor are bearing the brunt of environmental crises. To quote Nandini Nair (2016), "Adiga's Mumbai is not only a city of ambition, but also a city where ecological collapse seems inevitable --- a place where poor breathe in the toxins of both industrialisation and social inequality" (p 45). Adiga brilliantly delineates the physical environment of the Mumbai city. The air of the city seems to be oppressive and the surroundings are equally polluted. "The air was heavy with the odour of the Arabian Sea, the slums, and the factories—an unbearable combination that made your eyes water and throat burn" (Adiga, 2016, p. 15). Adiga describes the air of the Mumbai as "heavy" "unbearable" which in-fact symbolises struggle of existence of poor people in ensuing environmental degradation of the city. Adiga brilliantly portrays how Mumbai city is an intersection of social inequalities and environmental crises and how it is affecting the residents of the metropolis specially the poor. Environmental degradation is affecting, almost every aspect of the residents such as health, economy, opportunity and their psyche. "the economically disenfranchised" (Saiket Majumdar, 2017, p. 23). Mumbai city is epitome of scarcity. Adiga writes about the scarcity of clean air, scarcity of clean water and scarcity of land in the novel. Adiga writes, "Heaps of plastic bags and rotting food surrounded by the cricket field, as if the trash itself was a boundary marker, a reminder of where hope ended and despair began" (Adiga 2016, p. 54). Adiga further writes, "Mohan coughed violently, his lungs heaving with the weight of the air that was thick with smoke and dust. It was the city itself, he thought, choking him slowly, day by day" (Adiga 2016, p.176).

Mumbai as an urban ecology also symbolizes commodification of nature. All the natural resources including land is exploited for profits. The cricket ground where Radha and Manju practice everyday is one of the last open space in the city. Real Estate Developers are eyeing the cricket ground for developing buildings. There is absence of green spaces in the city, all one can see is luxurious buildings

and apartments. To quote Adiga, "Everywhere you looked, land was being eaten up by concrete, and the city's lungs--- the trees, the parks, the open-fields--- were suffocating under the weight of the new Mumbai" (Adiga, 2016, p. 142). Adiga poignantly depicts how neoliberal urbanisation is corroding away the environment and ecology of the city. Neelam Kumar (2017) says in this regards, "Adiga's critique of urban development reflects the broader concerns of neoliberal economics, where the city's landscape becomes a battleground between profit driven development and the environmental needs of its population" (p. 89.).

Theme of Environmental Injustice and Class Struggle

Adiga has beautifully coalesced the theme of environmental injustice and class struggle in his masterpiece novel. The people placed in the lowest rung of the city are facing grave environmental crises while rich people are enjoying the bounties of environmental loot and plunder. Adiga writes, "In this city the rich had walled themselves off from the stench and the dirt, living in their air-conditioned towers, while the rest of us were left to breathe the city's filth" (Adiga, 2016, p 205). The divide between rich and the poor is increasing day by day and this often reflected in their standard of living, access to health care system and their lifestyles. Adiga narrates how the poor are living in ghettos and cramped up spaces with environmental degradation, stench, filth, and dirt. While the "wealthy inhabit the isolated enclaves which shield them from the environmental degradation" (Banerjee, 2019 p. 67). Adiga clearly shows how the system prioritises the rich and wealthy class so that they can manipulate and exploit the resources for their own betterment while the poor class are left at the periphery. The economic growth benefits the rich class and poor class are bear the brunt of the exploitation and ecological degradation. Thus, Adiga brilliantly deals with the theme of environment degradation and class struggle in his novel.

CONCLUSION

Arvind Adiga's scintillating novel Selection Day is an outstanding emphatic critique on rampant economic development and ecological destruction. Through the depiction of urban ecology of Mumbai city, Adiga makes it clear that there is relationship between environmental degradation and social injustice. The novelist has dealt with the themes of ecological destruction and degradation, commodification of nature, pollution, waste management. The social inequality caused by the disproportionate division of resources and unbridled economic development has also been dealt by the novelist. Drawing on critical analisis of Adiga's Selection Days, this paper explores the nuances of environmental crises and ecological sustainability. Adiga not only critically analyses the 'cricket stardom' but also environmental and social challenges of 21st century.

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ASSESSING CLIMATE CHANGE IMPACTS ON ENVIRONMENTAL DEGRADATION AND STRATEGIES FOR SUSTAINABLE DEVELOPMENT

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ABSTRACT:

Climate change has become a major danger to global environmental sustainability, significantly contributing to environmental degradation. This study article examines the intricate relationship between climate change and environmental degradation, emphasizing critical areas such as deforestation, biodiversity loss, soil erosion, water scarcity, and extreme weather events. This study analyses data from several global locations, demonstrating how increasing global temperatures, modified precipitation patterns, and heightened natural catastrophes accelerate the deterioration of ecosystems and natural resources. The ramifications of this degradation on human health, economic stability, and overall environmental security are also analysed.

The research examines solutions to alleviate climate change effects and foster sustainable development. This entails an evaluation of international climate accords such as the Paris Agreement and their effectiveness in lowering greenhouse gas emissions. The significance of renewable energy sources, sustainable farming methods, forest conservation, and environmentally sustainable urban development is examined as essential elements for climate resilience. Particular focus is directed towards adaptation techniques customized for local communities, guaranteeing that development initiatives correspond with ecological conservation and social fairness.

The research emphasizes the necessity of combining policy measures with scientific and technological advances in response to the escalating urgency of climate concerns. Effective climate governance, public-private partnerships, and community-led initiatives are promoted as crucial catalysts for attaining sustainable development. This study seeks to evaluate current initiatives and propose comprehensive frameworks to mitigate the adverse effects of climate change while promoting resilient ecosystems and society. The research advocates for cooperative and proactive strategies to guarantee that development objectives do not undermine environmental integrity, but rather foster a balanced and sustainable future for all.

KEYWORDS:

Climate change, environmental degradation, sustainable development, climate resilience, mitigation strategies

INTRODUCTION

Climate change denotes enduring modifications in temperature, precipitation, and other climatic variables on Earth. Human activities, including the combustion of fossil fuels, deforestation, and industrial operations, primarily drive the growth in greenhouse gas concentrations in the atmosphere. The increase in greenhouse gases leads to global warming, severe weather phenomena, and disturbances to ecosystems. Environmental degradation refers to the decline of natural habitats resulting from both anthropogenic and natural factors, resulting in problems such as biodiversity loss, soil erosion, deforestation, and pollution. The two are closely interconnected, with climate change intensifying environmental degradation and vice versa, establishing a detrimental cycle that jeopardizes world sustainability.

Increasing global temperatures lead to the melting of glaciers and ice sheets, resulting in elevated sea levels. This phenomenon results in the inundation of coastal areas, jeopardizing human habitats and ecosystems. The 2019 Cyclone Idai in Mozambique, among the most lethal tropical storms recorded, was exacerbated by elevated ocean temperatures associated with climate change, demonstrating the relationship between climate-induced catastrophes and environmental degradation. Furthermore, the deforestation of the Amazon rainforest, commonly known as the "lungs of the Earth," exacerbates climate change by diminishing the planet's ability to sequester carbon dioxide and further deteriorates essential habitats.

Legal instances also underscore these effects. In Massachusetts v. Environmental Protection Agency (2007), the U.S. Supreme Court determined that greenhouse gases qualify as pollutants under the Clean Air Act, underscoring the government's need to regulate emissions that contribute to climate change. The Urgenda Foundation v. The Netherlands (2015) case exemplified the capacity of legal systems to compel governments to diminish greenhouse gas emissions in order to alleviate the environmental consequences of climate change. These instances demonstrate the complex issues presented by climate change and the continuous endeavours to combat environmental deterioration through policy, legislation, and international collaboration.

OBJECTIVES OF THE STUDY

Following are the objectives of the research:

1. To evaluate the impact of climate change on environmental degradation globally and regionally.
2. To analyse the socio-economic implications of climate-induced environmental changes.
3. To assess the effectiveness of current climate change policies and international agreements.
4. To identify sustainable development strategies that can reduce the adverse effects of climate change.
5. To explore innovative approaches to sustainable development and climate resilience.

RESEARCH METHODOLOGY

The research is based on secondary resources and qualitative analysis such as reviewing of literature, reports and case studies on climate change impacts, sustainable strategies, analysis of policies, trends and narratives related to climate resilience.

Rationale of the Study

Climate change has become a critical global concern of the 21st century, significantly affecting ecosystems, human civilizations, and economy. Increasing temperatures, glacial melt, unpredictable weather patterns, and a heightened occurrence of extreme climatic events are clear symptoms of a swiftly transforming world. These phenomena lead to environmental deterioration, encompassing biodiversity loss, deforestation, soil erosion, and water scarcity. The connection between climate change and environmental degradation highlights the necessity to evaluate the comprehensive range of effects to formulate appropriate mitigation and adaptation strategies. This study aims to address gaps in comprehending these processes by analysing the complex effects of climate change on the environment.

SCOPE AND LIMITATION

The study will examine the interrelationship among climate change, environmental degradation, and sustainable development initiatives. It will encompass case studies and analyse policy interventions. The study may encounter difficulties in acquiring current data and region-specific insights due to changing climate dynamics.

Literature Review

The convergence of climate change, environmental degradation, and sustainable development has been extensively examined in scholarly literature. Extensive research indicates that climate change is a major catalyst of environmental deterioration, leading to issues such as increasing temperatures, deforestation, desertification, and biodiversity loss.

Research conducted by Smith et al. (2018) and Johnson (2020) highlights that global warming's effects on ecosystems, especially in susceptible areas, have led to habitat loss and changes in precipitation patterns, influencing both terrestrial and marine organisms. The Intergovernmental Panel on Climate Change (IPCC) has delineated how climate change exacerbates environmental degradation by intensifying natural disasters, including floods, droughts, and hurricanes, so undermining the sustainability of populations reliant on natural resources.

Moreover, literature on sustainable development strategies has emphasized various mitigation and adaptation methods. Researchers, including Miller (2019) and Harris et al. (2021), have suggested key initiatives such as promoting renewable energy sources, conserving natural resources, implementing

sustainable agricultural methods, and developing climate resilient infrastructure. These techniques seek to mitigate emissions and bolster the resilience of ecosystems and human communities in adapting to the impacts of climate change. The United Nations Sustainable Development Goals (SDGs) provide a framework for resolving these difficulties by integrating environmental, social, and economic considerations into development policy.

Although extensive literature exists on the individual effects of climate change on environmental degradation and suggested sustainable strategies, a thorough, integrated approach to evaluating these factors—particularly from the viewpoint of developing nations— remains insufficiently explored. Future research might address these gaps by concentrating on multidisciplinary approaches that integrate environmental, socio-economic, and cultural concerns, along with innovative and participatory techniques for sustainable development.

Climate Change and Environmental Degradation: An Overview

Climate change and environmental degradation are interrelated worldwide issues that jeopardize the planet's ecosystems, human health, and economic stability. The intensifying effects of climate change, propelled by greenhouse gas emissions from industrial operations, deforestation, and unsustainable land practices, are hastening environmental deterioration, evident in deforestation, soil erosion, biodiversity decline, and pollution. Increasing temperatures, melting ice caps, and changing weather patterns intensify these impacts, harming ecosystems and livelihoods. Environmental degradation exacerbates climate change via feedback mechanisms. Deforestation diminishes carbon sequestration, but soil degradation liberates stored carbon into the atmosphere. This cyclical link intensifies vulnerabilities, especially in developing countries with constrained adaptive capacities. Coastal regions confront elevated sea levels and intensified storm surges, whilst arid zones endure desertification and water deficiency, jeopardizing food security and human habitation.

Resolving these difficulties necessitates a multidisciplinary approach that combines mitigation, adaptation, and sustainable development measures. Mitigation strategies concentrate on diminishing emissions via renewable energy, energy efficiency, and reforestation projects. Strategies for adaptation, including climate-resilient agriculture and infrastructure, are crucial for mitigating immediate effects. Policy frameworks such as the Paris Agreement underscore the necessity of international collaboration to restrict global temperature increases while advocating for national pledges to combat climate change.

Sustainable development functions as a long-term remedy by reconciling economic advancement with environmental conservation. It promotes ethical consumerism, circular economies, and the incorporation of environmental factors into urban planning and industrial operations. Research is

essential for discovering creative solutions, evaluating vulnerabilities, and measuring the effectiveness of interventions.

The interplay between climate change and environmental degradation establishes a detrimental feedback loop. Degraded habitats exhibit diminished resilience to climate change impacts, including floods, hurricanes, and heatwaves, hence exacerbating their degradation. Coral reefs, essential marine ecosystems, are being obliterated by ocean acidification and elevated temperatures due to climate change, resulting in less marine biodiversity and destabilization of coastal ecosystems. **Climate Change Policies and International Agreements**

Global climate change policies prioritize reducing greenhouse gas emissions, improving adaption measures, and promoting international collaboration to address climate consequences. Many countries have adopted Nationally Determined Contributions (NDCs) under the Paris Agreement, which outline country-specific goals for reducing emissions and transitioning to sustainable energy sources. For example, regulations promoting renewable energy, energy efficiency, and carbon capture technology are widely implemented. Carbon pricing methods, such as carbon taxes and emissions trading systems, are increasingly being used to promote carbon footprint reductions. Furthermore, many governments have implemented policies promoting climate resilient infrastructure, catastrophe risk management, and reforestation. For example, the European Union's Green Deal seeks to reach net-zero emissions by 2050 through sustainable industry, clean energy, and biodiversity conservation. Similarly, developing countries are working on adaption techniques like as early warning systems and climate-resilient agricultural practices, with assistance from international finance channels such as the Green Climate Fund (GCF).

Several significant international accords form the framework for global climate action. The United Nations Framework Convention on Climate Change (UNFCCC), approved in 1992, provides a framework for international collaboration in combating climate change. Building on this, the Kyoto Protocol (1997) established legally binding promises by developed countries to reduce greenhouse gas emissions. However, the scope of the Kyoto Protocol was limited, prompting its replacement by the broader Paris Agreement (2015).

The Paris Agreement is a historic agreement in which 196 nations pledged to limit global warming to well below 2°C, with efforts to keep it to 1.5°C over pre-industrial levels. It underlines the significance of NDCs, frequent progress reports, and financial and technological assistance for developing countries. Another major agreement is the Montreal Protocol, which was originally created to protect the ozone layer but is also effective in combating climate change by phasing out hydrofluorocarbons (HFCs), which are powerful greenhouse gases.

Furthermore, worldwide initiatives such as the Glasgow Climate Pact (2021), agreed at COP26, aim to accelerate the phase-out of coal and reduce methane emissions. The Sendai Framework for Disaster Risk Reduction (2015-2030) and the Sustainable Development Goals (SDGs) strengthen climate agreements by focusing on resilience and environmental sustainability.

Sustainable Development Practices Evaluation

Sustainable Development Practices Evaluation denotes the methodical appraisal of policies, initiatives, and strategies designed to fulfill current demands without jeopardizing the capacity of future generations to satisfy their own requirements. This assessment emphasizes the equilibrium between economic development, environmental conservation, and social justice.

An exemplary instance of evaluating sustainable development practices is evident in renewable energy programs. Countries like Denmark have significantly shifted a large percentage of their energy requirements to wind power, thus diminishing their carbon impact. Evaluations of Denmark's wind energy program highlight the reduction in greenhouse gas emissions and the development of green jobs as significant markers of success, creating a replicable example for other countries. The difficulty, however, remains in maintaining grid stability and assuring technological breakthroughs in storage. The National Solar Mission in India, a component of the National Action Plan on Climate Change (NAPCC), seeks to advance solar energy as a fundamental element of India's energy portfolio. Evaluations of the mission suggest to a significant increase in solar capacity installation. Although this is praiseworthy, restrictions persist, such as financial access for smaller developers and deficiencies in distribution infrastructure.

Sustainable agriculture represents another critical domain for assessment. Methods include crop rotation, organic agriculture, and agroforestry can improve soil fertility and mitigate environmental effect. In Kenya, agroforestry projects that incorporate tree planting alongside crops have enhanced yields, mitigated soil erosion, and sequestered carbon. Evaluations of these projects emphasize their success in raising farmer income while conserving biodiversity. Nonetheless, adoption rates may be constrained by insufficient training and a lack of initial financial assistance.

Judicial precedents also demonstrate a dedication to sustainable development. In the Supreme Court of India case M.C. Mehta v. Union of India (1987), the court set more stringent environmental laws for industries to address air pollution in Delhi. This pivotal ruling underscored the "polluter pays" principle and prompted other firms to relocate and implement cleaner technology, demonstrating how judicial intervention may harmonize development with sustainability objectives.

Climate Impact on Biodiversity Loss

Climate change is a significant catalyst for biodiversity decline, destabilizing ecosystems and endangering species with extinction. Increasing temperatures, changing precipitation patterns, and extreme weather phenomena modify habitats, migration patterns, and the accessibility of resources essential for species survival. Coral reefs, essential ecosystems that sustain numerous marine species, are extremely sensitive to fluctuations in sea temperature. Elevated water temperatures result in coral bleaching, as seen by the widespread bleaching occurrences in the Great Barrier Reef. In 2016 and 2017, significant bleaching due to elevated ocean temperatures resulted in the mortality of approximately fifty percent of the corals in certain areas of this reef system, jeopardizing the marine biodiversity dependent on coral ecosystems.

Another example is the influence of climate change on polar regions. The warming of the Arctic has led to the swift loss of sea ice, endangering species like polar bears who rely on ice for seal hunting. In Alaska Oil and Gas Association v. Jewell (2016), the court emphasized the designation of polar bears as a vulnerable species attributable to habitat degradation resulting from sea ice reduction, so underscoring the relationship between climate change and species vulnerability.

Mitigating biodiversity loss due to climate change necessitates the implementation of solutions such as decreasing greenhouse gas emissions, preserving essential ecosystems, and fostering adaptive measures for species resilience. International accords, including the Convention on Biological Diversity (CBD) and initiatives under the Paris Agreement, seek to mitigate the climate crisis and reduce its detrimental impacts on global biodiversity.

Socio-Economic Implications of Climate-Induced Environmental Changes

Climate change has far-reaching socioeconomic consequences, disrupting livelihoods, worsening inequities, and testing communities' resilience around the world. Rising temperatures and changing weather patterns have a negative impact on agriculture, which is a key source of income for millions of people. Crop failures, lower yields, and increased pests caused by irregular rainfall and extended droughts result in food insecurity and higher market prices, disproportionately affecting underprivileged communities. The loss of arable land to desertification reduces economic prospects in rural areas, increasing migration and straining urban resources.

Floods, hurricanes, and wildfires devastate ecosystems, imposing substantial financial consequences on governments and communities. These calamities devastate infrastructure, disrupt transportation and supply lines, and necessitate significant investments in rehabilitation and restoration. Developing countries, which frequently lack the resources to respond effectively, are especially vulnerable, contributing to an increasing global economic gap. Climate-related events such as heatwaves and sea-

level rise impose additional burdens on metropolitan areas, such as increased cooling energy costs, property loss, and increased demand for public services.

Another significant consequence of environmental change is socioeconomic issues relating to health. Rising temperatures and changing ecosystems aid in the spread of diseases like malaria and dengue, raising healthcare expenditures and lowering workforce productivity. Water scarcity and diminishing quality worsen public health concerns, affecting sanitation and nutrition, particularly in low-income areas. Furthermore, environmental deterioration reduces tourism and recreation opportunities, which directly affect industries that rely on natural beauty and biodiversity.

On a global scale, climate-induced environmental changes are fuelling geopolitical tensions over decreasing resources such as water and agricultural land. Competition for these resources can spark conflict, threatening trade and economic stability. Furthermore, involuntary migration due to environmental disasters reduces human capital, strains social structures in receiving regions, and complicates international relations.

Innovative Approaches to Sustainable Development

The transition from linear to circular economies can considerably cut waste and resource usage. Industrial symbiosis, in which waste from one industry is used as raw material in another, and advanced recycling technology can help to increase resource efficiency. For example, utilizing AI to sort and process recyclable materials can increase recycling rates while decreasing landfill consumption. Expanding access to decentralized energy solutions such as rooftop solar panels, wind microturbines, and community-based energy networks will help speed up the transition to clean energy. These technologies enable small communities to become energy self-sufficient, minimizing their reliance on fossil fuels and grid-based electricity. Cities can use vertical gardens, green roofs, and urban forests to increase biodiversity, reduce urban heat, and improve air quality. Smart cities that integrate IoT-enabled technologies, such as smart grids for energy and automated water management systems, can maximize resource consumption while assuring sustainability. Precision farming, aquaponics, and regenerative agriculture are all techniques that can help to improve soil health, increase water efficiency, and reduce emissions. Drought-resistant crops and biofertilizers are examples of biotechnologies that can help address food security concerns in a sustainable manner. Mangroves, wetlands, and coral reefs can be restored to act as natural buffers against flooding, storm surges, and coastal erosion. These measures not only preserve communities, but they also improve biodiversity and carbon sequestration. Empowering local communities through education, capacity building, and participatory planning ensures that resilience measures are contextually relevant and inclusive. Water

harvesting, agroforestry, and cooperative disaster management initiatives all help to develop grassroots adaptation.

CONCLUSION AND SUGGESTIONS

The research on analysing climate change impacts on environmental degradation and methods for sustainable development shows the major and expanding issues provided by climate change. Increasing temperatures, altered precipitation patterns, and extreme weather phenomena are expediting environmental deterioration, encompassing deforestation, soil erosion, biodiversity loss, and the depletion of natural resources. These impacts not only harm ecosystems but also have substantial ramifications for human health, food security, and economic stability. The research underlines the significance of addressing these challenges through coordinated global efforts, covering both mitigation and adaptation techniques to decrease the detrimental effects of climate change while encouraging sustainable development.

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A REVIEW PAPER ON PHYSICOCHEMICAL AND BIOLOGICAL PARAMETERS OF DIFFERENT RESERVOIRS FROM AHMEDNAGAR DISTRICT

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ABSTRACT

In this review of literature, which concentrated on physicochemical and biological parameters in various dams and water reservoirs from the district of Ahmednagar located in Maharashtra. Parameters like pH, Temperature, Transparency-Turbidity, Total Alkalinity, Total hardness, Chlorinity, Salinity, DO, Free CO2, Total acidity, BOD, COD, Nitrate-Nitrogen, and Nitrite Nitrogen are essential components of water for all living things to survive in better way as well as the biological parameters like Microorganisms, Zooplanktons, Phytoplankton's, Fish, Birds and Reptiles are also important components of any ecosystem. Periodic assessments of these parameters help in evaluating the health of any ecosystem. The literature reviewed in this review article would help us understand the conditions of freshwater aquatic ecosystems specially dams and other water reservoirs from Ahmednagar District.

INTRODUCTION

The district of Ahmednagar is located in central Maharashtra. Geographically speaking, the district holds the distinction of being the first in Maharashtra. The district covers an area of 17048 square kilometers, which is about 5.6% of the state's total area. Reserves are essential for the sustenance of the vast majority of the human race. Our greatest civilizations originated on the banks of rivers. Millions of individuals worldwide inhabit the shores of rivers and rely on them for sustenance. The most significant resource on earth is fresh water: it's the key ingredient of life. Natural aquatic ecosystems are being heavily affected by increasing demand for resources. Water is one of the essential needs in a person's life, with its uses for different purposes like drinking water, irrigation, transport, sanitation, power generation and industry. Today, more than 1 billion people in developing countries have no access to safe drinking water, according to WHO 2000.

Healthy aquatic ecosystem depends on biological diversity and physicochemical characteristics of water, (Venkatesharaju et.al 2010). Physicochemical analysis of water is important to find out its quality. Study of physicochemical parameters is useful to detect water quality.

REVIEW OF LITERATURE

Khedkar et. al (2005), Recorded around 69 different bird species in Nathsagar reservoir. The present study was undertaken for analyzing fish diversity the prime food for most of the migratory birds. Fish diversity comprises 7 orders, 19 families and 67 species. Out of total 67 fish species 40 species are food fishes and 27 fish species belong to weed fish category. The population of large carnivorous fishes has drastically increased which is 16% as compared to other weed fishes on which it feeds. **Kamble et. al (2011),** Investigated physico chemical parameters and Statistical studies have been performed calculating mean, standard deviation, covariance and correlation coefficients between the various pairs of parameters during the period September to December 2008 in order to assess water quality from Bhandardara Reservoir. In his opinion, the results of the study indicate that water from Bhandaradara reservoir is suitable for consumption as shown by positively and negatively correlated parameters.

Dhamak et. al (2013), Work at the dam Bhandaradara has shown that there are variations between phytoplankton groups, and they have been presented in a paper. From the region, five types of Cyanophyta were identified, 22 varieties of Chlorophyta, 14 variety of Bacillariophyta and a single representative of Xanthophyta. The pond had a wide range of aquatic algae, dominated by the Chlorophycean members: bacillariophyceae, cyanophychiae and xanthophyceae. For the purpose of assessing and reducing water pollution, it is essential to conduct algal studies. Unlike more traditional descriptors of biomass and productivity indices, Phytoplankton or its spring succession indicators can be used as an indicator of the longer term environmental change in aquatic systems. According to **Desh Bharatar (2014),** some specific heavy metals are required in Bhandaradara Reservoir for the purpose of determining and reporting quality and sustainability on a variety of occasions. These observations show that some heavy metals have been detected in water samples at several sites, with significant concentrations of certain elements. The results of this study show that the detrimental effects resulting from heavier metals and their synergistic activity may be a potential hazard to humans, plants and the environment.

Gholap et. al (2014) investigated during the year 2009-10 a diversity of zooplankton and physiochemical characteristics was observed at Sadatpur Reservoir. In total, 25 zooplankton species were found to belong to different taxonomic groups. Among these, 6 species belonging to protozoa, 10 species to rotifer, 5 species of cladocerans, 3 species to copepods and 1 species from decapods are reported. The frequency of occurrence of some protozoa and rotifers has been shown to be 81.8% by the numerical superiority of zooplankton. The maximum value of relative density (4.36) was recorded in the Sinantherina species (rotifer). For the species Rotaria (rotifer), a maximum relative frequency of 15.35 was recorded. The maximum value of relative abundance (7.6) was recorded in Rotaria and

Asplanchuna species (rotifer). These are pollution indicator species used for monitoring the aquatic body.

Aher and Sonawane (2015) worked at Mula Dam Reservoir in Rahuri; the work was carried out on freshwater fish fauna of the Mula River. During the period from January to March 2004, this work was carried out. For the assessment of fishery practices in this area, individual observations and interviews have also been used. The studies revealed that the reservoir contained 19 species of fish belonging to 6 orders and 10 families. The order Cypriniformes is dominant followed by the Perciformes; Beloniforms and Silurianformse; Synbrachiformes and Osteoglossiformes. The fish diversity of the reservoir is excellent; there are economically important and cultivable species as well as ornamentals living in it.

Arangale et. al (2018), in different sites in the Ahmednagar district of Maharashtra, work has been carried out to assess physicochemical parameters with regard to water from dams. The current research compares the physical-chemical characteristics of the water from the Bhandardara and Mula dams in Maharashtra's Ahmednagar district. In addition to characteristics pertaining to temperature, pH, TDS, free CO2, alkalinity, chlorides, total hardness, calcium hardness, magnesium hardness, dissolve oxygen, BOD, and COD, four samples were taken during the investigation in February, July, and November 2017. The result indicates that the physico chemical parameters of this dam water vary considerably. Most parameters are shown to have a prescribed limit from IS and WHO during the present study.

Kale et. al (2018), Worked on ichthyofauna of Lonimavla reservoir for fish culture. Eleven fish species from five orders and six families were discovered in the dam throughout the study period. Six species dominate the order Cypriniformes, followed by two species in the Perciformes order and one species each in the Clupeiformes, Mastacembeliformes, and Siluriformes orders. The current study demonstrated the wide diversity of fish in the Lonimavla reservoir.

Wagh and Jondhale (2021) revealed that Chlorophyceae (34 genus and 69 species) are the dominant class in the Kotmara reservoir. Following it were 11 genera and 22 species of Bacillariophyceae and 14 genera and 30 species of Cyanophyta. Xanthophyceae, Dinophyceae, and Charophyceae are the other groups of algae. In Summer time saw the least amount of development in algal density, with winter and monsoon seasons showing the greatest growth.

Kunjir and Kawade (2021), examined the Ghod Reservoir's ichthyofauna and its potential for fish cultivation. He discovered 25 species of fish, spread throughout 10 families, 19 genera, and 6 orders. With 14 species, the Order Cypriniformes was the most abundant, followed by the Perciformes (4

species), Mastacembaliformes (2 species), Siluriformes (2 species), and Clupeiformes (1 species) orders. The results of the investigation showed that the fish diversity in the Ghod reservoir is abundant.

Jadhav and Dandawate (2021), The present work was done from 1 April 2020 to 31 March 2021. It deals with study of Distribution and Ichthyofaunal biodiversity in Mula Dam Reservoir Tal-Rahuri Dist. -Ahmednagar MS, India. The current work deals with the fresh water fish recorded and confirmed by various other 15 species belong to 6 Order and 7 Families were present in the reservoir. This reservoir is rich in fish diversity and inhabited by economically important.

Dalavi and Pawar (2021) examined the Mandohol reservoir's physicochemical characteristics and overall water quality index (WQI) from September 2020 to August 2021 to determine whether it was suitable for industrial, drinking, irrigation, fishing, and other uses. Standard techniques were used to evaluate the following water parameters: temperature, electrical conductivity, total dissolved solids, pH, dissolved oxygen, total alkalinity, hardness, chloride, nitrate, nitrite, sulphate, phosphate, BOD, and COD. By using the Weighted Arithmetic Index approach, the reservoir's WQI was found to be 38.67068 (Grade- B).

The average observed values of the parameters under investigation are lower than the drinking water quality requirements set by the WHO, ICMR, and BIS. This suggests that there is little water pollution and no signs of eutrophication. Although reservoir water doesn't need to be treated to be used for domestic, commercial, or agricultural purposes—including fish culture—it does need to be properly treated before being consumed.

Dalavi and Pawar (2022) investigated piscivorous avifauna of Mandohol reservoir by conducting a monthly survey from September 2020 to August 2021. It contains a diverse assemblage of algae, aquatic weeds, phytoplankton and zooplankton which facilitate the growth of fishes and other aquatic animals and attracts several birds. Altogether 8 piscivorous bird species were observed from 4 different families and 3 orders. It was found that1 species (12.5%) was very common, 3 species (37.5%) were uncommon and 4 bird species (50%) were occasional. As per the IUCN status, 7 species (87.50%) of observed bird belong to least concernand1 species (12.50%) was near threatened. The migratory status of observed bird species showed that 6 species were residential (87.50%) and 1 species was a local migrant (12.5%). Out of the piscivorous birds sighted, the family Ardeidae was abundant in the study area but have the lowest predation threat.

Foraging behavior of observed species showed that, Cattle egret (Bubulcus ibis) and little cormorant (Phalacrocorax niger) were frequently observed. Kingfisher (Halcyon smyrnensis) consumes only small fish but feed more frequently. A minor number of piscivorous avifauna, good quality of water and manageable human interference indicated an opportunity for fish culture.

Dalavi and Pawar (2022) examined the water quality of the Mandohol reservoir in the Maharashtra district of Ahmednagar from September 2020 to August 2021 to determine whether or not it was suitable for fishing. Seasonal variations in the following physico-chemical parameters are found to be within the desirable limits for fish and fisheries practices: temperature during the monsoon and summer, chloride only during the summer, electrical conductivity, total dissolved solids, pH, dissolved oxygen, total alkalinity and hardness, nitrate, nitrite, BOD, and COD in all seasons. Nonetheless, all seasons showed relatively low levels of calcium, magnesium, and sulphate; water temperature from post-monsoon to winter and chloride from monsoon to winter; and high levels of phosphates and clarity from all seasons.

CONCLUSION

The review article presented here is based on the evaluation of physicochemical and biological parameters of the various water reservoirs spread across the largest district of Maharashtra, which is Ahmednagar. Eight reservoirs across the district are evaluated. Nathsagar, Bhandardara, Sadatpur, Mula Dam, Kotmara reservoir, Lonimavla reservoir, Ghod reservoir, Mandohol reservoir are the ones to name.

Most of the worker have found that the physicochemical parameters of water of most of these reservoirs are well within the permissible limits to qualify the drinking water standards as suggested by WHO, though at certain sites it has been noticed that the heavy metal concentrations of water of Bhandardara dam was higher. The fluctuations in some of the physicochemical parameters of water, in almost all the reservoirs can be attributed to the seasonal fluctuations.

Biological evaluations based on biodiversity assessment were carried out by many workers in and around these water reservoirs. Most of them have recorded diverse fish diversity, amphibian fauna, reptilian as well as avian fauna. Bhandardara and Sadatpur waters were found to be rich in phytoplankton and zooplankton diversity, which consecutively suggests the rich diversity of fish in these waters. The feasibility report on sustainable pisciculture in Mandohol reservoir suggests the same.

Based on the review presented in this study it can be concluded in one line that the water reservoirs under considerations are in good conditions looking at their physicochemical and biological parameters continuous efforts by the government and local of the region can help in continuing the existing good condition of these reservoirs.

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BIODIVERSITY OF ZOOPLANKTON AND ITS IMPORTANCE FOR FISH PRODUCTION ON NATH SAGAR DAM (JAYKAWADI)RESERVOIR DISTRICT SAMBHAJINAGAR. MAHARASHTRA STATE. INDIA.

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ABSTRACT

Nath Sagar Dam (Jayakwadi) was constructed on the river Godhavari which is a tributary of River Godavari, in Aurangabad District (Maharashtra, India) in 1965.The Dam Nath Sagar has been under constant threat of pollution by sewage and industrial wastes, disposal of dead bodies, deforestation, excessive use of fertilizers and pesticides, bathing and water development programmers. The dam has a Height 41.30 .m and Lenth is 9,998m. It is of great Importance for the region because its water is used for human and cattle consumption, power generation, fish production and irrigation. A total of 33 species of phytoplankton's, 29 species of zooplanktons and 11 species of fishes were identified. The importance of plankton in fisheries is well established. It has been clearly demonstrated that the zooplankton constitute the only food for the fish fry and the adult fish not only eat them, but also select them as a delectable item. Thus, zooplankton have a direct bearing in the fish industry. In India, several studies were conducted in reservoirs elucidating the characteristics of zooplankton. The zooplankton peak was found during summer followed by winter and rainy season. Microfauna (zooplankton) was observed about four groups as Rotifer observed about eleventh species, Copepod observed about nine species, Cladocera observed seven species and Ostracoda observed about two species.

The macro fauna or fish fauna were observed at the Nath sagar Dam reservoir. There is culture of fish with quick growing varieties of fishes including Indian Major Carps, exotic species have been popular in recent time. There is abundance of the species such as Labeo rohita, Cirrhina mrigal, Catla catla, Cyprinus Carpio, Silver carp, Wallago atta, Mystacenbelusc, armatus, Notoptemus chital, Puntues ticto, Channa staitus, Mystus seenghala, Mystuscavaassius, Eutroplus suratensis, Belon concila, Chela, Tilapia Mossambica, Rohtee alfrediana, Gobius giuris, etc. Fish is economically a very important group of animals be side being used as food. Fish liver is an important source of oil containing Vitamins A and D, several minerals and protein.

KEYWORDS:

Reservoir, Zooplankton, Pollution, Fish production.

INTRODUCTION:

India has a large network of river, canals, lakes and ponds, which contribute more than 30% of the total fish production. Fish form one of the most important group of animals for man and have received his attention from ancient time. Majority of our people suffer from hunger and malnutrition. Fish is an excellent food for man and provides protein, fat and vitamin A and D, which are essential for the health of man. Fish is also provide source of vitamin B, it food rich in protein is specially preferred for containing essentially amino acid such as Lysine and methionine abundantly required for formation of phospholecithine in gray matter of the brain unsaturated fat in fish also reduce the risk of formation of high blood cholesterol. Phosphorus and several minerals are also present in it. They have good test and easily digestible. Besides being a rich source of food, fishery provides job opportunities also. By product of fishes i.e. fish manure, isinglass and several other production of commerce. Considerable studies on fish diversity from different fresh water bodies of India have been carried out during the last few decades Hamilton Buchanan (1822), Day(1878), Mishra (1962), Jayram (1981) Thomus et.al. (1989), Talwar & Jhingrah (1991), Menon (1992), Rao et.al (1999). Sarkar and Banergee (2000), Mishra et.al.(2003). There are over 19000 reservoirs in India. Covering 3, 15,366 ha. And many more are under construction. (Suguman 2000) Reservoir Fishery in India is also important from social economic point of view as it has the potential of providing employment to about 2 million people (Khan Et.al.1999). According to sreenivasan (1993) the Maharashtra is endowed with an area of 1,79,430 ha. Under reservoir and the state produces 516 tons of fish of these area the state fisheries corporation was operating in 6,272 ha. Of reservoir and marketing the catches.

The present investigation was under taken to study the aquatic vertebrate animals with reference to fishes from Nath sagar dam reservoir water. It is a second stage of Jayakwadi Project of Nath N Sagar. It is irrigation project of Maharashtra state. It is situated in the latitude 160168 and longitude 730 26E. It is multipurpose type like irrigation and power production and also fishing purposes (Table No. 1).

Material and Method:

Sample collected and preserved in 4 % solution of formalin. The quantitative andqualitative analysis was carried out by taking 20 ml of concentrate obtained by siphoning the supernatant liquid. The genera of Zooplankton were identified and quantitative determination was carried out referring Needhan and work of Edmondson. Zooplankton were counted by drop count method and the results were converted to organisms per ml of water. The counting was done following the work of Edmondson (1965), APHA, AWWA and WPCF (1985), Trivedy and Goel (1984), Tonapi (1980), Standard key & other literature were used for identification of different species and the identified species were expressed in no. per liter.

The fishes were collected from the Nath sagar dam reservoir with the help of fisherman during the year June 2015 – May 2016. The specimen were preserved in 10% formalin and subsequently identified following work of Lagler (1956) Menon and Talwar (1972), Day (1878), Datta Munshi & Srivastav (1968), Jayram (1981) and Talwar & Jhingran (1991).

RESULT AND DISCUSSION:

The importance of plankton in fisheries is well established. It has been clearly demonstrated that the zooplankton constitute the only food for the fish fry and the adult fish not only eat them, but also select them as a delectable item. Thus, zooplankton have a direct bearing in the fish industry. In India, several studies were conducted in reservoirs elucidating the characteristics of zooplankton. The zooplankton peak was found during summer followed by winter and rainy season. Microfauna (zooplankton) was observed about four groups as Rotifera observed about eleventh species, Copepoda observed about nine species, Cladocera observed seven species and Ostracoda observed about two species.

Fish as constitute economically a very important group of animals. A large number of dams and reservoir has been constructing during the recent year to provide water for irrigation and power production. These bodies of water offer immense scope for fish culture for successful fish farming in dam and reservoir.

Nath Sagar dam (Jayakwadi) reservoir is very productive more work has been carried out of fish fauna. The distribution of fish species is quite variable because of geographical and geological condition.

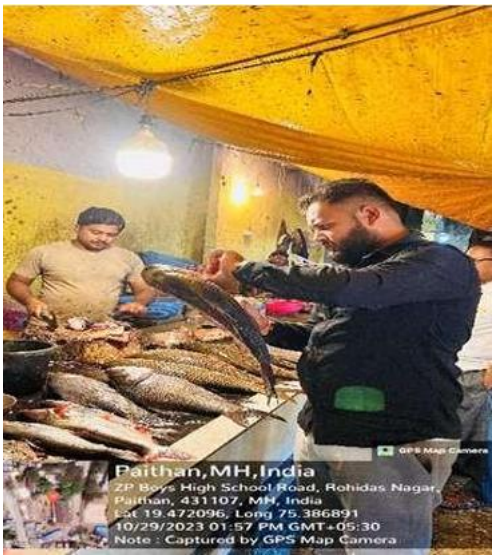
The Eleven species of the fish fauna in this study belonging to four order and six families are given in the table No. 2 among them order Cypriniforms was dominant with eight species to be followed by the Mastalimbeliformes, Osteoglossifomes, and Ophiocephalifomes each with one species. Valsangkar (1993) recorded 17 indigenous and 5 introduced fish species from Shivaji Sagar reservoir. Sakhare (2001) recorded 23 fish species belonging to 7 orders in Jawalgaon reservoir in Solapur district. Pawar and Madlapure (2002) recorded 11 fish species belonging to 5order in sivur dam. Ingole (2005)

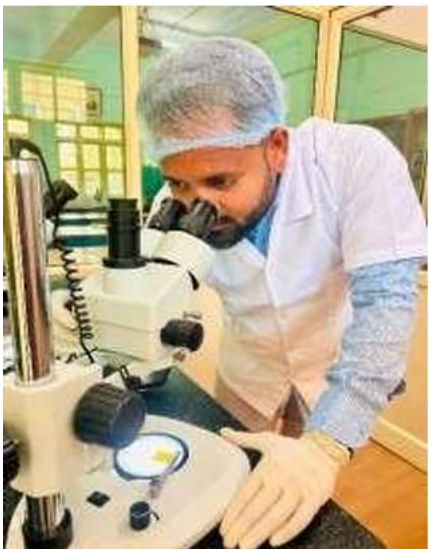
Highlight of Jayakwadi dam reservoir.

Name	Jayakwadi -I Do2995
Type	Multipurpose (Irrigation and Power production)
River	Godavari river
Basin	Godavari

Location	Jayakwadi sambhajinagar District, (M.S.) India
Year of start of Construction	1965
Year of completion	1976
Catchment area	21,750 km ^{2}
Construction Cost	4,700 cr
Surface area	350km^2

Fish diversity from Nath Sagar Dam reservoir





Class – Pisces	Family -3 – Siluridae
Sub-class – Teleostomi	Spcies – 8 – Wallago altu
Order 1 – Cypriniformes	Order – 2 – Mastaembeliformes
Family 1 – Cyprinidae	Family 4 – Mastamecembelidae
Speices – 1 – Catla Catla	Species 9 – M. armatus
Species 2 – Labeo rohita	Order 3 – Osteoglossiformes
Species 3 – Cirrhina mrigal	Family 5 – Notopteridae
Species 4 – Cyprinus carpio	Species – 10 – N. chital
Speices 5 – Silver carp	Order 4 – Ophiocephaliformes
Species 6 – Barbus ticto	Family 6 – Channidae
Family 2 – Bagridae	Speices – 11 – Channa Staitus

Species 7 – Mystus seenghala	

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TO STUDY THE BIKE TOURISM OF MAHARASHTRA-CASE STUDY OF MUMBAI AND PUNE

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ABSTRACT

This work contributes to the field of urban tourism by highlighting the potential of bike tourism in Mumbai and Pune. Future studies can explore long-term trends in bike tourism adoption and the impact of emerging technologies such as smart cycling routes and e-bike sharing systems

KEYWORDS –

Urban, tourism, statistical stool

INTRODUCTION

Bike tourism is gaining traction as a sustainable and experiential travel alternative. In Maharashtra, the cities of Mumbai and Pune have witnessed a rise in cycling enthusiasts, driven by health consciousness, environmental awareness, and adventure-seeking behavior. This study investigates the key factors influencing bike tourism in these metropolitan regions and the role of local authorities in promoting cycling-friendly infrastructure.

LITERATURE REVIEW

Previous studies on bike tourism highlight its benefits, including reduced carbon footprint, health advantages, and economic opportunities for local businesses. Research also points to challenges such as inadequate cycling lanes, traffic congestion, and safety concerns. Understanding the interplay between urban planning and bike tourism development is crucial for fostering a more cyclist-friendly environment.

RESEARCH OBJECTIVES

To identify the key motivators for bike tourism in Mumbai and Pune. To analyze the challenges faced by cyclists in urban environments. To assess the economic and environmental benefits of bike tourism. To propose recommendations for enhancing bike tourism infrastructure.

RESEARCH METHODOLOGY

A mixed-methods approach will be employed, incorporating both qualitative and quantitative research:

Survey: A structured questionnaire will be distributed to 300 bike tourists and cycling enthusiasts in Mumbai and Pune.

Interviews: In-depth interviews with 15 tourism industry experts and city planners.

Data Analysis: Thematic analysis and statistical tools will be used to evaluate responses and identify key trends.

FINDINGS AND DISCUSSION

The study anticipates the following insights:

Health benefits and adventure as primary motivators for bike tourism. Poor road conditions, lack of dedicated cycling lanes, and traffic congestion as major challenges. Positive economic impacts, including increased footfall for local cafés, rental services, and tourism hotspots. Policy recommendations for improving bike tourism infrastructure.

IMPLICATIONS FOR SUSTAINABLE TOURISM DEVELOPMENT

Developing bike tourism requires a multi-stakeholder approach, including government intervention, community participation, and business involvement. This study suggests policy enhancements such as dedicated bike lanes, rental hubs, and public awareness campaigns to encourage safer and more sustainable biking experiences.

CONCLUSION AND FUTURE RESEARCH

This research contributes to the field of urban tourism by highlighting the potential of bike tourism in Mumbai and Pune. Future studies can explore long term trends in bike tourism adoption and the impact of emerging technologies such as smart cycling routes and e-bike sharing systems.

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IMPACT OF GEOGRAPHICAL ELEMENTS ON FOOD AND NUTRITION HABITAT OF INDIA

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ABSTRACT

The geographical diversity of India plays a pivotal role in shaping its nutritional habitat. This paper investigates how geographical elements such as climate, topography, soil composition, and water availability impact the availability, accessibility, and quality of nutrition across various regions. The focus is on analyzing the relationship between the diverse geography of India and its effects on agriculture, food security, and regional dietary patterns. The study highlights how geographical factors contribute to disparities in nutrition, emphasizing the importance of sustainable agricultural practices and policy interventions to mitigate regional imbalances.

KEYWORDS:

Geographical elements, nutritional habitat, agriculture, climate, soil, food security, India, malnutrition, sustainable development

INTRODUCTION

India's vast geographical diversity, ranging from the towering Himalayas to the fertile plains and arid deserts, creates a complex nutritional landscape. This research explores how the interplay of geographical elements—climate, topography, soil composition, and water resources—directly influences agricultural productivity, regional dietary patterns, and food security. Understanding these elements' impacts on nutrition is crucial for addressing the challenges of malnutrition, regional disparities, and sustainable development.

1. Indian Geographical Diversity

India's diverse climate zones, ranging from the warm tropics in the south to the high mountains in the north, significantly shape the country's food habits. The different types of crops grown are determined by the climate, impacting the availability of ingredients and the cooking preferences of various regions India's rich climatic diversity has a profound impact on the food habits of its people. Stretching across a vast geographical expanse, the country encompasses multiple climate zones—tropical, temperate, arid, alpine, and coastal—each shaping the regional availability of ingredients, traditional agricultural practices, and culinary preferences. The interplay between climate and food habits is deeply rooted in history, culture, and the adaptation of local communities to the environment, leading to a unique blend of cuisines across the country.

1. 1. Tropical Climates

The tropical regions, particularly in southern India, experience hot and humid conditions, influencing food preferences toward lighter, hydrating, and cooling foods. The staples in these areas include rice, coconuts, and a variety of spices, which are well-suited to the climate and aid in managing body heat.

South India (Kerala, Tamil Nadu, Karnataka, Andhra Pradesh): Rice is the dominant staple, often paired with coconut-based curries, tangy tamarind, and spicy chutneys. The warm, humid climate encourages the use of fermented foods like dosas and idlis, which are easy to digest and provide a cooling effect in hot weather.

Coastal Areas: Coastal regions have access to abundant seafood, which forms a major part of the local diet. Fish, prawns, and crabs are prepared with regional spices, often using coconut milk or tamarind to balance the heat. Cooling beverages like buttermilk (lassi) and tender coconut water are widely consumed to combat the tropical heat.

1. 2. Temperate Climates

The temperate regions, especially in northern India, experience distinct seasons with hot summers and cold winters, leading to variations in food habits based on seasonal availability and temperature. **North India (Punjab, Haryana, Uttar Pradesh, Bihar):** The fertile Indo-Gangetic plains support wheat as the staple grain, giving rise to a cuisine dominated by bread (chapati, naan, paratha). In winter, people consume rich, warming foods such as ghee-laden curries, lentils, and dairy products. Sarson da saag (mustard greens) and makki di roti (corn bread) are winter staples, providing warmth and nourishment during the cold months. Summer diets lean toward lighter fare, such as yogurt-based dishes and cooling drinks like chaas (buttermilk).

Seasonal Adaptation: In temperate climates, seasonal changes bring variations in food preferences. For instance, during winters, people consume high-energy, nutrient-dense foods to stay warm, while summers see a shift toward salads, fruits, and lighter meals.

1. 3. Arid and Semi-Arid Climates

The arid and semi-arid regions of western India, such as Rajasthan and Gujarat, experience extreme temperatures and scarce rainfall. These harsh conditions have shaped local food habits, leading to the use of drought-resistant crops and preservation techniques.

Rajasthan: In Rajasthan's desert climate, food must be designed to last long in arid conditions. Millet (bajra) and sorghum (jowar) are common staples, along with legumes like lentils. Due to the lack of fresh vegetables, preserved foods like pickles and dried lentil dumplings (papad) are integral to the diet. Dairy, particularly buttermilk and ghee, plays a significant role in both cooling the body and providing sustenance.

Gujarat: In Gujarat's semi-arid climate, the cuisine relies on hardy crops like pulses, millets, and groundnuts. Gujarati cuisine is known for its balance of sweet, sour, and spicy flavors, often featuring foods like dhokla, thepla, and farsan (savory snacks) that can be stored for extended periods.

1. 4. Alpine and Cold Climates

The cold, alpine regions of northern India, such as the Himalayan belt, face short growing seasons and harsh winters. Food habits in these areas are heavily influenced by the need for warmth and high-energy foods that provide sustenance in the extreme cold.

1. 5. Coastal Climates

India's coastal areas, stretching from Gujarat in the west to Bengal in the east, have humid and tropical climates. The abundance of water bodies and marine resources has shaped the diets of these regions, with seafood being a staple.

West Coast (Goa, Maharashtra, Kerala): Seafood such as fish, prawns, and crabs dominate the diet, often prepared with coconut milk and spices like turmeric, cumin, and tamarind. Goan cuisine, influenced by Portuguese flavors, includes fish curries, vindaloo, and coconut-based sweets like bebinca.

East Coast (Odisha, West Bengal): The eastern coastal regions are known for their love of rice and fish. In Bengal, fish is prepared in mustard oil, and the famous "machher jhol" (fish curry) is a signature dish. The humid climate encourages the consumption of cooling foods such as curd, rice, and water-based vegetables like gourds and cucumbers. irrigation from river systems supporting the crops. The Green Revolution, which introduced high yield varieties of wheat and advanced farming techniques in the 1960s, transformed these plains into a major grain-producing area, ensuring food security for the country.

Rice Cultivation: The eastern Indo-Gangetic plains, including West Bengal and Bihar, are more suited for rice cultivation due to higher rainfall and the availability of water resources. Rice is a water-intensive crop, and the monsoon rains, combined with the riverine system, make these plains perfect for paddy farming. The traditional method of rice cultivation involves transplanting seedlings into flooded fields, which helps control weeds and ensures good crop growth.

Sugarcane Farming: Sugarcane is another major crop grown in the Indo-Gangetic plains, particularly in Uttar Pradesh. The fertile soil and abundant water supply make this region ideal for sugarcane farming, which is labor-intensive but highly profitable. Sugarcane is used to produce sugar, jaggery (a traditional unrefined sugar), and ethanol, contributing significantly to the rural economy

METHODOLOGY

To study the impact of geographical elements on India's food and nutrition habitat, the most suitable methodology is a geospatial analysis using Geographic Information Systems (GIS), which allows for mapping and overlaying data on geographical features like topography, climate, soil types, and water availability with data on food production

RESULT AND DISCUSSION

Geography has always played a pivotal role in shaping human societies, influencing everything from settlements to culture. One of the most profound impacts of geography is on the food habitat of a region—what people grow, harvest, cook, and eat. Across the globe, and particularly in a diverse country like India, geographical elements such as climate, soil types, topography, and proximity to water bodies continue to determine local food practices, culinary traditions, and even agricultural sustainability. The enduring legacy of geographical factors on food habitat can be understood by examining the relationship between natural conditions and human adaptation to them over centuries. The way communities have historically adapted to their physical environment has led to the development of unique cuisines and sustainable food systems that resonate with cultural identity.

Climate and Seasonal Diets

Climate is one of the most influential factors in determining the types of crops grown in a region and the kinds of foods people consume. The seasonal nature of farming due to changing weather conditions means that food habits shift with the seasons.

Tropical and Subtropical Climates

Regions with warm, humid climates, such as southern and eastern India, grow an abundance of rice, coconut, spices, and tropical fruits. The high rainfall supports the growth of water-intensive crops like paddy, and the availability of fresh ingredients throughout the year defines the food culture. For example, coastal regions have long relied on rice and fish as staples, along with a variety of fresh spices and coconut, all of which thrive in tropical climates.

Cold and Arid Climates

In colder regions like Kashmir and Ladakh, the harsh winters necessitate a reliance on preserved foods like dried vegetables, meats, and pulses. The cuisine of these regions features hearty, warming dishes that help people withstand the cold. Similarly, in the arid regions of Rajasthan, where water is scarce, millet and lentils are the mainstay of the diet, as they require less water to grow and are resilient to drought conditions.

Monsoon-dependent Agriculture

In much of India, agriculture is dependent on the monsoon rains. This seasonal rain not only dictates when crops are planted and harvested but also influences the food available during different times of

the year. Seasonal eating patterns arise, with fresh produce during the rainy season and dried or preserved foods during the dry season. This seasonal rhythm of food consumption is deeply embedded in cultural practices, with festivals like Makar Sankranti and Baisakhi celebrating harvests. **Topography and Agriculture**

Topographical features such as mountains, plains, deserts, and coastal areas have a direct bearing on the types of crops grown and the agricultural practices of a region. These features create distinct ecological zones, each supporting specific types of food production.

Mountainous Regions: In hilly areas such as the Himalayas and the Western Ghats, terraced farming is practiced to adapt to the steep terrain. Crops like tea, coffee, cardamom, and temperate fruits (apples, peaches) are grown on these slopes. In the northeastern states, the indigenous practice of jhum or shifting cultivation involves clearing patches of forest to grow a variety of crops, from rice to vegetables, which are integral to the local food culture.

Fertile Plains: The flat, fertile plains of northern India, particularly the Indo-Gangetic plain, are known as the "breadbasket" of India. This region produces vast quantities of wheat, rice, sugarcane, and pulses. The agricultural abundance in these areas has allowed for the development of rich culinary traditions that use wheat-based breads (like chapati and paratha) and rice as staples. The availability of surplus food has also led to elaborate cooking styles, including the use of dairy products like ghee, butter, and yogurt.

Desert Regions: In contrast, desert areas like Rajasthan have sparse water and limited vegetation, which has led to a cuisine based on hardy crops such as millet and barley. In these regions, preservation techniques such as pickling and drying are common, as they help ensure food security in times of drought. The cuisine is characterized by the use of dried spices, lentils, and pulses, and meals are designed to be nutrient-dense yet simple, reflecting the scarcity of fresh produce. **Proximity to Water Bodies**

Water bodies, such as rivers, lakes, and seas, have long influenced food habits in the regions they touch. Proximity to water not only ensures fertile soil but also provides access to fish and other aquatic resources.

River Valleys: River systems like the Ganges, Brahmaputra, and Cauvery have supported rich agricultural systems along their banks. These areas are known for their rice cultivation, which is supported by the abundant water supply. Fish is also a crucial part of the diet in regions along the rivers, as seen in the fish and rice-based cuisine of Bengal and Assam. Riverine ecosystems also support the cultivation of jute, sugarcane, and other cash crops.

Coastal Areas: Coastal regions, particularly in Kerala, Goa, and West Bengal, have diets that are heavily centered around seafood. The availability of fresh fish, prawns, and shellfish is complemented by coconut, tamarind, and spices, resulting in flavorful curries and stews. The sea's bounty has led to the development of maritime culinary traditions, such as meen moilee (Kerala fish curry) and Goan prawn curry.

Fishing and Aquaculture: The fishing practices in these regions have evolved to sustainably manage the aquatic resources. In areas like Kerala and West Bengal, traditional methods of aquaculture are still practiced, where rice paddies double as fish farms, showcasing the interconnectedness of geography and food production.

CONCLUSION

In summary, cross-border cultural exchange along trade routes fostered reciprocal influence and interdependence. These exchanges have left their mark on the rich tapestry of human history. When we take into account the historical interactions along trade routes, we can see how the dynamic interplay of civilizations has impacted not just our history but also our present and future.

India's geographical diversity is both a blessing and a challenge for its nutritional habitat. While fertile regions like the Indo-Gangetic plains offer high agricultural productivity, arid and semi-arid regions face persistent challenges related to food security and malnutrition. Geographical elements such as climate, soil type, and water availability significantly influence regional dietary patterns and nutrition. Addressing these disparities requires sustainable agricultural practices, improved irrigation infrastructure, and policies focused on mitigating the impacts of climate change. A comprehensive understanding of the geographical factors influencing nutrition is crucial for ensuring food security and promoting regional equity in dietary habits.

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MAIZE PEST CROP MANAGEMENT BY USING BIOPESTICIDES IN A SHRIRAMPUR TALUKA, AHMEDNAGAR DISTRICT, MAHARASHTRA

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ABSTRACT

Manufacture and use of pesticides has been improved enormously but it has developed lots off harmful effects on animal. It is necessary to develop a good biopesticide for crops like maize used to feed cattle. This developed pesticide may damage the crop plant and affect productivity of Crop land. Dashparni ark is an admirable organic bio-pesticide in liquid form. It is beneficial to control pests and diseases occur in any crop, vegetables and fruit crops. It is a very influential bio-pesticide prepared using natural ingredients of plant resources. It develops resistance within plants and shows properties against antifungal, antibacterial, antiviral. Phytochemical constituents in plants with a varied biochemical properties having protection activity has received attention to use them as plant protector or pest repellents. So, it is indicated that plant leaves contain a number of important properties which has different protection/repellent properties which we can use to manage naturally developed pests on maize crop. Introduction:

KEYWORDS

Pesticide, Bio-pesticide, dashparni ark, Maize, Repellant, Resistance etc.

INTRODUCTION

A biological substance or organism that damages, kills, or repels organisms perceived as pests is called as Biopesticide. Biological pest management or control involves predatory, parasitic, or chemical relationships. Biopesticides are the biological agents or plant-based products used to control the population of harmful organisms to the ecosystem. They are naturally occurring substances from living organisms i.e. natural enemies or their products and their by-products that can control pests by non-toxic mechanisms (Salma and Jogen 2011). They are considered as minimal risk products safe to human and his environment. It includes the use of botanicals, microbial pathogens such as fungi, bacteria, viruses and natural enemies of pests such as parasitoids and predators, nematodes and semiochemicals. Indis criminate use of synthetic pesticides resulted in the development of resistance, resurgence and outbreak of secondary pests. Stringent regulation in the use of synthetic pesticides and the demand for organics promote the use of biopesticides. Management of pests without using

harmful chemicals to human health and the environment is possible only by using biopesticides (Chandler et al. 2011; Bastiaans et al. 2008). Destructive activities of numerous pests like plant pathogens (fungi, bacteria, nematodes etc), insects and weeds have inundated agriculture and this leads to a drastic decrease in yields (Saima and Jogen, 2011). Biopesticides play an important role in sustainable agriculture (Prasad et al. 2014, 2017). Management of these pests to increase food security in order to meet the needs of increasing human populace is imperative and this should be done in such a way that no damage is done to human health, public goods and environment that farming brings (David et al., 2011; Bastianns et al., 2008). The phenolic extracts from the olive leaf extract could be used as a source of potential antioxidant and antimicrobial agents (Altemimi A. et al., 2017). It causes mortality by substantially reducing arthropod populations before it reaches the economic threshold level (Betz et al. 2000). There is an urgent requirement to include biopesticides in Integrated Pest Management Programmes (IPM) to make it more sustainable since it lacks phytotoxicity, leaves no residues and is eco-friendly (Bhattacharyya et al. 2016).

Chemicals or pesticides derived from plant origin are known to be Phytochemicals or herbal pesticides. Each phytochemical possesses specific structure, performs various functions such as protection, growth acceleration and reproduction in plants (Huang et al. 2014). These phytochemicals are available in several parts of the plants like vegetables, fruits, seeds, grains, pulses, nuts, barks, etc. Since it has several Nutraceuticals (bioactive compounds) that contains various antiparasitic, bactericidal, fungicidal, viricidal and insecticidal properties, it can be considered as a potential alternative for inorganic pesticides. There are secondary metabolites produced by plants by nature such as terpenes contain phyto volatiles, glycosides and sterols contain phenolic compounds such as phenolic acids, lignin, tannins and alkaloids. These secondary metabolites play an important role in the plant resistance system against insects. It acts as a toxicant, insect growth regulator, repellents and antifeedant (Mossa 2016). Phytochemicals from the plants can be extracted using solvent extraction, microwave-assisted extraction, ultrasonic assisted extraction based on the presence of a group of phytochemicals present in it (Altemimi et al. 2017).

India's traditional agriculture has shown to be sustainable by maintaining the country's fertility and biodiversity over centuries (Roychourdhry, 1964). Traditional knowledge exists worldwide in all communities covering varied areas including health, agriculture and natural resource management. Asia in general and India in particular have a distinction that traditional knowledge is found not just as oral tradition but also as classical literature that is written down with its own theoretical framework and with a clear exposition of the basic principles of world views (Trease, 1970). In most of the states leaves of Neem (Azadirachta indica), Nirgudi (Vitex negundo) Karanj (Pongamia pinnata) Supla

(Mundulea sericea) Tun(Toona ciliate,) Teak (Tectona grandis) Young leaves of Komal (Koelzell apadularia) Bhang (Cannabis sativa) and Metho Dodi (Leptadenia reticulate) have been used. In addition wood ash of some plants such as Babhul (Acacia nilotica), Suru (Casurina equisitifolia) Mango (Mangifera indica), Tamarand (Tamarindas indica) are used. Some places powdered rhizome of sweet flag (Acorus calamus) or turmeric (Curcuma longa) is used to protect crops from pest attack (Kulkarni and Kumbhojkar, 1996). Mahadeokoli tribe from Maharashtra uses leaves of Kulith (Dolicho suniflorus) and Sag (Tectona grandis) as preservatives for seed storage (Kulkarni and Kumbhojkar, 2003)

One of the most noteworthy problems is protecting maize crops from insects. The maize crop is most vulnerable to the infestation of the maize stem borer when it is 10 to 12 days old and has no antibiosis (Sekhon & Sajjan, 1985). Sharma & Gautam (2010) have reported 27 to 30 % maize grain yield losses due to C. partellus. However, the evidence on the sufferers produced by C. partellus in maize has not been updated since last time specially after the reference of hybrid maize diversities for cultivation. These hybrids are mildly disposed to the damage of C. partellus (NMRP, 2019). In gathering, it has been eminent that contempt admirable regulator exertions, crop sufferers due to insect pests undergo very high. For the control of insect pest synthetic chemicals are continuously used and their toxicity endangers health of farm operators, animals and food consumers. The negative effects on human health led to a resurgence of interest in botanical insecticides due to their minimal costs and ecological side effects (Kulkarni et.al., 2019). ‘Dashparni’ word consists of two different words ‘Dasha’ is ten and ‘Parna’ means leaves of plant. ‘Ark’ means juice/ crude extract. This ark is made up from ten different plants with specific properties for pest and weed management. It is a natural pesticide which can be used on any crop, vegetables and fruit crops. It is a very powerful liquid pesticide prepared using all natural ingredients. It is useful against all types of pests and diseases bacterial, parasitic, viral including observed in crop plants. Even for juice sucking insects such as aphids and jassids developed on maize crop. It develops great immunity in plants and also shows antiviral, antibacterial and antifungal effect. Dashparni ark is an excellent organic liquid use as a bio-pesticide. Spraying rate of 125 ml. per 10 lit. of water for one pump spray. Use 2.5 lit solution of ark along with 200 lit of water per acre. Spray of ark with 10 present concentration inhibited the growth of Erysiphe and Sphaerotheca species (Pawar and Chavan, 2010). Phytochemicals such as tannins shows strong activity against several plant pathogens and pest. Saponin has insecticidal activity like repellent and deterrent activity (Ellen De Geyter, 2007). The use of plant compounds like essential oils, flavonoids, alkaloids, glycosides, esters and fatty acids having repellent effects. These interesting plant groups of 10 different types have different chemical compounds and gives new dimension to crops protection in modern agriculture and horticulture with integrated pest management program.

Types of biopesticides:

Biopesticides included into four major types:

(a) Microbial pesticides: These consist of microorganisms such as bacterium, virus, fungus, protozoan as active ingredients which are used for the biological control of plant pathogens, pestiferous insects and weed. E.g. Bacillus thuringiensis (Bt) is bacterium serves as an insecticide for most Lepidoptera, coleopteran anddiptera (Gill et al.,1992).

(b) Plant-Incorporated-Protectants (PIPs): Theses are also known as Genetically Modified Cros, which are biopesticidal substances produced by plants from genetic material that have been added or incorporated into their genetic makeup (Lacey and Siegel, 2000). Known example for PIPs is Bt toxin protiens, it is host specific and is capable of causing death within a short time, usually 48 hours (Siejel, 2001). And it is safe to beneficial organisms, human, environment and it does not harm vertebrates (Lacey and Siegel, 2000).

(c) Biochemical pesticides: Plants produces secondary metabolites are considered as biopesticides (Schumutterer, 1990). They are also known as herbal pesticides are naturally occurring substances used for controlling pests through a non-toxic mechanism (Pal and Kumar, 2013).

(d) Semiochemicals: A semiochemical is a chemical signal produced by one organism, usually insects which is responsible for a behavioral change in an individual of the same or different species. For example, most widely used semiochemicals are the insect pheromones which serve as a signal to communicate with opposite sex in their species for a number of reasons and synthesized for pest control by mating interruption (Preddy et al., 2009).

Advantages and Disadvantages of Biochemical Pesticides:

Benefit or Advantages of Biochemical Pesticides:

(a) These are safe for natural enemies, environment and human beings i.e. are usually inherently less harmful/toxic and cause less environmental load or pollutions.

(b) Designed to only one specific pest or, in some cases, a few target pests as opposed to chemical that have a broad spectrum activity.

(c) These have very less chance to develop resistance to the pesticides.

(d) Biopesticides are economical, biodegradable, renewable and user friendly.

(e) Active component degrade rapidly thus it is more acceptable.

(f) Cost of developing biopesticides is significantly lower than those of synthetic chemical pesticides.

(g) Their nature of control is preventive not curative and their effects on flower is less.

(i) They are stable and can be stored for extended period.

(j) They are insect specific especially in case of semiochemicals.

Disadvantages of Biochemical Pesticides

(a)More quantity of pesticide required due to its crude formulations.

(b)Mode of action is slow as compare to chemical pesticide.

(c)Higher specificity and require an exact identification of the pest/pathogen.

(d)Specificity is high which may require an exact identification of the target pest/ pathogen. (e)Because of their slow speed of action, biopesticides are often unsuitable if a pest outbreak is an immediate and became a threat to crops.

(f)Biopesticides are not suited for a stand-alone treatment rather they have to be with a compartible method for high efficacy.

(g)Living organisms evolve and increase their resistance to biological, chemical, physical and any other form of control.

Materials and Methods:

a) Plant collection and identification: Collection of leaves from plant material like Azardica indica (Neem), Annona squamosa (Custard apple), Aloe vera (Aleo vera), Eucalyptus teriticornis (Eucalyptus), Dhatura stratum (Dhatura), Senna auriculata (Tarvad), Mangifera indica (Mango), Calotropis gigantean L. (Rui), and Lantana camara L. (Ghaneri) from different location of Shrirampur taluka. These samples were collected by observation for free from any disease. Plant materials were identified with stranded literature.

b) Extraction of plant material: Preparation of aqueous extracts Samples were weighed using an electronic balance and 10 gm of plant material were crushed in 100 ml of distilled water and filter through muscline cloth (A. Kasarkar et.al). These samples were used as dashparn ark in field of Maize crop and observations were noted in interval of 2 days for one month. The total number of number of dead hearts/white ear heads per leaves was counted for Maize shoot fly, Corn worms, Fall army worms and other pests. Total number of leaves and infested leaves of maize was counted. Pre-treatment observations were recorded on at least one feet plant in maize field before first spray. Spraying was done after beginning of pest infestation by knapsack sprayer or any available sprayer. Three sprays were taken at 10 days interval in a month. The observations were recorded at 8th, 18th and 28th day after each spray. Observation was taken on foliage injured percent at before tasseling stage, tunnel length per plant (cm), dead heart (%) The data thus obtained was subjected to appropriate transformation and was analyzed statistically.

Fig.4.1 Crushing of Plant material

OBSERVATIONS:

The mean foliage damaged percentage before tasseling stage, exit hole, tunnel length (cm), dead heart (%). The higher mean foliage damaged percentage before tasseling stage (5.98%), higher numbers of exit hole (8.37), higher tunnel length (6.88 cm), higher dead heart (6.34%) and foliage damage was seen when maize was non sprayed. While these all parameter showed decreased infection on maize plant after dashparn ark spraying.

Table 1: Effect of Dashparn ark spray and non-spray on maize infested with major pest.

Treatments	Exit hole (cm)	TL /PL (cm)	DH (%)	Damaged foliage (%)
Pest control condition				
Non Spray (NS)	8.37	6.88	6.34	88.32
Spray(S)	2.82	1.78	1.81	23.56

CONCLUSION:

The presence of phytochemicals in plant material shows usefulness for treating different diseases occurring in crops. These plants can be used in the maize farm to avoid damage cause by pest and also chemical pollution during spraying of chemical pesticide. These plants were used in the combination of different bio-pesticides. In modern agriculture like organic farming these bio pesticides have great advantage due to its different properties. These botanical pesticides are easily available and due to its non-residual effect, they are commonly using by farmer for integrates pest management (Gupta and

Goel, 2013). The use of biopesticides as supplement has emerged as promising alternative to chemical pesticides and their demand is rising steadily in maize crop plant. Therefore, this report has provided some information about the potentials of "biopesticides for pest control" and if fully exploited, could serve as a very effective alternative method for pest control in maize feild as well as good component of integrated pest management.

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EVALUATION OF PRIMARY HEALTH FACILITY READINESS AND STUDY OF KABP OF COMMUNITY HEALTH OFFICERS ON CERVICAL CANCER SCREENING AMONG WOMEN IN KHARGONE DISTRICT OF MADHYA PRADESH

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ABSTRACT:

Cervical cancer is a major public health concern in India, particularly in rural areas where awareness and access to healthcare are limited. This study examines the Knowledge, Attitudes, Beliefs, and Practices (KABP) of Community Health Officers (CHOs) regarding cervical cancer screening in Khargone, Madhya Pradesh. It also evaluates the readiness of primary healthcare facilities to provide screening service

INTRODUCTION:

Cervical cancer continues to be a significant public health issue in India, with rural areas facing uplifted weakness because of restricted healthcare access and insufficient awareness of preventive measures. Screening for cervical cancer, which can significantly decrease death rates through early detection, is a fundamental piece of public health initiatives. In rural regions like the Khargone district of Madhya Pradesh, the effectiveness of these initiatives to a great extent depends on the readiness of primary healthcare facilities and the knowledge and commitment of Community Health Officers (CHOs).

Primary health centers are the foundation of rural healthcare, yet numerous underserved areas face considerable gaps in infrastructure, resources, and trained personnel expected for compelling cervical cancer screening (Dhilon 2013). Besides, the job of CHOs is basic in ensuring that women in these regions get exact information and access to screening services.

Their understanding of cervical cancer, screening protocols, and their capacity to impart the significance of customary screenings to the community is essential for the success of prevention efforts.

This study focuses on evaluating the preparedness of healthcare facilities in Khargone for cervical cancer screening, while also investigating the Knowledge, Attitudes, Beliefs, and Practices (KABP) of CHOs in promoting these essential health practices. By exploring these two aspects — facility readiness and CHOs' capabilities — this research aims to give insights into the present status of cervical cancer prevention and distinguish areas for development in rural healthcare systems.

Background: Cervical cancer is one of the leading causes of cancer-related deaths among

women in India, with rural populations being disproportionately impacted (Lal). The absence of awareness, cultural barriers, restricted healthcare access, and inadequate screening infrastructure compound the weakness of women in these regions. Early detection through customary cervical cancer screening is essential for reducing death rates, yet the execution of successful screening programs has been hindered by several factors, including unfortunate healthcare facilities, insufficiently trained healthcare professionals, and restricted outreach efforts. The job of Community Health Officers (CHOs) is basic in bridging these gaps, as they are often the first point of contact for rural populations and assume a key part in educating communities about preventive healthcare measures.

1.1 Challenges: The Khargone district of Madhya Pradesh, in the same way as other rural areas in India, faces significant challenges in cervical cancer screening, including chronic weakness infrastructure, inadequate resources for screening, and an absence of trained personnel (Pakhare 2015). Numerous primary healthcare centers come up short on necessary equipment to perform cervical cancer screenings, and in any event, when equipment is free, the staff may not be satisfactorily trained to use it. Furthermore, cultural factors and misconceptions about cervical cancer among both the healthcare providers and the rural populace hinder the effectiveness of screening programs. These challenges limit the compass of existing screening initiatives and forestall early detection, which is critical for reducing the incidence and mortality of cervical cancer in rural areas.

RESEARCH METHODOLOGY

Research Design:This study employs a blended methods research design to assess both the readiness of primary healthcare facilities and the Knowledge, Attitudes, Beliefs, and Practices (KABP) of Community Health Officers (CHOs) regarding cervical cancer screening in Khargone district, Madhya Pradesh. A pilot approach was chosen to give initial insights into the present status of cervical cancer screening efforts and to recognize gaps in healthcare infrastructure and CHO awareness. The research design integrates both quantitative and subjective methods to offer a comprehensive evaluation, enabling a relative analysis of previous studies on healthcare readiness and CHO involvement in cervical cancer prevention.

Data Collection Methods:

Facility Assessments: To measure the readiness of healthcare facilities, a point-by-point checklist will be created, based on standards such as the availability of screening tools (Pap smears, HPV testing), trained staff, and functional infrastructure. The checklist will be administered to a sample of 30 primary health centers across Khargone. Structured Surveys for CHOs: A pre-designed questionnaire will be

distributed to 200 CHOs. This questionnaire will assess the degree of knowledge about cervical cancer, understanding of screening protocols, and willingness to participate in screening programs.

RESULTS AND DISCUSSION:

The analysis of the gathered information provides significant insights into the effect of orientation representation in school textbooks within the Kerala educational plan. By examining both historical and contemporary textbooks, this study identifies patterns, progress, and persistent challenges in achieving orientation equity in educational substance. The findings feature an evolving account of orientation depiction that reflects societal changes and policy interventions throughout the long term. Notwithstanding, they also underscore the ongoing struggle to beat well-established biases.

The near analysis reveals that prior textbooks predominantly highlighted male characters in dynamic and leadership roles, with restricted representation of female characters. Women, when present, were often portrayed in conventional roles, such as homemakers or caregivers, reinforcing stereotypical notions of orientation. The language used in these textbooks further sustained orientation biases, now and again employing male-dominated pronouns and examples. These patterns mirror the socio-cultural context of the time, where customary orientation roles were profoundly settled.

Contemporary textbooks, then again, demonstrate a striking shift towards more inclusive representation. There is a noticeable increase in the visibility of female characters, with women depicted in various roles, including professionals, scientists, and leaders. This shift aligns with more extensive societal efforts to advance orientation correspondence and the influence of policy initiatives pointed toward creating more evenhanded educational materials. The narratives and examples used in current textbooks reflect more noteworthy diversity and challenge customary orientation stereotypes, portraying all kinds of people as similarly proficient and versatile.

Despite these improvements, subtle forms of bias persist in current textbooks. Women remain underrepresented in certain areas, especially in leadership roles and STEM-related contexts. While the depiction of orientation roles has become more adjusted, customary stereotypes occasionally resurface, indicating the requirement for continued watchfulness in the survey and revision of educational substance. Statistical analysis corroborates these observations, showing a significant decrease in obvious orientation bias yet it is necessary to feature areas where further improvement. The thematic coding of the substance also sheds light on the interplay between policy interventions and educational plan reforms. Throughout the long term, initiatives pointed toward fostering orientation-sensitive education play had a basic impact in reshaping the narratives within textbooks. Be that as it may, the execution of these reforms has been inconsistent, leading to changeability in the quality and inclusivity of educational materials across various subjects and grade levels.The findings of

this study emphasize the significance of a holistic way to deal with educational plan improvement. It is essential to ensure that educational materials consent to policy guidelines as well as effectively add to dismantling orientation stereotypes. This involves a coordinated exertion from policymakers, educators, and course-reading authors to make content that fosters decisive thinking and promotes an inclusive perspective among students.

Table 4: Knowledge, Attitude, Belief, and Practice (KABP) Scores of CHOs

KABP Dimension 80%	Average Score (%)	Percentage Above	Percentage Below 50%
Knowledge	70	45	10
Attitude	85	65	5
Belief	75	50	8
Practice	60	30	20

Table 5: Cervical Cancer Screening Uptake and Facility Readiness Correlation

Facility Readiness Level	Screening Uptake (%)	Number of Women Screened
High (Above 80%)	85	500
Moderate (50-80%)	65	300
Low (Below 50%)	40	150

CONCLUSION:

The evaluation of primary health facility readiness and the study of knowledge, attitude, beliefs, and practices (KABP) of Community Health Officers (CHOs) on cervical cancer screening among women in Khargone District, Madhya Pradesh, has given basic insights into the present status of cervical cancer prevention efforts. The findings uncover a significant hole in the preparedness of primary health facilities to convey successful screening services, despite cervical cancer being a significant public health concern.

Primary health facilities, while furnished with basic infrastructure, often miss the mark on resources, including trained personnel, useful equipment, and consistent supply chains for screening tools like visual inspection with acidic corrosive (By means of) kits or Pap smear equipment. Also, the integration of cervical cancer screening into routine primary healthcare services remains inadequate, limiting the range of these services to the objective populace The KABP analysis of CHOs underscores the two strengths and areas for development. While CHOs for the most part show a positive attitude toward the significance of cervical cancer screening and a willingness to add to these efforts, their knowledge

about cervical cancer risk factors, symptoms, and it is often incomplete to screen guidelines. This knowledge hole significantly affects their capacity to counsel women actually and do screenings with certainty. Beliefs and practices further feature barriers such as stigma, cultural perceptions, and restricted community awareness, which hinder the take-up of cervical cancer screening services among women.

The study also distinguished challenges connected with training and capacity-building programs for CHOs. Inconsistent and infrequent training opportunities result in changeability in their skill and readiness to execute cervical cancer screening protocols. Strengthening these training programs, especially with a focus on pragmatic, hands-on learning and community commitment strategies, is essential for improving outcomes.

By and large, the findings feature a dire requirement for a multi-pronged way to deal with and address the gaps in health facility readiness and CHO capacity. Recommendations include the assignment of committed resources for cervical cancer screening at primary health centers, the establishment of standardized training modules for CHOs, and community-level awareness campaigns to diminish stigma and increase screening take-up. These measures, when executed actually, can significantly upgrade the early detection and prevention of cervical cancer, at last improving women's health outcomes in Khargone District and similar setting.

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INFLUENCE OF PANDEMIC OF COVID-19 ON THE SERICULTURAL ENTERPRISE

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ABSTRACT

The pandemic through corona virus (COVID-19) made the lockdown protocol all over the world, which affected most of the sectors of human life including the economic growth and development. The sectors of the economy are the recipients of the hard hit through COVID-19 and sericultural sector is not an exception for this influence. The present attempt deals with assessment of the economic influence of COVID-19 on usefulness (profitability) in sericultural practices in Pune District of India. The preliminary data on cultivation of mulberry and rearing of larval instars of silkworm, Bombyx mori (L) were elicited from the sample farmers selected randomly from selected taluka places of Pune districts of Maharashtra state. The schedule of semi-structure was followed for the collection of the primary data (number of farmers and area of mulberry cultivation) through the discussion through the google meet. The secondary data on quantitative status (yield of the silk cocoon and prices) was collected through silk board (central and state) for the year: 2018; 2019; 2020 and 2021. Statistical analysis of the data revealed that, the cost on mulberry cultivation and rearing of silkworm larvae for commercial silk has remained same for the year: 2018; 2019; 2020 and 2021 (during pre-COVID-19 and COVID-19 periods). The drastic variations in gross returns (in the form of income) accrued was exhibited during the respective periods. This was due to drastic changes, such as closing the significant cocoon markets (of higher prices, like Ramanagara cocoon market of Karnataka state), decreased price) for the silk cocoon and inconvenience in travelling to reach market. The lockdown made to stop the reeling the silk from cocoon by the commercial reeling units. This was resulted into incurring double loss. Sericulture farmers have not recovered the cost of production of Rs. 19377.60 and forgone Rs. 12621.99 per crop of hundred disease free laying (DFLs).

KEYWORDS

COVID-19, Silk Cocoons, Moriculture, Sericulture.

INTRODUCTION

The pandemic of COVID-19 is viral disease caused by corona virus. The corona virus is scientifically recognized as, “Severe-Acute-Respiratory-Syndrome-2” (SARS-CoV-2). This viral pathogen was identified firstly through the outbreak in Wuhan city of the country China, in the month of December of the year: 2019. All the attempts to control COVID-19 there are reported as failed. This situation was

allowed the corona virus to spread worldwide with significant speed. On the day 30 January, in the year: 2020 the "World Health Organization" (WHO) used to declare a "the Public Health Emergency of International Concern". On the day 11 March, in the year: 2020 the "World Health Organization" (WHO) used further to declare a "the COVID – Pandemic". As per the record of 7 April, 2022, the pandemic of COVID – 19 had caused more than four hundred ninety-five million persons affected by the disease of COVID – 19 and about six million deaths through the disease of COVID – 19. Isn't it a deadliest in history? The symptoms of corona disease (COVID -19) appeared to range from undetectable to deadly. The fever, cough of dry nature and fatigue are common symptoms of disease of COVID – 19. There was severe illness more likely in elderly patients of COVID – 19. The pathogens of disease COVID – 19 deserve capacity of fast transmission through the breathing of the patients. When the people are in close proximity, the risk of breathings in close proximities of the air contaminated with "COVID – 19" was the most significant. The contaminated fluid reaching close to the eyes, nose and mouth of healthy person was also responsible for the transmission of "COVID – 19" disease. Infected persons are typically contagious for 10 days, and can spread the virus even if they do not develop symptoms. Mutations have produced many strains (variants) with varying degrees of infectivity and virulence (Zoumpourlis, et al., 2020).

Since December, 2020, the vaccines against "COVID – 19" disease have been approved. The vaccines against "COVID – 19" disease have been widely distributed all over the world. The preventive measures for the "COVID – 19" disease include: masking over mouth and nose; social distancing; improved ventilation; filtration of the air; etc. The quarantining the symptomatic persons serve to control the transmission of "COVID – 19" disease. Use of monoclonal antibodies and novel antiviral medicines serve to treat the patients of "COVID – 19" disease.

MATERIAL AND METHODS

The study was completed through the steps like, selection of region, collection of the data and statistical analysis of collected data. The agricultural land under the cultivation of mulberry and number of farmers busy in the rearing of silkworm larvae for commercial silk, both are significant in Pune districts of Maharashtra state at Indian national level, which made to select purposely for the present attempt. Pune districts of Maharashtra state stands first both in mulberry acreage and production of mulberry silk cocoon in the country (Anonymous, 2019). For the purpose to assess the influence of COVID-19 induced lockdown on usefulness (in the form of profit) of sericultural enterprise, the essential primary data with reference to: resources used in the cultivation, production of silk cocoon through the rearing the silkworm larval instars, number of crops. For the purpose to obtain consistency in the results, attempt on collection of the data was in triplicate set.

RESULTS & DISCUSSION

The results on the attempt to analyse the influence of pandemic of COVID – 19 on sericultural enterprise are summarised in tables (Table- 1, 2 and 3) and presented in fig. 1. The variable cost and fixed costs for the mulberry cultivation are the two different types of expenditure considered in present attempt. The variable cost (expenditure in Rs) against human labour, bullock labour, use of farm yard manure (FYM), use of fertilizers and the use of plant protection chemicals in present attempt of analysis was found recorded Rs. 15850; Rs. 5700; Rs. 24000; Rs. 12000 and Rs. 1600 respectively (Table-1 A). The total variable cost (TVC) for the mulberry cultivation in the region selected in the attempt was Rs. 69150 (Table-1 A). The heads of expenditure with reference to fixed cost for the production of leaves of mulberry, Morus alba (L) considered in present attempt include: Depreciation (Rs); Interest on Fixed Capital (Rs); Rental Value of land (Rs); Total Fixed Cost (TFC) (Rs); Total Cost (TC) (Rs); Total Yield of Mulberry Leaves (Kg) and Cost Per Kg of Mulberry leaves (Rs) and found recorded: Rs. 8089; Rs. 12220; Rs. 16800; Rs. 37109; Rs. 93309; 24656 Kg and Rs. 3.75 respectively (Table-1 B). In the irrigated region the cost of production (both, variable and fixed) of leaves of mulberry was lower in comparison with rainfed region (Daund Taluka), sample selected for the study in present attempt. The unit cost of production (both, variable and fixed) of leaves of mulberry was lower under the irrigated condition as compared to the rainfed condition. However, the gross returns, net returns were more under irrigated condition over rainfed condition with higher being among big farmers over medium and small farmers. In cocoon production, the total cost of cocoon production was lower with rainfed farmers as compared to irrigated farmers with lesser among small farmers category over medium and big farmers category. The unit cost of cocoon production was lower under irrigated farmers over rainfed farmers with least being among medium farmers over big and small. The heads of expenditures for labours for the rearing the larval instars of silkworm, Bombyx mori (L) considered in the present attempt include: expenditure for rearing the third instars; expenditure for rearing the fourth instars; expenditure for rearing the fifth instars; Transfer of mature fifth instar on mountage (chandrake) (OR Spreading the Mountage on mature fifth instar; Harvesting the silk cocoon and grading; Cleaning the bed; Disinfection of the Rearing House; Total Cost of Production for Labour and recorded Rs. 540; Rs. 1080; Rs. 2700; Rs. 360; Rs. 720; Rs. 270; Rs. 270; Rs. 5940 respectively Table- 2 A). The heads of expenditures for the rearing the larval instars of silkworm, Bombyx mori (L) considered in the present attempt include: Larvae after the Second moult (Chawki worms) (DFL); Bleaching powder (Kg); Detol (Lit); Astra (gm); Vijetha (Kg); Leaves of mulberry (Kg); Lime (Kg) and total expenditure and recorded Rs 2300; Rs. 225; Rs. 600; Rs. 600; Rs. 600; Rs. 2486; Rs. 75 and Rs. 6886 respectively (Table-2B). Total cost of production in sericulture enterprise for pre-pandemic period

(Year: 2018); pandemic period (Year: 2019 and 2020) and post pandemic period (Year: 2021 and 2022) for Pune district was found reported Rs. 29066. Cost of production was found remained constant for all the three periods (pre-pandemic; pandemic and post-pandemic) of the study. The yield of silk cocoon (Kg) for the pre-pandemic period (Year: 2018); pandemic period (Year: 2019 and 2020) and post pandemic period (Year: 2021 and 2022) for Pune district was found reported 120 Kg. The yield of silk cocoon (Kg) was found remained constant for all the three periods (pre-pandemic; pandemic and post-pandemic) of the study.

Table-1 (A): Variable Cost of Production of Mulberry leaves through the Maintenance of Garden of Mulberry, Morus alba (L).

Serial No.	Particulars of variable cost (expenditure)	Quantity	Rate (Rs)	Total Variable Expenditure (Rs)
1	Human Resource as Labours	54	300	16200
2	Resources of Bullock as Labours	06	950	5700
3	Input – Farm Yard Manure (FYM) (Quintal)	06	4000	24000
4	Input– Fertilizers (Quintal)	06	2000	12000
5	Input- Plant Protection Chemicals (Lit.)	28.125	400	11250
6	Total Variable Cost (Rs)	-	-	69150

Table-1 (B): Fixed Cost of Production of Mulberry leaves through the Maintenance of Garden of Mulberry, Morus alba (L).

Serial No.	Particular of Fixed Cost	Total Expenditure (Fixed Cost) (Rs)
1	Depreciation (Rs)	-08089
2	Interest on Fixed Capital (Rs)	12220

3	Rental Value of Land (Rs)	16800
4	Total Fixed Cost (Rs)	37109
5	Total Cost (TC) (Rs)	93309
6	Yield of Leaves of Mulberry (Kg)	24856
7	Cost of Production of Leaves of Mulberry per Kg	03.75

Table-2 (A): The Expenditures for Labours for the Rearing the Larval Instars of Silkworm, Bombyx mori (L).

Serial No.	Expenditure Particulars	Quantity	Rate (Rs)	Total Expenditure (Rs)
1	Labour Expenditure for Rearing the Third Instar Larvae	2	300	0600
2	Labour Expenditure for Rearing the Fourth Instar Larvae	3.6	300	1080
3	Labour Expenditure for Rearing the Fifth Instar Larvae	9	300	2700
4	Transfer of the mountage (Chandrika) on mature larvae for spinning	2.4	150	360
5	Harvesting the Cocoons and their grading	4.8	150	720
6	Disinfection of Rearing House	0.9	300	270
7	Bed cleaning	0.9	300	270
8	Total Expenditure for labour for rearing silkworm larvae	-	-	5940

Table-2 (B): The Expenditures towards the Inputs for the Rearing the Larval Instars of Silkworm, Bombyx mori (L).

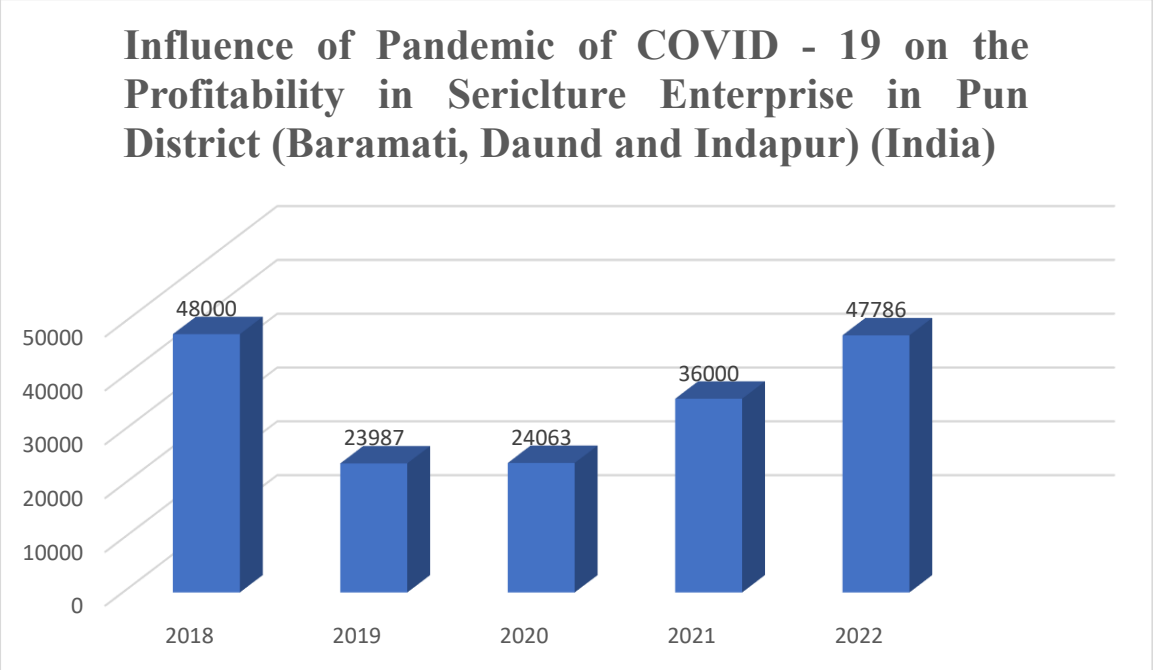
Serial No.	Inputs Particulars	Quantity	Rate (Rs)	Total Expenditure (Rs)
1	Larvae after the second moult (Chawki worms)	100	34.5	3450
2	Bleaching Powder (Kg)	7.5	30	0225
3	Lime (Kg)	7.5	10	0075
4	Decol (Lit)	3	200	0600
5	Astra (gm)	150	200	0600
6	Vijetha (Kg)	6	100	0600
7	Mulberry leaves (Kg)	2486	3.75	9322.50
8	Total Variable Cost (Rs)	-	-	20812.50
9	Depreciation (Rs)	-	-	1497
10	Interest on Fixed Capital (Rs)	-	-	6757
11	Total Fixed Cost (Rs)	-	-	8254
12	Total Cost (Rs)	-	-	29066.50

Table-3: Influence of Pandemic of COVID – 19 on Profitability (Advantageousness) of Production of silk cocoons.

Serial No.	Particulars	Year: 2018 (Pre-COVID-19)	Year: 2019 (COVID-19)	Year: 2020 (COVID-19)	Year: 2021 (Post-COVID-19)	Year: 2022 (Post-COVID-19)
1	Total Cost of Production (Rs)	29066.50 (±476.87)	29066.50 (±715.31)	29066.50 (±597.08)	29066.50 (±538.48)	29066.50 (±521.69)
2	Yield of Silk cocoon (Kg)	120 (±1.968)	120 (±6.891)	120 (±8.429)	120 (±19.786)	120 (±21.173)

3	Price (Rs) (per Kg Silk Cocoon)	400	200	200**	300*	400
4	Gross Return (Rs)	48000 (±779.49)	24000 (±391.74)	24000** (±489.68)	36000* (±447.71)	48000 (±721.84)
5	Net Return (Rs)	18933.50	-5066.50	-5066.50**	-3799.50*	18933.50
6	Cost per Kg	242.22	242.22	242.22	242.22	242.22
7	Gross Return per Kg Profit per Kg	400	200	200	300	400
8	Profit per Kg	157.78	-42.22	-42.22**	118.33*	157.78

**: P≤0.01; *: P≤0.05



The price of silk cocoons per Kg was found fixed in Maharashtra (Rs. 400 per Kg silk cocoon). The price of silk cocoons per Kg was found fixed in Karnataka state was variable. It depends on the quality of the silk cocoon. The price of silk cocoon in Karnataka state is ranging from Rs. 200 to Rs 1600 (per Kg silk cocoon). The well esteemed Ramanagara silk cocoon market is one of the significant markets for silk

cocoon in Asia. Location of this Ramanagara silk cocoon market is 40 km away from Bangalore. The Ramanagara silk cocoon market is towards Mysore. The record of the silk cocoons sold each day in this market is about 40,000 Kg to 50,000 kg (on an average). This is the silk market of authority of Karnataka government. This market use to welcome the silk city to Ramanagaram, between Sholay Hill and another Sri Sri Ravana Siddheshwara Betta between the two hills, on the banks of the Arkavati river. It deserves the historical background, which appears to be the due to the traditional silk industries established during the political period of Emperor Tipu Sultan of Mysore. The Farm of Coconut has been established here in about 2.00 acres of land. The significant feature of this farm of coconut lies in nurturing the farmers of silk production and the reelers of the silk. This market availed the silk work for many more families. Therefore, the Ramanagar silk market gained the accreditation of the most significant commercial centre in Asia (Anonymous, 2020). The average price of selling the silk cocoons by the farmers during the pre-COVID-19 period was Rs.400.00 per Kg. The pandemic of COVID – 19 made to lower this price to Rs. 200 per Kg of silk cocoons. while that of COVID-19 period was Rs.200.00. This was evident with attempt of studies by Niyati and Vijayamba (2020). The gross return accrued to farmers during the pandemic of "COVID-19- induced lockdown period" was the most insignificant. This situation made not even covered the total cost incurred by silk farmers and leading to face a double loss. Constraints faced by Indian farmers of sericulture during "COVID-19 lockdown period" include: (1) Crashes in price of silk cocoon due to negative psychology (unwillingness) of the reelers to purchase the silk cocoons; (2) Locks to the silk cocoon markets (The closure of silk cocoon market; (3) Closure of the rearing of silkworm larvae by the farmers. This was due to non-availability of chawki worms (2nd instar) at the government farms. Due to non-availability of the human resource (labour), the government farms of chawki rearing were closed the work during lockdown period of pandemic of COVID - 19; (4) Inconvenience in the transport of silk cocoon from the rearing farm to the market; (5) Lockdown period during pandemic of COVID – 19 resulted into non-availability of critical inputs for moriculture and appliances essential for silkworm. rearing appliances as majority of shops were closed during lockdown (Kumaresan et al, 2020 & Anonymous, 2020).

CONCLUSION

The attempt of studies on the analysis of the influence of pandemic of the COVID – 19 on sericulture enterprise coincided with two crops each of hundred DFLs (Disease Free Laying) concluding leading to double loss. The silk farmers, in addition to economic loss have encountered personal inconveniences at the time of marketing of silk cocoon the local market as well as to Ramanagara market. This inconvenience was due to lack of transport and frightened psychology towards the possibility of getting infected with corona virus. The farmers busy in mulberry cultivation and rearing the silkworms during

the pandemic of the COVID – 19 in Pune district (Baramati taluka, Indapur taluka and Daund taluka) faced the strategy of greater expenditure and insignificant returns. Looking into the magnitude of loss, in future, the government (or the associations of silk farmers) (or both) should plan on the reasonable relief/ compensation to sericulture growers to retain their interest in sericulture enterprise. Besides, the government (or the associations of silk farmers) (or both) should plan for covering such unforeseen (unexpected) situations having negative (or non-significant) repercussions on- silk farming community under the coverage of insurance.

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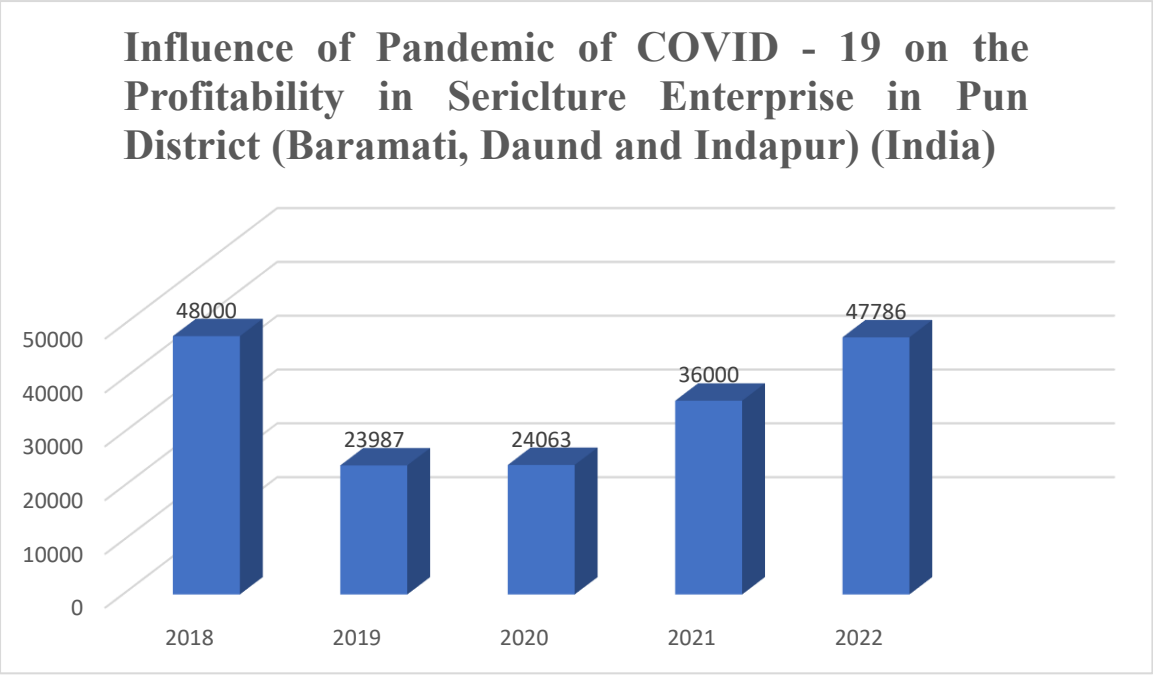

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VEHICLE SAFETY INNOVATIONS AND ELECTRIC MOBILITY: TECHNOLOGIES, TRENDS, AND CHALLENGES

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ABSTRACT

Road traffic injuries impose a profound public health burden worldwide. This review synthesizes the state of the art in advanced vehicle safety, spanning active safety and driver assistance, passive occupant protection, human–machine interaction and driver monitoring, connectivity and vehicle-to-everything (V2X), automated driving and safety assurance, and electric vehicle (EV) battery and high-voltage safety. Accident trends are analyzed to motivate safety investments, with figures illustrating historical changes in fatalities per vehicle mile traveled and modal risk distribution. Each technology's utility, limitations, and notable production implementations are discussed, incorporating research findings, standards, patents, and market evidence. The review concludes with priorities for verification and validation, human-centered design, cybersecurity, EV thermal safety, equitable deployment, and post-crash response optimization.

KEYWORDS

vehicle safety, ADAS, passive safety, driver monitoring, V2X, automated driving, cybersecurity, battery thermal runaway, EV safety, verification and validation

INTRODUCTION

Road traffic deaths remain high globally despite decades of progress in engineering, enforcement, and health systems. The World Health Organization estimates approximately 1.19 million road traffic fatalities annually, with substantial regional disparities (WHO, 2023). In the United States, fatalities per 100 million vehicle miles traveled (VMT) declined in the long term but experienced volatility during the COVID-19 period (NHTSA, 2023a). Meanwhile, vehicles have evolved into software-defined platforms with sensor fusion, advanced control, connectivity, and high-voltage electrification—capabilities that enable significant safety improvements while introducing new risks. This review organizes technologies into major safety domains and provides synthesis across literature, standards, patents, and products, with emphasis on both conventional and electric vehicles.

1. Accident Trends and the Case for Safety

Long-term U.S. fatality rates per 100 million VMT fell markedly from peaks in the 1970s through 2019, reflecting interventions such as seatbelt adoption, airbags, crashworthiness standards, and active safety systems. Pandemic-era traffic changes, speed selection, and risk behaviors temporarily disrupted the downward trend (NHTSA, 2023a). Globally, risk remains unevenly distributed, with pedestrians, cyclists, and motorcyclists absorbing a large share of fatalities, particularly in low- and middle-income countries (WHO, 2023). These trends underline the need for both in-vehicle and system-level interventions. Comparative fatality-rate curves and global road user distributions are shown in Figure 1 and Figure 2; these figures motivate the development and deployment of active and passive safety technologies while highlighting the importance of protecting vulnerable road users. As shown in Figure 1, fatalities per 100 million VMT decreased significantly over decades but experienced recent volatility.

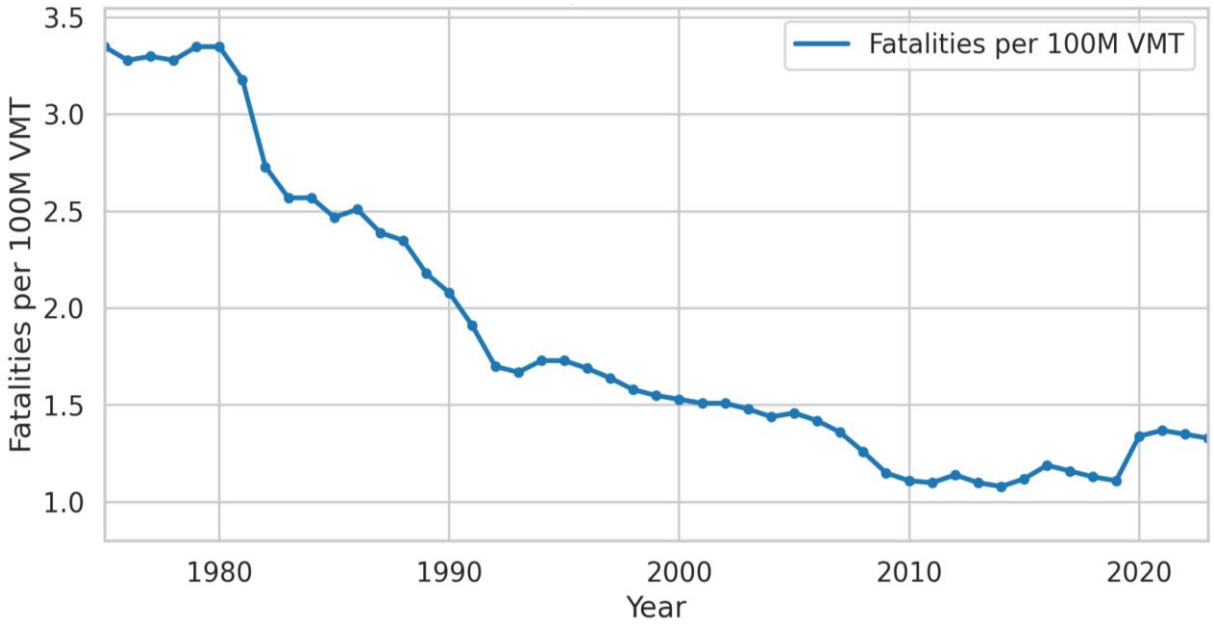

Figure 1: U.S. Traffic Fatalities er 100 Million VMT (1975-2023)

The composition of fatalities by user type and region in Figure 2 highlights persistent risks to pedestrians, cyclists, and motorcyclists.

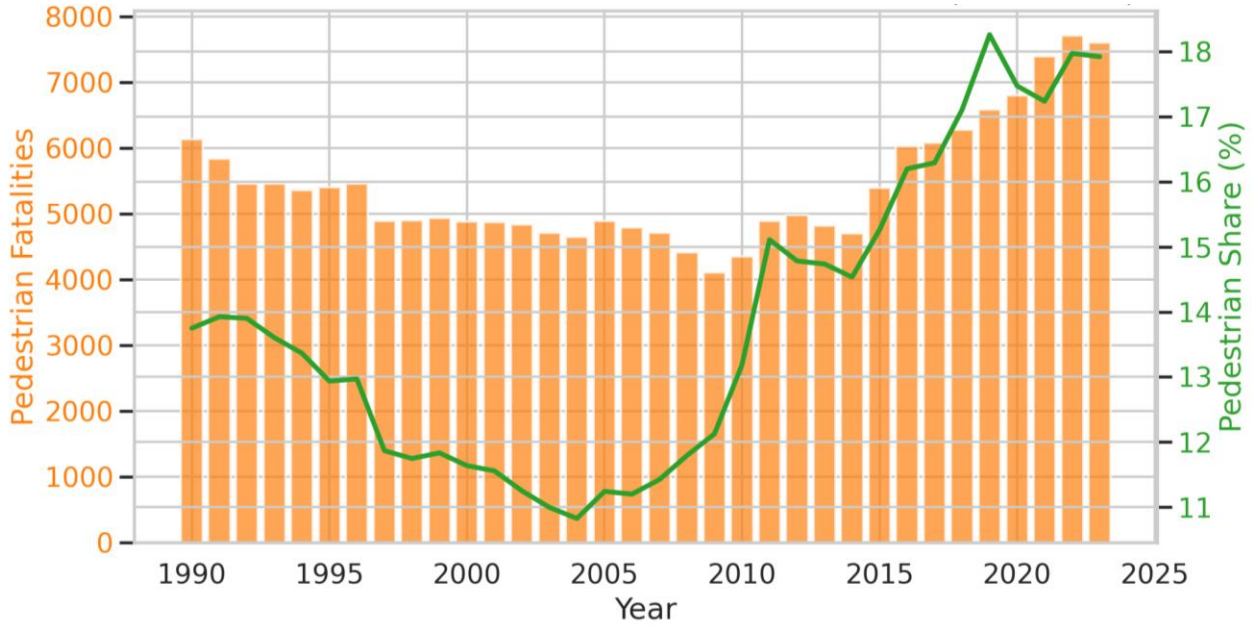

Figure 2: U.S. Pedestrian Fatalities and Share of Total Fatalities (1990-2023)

2. Active Safety and Advanced Driver-Assistance Systems (ADAS)

2.1 Sensing and Perception

Sensors: Automotive radar (77 GHz) provides robust range/velocity in adverse weather; lidar offers high-resolution depth; camera-based vision provides classification and scene understanding; ultrasonic aids low-speed maneuvers; inertial and GNSS support localization (Eskandarian, 2012; Caesar et al., 2020).

Perception: Modern pipelines integrate deep convolutional and transformer models for detection, segmentation, and tracking; multi-sensor fusion enhances reliability; uncertainty estimation and ODD-aware perception remain key challenges (Chen et al., 2015; Caesar et al., 2020).

Usefulness: Multi-modal sensing improves detection across conditions, enabling robust ADAS. **Limitations**: Degradation in heavy rain/snow/fog and glare; occlusion and long-tail edge cases; sensor cost and calibration.

2.2 Collision Avoidance and Control Functions

Forward Collision Warning (FCW) and Automatic Emergency Braking (AEB) reduce rear-end crashes (Cicchino, 2017). Many manufacturers deploy AEB standards (e.g., Toyota Safety Sense, Honda Sensing, Tesla Autopilot AEB, Volvo City Safety).

Lane Departure Warning (LDW) and Lane Keeping Assistance (LKA) prevent run-off-road and sideswipe events; performance depends on lane quality, curvature, and weather (IIHS, 2023).

Blind Spot Detection (BSD) and Rear Cross-Traffic Alert (RCTA) reduce lane-change and backing collisions.

Intersection AEB and Turn Across Path (TAP) features address complex conflict points; these are emerging in models like Subaru EyeSight and Mercedes-Benz Drive Pilot adjuncts.

Adaptive Cruise Control (ACC) and Traffic Jam Assist (TJA) manage longitudinal and limited lateral control in constrained ODDs.

Usefulness: Proven crash reductions for FCW/AEB; improved comfort and workload management with ACC/TJA. Limitations: False positives/negatives, reliance on lane markings, map dependency, and weather sensitivity. Real-world crashes are reduced for FCW/AEB as illustrated in Figure 3.

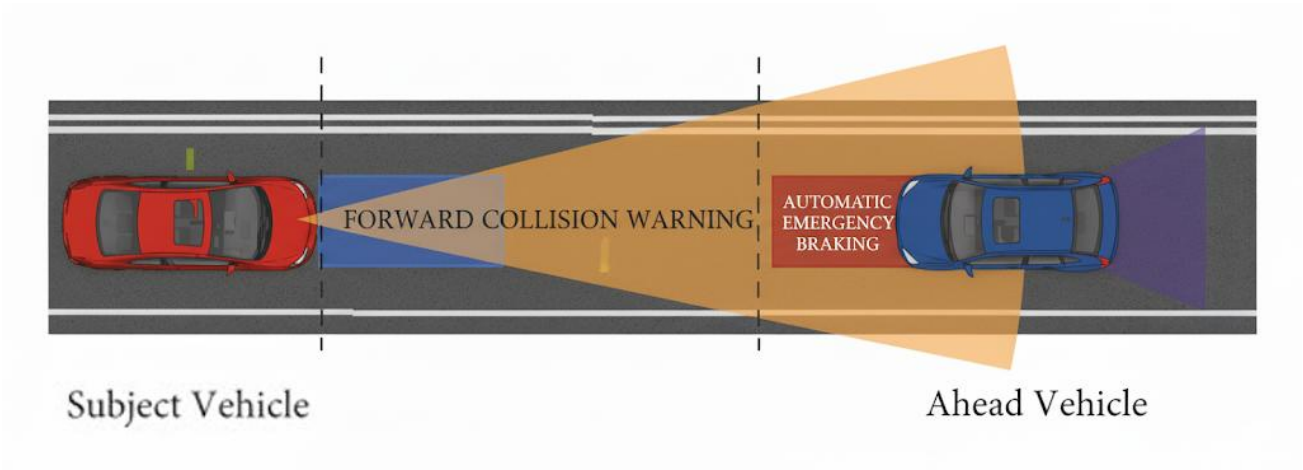

Figure 3: Forward Collision Warning (FCW) and Automatic Emergency Braking (AEB)

2.3 Market Deployments and Patents

Production examples: Toyota (Safety Sense), Honda (Honda Sensing), Tesla (Autopilot/Active Safety), GM (Super Cruise adjuncts), Ford (Co-Pilot360), Hyundai/Kia (SmartSense), Volvo (Pilot Assist/City Safety), Mercedes-Benz (Distronic/Active Brake Assist), BMW (Driving Assistant Professional), Volkswagen (Travel Assist).

Patents: Advancements in sensor fusion, AEB decision logic, and occlusion handling; OEMs and Tier 1s (Bosch, Continental, Mobileye) continue to patent scene understanding, prediction, and control algorithms, emphasizing redundancy, fail-operational design, and environmental robustness.

3. Passive Safety and Occupant Protection

3.1 Structures and Restraints

Crashworthiness: Energy-absorbing crumple zones, high-strength steels, aluminum, and composite structures tuned for offset, small-overlap, and side impacts (Happee et al., 2010).

Restraints: Seatbelts with load limiters and pretensioners; adaptive airbags (multi-stage); knee and center airbags to mitigate occupant-to-occupant interaction in far-side impacts.

Child restraint systems: ISOFIX/LATCH designs, side-impact protection, and misuse-prevention features.

Usefulness: Substantial historical reductions in fatality and serious injury via structural and restraint advances. Limitations: Belt misuse or non-use, small-overlap challenges, and injury patterns in elderly occupants.

3.2 Compatibility and Vulnerable Road Users

Vehicle compatibility: Front-end stiffness management and pedestrian protection via deformable structures, energy-absorbing hoods, and pop-up hood mechanisms.

Far-side impacts: Center airbags and improved side structures reduce injury risk in far-side crashes.

IIHS/Euro NCAP testing and consumer information: Drive material improvements across markets (Euro NCAP, 2023; IIHS, 2023).

4. Human–Machine Interaction (HMI) and Driver Monitoring

HMI clarity: Clear mode indication, takeover requests with graded urgency, and multimodal alerts improve driver understanding of system limits (Carsten & Martens, 2019; Gold et al., 2015).

Driver Monitoring Systems (DMS): Camera-based gaze/eyelid metrics, steering/torque inputs, and head pose models detect distraction and drowsiness (Fridman et al., 2016).

Intelligent Speed Assistance (ISA): Provides speed limit information and optional speed control; mandated in the EU for new types from 2022 (European Commission, 2021).

Usefulness: Reduces misuse and over-reliance; improves response in handover events. Limitations: Privacy concerns, environmental lighting/occlusion for DMS, and user acceptance.

5. Connectivity and V2X Safety Applications

Technologies: DSRC/IEEE 802.11p and C-V2X (PC5 and Uu) provide cooperative awareness and low-latency messaging (Kenney, 2011; Campolo et al., 2017).

Safety applications: Intersection Movement Assist, Left Turn Assist, Emergency Electronic Brake Light, Vulnerable Road User alerts, and cooperative perception.

Integration with ADAS: V2X augments line-of-sight constraints and supports occlusion handling; complements radar/lidar/camera by providing intent and non-line-of-sight information.

Usefulness: Enhances situational awareness and addresses occlusions.

Limitations: Penetration rates, interoperability, spectrum policy, and security credentials management.

Insert the figure after this paragraph: Representative intersection V2X scenarios are illustrated in Figure 7, showing conflict points and message exchanges.

6. Automated Driving and Safety Cases

ODD and safety case: Clear ODD definition and continuous hazard analysis are essential; safety cases synthesize evidence from simulation, testing, and field data (Koopman & Wagner, 2016).

Scenario-based verification: Systematic coverage of critical scenarios via datasets like nuScenes and naturalistic driving studies (Caesar et al., 2020; Brännström et al., 2010). Dataset diversity for automated driving development is exemplified in Figure 4, which depicts multimodal scenes from nuScenes.

Runtime safeguards: Safety envelopes, reachability analysis, and fallback strategies for degraded sensing/actuation (Althoff & Dolan, 2014).

Usefulness: Supports scaling of automated features in bounded domains (e.g., traffic jam pilot).

Limitations: Rare-event validation, distribution shift, and generalization beyond trained conditions.

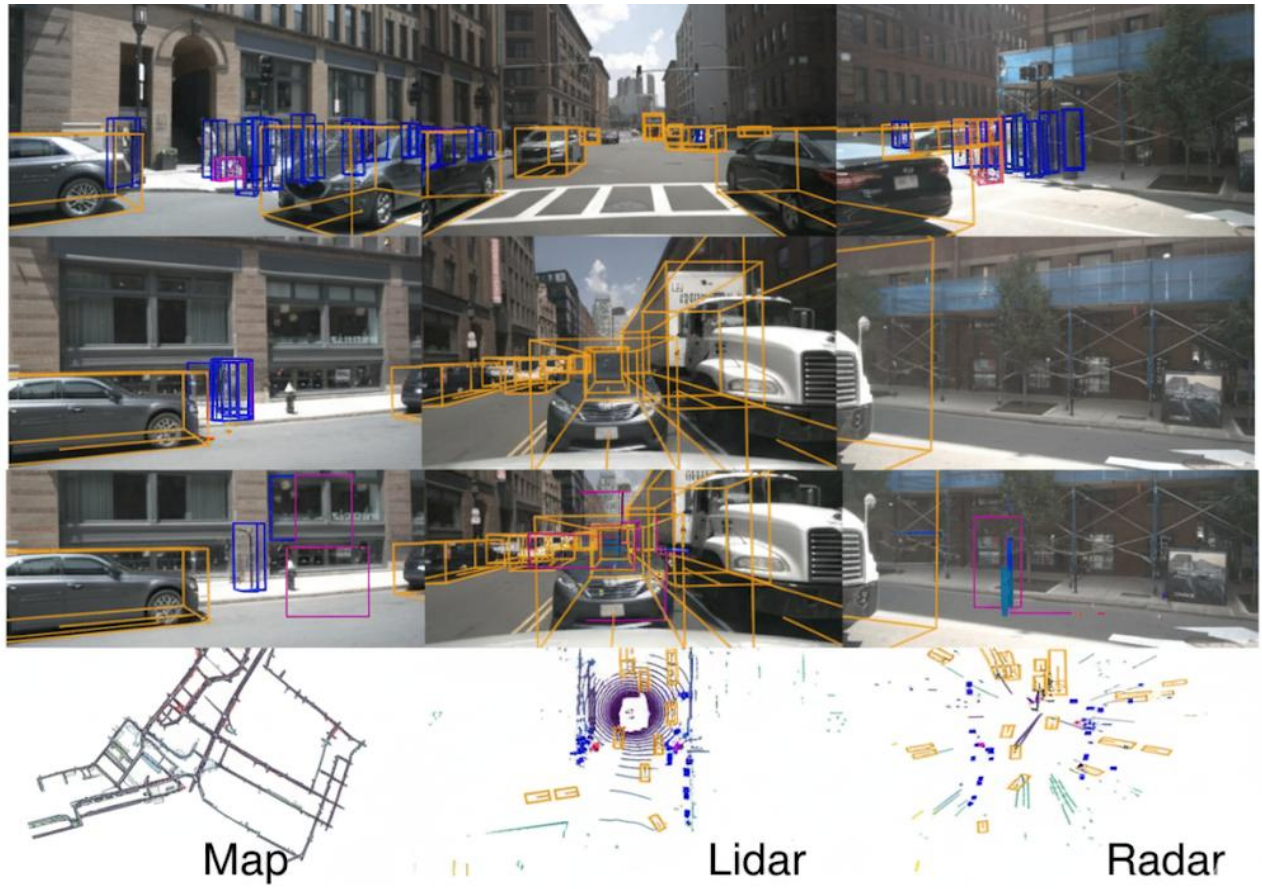

Figure 4: Ped with pet, bicycle, car makes a u-tum, lane change, peds crossing crosswalk

7. EV Battery and High-Voltage Safety

7.1 Battery Pack Design and Thermal Safety

Chemistry and form factor: NMC, NCA, LFP chemistries; prismatic, cylindrical, pouch cells; trade-offs in energy density, thermal performance, and safety margins.

Thermal management: Liquid-cooled plates, heat pipes, phase-change materials, and thermal propagation barriers (UL 2580, SAE J2929).

Thermal runaway mitigation: Early detection via gas/smoke sensors, pressure relief, and pack venting; hardware fusing and pyro-fuse isolation to prevent arcing.

Standards: ISO 6469 (EV safety series), UN GTR 20 (electric vehicle safety), UL 2580 (battery safety), SAE J2929 (EV battery system safety).

Usefulness: Reduces risk of cell-to-cell propagation and post-crash hazards.

Limitations: Abuse tolerance under extreme conditions; diagnosis of internal short circuits; end-of-life degradation effects. A cross-sectional schematic of an EV battery pack with thermal barriers and isolation components is illustrated in Figure 5.

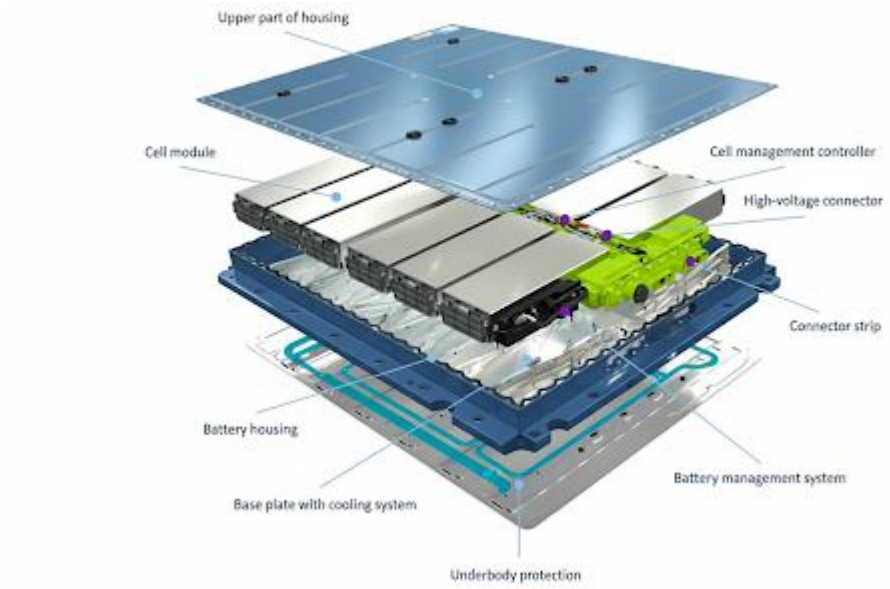

Figure 5: A cross-sectional schematic of an EV battery pack with thermal barriers and isolation components

7.2 Battery Management Systems (BMS) and Diagnostics

State estimation: SOC, SOH, SOF via equivalent-circuit and electrochemical models; ML-enhanced observers improve accuracy across temperature and aging (Guha & Patra, 2018). A reference BMS architecture integrating physics-informed models and ML estimators is illustrated in Figure 6.

Fault detection: Over/under-voltage, temperature gradients, impedance rise, cell imbalance; early anomaly detection to preempt hazardous conditions.

High-voltage interlock loop (HVIL) and isolation monitoring: Ensures circuit integrity; immediate shutdown on breach.

Usefulness: Maintains safe operation across life, temperatures, and use cases.

Limitations: Model drift with aging, dataset representativeness, and robust estimation under transient high-C-rate events.

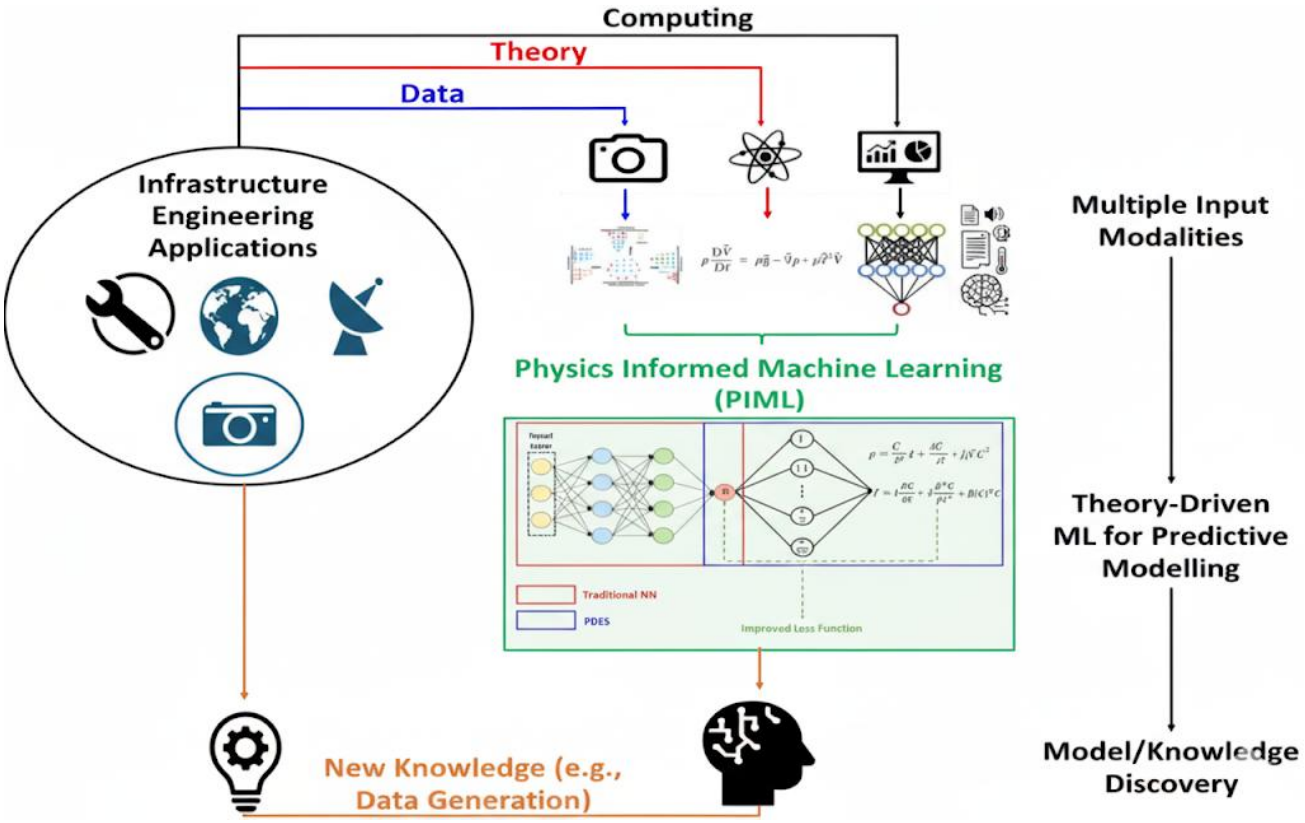

Figure 6: Reference BMS architecture integrating physics-informed models and ML estimators

7.3 Crash Safety and Post-Crash Handling

Isolation and disconnection: Pyro-fuses and contactors open upon crash detection to isolate the pack (ISO 6469; UN GTR 20).

Thermal event response: Guidance for first responders and post-crash storage; long-duration monitoring for re-ignition risk (NFPA, 2023).

Market examples: Tesla, GM Ultium, Hyundai E-GMP, BYD Blade pack architectures focus on cell-to-cell propagation mitigation and strong pack isolation; Mercedes-Benz and Volvo incorporate advanced post-crash HV isolation strategies.

8. Verification, Validation, and Safety Assurance

Safety assurance for software-defined vehicles integrates ISO 26262, ISO 21448 (SOTIF), and cybersecurity (ISO/SAE 21434; UNECE R155/R156). Scenario-based testing, mixed-reality simulation, and formal verification techniques support evidence generation for safety cases (Brännström et al., 2010; Althoff & Dolan, 2014; Koopman & Wagner, 2016). OTA updates require robust governance, staged rollouts, regression testing, and in-field monitoring to detect safety degradations (ENISA, 2021). Metrics include residual risk by scenario class, minimum required risk time, and hazard exposure time. Limitations remain in coverage of rare events, generalization across ODDs, and cyber-physical co-assurance.

9. Post-Crash Response and Ecosystem Safety

eCall/automatic crash notification: Mandated in the EU for new vehicle types since 2018; reduces time-to-care through automatic emergency communication and GNSS coordinates (European Commission, 2018). A taxonomy of active safety functions and enabling sensors is summarized in Table 1.

Responder guidance and training: NFPA and OEM-specific protocols for EVs; thermal event management and water application strategies (NFPA, 2023).

Data for continuous improvement: Event Data Recorders (EDR), telematics, and safety analytics feed back into design and policy (NHTSA, 2023b).

Table 1: EV battery safety standards and tests

Test Type/Procedure	Purpose	Key Standards/Criteria
Safety and Abuse Testing	To characterize the response of integrated battery systems to expected and worst-case accident and abuse situations.	Performed on full-size batteries or representative modules with ancillary components installed. Batteries must first be conditioned with a low number of electrical cycles (e.g., 50). Internal electrical safety devices can be bypassed for select abuse testing.
Thermal Performance Test	To characterize the effects of ambient temperature variation on battery performance.	Perform a series of discharge/charge tests after the battery has stabilized at a specific temperature. This procedure is generally for ambient temperature batteries.

Battery Vibration Test	To test the adequacy of the battery design to withstand vibration regimes.	The battery is tested electrically before and after exposure to vibration, with no significant differences in performance expected. During testing, the battery is instrumented to detect failure conditions such as loss of electrical isolation, abnormal voltages, or unexpected resonances. A trial criterion for isolation is 0.5 MΩ or greater.
Fast Charge Test	To determine the fast charging capability of a battery.	The test series terminates if the battery's temperature, voltage, or other operating limits are exceeded during recharge.
Life Cycle Testing	To accelerate the aging of battery test units.	End-of-life is reached when the net delivered capacity or the peak power capability is less than 80% of its rated value.

10. Market Status, Regulation, and Consumer Information

Regulations: ESC mandates (FMVSS No. 126), AEB and ISA rollouts, UNECE R155/R156 for cybersecurity and updates, and evolving pedestrian safety requirements (NHTSA, 2011; European Commission, 2021; UNECE, 2021a; UNECE, 2021b). A taxonomy of active safety functions and enabling sensors is summarized in Table 2.

Consumer programs: Euro NCAP, IIHS, and NHTSA NCAP updates incentivize active safety, VRU protection, and assisted driving performance (Euro NCAP, 2023; IIHS, 2023; NHTSA, 2023b).

Market trends: Wider standardization of AEB and LKA; proliferation of DMS due to Euro NCAP protocols; rapid growth of high-voltage EV architectures with advanced thermal propagation countermeasures.

Table 2: A taxonomy summary of active safety functions and their enabling sensors

Methods	**Detection Techniques**	**Sensor Types**	**Sensor details**	**Physiological Parameters**	**Advantages**	**Disadvantages**
ECG	Contact ECG	Wearable ECG sensors	Small wearable ECG modules	HR, HRV, RR	High accuracy during real driving; continuous long-term monitoring	Discomfort during wearing, as the contact electrodes are sometimes perceived as

						intrusive by the driver; can peel off when sweating
ECG	Contact ECG	Wearable ECG sensors	Small wearable ECG modules	HR, HRV, RR, BP * (* ECG in combination with PPG)	High accuracy during rest; easy to wear and use; no skin irritation and discomfort; affordable and widely available	Does not record data if not worn; issue due to need of recharging; lack of reliability in connection; low accuracy during movements and physical activity
ECG	Contact ECG	Non-wearable (integrated in steering wheel) ECG sensors			***Unobtrusive techniques for the driver; measurements are available at any time	Requirement of two-handed grip at precise steering wheel location; interference from triboelectric effects
ECG	Non-contact (capacitive) cECG (integrated in the seat			HR, HRV	More comfortable for the driver; no need for driver involvement; plus *** advantages	Interference from triboelectric effects

	and the safety belt)					
ECG	Hybrid ECG (with conductive and capacitive electrodes)			HR, HRV	No need for two-handed grip at precise steering wheel location; plus *** advantages	Requirement of constant hand grip for monitoring; interference from triboelectric effects
PPG	Optical, Contact PPG	Wearable PPG sensors	Smart watch/wristband	HR, HRV, RR, SpO2, BP	High accuracy during rest; easy to wear and use; affordable and widely available	Does not record data if not worn; issue due to need of recharging; lack of reliability in connection; low accuracy during physical activity
PPG	Optical, Contact PPG	Wearable PPG sensors	Smart ring	HR, HRV, RR, SpO2	High accuracy; easy to wear continuously	No research data from studies
PPG	Optical, Contact PPG	Wearable PPG sensors	PPG module attached to the	HR, HRV, RR, SpO2	High accuracy during real driving; continuous long-term monitoring	Discomfort during wear as a result of obtrusive contact for continuous monitoring

			ear/finger			
PPG	Optical, Contact PPG	Non-wearable PPG sensors	PPG sensor in the steering wheel	HR, HRV, RR, SpO2, BP	Unobtrusive techniques for the driver; measurements are available at any time	100% sensor coverage by driver's skin cannot be guaranteed; driver involvement for continuous monitoring is required
PPG	Optical, Contact PPG	Non-wearable PPG sensors	PPG sensor integrated in the seat	HR, HRV,RR	Unobtrusive techniques for the driver; measurements are available at any time	Limited accuracy due to motion artifacts because of driver's movements
PPG	Optical, non-contact (camera-based PPG) iPPG	Visible light (RGB, web) cameras		HR, HRV, RR	Analyzed facial expressions based on the driver's face reference points; affordable and widely available; plus *** advantages	Accuracy is not guaranteed due to vibrations and ambient light; requirement of direct line of sight; personal data privacy is not protected; sensitive to skin

						tone variations and driver distance; reduced accuracy due to facial makeup and g
PPG	Optical, non-contact (camera-based PPG) iPPG	Active infrared (NIR) camera		HR, HRV, RR	Lower ambient light interference compared to visible light cameras; lighttime operation; affordable; plus *** advantages	Accuracy is not guaranteed due to vibrations; requirement of direct line of sight; eye fatigue during prolonged monitoring; compliance with safety standards is required; complex algorithms to improve accuracy
IRT	Non-contact IR thermal camera technique	Non-wearable far-infrared thermography (FIR) sensor		RR, HR, BT	Complete darkness operation; no energy transfer to the driver; no ambient light interference; privacy of personal data	Expensive; less expensive thermal IR-array devices have low resolution and low sampling frequency

BIM	Contact BIM 4-electrode technique	BIM sensor integrated in smart ring		HR, HRV, RR, BP	High accuracy; easy to wear continuously; no sensitivity to skin color and tissue structure; more stable contact with the skin	Limited monitoring data from laboratory environment only
BIM	Inductive BIM (magnetic induction)	Single-coil (resonant circuit) technique		HR, RR	No need for driver involvement; plus *** advantages	Limited results from real-world driving; sensitive to driver movements during turning, Multi-coil (gradiometer) technique acceleration and deceleration; lower accuracy in real driving conditions
BIM	Inductive BIM (magnetic induction)	Multi-coil (gradiometer) technique		HR, RR	No need for driver involvement; plus *** advantages	Limited results from real-world driving; sensitive to driver movements during turning, Multi-coil (gradiometer)

						technique acceleration and deceleration; lower accuracy in real driving conditions
BCG/ SCG	BCG, SCG technique	Quasi-piezoelectric force (EMFI sensor) in the seat		HR, RR	No need for driver involvement; plus *** advantages	Significant impact of motion artifacts; low accuracy due to vibrations
BCG/ SCG	BCG, SCG technique	Liquid bladder with pressure sensor integrated in the seat		HR, RR	No need for driver involvement; plus *** advantages	Significant impact of motion artifacts; low accuracy due to vibrations
BCG/ SCG	BCG, SCG technique	Wearable accelerometer and gyroscope sensors attached to the body		HR, RR	No need for driver involvement; plus *** advantages	Significant impact of motion artifacts; low accuracy due to vibrations
RADAR	Electromagnetic, non-contact radar technique	CW radar sensor		HR, HRV, RR, BP	No need for direct visibility; operates in foggy and dark environments; operates through obstacles (clothing);	Requires precise positioning to minimize motion artifacts; needs more accurate algorithms for

					privacy of personal data; monitoring of multiple objec	determining physiological parameters; interference from nearby electronics equipment
RADAR	Electromagnetic, non-contact radar technique	FMCW radar sensor		HR, HRV, RR, BP	No need for direct visibility; operates in foggy and dark environments; operates through obstacles (clothing); privacy of personal data; monitoring of multiple objec	Requires precise positioning to minimize motion artifacts; needs more accurate algorithms for determining physiological parameters; interference from nearby electronics equipment
RADAR	Electromagnetic, non-contact radar technique	SFCW radar sensor		HR, HRV, RR, BP	No need for direct visibility; operates in foggy and dark environments; operates through obstacles (clothing); privacy of personal data; monitoring of multiple objec	Requires precise positioning to minimize motion artifacts; needs more accurate algorithms for determining physiological

						parameters; interference from nearby electronics equipment
RADAR	Electromagnetic, non-contact radar technique	UWB-IR sensor		HR, HRV, RR, BP	No need for direct visibility; operates in foggy and dark environments; operates through obstacles (clothing); privacy of personal data; monitoring of multiple objects	Requires precise positioning to minimize motion artifacts; needs more accurate algorithms for determining physiological parameters; interference from nearby electronics equipment
US	Non-contact technique	Doppler-effect-based ultrasound sensor		HR, BP	Potential for contactless monitoring of BP; plus *** advantages	Limited monitoring data from laboratory environment only
SC (EDA)	Wearable SC technique	SC sensors attached to the palm/fingers/ wrist		EDA	High accuracy during real driving; continuous long-term monitoring	Discomfort during wear in result of obtrusive contact electrodes

SC (EDA)	Wearable SC technique	SC sensor wristband/glove		EDA	High accuracy during real driving; continuous long-term monitoring	Discomfort during wear in result of obtrusive contact electrodes
SC (EDA)	Non-wearable SC technique	SC sensor integrated in the steering wheel		EDA	Unobtrusive for the driver; measurements are available at any time	Requirement of constant hand grip for monitoring; temperature, humidity, and individual sweating may influence the results

*** Unobtrusive techniques for the driver; measurements are available at any time

11. Limitations and Open Challenges

Long-tail rare events and domain shift stress data-driven systems beyond training distributions.

Human factors: Over-trust and misuse of partial automation; need for transparent HMI and robust DMS.

Equity and externalities: Ensuring benefits extend to vulnerable road users and all regions; addressing unintended risk compensation.

Cybersecurity co-assurance with safety: Adversarial attacks on sensors and connectivity.

EV lifecycle safety: Aging, second-life, transport, and recycling introduce new safety contexts.

Evidence-based regulation: Harmonized metrics, scenario libraries, and post-deployment monitoring.

CONCLUSION

Advanced vehicle safety demonstrates proven benefits in reducing crash frequency and severity, with active safety (e.g., AEB) and passive systems (e.g., optimized structures, airbags) delivering measurable gains. Emerging capabilities in V2X, DMS, and partial automation offer further potential, provided that safety assurance keeps pace with complexity and that deployment is coupled with rigorous validation,

clear HMI, and robust cybersecurity. EV-specific safety requires continued innovation in pack design, thermal propagation mitigation, BMS diagnostics, and post-crash protocols. Future work should prioritize standardized scenario-based validation, equity for vulnerable road users, resilient software update processes, and integrated ecosystem-level safety.

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THE ROLE OF ELECTION COMMISSION AND ELECTORAL REFORMS IN INDIA

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ABSTRACT

India stands as a model for many emerging democracies around the world. Free and fair elections are the hallmark of a well-functioning democracy. While we are justifiably proud of our democracy, there are a number of areas which need to be strengthened for us to realize the true potential of a well-functioning democracy. Our election system, from the selection of candidates, to the manner in which funds are raised and spent in election campaigns, are in dire need of significant changes. There has been a growing concern over the years in India about several aspects of us electoral system. The Election Commission has made changes in several areas to respond to some of the concerns. There have also been a number of committees which have examined the major issues pertaining to our electoral system and made a number of recommendations. But there remain some critical issues that might need legislative action to bring about the required changes. The criminalization of our political system has been observed almost unanimously by all recent committees on politics and electoral reform. Criminalization of politics has many forms, but perhaps the most alarming among them is the significant number of elected representatives with criminal charges pending against them. enforcement of the disclosure of criminal antecedents of candidates, and eligibility restrictions for candidates with criminal cases pending against them. The financing of elections has become a major issue in the past few decades. It is widely believed that the cost of fighting elections has climbed far above the legal spending limits. This has resulted in lack of transparency, widespread corruption, and the pervasiveness of so-called 'black money.

KEYWORDS

Electrol Reforms, Democracy, Election, Politics and Committees.

INTRODUCTION

Electoral reform refers to improving a country's electoral systems to ensure free, fair, and transparent elections. In a democratic country, elections form the foundation of governance, and ensuring their credibility is essential for democracy's success. However, various challenges in the electoral process necessitate ongoing reforms. The Election commission is an autonomous body It was established on 25th January, 1950 It is a permanent constitutional body For the success of democracy, it is

indispensable Article 124 of the Constitution provides that the power of superintendence, direction and control of elections to parliament state legislatures, the office of president of India and the office of vice-president of India shall be vested in the election commission. Originally the commission had only one election commissioner but after the Election Commissioner Amendment Act 1989, it has been a multi-member body. However, the two posts of election commissioners were abolished in January 1990 and the Flection Commission was reverted to the earlier position. Again, in October 1993. since 1993 1 to present the election commission of India having three commissioners. Since then, the Election Commission has been functioning as a multi-member body consisting of three election commissioners. The Chief election commissioner and two election commissioners Election Commission of India conducts the entire process of conducting elections to Parliament and Legislature of every State and to the offices of President and Vice-President of India Recognition of political parties and allotment of symbols Preparation of electoral roll (Voter's list) Scrutiny of nomination papers of the contesting candidates Scrutiny of election expenses of the contesting candidates Deciding model code of conduct for contesting candidates and political parties. Deciding election schedules for conduct of election Disqualifying candidates stopping of cancelling elections in a particular polling booth or station on the basis of allegations avoidance of poll rigging.

OBJECTIVES OF THE STUDY

1 To study the reasons for electrol reforms

2. To find out the various electoral reforms implemented since independence present 3 the reforms recommended by the Election Commission of India

METHODOLOGY: Based on secondary data

FINDINGS OF THE STUDY

1. (Practical implementations of the various recommendations)
2. To find out the method of conduct conducting one nation and one election
3. To find out issues and challenges in electrol reforms
4. The Working system of the election commission of India

NEED FOR ELECTORAL REFORMS

The removal of malicious people and malevolent activities has made electoral reforms necessary. The reason for the need for electoral reforms are listed below

- Free and fair elections have been made possible by electoral reforms Election reforms include things like implementing best practices to ensure better, more accountable parliamentary democracy, fixing structural problems, promoting honest politics, and preserving public confidence

- There should be transparency in politics like giving Indian citizens the right to information, facilitating voting with assurance, ending the criminalization of politics, maintaining the secrecy of voters, ensuring free and fair elections, fairly registering political parties, finding a solution for delisting voters, the non-partisan role of the media, and enforcing the model code are all examples of transparency in politics
- The need for electoral reforms has also been felt primarily in order to fulfil the aspirations of the younger generation prevent the criminalization of politics, discourage the use of force and money in politics, stop the abuse of government resources, increase public trust, strengthen election commission, make them independent, and use technology in the electoral process
- The Election Commission of India is an autonomous constitutional authority and responsible for administering Union and State election processes in India. The body administers elections to the Lok Sabha, Rajya Sabha, and State Legislative Assemblies in India, and the offices Part XV of the Indian constitution deals with elections, and establishes a commission for these matters The Election Commission was established in accordance with the Constitution on 25thJanuary 1950Article 324 to 329 of the constitution deals with powers, function, tenure, eligibility of the commission and the member

FUNCTIONS OF THE ELECTION COMMISSION OF INDIA

Election Commission of India superintendents, direct and control the entire process of conducting elections to Parliament and Legislature of every State and to the offices of President and Vice-President of India. The most important function of the commission is to decide the election schedules for the conduct of periodic and timely elections, whether general or bye-elections. It prepares electoral roll issues Electronic Photo Identity Card (EPIC) 2/4

It decides on the location polling station assignment of voters to the polling stations, location of counting centers, arrangements to be made in and around polling stations and counting centers and all allied matters. It grants recognition to political parties & allot election symbols to them along with settling disputes related to it. The Commission also has advisory jurisdiction in the matter of post-election disqualification of sitting members of Parliament and State Legislatures li issues the Model Code of Conduct in election for political parties and candidates so that the no one indulges in unfair practice or there is no arbitrary abuse of powers by those in power. It sets limits of campaign expenditure per candidate in all the political parties, and also monitors the same

STRUCTURE OF THE COMMISSION

Originally the commission had only one election commissioner but after the Election Commissioner Amendment Act 1989, a has been made a multi-member body The commission consists of one Chief

Election Commissioner and two Election Commissioners. The secretariat of the commission is located in New Delhi At the state level election commission is helped by Chief Electoral Officer who is an IAS rank Officer The President appoints Chief Election Commissioner and Election Commissioners. They have a fixed tenure of six years, or up to the age of 65 years, whichever is earlier They enjoy the same status and receive salary and perks as available to Judges of the Supreme Court of India The Chief Election Commissioner can be removed from office only through a process of removal similar to that of a Supreme Court judge fir by Parliament Procedure of Removal Judges of High Courts and Supreme Court, CEC, Comptroller and Auditor General (CAG) may be removed from office through a motion adopted by Parliament on grounds of Proven misbehavior or incapacity Removal requires special majority of 2/3rd members present and voting supported by more than 50% of the total strength of the house The Constitution does not use the word 'impeachment, for the removal of the judges, CAG, CEC The term 'Impeachment is only used for removing the President which requires the special majority of 2/3rd members of the total strength of both the houses which is not used elsewhere. Election reforms in India mean improvements and lawful modifications made to India's electoral procedures to enhance democracy, fair politics, selection of the best candidate for election and equal representation Elections in India can be strengthened by making the election commission more powerful and empowered. In its Report on Electoral Reforms, the Law Commission made several recommendations, including strengthening the Election Commission of India office to give the organization more independence and powerful electoral Reforms, constitutional articles on electoral reforms and measures taken by the Election Commission of India The Lok Sabha passed the Election Laws (amendment) in the year 2021, This amendment arms to provide electoral registration officers with the authority to verify voters' identities by asking for their Aadhaar numbers. An individual who is eligible to be registered as a voter must submit an application before being added to the electoral roll The new applicant may voluntarily submit an Aadhaar number with the application for the purpose of establishing identity under the terms of this amendment The new bill recommended electoral system changes that will aid in filtering out fraudulent voters Multiple enrolments of the same individual at several locations are one of the key issues with electoral database management, which would be resolved by integrating Aadhaar into the electoral roll This can be the result of electors frequently moving then residences and enrolling in the new location without removing their previous enrolment Consequently, the possibility of voters whose names appear on more than one electoral roll or occasionally on the same electoral roll more than once can be eliminated.

THE MAIN REASONS FOR ELECTORAL REFORMS

Electoral reforms refer to the changes or improvements made to the electoral process to ensure the integrity and transparency of the electoral system These reforms are necessary to maintain the credibility of the electoral process and to ensure that every vote counts

1) Ensuring free and fair elections (Article 324) Electoral reforms aim to address the issues of electoral malpractices and ensure that elections are conducted in a free and fair manner

2) Enhancing voter participation Electoral reforms aim to increase voter turnout and to address the issue of voter apathy, difficulty in accessing polling booths, etc

3) Reducing the influence of money and muscle power Electoral reforms help to reduce the influence of money and muscle power by regulating campaign finance and ensuring the safety of voters

4) Encouraging transparency and accountability Electoral reforms initiate the measures such as mandatory disclosure of criminal records by candidates and the use of technology to monitor the electoral process

5) Addressing electoral inequalities Electoral reforms try to bring down the inequalities such as the under-representation of women and marginalized communities

THE CHALLENGES FACED IN CONDUCTION OF FREE AND FAIR ELECTIONS IN INDIA

1. Booth Capturing. Even in new era and world of developments, there are reported incidents of violence and intimidation of voters at the booth in general elections and assembly elections
2. Criminalization of Politics Despite the EC's measures regarding the disclosure of criminal records, the parties have not refrained from giving tickets to candidates having serious criminal antecedents for ex About 40% of sitting MPs have criminal cases registered against them out of which 25% have declared serious criminal cases under charges of murder
3. Violation of Model Code of Conduct The elections in India witness violations of the model code of conduct by the candidates and the political parties for example, Illegal use of public places, loudspeakers, money for votes etc
4. Electoral Finance Electoral finance has always been an Achilles heel problem for elections in India Laundered and Black money are major sources of electoral finance
5. Electoral Overspending. The political parties have no expenditure limit in the elections. This is exploited by the candidates for over expenditure in their constituencies during the election for ex-Star campaigners' expenditure is not included in candidate's expenditure
6. Use of casteism and communalism card- The elections in India witness the card of casteism, communalism and regionalism played by the political parties to garner votes This led to social fragmentation of the electorate. For example, Use of Hate Speech in elections

7. Misuse of Government Machinery Misuse of government machinery takes many forms, including the publication of advertisements at the expense of the government and the public exchequer highlighting their accomplishments, disbursements from ministerial discretionary funds, and the use of government vehicles for canvassing
8. Muscle Power Violence, pre-election intimidation, post-election victimization, the vast majority of riggings of any kind, and silent and violent booth capturing are all fruits of muscle power
9. Money Power. Electioneering is a costly event in any democratic government, but it is especially so in India. Money power plays a negative influence in our electoral system, substantially influencing the functioning of periodic elections
10. Lack of Moral Values in Politics Political parties' ideological orientation has deteriorated dramatically. In India, party dynamics have resulted in the creation of worthless politics

CONSTITUTIONAL ARTICLES RELATED TO ELECTORAL REFORMS IN INDIA

• Article 324 The Constitution entrusts the responsibility to supervise, direct and control the entire procedure and machinery for election and also for some other ancillary matters, to the Election Commission of India under Article 324

• Article 325. There shall be one general electoral roll for every territorial constituency for election to either House of Parliament or to the House or either House of the Legislature of a State and no person shall be ineligible for inclusion in any such roll or claim to be included in any special electoral roll for any such constituency on grounds only of religion, race, caste, sex or any of them

• Article 326. Elections to the House of the People and to the Legislative Assemblies of States to be on the basis of adult suffrage

• Article 327 Power of Parliament to make provision with respect to elections to Legislatures Subject to the provisions of this constitution, Parliament may from time to time by law made provision with respect to all matters relating to, or in connection with elections to either House of Parliament or to the House or either House of the Legislature of a State

• Article 328 Power of Legislature of a State to make provision with respect to elections to such Legislature Subject to the provisions of this Constitution

THE VARIOUS ELECTORAL REFORMS IMPLEMENTED SINCE INDEPENDENCE TO PRESENT TO PRESENT

ELECTORAL REFORMS BEFORE 1996

• Increase in the number of proposers. In 1988, the number of proposers in nomination papers for elections to the Rajya Sabha and State Legislative Council was increased to 10 percent of the electors of the constituency or ten such electors, whichever is less

• Lowering of Voting Age, the 61st Constitutional Amendment Act of 1988 reduced the voting age from 21 years to 18 years for the Lok Sabha as well as the assembly elections to make youth a part of the political process

• Booth capturing. In 1989, a provision was made for the adjournment of polls or countermanding elections in case of booth capturing

• Electronic Voting Machines (EVM) Fust-time use of EVMs occurred in the general election in Kerala in May 1982 In 2004 in the General Election to the Lok Sabha, the EVMs were used in all 543 Parliamentary Constituencies in the country.

ELECTORAL REFORMS OF 1996

• Some of the recommendations of the Dinesh Goswami Committee (1990) were implemented in 1996. These are explained here

• Listing of names of candidates. The candidates contesting elections are to be classified into three categories for the purpose of listing then names They are

Candidates of recognized political partiesCandidates of registered unrecognized political parties

Other (independent) candidates

• Disqualification under Prevention of Insults to the National Honour Act A person convicted for the offenses under the Prevention of Insults to National Honour Act of 1971 is disqualified to contest in the elections to the Parliament and State Legislature for 6 years

• Number of proposers the nomination of a candidate in a Parliamentary or assembly constituency should be subscribed by 10 registered electors of the constituency as proposers if the candidate is not sponsored by a recognized political party

• Contestants restricted to two constituencies A candidate would not be eligible to contest from more than two Parliamentary/assembly constituencies and Rajya Sabha/State legislative council

ELECTORAL REFORMS IN INDIA AFTER 1996

• The number of proposers and seconders increased for the post of President and Vice President The number of proposers and seconders for the post of President increased to 50 and for the post of Vice President the number increased to 20

• Voting through postal ballet for persons who cannot come to polling booths, the postal ballot system was introduced This provision was also extended to persons in the armed forces

• Declaration of criminal records and assets. For a candidate contesting elections, he has to provide a declaration for any criminal case registered against him He also needs to declare all the assets and liabilities during the nomination

• Domicile and residency requirements changed for contesting elections from any constituency from 2003 onwards.

• An open ballot system in Rajya Sabha was introduced

• Under section and other laws Amendment Act 2003, travelling expenses were not included in election expenditure

• Parties are entitled to receive donations for their election campaigns from any private organization or individual A single individual needs to report to the Election commission for donating more than 20000

• Prohibition of arms near polling booths Any unauthorized person is prohibited from carrying arms near polling booths

• The period of campaigning is reduced to 14 days

• Electoral Reforms after 1997 to 2003

• Presidential and Vice-Presidential elections in 1997, the number of electors as proposers and seconders for contesting election to the office of the President was increased from 10 to 50 and to the office of the Vice President from 5 to 20

• Declaration of criminal antecedents, assets, etc., by candidates in 2003, the Election Commission issued an order directing every candidate to disclose the information on the matters of conviction, accusation, assets, and any liabilities

• Free supply of electoral tolls, etc. According to a 2003 provision, the Government should supply, free of cost, copies of the electoral rolls and other prescribed material to the candidates of recognized political parties for the Lok Sabha and Assembly elections

• Parties entitled to accept contribution in 2003 the political parties had to report any contribution in excess of 220,000 to the Election Commission for making any claim to any income tax relief

• Allocation of time on electronic media Under a 2003 provision, the Electron Commission should allocate equitable sharing of time to recognized political parties based on past performance, on the cable television network and other electronic media

ELECTORAL REFORMS SINCE 2010

• Restrictions imposed on exit polls. According to a 2009 provision, conducting exit polls and publishing results of exit polls would be prohibited during the election to Lok Sabha and State Legislative Assemblies

• Time limit for submitting a case for disqualification: In 2009, a three-month time limit was added within which the specified authority will have to submit the case of a person found guilty of corrupt practice to the President to determine the question of disqualification

ELECTORAL REFORMS IN INDIA OF 1996

• Listing of the name of candidates the candidates contesting in the election were classified into the candidates of recognized political parties, Candidates of unregistered & recognized parties and independent candidates and their order was listed in this sequence on the ballot paper

• Disqualification on conviction for violating the National Honors Act 1971 A person shall be disqualified from contesting elections to Parliament and state legislative assemblies for six years if he or she is found the violation of the National Honors Act 1971 for certain conditions like a dishonor to National Flag or National Constitution

• Prohibition on sale of liquor the sale of liquor is prohibited at all public places for 48 hours till the end of election polls If found it may result in jail for 6 months or a fine of Rs. 2000

• The number of proposals A candidate contesting election for a constituency from a non-recognized political party required proposals from at least 10 members belonging to that constituency

• Provision on the death of candidate If during elections, there occurs death of a candidate from a recognized political party then the election commission asks the political party to nominate another candidate within 7 days from the date of issue of notice

• Time of bye-elections for conducting elections for vacant seats the time period for conducting bye-elections is six months if the tenure of the vacated seat is more than 1 year on polling day, employers of various organizations are provided a paid holiday

• Restriction on contesting from constituencies A candidate can contest elections from a maximum of two parliamentary or two constituencies

• Prohibition of arms near polling booths Any unauthorized person is prohibited from carrying arms near polling booths

The period of campaigning is reduced to 14 days

ELECTORAL REFORMS AFTER 1997 TO 2003

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• Increase in security deposit in 2009, the amount of security deposit to be paid by the candidates contesting elections to the Lok Sabha was increased from ₹10,000 to 225,000 and Rs 5000 for SC/ST category individuals

• Appellate authority within the district in 2009, a provision was made for appointment of an appellate authority within the district against the orders of the Electoral Registration Officers, instead of the Chief Electoral Officer of the state

• Persons in jail or police custody can contest elections. In 2013, Representation of the People Act, 1951 was amended to allow the persons in jail or police custody to contest elections

• Immediate disqualification of convicted MPs and MLAs Supreme Court, in Lily Thomas case (2013), held that convicted MPs and MLAs will be immediately disqualified from holding membership of the House without being given three months' time for appeal, as was the case before

• Ceiling on cash donations lowered in the 2017 budget, the limit for anonymous cash donations by any individual to a political party has been lowered from 220,000 to ₹2,000

• Cap on corporate contributions lifted in the 2017 budget, the limit on corporate contributions from 7.5 percent of the net profit of a company's past three financial years has been removed

• Introduction of electoral bonds Electoral Bonds, introduced in 2018, are touted as an alternative to cash donations made to the political parties. It is aimed at bringing clean money and substantial transparency into the system of political funding

• Foreign funding allowed Receiving of foreign funds by the political parties has been allowed by amending Foreign Contribution (Regulation) Act, 2010

• Voting rights to citizens of India living abroad. This was introduced by the representation of the people Amendment Act 2010. Persons living abroad who have not acquired citizenship in another country are eligible to vote in India

• Registration of the electors' amendment rules 2013

• NOTA introduced. The option of none of the above was introduced in cases where the voter is not satisfied with any of the candidates contesting the election Measures Taken by ECI

• The Election Commission has recently taken several new initiatives, including the use of state-owned electronic media for political party broadcasts or telecasts, checking

• The Criminalization of political parties, providing electoral identification cars, streamlining the procedure for registering political parties and requiring them to hold regular organizational elections variety of measures to ensure strict compliance with the Model Code of Conduct to ensure a level playing field for contestants

• There is a widespread perception that something is amiss with India's election process

• Now is the time to include some tough norms and legislation in our Constitution to keep those antisocial evils out of India's election system

• The ECI hay made initiatives to ensure voter confidence in the use of electronic voting machines in elections

• During the election process, Voter verifiable Paper Audit Trail (VVPAT) machines are used to ensure that the votes cast by voters go to the correct candidates

• The second layer of verification is VVPATS have been used in several elections to prevent EVMs from being tampered with

• VVPATs are critical for increasing voter confidence and ensuring voting integrity

• The Electrol Reforms Recommended by The Election Commission of India

• The Election Commission of India (FCI) has made several recommendations for electoral reforms over the years to improve the electoral process and ensure free and fair elections Some of the major recommendations are

• The Commission is of the view that the law should be amended to provide that a person cannot contest from more than one constituency at a time

• Election commission endorsed the call for a lifetime ban in the court. It had argued that such a move would champion the cause of decriminalization of politics

• The Commission proposes that where any general election is due on the expiration of the term of the House, advertisements of achievements of the governments, either Central or State, in any manner, should be prohibited for a period of six months to the date of expiry of the term of the House

• The Election Commission proposes an amendment to provide the same protection and safeguard in the matter of removability of Election Commissioners from office as is available to the Chief Election Commissioner

• The decisions relating to anti-defection matters should be rendered by the President of the Governor with the recommendation of the Election Commission

• There should be the use of common electoral rolls at elections conducted by the Election Commission and the State Election Commissions

• Election Commission proposes that making false declarations concerning elections be an offense

• Rule-making authority under the Representation of the People Act, 1950, and Representation of the People Act, 1951, should be conferred on the Election Commission instead of the Central Government

• The Various Committees on Electoral Reforms in India

• The recommendations of the Committees on Electoral Reforms in India are listed below

JEEVAN REDDY COMMITTEE

• The major recommendations of the Jeevan Reddy Committee are listed below

• The Commission advocated a total ban on splits and mergers of political parties during the term of the Lok Sabha or Legislative Assembly. The Commission has recommended an adequate representation

• Once a member has been elected on the platform of a particular recognized party, he must remain a member of that party until the House is dissolved

• The Commission has recommended a sharp ten-fold increase in the deposits for independent and non-recognized party candidates in an effort to deter insincere people from running for office

• A person should be disqualified from running in elections for the Lok Sabha or an Assembly if a court has ordered the proceedings of charges in relation to offences listed in the Representation of the People Act, 1951 This is the recommendation made by the Commission to stop the criminalization of politics

TARKUNDE/J.P. COMMITTEE (1975)

A committee was appointed to study and report on schemes for electoral reforms in 1974 The members of the committee were V M. Tarkunde, MR Masas, etc. and it is known as J.P. Committee or Tarkunde committee. The important recommendations of the Tarkunde Committee are as follows

The election commission should be a three-member body

• The minimum age for voting should be 18 years

• The TV and radio should be placed under the control of an autonomous statutory corporation

• A voter's council should be formed in as many constituencies as possible which can help in free and fair elections

GOSWAMI COMMITTEE (1990)

• The major recommendations of the Goswami committee were as follows

• In addition to giving the Flection Commission the necessary authority to name investigating agencies, prosecuting agencies, and create special tribunals, the ordering of a re-poll or countermanding should be based on more than just the returning officer's report

• The anti-defection statute has to be changed to limit disqualification to situations where an elected official voluntarily leaves then political party or when they vote or abstain from voting against party whips, directives, etc solely when it comes to motions or votes of confidence

• The speaker or the chairman of the relevant House should not make the decision about a member's ineligibility

• The time limit for bye-elections

• Increase in deposits from independents

• A check on advertisements in newspapers and strengthening of the election commission

INDRAJIT GUPTA COMMITTEE ON STATE FUNDING OF ELECTIONS (1998)

Indrajit Gupta committee set up by the all-party conference in May 1998, submitted its report in 1999 with the following recommendations

• State funding should be in kind, that is, no financial support is to be given to parties and also, part of the financial burden of the parties should be initially borne by the state

• Only political parties authorized by the ECI shall receive state assistance in the form of printing supplies and facilities, time on electronic media, vehicles and petrol, etc.

• The income tax agency should require political parties to disclose their annual accounts

• The parties should file a detailed account of the election expenses with the ECI

• The Committee observed that the country's economic circumstances at the time of the report only permitted partial, not complete, state funding of elections

• The recommendations various committees have been implemented by the governments

CONCLUSION

In the present-day scenario, it is very much required to reform, restructure and strengthen the election commission of India the more radical reforms are required for strong, and stable election system. In order to conduct elections in a free and fair manner more autonomy should be given to the commission. The hands of the election commission must be strengthened by the electrol reform. The electrol reforms pave the way for the establishment of responsible government and also healthy

democracy in India the electoral reforms continuous process, it should be done as and when required The elections rules must be made as strict and stringent action must be taken those who violates rules and regulations of the commission, moreover, transparency must be maintained with the working of the commission The Election commission is the only hope for stabilizing the election system in India Electoral reforms are crucial for ensuring free, fair, and transparent elections in India. Addressing challenges such as money and muscle power, criminalization of politics, and misuse of government resources is essential to upholding democratic principles. By implementing these proposed reforms, India can strengthen its electoral process, enhance voter confidence, and maintain the integrity of its democracy.

Electoral reform enhances free, fair, and transparent elections by addressing challenges like money power, muscle power, and political criminalization. Strengthening EVM-VVPAT mechanisms, eliminating fake voters, enforcing campaign regulations, and ensuring electoral integrity are vital. These reforms uphold democratic principles and boost voter confidence in India's electoral process.

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ANIMAL DISSECTION AND ITS ALTERNATIVE RESOURCES ON WEBSITES

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INTRODUCTION

Animal dissection was introduced in schools in the 1920s. It was believed that using animals would help students learn about their bodies and how they work. However, over 5.7 million animals are killed every year for educational purposes. This has become a big business, but it can also be cruel and painful for the animals. Some people think that dissecting animals can have long-lasting effects on students, and not all of them are positive. It can make students see animals as objects rather than living beings. Some students may feel uncomfortable or even cruel towards animals because of this practice. Alternatives to Dissection: Fortunately, there are now many alternatives to dissection available, such as computer simulations, models, and interactive programs. These alternatives can be just as effective in teaching students about anatomy and physiology. If you're uncomfortable with dissection, you can talk to your teacher about it. You can explain your concerns and ask if there are alternative projects that can teach you the same things. You can also get a note from your parents supporting your decision.

Research Findings: Studies have shown that students who use alternative methods to learn about anatomy and physiology do just as well as those who use dissection. In fact, some studies suggest that alternative methods can be more effective because they allow students to focus on the material without being distracted by the gore of dissection. Alternative methods are also more cost-effective and can be used repeatedly without having to purchase new materials. They also save time and effort in setting up and cleaning up after dissection.

Overall, the text presents a balanced view of the issue, highlighting both the benefits and drawbacks of animal dissection in education. It also suggests that there are viable alternatives available that can be just as effective in teaching students about anatomy and physiology.

The task discussing about alternatives to animal dissection in educational settings. The text explains that many organizations, including the National Science Teachers Association (NSTA) and the Human Anatomy and Physiology Society (HAPS), now support using alternatives to animal dissection. It also mentions that some states and schools have laws or policies that allow students to choose not to participate in animal dissection.

The document provides information on various alternatives to animal dissection, including online dissection programs and additional resources. It lists several organizations that provide these alternatives, such as the Physicians Committee for Responsible Medicine (PCRM) and the Ethical Science Education Coalition.

ANIMAL DISSECTION ALTERNATIVES

Some groups, like the National Science Teachers Association and the Human Anatomy and Physiology Society, now say it's okay to use other methods instead of cutting open animals to teach students. Many schools and states have rules that let students choose not to cut open animals.

There are many online tools and resources that can help teachers teach without cutting open animals. Some groups that provide these tools include:

* Physicians Committee for Responsible Medicine
* Ethical Science Education Coalition

These groups want to help schools teach students without hurting animals. They provide software, online programs, and other resources to make it easier for teachers to use alternative methods.

Simple Summary:

* Some groups say it's okay to use alternatives to animal dissection.
* Many schools and states let students choose not to cut open animals.
* There are online tools and resources available to help teachers.
* Some groups provide these tools to help schools teach without hurting animals.

ALTERNATIVES SECTION

* The section begins by suggesting that students search for alternatives to dissection on their preferred web search engine.
* It advises students to express their concerns about dissection to their teacher early in the semester.
* If dissection is part of the curriculum, students are encouraged to be firm in their beliefs and clearly state their reasons for objecting.
* Students are also advised to be prepared to offer an alternative project that teaches the same concepts.
* If appropriate, having a note from parents stating their support for the student's beliefs is recommended.

PROPOSED ALTERNATIVES

* Many have proposed substituting dissection with computer simulations, realistic models, multimedia presentations, anatomical overlays, and butcher shop "parts."

* Creative alternatives include using marine "specimens" from supermarkets, Play Doh (TM) to study brain anatomy, and interactive videodisc simulations.

* The rapidly expanding resources on the World Wide Web also offer many new alternatives.

EDUCATIONAL GRANTS

PETA can provide software donations to help your school replace dissection with humane alternatives. Learn more. To learn about PETA's free Web-based training sessions in dissection alternatives, e-mail SamanthaS@peta.org.

ONLINE DISSECTION PROGRAMS AND ADDITIONAL RESOURCES

1. The Physicians Committee for Responsible Medicine (PCRM) (202-686-2210)
2. Anatomy in Clay® Learning System.
3. Glencoe Interactive Dissections.
4. Froguts.
5. Kidwings.
6. ScienceWorks.
7. Virtual Frog Dissection Kit.
8. Virtual Pig Dissection (VPD).

ORGANIZATIONS

Ethical Science Education Coalition, 167 Milk Street #234, Boston, MA 02109-4315 [Phone: (617) 367-9143]

Johns Hopkins University Center for Alternatives to Animal Testing, 111 Market Place, Suite 840, Baltimore, MA 21202-6709 [Phone: (410) 223-1693]

National Association of Biology Teachers, 11250 Roger Bacon Drive, No. 19, Reston, VA 22090-5202 [Phone: (703) 435-5582]

National Science Teachers Association, 1840 Wilson Boulevard, Arlington, VA 22201-3000 [Phone: (703) 243-7100]

The Humane Society of the United States, Youth Education Division, P.O. Box 362, East Haddam, CT 06423-0362 [Phone: (203) 434-8666]

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KASTURBA GANDHI MEMORIAL TRUST: A LEGACY OF WOMEN'S AND RURAL EMPOWERMENT IN INDIA

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ABSTRACT

The Kasturba Gandhi Memorial Trust (KGMT), established in 1945, is an important but often understudied institution in the field of Indian social development. Established as a national tribute to Kasturba Gandhi, the institution was conceived by Mahatma Gandhi to perpetuate her work and ideals. This paper examines the historical origins, main objectives, functional evolution, and lasting impact of the KGMT. It argues that the Trust has served as a significant vehicle for translating the Gandhian principles of Sarvodaya (welfare for all) and Antyodaya (reaching the last person) into practical action, focusing primarily on women's empowerment and integrated rural development. By providing a historical analysis of the founding charter of KGMT and reviewing its major programmes in the areas of healthcare, education and economic self-reliance, this research positions KGMT not just as a monument but as a dynamic, living legacy that adapts Gandhian philosophy to meet the changing socio- economic challenges of post-independence India. The paper concludes that the Trust's grassroots, women-centred approach provides a relevant model for community-led development.

KEYWORDS

Kasturba Gandhi, Mahatma Gandhi, Indian independence movement, women empowerment, rural development, Gandhian philosophy, public health, trust, NGO, India.

INTRODUCTION

The Indian freedom struggle was not just a political movement but a profound social revolution. While the contributions of its male leaders have been widely documented, the role of its female leaders and the institutions built in their memory require in-depth scholarly engagement. The Kasturba Gandhi Memorial Trust (KGMT) is one such institution. Born out of Mahatma Gandhi's personal grief and the collective admiration of the nation, the Trust was formed to honour Kasturba Gandhi – not only as Mahatma Gandhi's wife but also as a great freedom fighter and social reformer in her own right.

This paper explores the history and mission of the KGMT. It attempts to answer several key questions: What were the immediate circumstances and philosophical ideals that led to its establishment? How were Kasturba Gandhi's distinctive contributions reflected in its mandate? How has the Trust implemented its objectives over the past few decades and what impact has it had on India's

development trajectory? By analysing these aspects, this paper aims to move the understanding of KGMT from a memorial institution to a major actor in India's ongoing journey towards social justice and equality.

Historical context and establishment

1. Kasturba Gandhi: The personality behind the memorial Kasturba Gandhi (1869-1944) was much more than Mahatma Gandhi's wife. She was his first partner in experimenting with truth (satyagraha) and non-violent resistance. She actively participated in the Champaran Satyagraha, the Bardoli Movement and the Quit India Movement, for which she was imprisoned several times. Her work consistently focused on issues close to home: women's welfare, education, sanitation and the plight of the rural poor. She died in prison in the Aga Khan Palace in Pune in 1944 and became a national martyr.

2. Founding Vision The country was deeply saddened by her demise. A huge fund was collected from the public to build the memorial. Mahatma Gandhi, who was not interested in a stone-and-earth memorial, proposed to use the funds to create a living memorial dedicated to Kasturba's work. Thus, the Kasturba Gandhi National Memorial Trust was established on 22 February 1945. Gandhi set out its primary objective: to address the problems of women in rural India, especially in the areas of education, health and economic self-sufficiency.

Main objectives and guiding philosophy

The charter of the Trust was deeply imbued with Gandhian principles:

1. Focus on women and children: Recognizing women as the foundation of the health of society and the family.

2. Rural centralization: A conscious focus on Gram Swarajya (Gram Swarajya) with the aim of developing model villages.

3. Integrated development: A holistic approach linking health, education and livelihood.

4. Self-reliance (Swaraj): Enabling communities to become agents of their own development rather than passive recipients of aid.

The motto chosen for the Trust was "Education, Health and Self-Reliance for Rural Women", which perfectly encapsulates this philosophy.

Major Activities and Working Methods

KGMT works primarily through a network of affiliated committees and institutions across India. Its most notable activities are:

1. The Kasturba Gram Sevika Training Programme is a flagship programme to train young village women ("Sevikas") in basic education methods, community health, sanitation, hygiene and handicrafts. These

Sevikas will then return to their native villages and act as catalysts for change and effectively become the foot soldiers of the Trust's mission.

2. Kasturba Balika Ashram/Residential Schools Recognizing the specific obstacles to girls' education, the Trust has established numerous residential schools in rural and tribal areas. These schools provide a safe, supportive environment for girls to pursue education, which includes vocational training to make them economically independent.

3. Health Care and Medical Services the Trust has established and supported numerous clinics, maternity homes and primary health centres in underprivileged areas. Their work in preventive healthcare, sanitation promotion and training of childbirth (traditional birth attendants) has been instrumental in improving rural health indices.

4. Through initiatives such as economic empowerment spinning and weaving centres (charkha training), handicraft promotion and establishment of women self-help groups (SHGs), the Trust has worked to provide sustainable sources of income to women, in line with Gandhiji's emphasis on Khadi and cottage industries.

Post-Independence Evolution and Adaptation

After Gandhiji's assassination in 1948 and India's independence, the role of the Trust evolved. The new government took on greater developmental responsibilities. KGMT adapted by shifting from a direct implementation role to a catalytic and supportive role:

1. Partnering with state governments and other NGOs.
2. Focusing on more remote and backward regions where the state's reach is limited.
3. Modernizing its programmes while staying true to its core philosophy (e.g., incorporating digital literacy along with traditional handicrafts)

Critical Analysis and Impact

KGMT's impact is deep-rooted, a hallmark of grassroots work.

Strengths: Its deep rural outreach, its women-to-women capacity-building model and its unwavering commitment to Gandhian ethics have given it immense credibility and sustainability.

Challenges: Like many large trusts, it has faced problems of bureaucratic inaction, lack of funds and the sheer scale of India's developmental problems.

Legacy: Its greatest achievement has been in empowering thousands of unknown women – teachers, nurses, midwives and entrepreneurs who have transformed their communities from within. It has kept the spirit of Sarvodaya alive in the decades since Independence.

CONCLUSION

The Kasturba Gandhi Memorial Trust is a testament to the power of the idea that a meaningful monument is not built in stone but in service. It has successfully translated Kasturba Gandhi's personal legacy into a national movement for the upliftment of rural and women. Following a philosophy of holistic, grassroots transformation, the Trust has demonstrated the enduring relevance of Gandhian thought to address contemporary issues. It is an important, though sometimes overlooked, pillar of India's civil society, proving that the most effective memorials are those that continue to grow, adapt and serve life.

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DEMOCRACY AND GLOBALIZATION IN INDIA

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ABSTRACT

India is largest democratic country in the world. The post-clod was project of globalization is changing the established notion of liberal democracy and local governance. This change has fur-reaching implication for the furfure of democracy, particularly in the third world. Aware of this challenge, new social movements in India, active at the grass roots of politics, are resisting global penetration of local commination, urging new political spaces opened up by the retread of the state from socioeconomic arenas. Today the values of Indian democracy have reached the global level and we can see its great influence in international politics.

KEYWORD

Democracy, globalization, political, Society, cold war, social, economic.

INTRODUCTION

Indian democracy is a considered as the largest democracy in the world. it seems that this democracy has emerged for struggle and has explained widely democracy advance after economic planning begin, and after the end of the cold war, it open the donor of globalization. Globalization means in integrating the Indian economy with the world economy. it is the outcome of the policy of a liberalization and privatization. Globalization, thus, has the powerful economy, political cultural and the social implication for the sovereignty. It means decline in power of the national government to direct and influence they are economies. (Bardhen P. 2001)

India begins liberating only after 1990 - 1991 India's transition to globalization is form and economic regime to state- led a growth. The gathering momentum of globalization in the world economy has conceded with the spread of the political democracy across countries' economies have become global. Indian democracy and its potential ability sustain globalization. (Basuk- 2001).

Beginning of Globalization in India:

Globalization in the modern sense of the term come into existence after the second world war one of the main factor for these war the plan by the word leaders to break down the border for festering trade relations between Nations. The beginning of globalization was the first field in the 1990's in India

when the finance minister Dr Manmohan Singh initiated the economy liberalization plan. Since, then India has the gradually become one of the economic giant in the world.(Dollar D 2001)

The implication of globalization for national economy are many globalization has intensified interdependent and competition between economy in the world market. The Indian economy was the major crisis in 1991 when foreign currency resaves went down to dollar 1 billion. Globalization had its impact on various sectors including agriculture, financial, health sector and many others.

After suffering a huge financial and economic crisis Dr Manmohan Singh brought a new policy which is known as the liberalization privatization and globalization policy has also known as new economy policy 1991 as it was a major to come out of the crisis that was the going on at that time (Bardhan Pranab -2015)

Effect of Globalization in Indian Politics:

Globalization has laid to the spread of the democratic value and ideas. This promotes transparency, accountability and good governance in the Indian political system. Opening up the Indian economy to foreign investor has increased the dependence on the foreign trade in the investment. Dispositive effect of globalization include economic advancement and the reduction in the poverty, creation of jobs greater access to technology cultural diversity and tolerance emergence of a new social movement and greater transparency globalization has been defined as the process of rapid integration of the countries and happening through greater foreign trade and foreign investment. It is the process of the international integration arising from the interchange of the world views product ideas and other aspects of culture (Dondekar VM and N. Rath,2009).

Today, it has become one of the fastest growing economies in the world with an average growth rate of around 6 to 7% the per capita income in the standard of living. Poverty has also reduced by around 10% the service in the industry has a share of around 54% of the annual gross domestic product while the industrial and agricultural sector share around 29% and the 17 respectively (GOI,2011)

Impact and Benefits of Globalization:

Globalization is the big concept of the world. One of the countries this succeeds significantly after the initiation and implementation of globalization. The growth of foreign investment is the field of the corporate retail. And the scientific sector is enormous in the country and it also had the tremendous impact on the social, monetary, cultural and political areas. In recent years globalization has increased due to the improvements of in transportation and the information technology. With the improved global synergies comes the growth of global trade doctors and culture. (Dr. Harpreet Kaur 2017)

Indian society is a changing drastically after urbanization and globalization. The economic policy have had a direct influence in the forming the basic framework of the economy. Economic policies

established and diminish diminished by the government also preferred and essential role in the planning level of the saving employment income and investment in the society. Cross country culture is one of the critical impacts of globalization on Indian society. It has significantly changes several aspects of the country inducing cultural social political and economical some benefits of globalization we can see.

* Access to new culture.
* The spread of technology and innovation.
* Higher standard of living across the globe.
* Access to New Market.
* Access to new talent.

METHODOLOGY

This research paper is on democracy and globalization in India. This research paper has adopted descriptive method. the secondary source are given more importance in this paper the secondary source of information used are the article of research journal, working papers, newspapers, thesis and books of the famous philosophers.

CONCLUSION

Today the process of globalization has brought the entire world closer together. No country is a exempt from this process. India has made a lot of a progress by accepting globalization development is taking place in the every sectors of this country. Problem likes employment poverty has been solved. A distinct identity of India has been created at the international level. The globalization refers to the integration of economy of the Nations with the world economy. The 1991 reform in India have lead to greater economy liberalization which has in the turn increased India's interaction with the rest of the world.

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ROLE OF INDIA IN SAARC

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ABSTRACT

India is a biggest democratic country in the world and second most populous country and 7th largest in area. The establishment of SAARC in 1985 was a milestone in the institutionalization of religion corporation in South Asia, a region be trying a glaring paradox abundant in human and natural resources Bird mixed in poverty as well. Shark AIMS at accelerating the process of socio-economic development in member state through collection self-Reliance.

KEYWORDS

SAARC, socio economic, Nations, development, poverty, globalization, religion.

INTRODUCTION

The emergence and evolution of shark have been examine keeping in focus India's early responses and subsequent approaches and priorities Economic, cultural, political strategic. Secondly the early years of SAARC are institutionalization and slow and gradual progresses during 1985 to 90 period have been examined. The institutional framework for Star provides the pyramid structure with Summit of the head of state government at the apex, supported by the council of ministers and arrangement of the standing committee and technical committee as earlier mentioned in the SAARC declaration (Muni.S.D-1984).

The most significant feature of the character in considered to be the provisional provision that other head of state and government old meet once a year, or more often, if necessary this provides an excellent opportunities to give a political direction to the regional cooperation process as well as the informally discuss the continuous by lateral issue on the side lines of the summit meeting (Gupta Sisir-1964).

RESULT AND DISCUSSION

India's approach was saffron the political and strategic divergence in the South Asia through greater economic and cultural cooperation in line with the India's approach. Which was shared by Pakistan as well for its own regions the bureaucracy of the seven Nations try to identify and evolve the possible

area of cooperation in the field search as agriculture rural development, telecommunication, metrology, health and population activity (Dhaka declaration, 1957).

The issue of trade of India was the important element of regional cooperation. However, this was excluded from the initial process of cooperation due to fears of India's neighbor that a liberal trade regime would work to the advantage of big India. India's approach was a to suggest a careful balance the inter independence and a division of labor based on local factor that hold provide strength region economic based and infrastructure, India, nevertheless, did not force the issues since her policy was to has turned slowly the process of regional cooperation in South Asia (SAARC report, 1996).

Bilateral Policy:

Some iritic consider relevance of SAARC in respect of reducing bilateral tensions enhancing the regional security and promoting economic well-being of people as almost negligible. Structure is an intergovernmental body in scene as limiting its role and merely embodying the relationship of force between member countries and their interstate tension. India as the largest state of South Asia has been making if two soften the political and strategic divergence among SAARC member countries through greater economic and social corporation SAARC has a generated considerable dynamism at the socio-cultural cooperation. Shark has generated considerable dynamism at the social NGO, civil society levels. India has a taken a lead in this respect (Goyalo. P-2010)

India effort to promote regionalism in South Asia through the egg is of SAARC continue to be married by the primary of continuous politic among the nations of region particularly between India and Pakistan. The challenge before India policy establishment therefore doubts. Indian policy has to response to the difficult task of smoothening the political and strategic divergence in the region India's effort to sick extra religion linkage with ASEAN, APEC and 10CARC as well as her desire for promoting sub relational cooperation with Bangladesh Nepal and Bhutan are partly attribute table to her frustration on account of slow growth of star process (Sharma Suman-2013).

India's Contribution in The SAARC:

India to sincere effort for the formation of shark eat player played a big role in the first Submit which was held during the origin of this organization as well as the preparation of character India was hosted to SAARC sumit three times the second Submit was held in 1980 was held in 1995 and 14th summit was held in 2007 India because of geography economic international structure and commitment to the regions in Central to sir the sir region has acute a symmetrical power balance at India encompasses more than 75% of the regions GDP and more than 70% of a population. Territorial dependency in India is high and it possesses enormous military power compared to other countries in the region (Murty's B.S-2017).

India's trade with South Asia accountants for around 5.5% of the global trade India have been advocating expedited negotiation implementation of agreements promoting investment trade exchange in the region the SAARC summit where on hold sins as India declared to by cot over the 2016 Uri attack. India has shown democratic Reliance and leadership by sorry jib unity is the neighborhood organized a tele smmit of SAARC summit 2020 to rise war against the ongoing virus spread in the SAARC summit 2020 India has a proposed common solution to fight the rapidly spreading of the virus which has killed many people worldwide.

The conference was attended by 8 member nation Bangladesh Afghanistan Pakistan Bhutan Maldives Nepal Sri Lanka and India (Ghosh Peu, 2009)

RESEARCH METHODOLOGY

The secondary source is given importance in the paper the secondary source of information use are the paper article newspapers thesis and books of famous philosopher.

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CONCLUSION

India's promotes regionalism in South Asia throw the eggless of SAARC continuous to be married by the primary of continuous politics among the nations of the region particularly between India and Pakistan India's referred to seek extra relational linkages with ASEAN APEC and 10CARC as well as her desire for promoting sub relational corporation with Bangladesh Nepal and Bhutan are partly attributed attributable to her for station and account of flow of SAARC process India policy is also pursuing a larger objective to grow out of the region for a playing and perhaps in the world affairs.

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CHATGPT: UNDERSTANDING ITS USES AND IMPORTANCE

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ABSTRACT

ChatGPT is an advanced AI chatbot from OpenAI that uses large language models (LLMs) to understand and generate human-like text, images, and code in response to user prompts, functioning as a versatile tool for answering questions, creating content, summarizing info, coding, and more, leveraging vast training data to predict patterns and provide context-aware, conversational replies. It's known for accelerating AI adoption and offers a free version with premium tiers, allowing interaction via text, voice, and image input.

KEYWORDS

ChatGPT, AI, data, intelligence, natural language.

INTRODUCTION

ChatGPT is a type of generative AI (created by OpenAI) that responds to your prompts by generating natural, human-like text. People use it to research, generate code, get writing and grammar help, and brainstorm ideas. It's built on a large language model (LLM) that's been trained on massive amounts of data and can fire back a human-sounding answer in seconds.

Like most cloud services, data you input to ChatGPT is transmitted over servers across the internet. The data is encrypted in transit to OpenAI servers and isn't published or indexed anywhere. But, nothing transmitted over the internet is 100% risk-free in theory, so avoid sharing personal, financial, or sensitive information.

While the chatbot itself is safe and easy to use, cybercriminals can also use ChatGPT to help them write code that can then be used for malicious purposes, such as to create fake sites aimed at stealing your data or spreading malware to your devices.

Objectives of the Research Study:

1. To study and understood the concept of ChatGPT
2. To study of How to use ChatGPT safely.
3. To study of importance of ChatGPT

RESEARCH METHODOLOGY

The primary source of data collection in this research paper is the secondary data. The available information on ChatGPT has been extensively used to complete the research paper. All the available

Journals, Related books, Web, Articles, Publish and unpublished information and Papers provided necessary information to the finalize the research paper.

Definition:

"ChatGPT is a generative artificial intelligence chatbot developed by OpenAI, and released in November 2022. It uses generative pre-trained transformers (GPTs), such as GPT-5, to generate text, speech, and images in response to user prompts".

"ChatGPT is a natural language chatbot developed by OpenAI that is designed to respond to user queries. It uses advanced natural language processing techniques to understand and generate human-like responses".

How to use ChatGPT safely:

Despite ChatGPT's security measures, as with any online tool, there are risks. Here are some key tips and best practices for staying safer while using ChatGPT:

1. Create a strong password for your account: Follow good password security practices by creating strong, unique passwords. Ideally, you should consider using a password manager.

2. Don't share sensitive data: Remember to keep personal details private and never disclose financial or other confidential information during conversations with ChatGPT.

3. Fact-check AI outputs: ChatGPT's outputs are not always accurate. That's why cross-checking additional sources ensures your data isn't false, misleading, or biased.

4. Report problematic outputs: Reporting problematic outputs helps create a feedback loop that flags harmful, biased, or misleading content for review. This can help OpenAI improve response accuracy and objectivity, and reduce future risks.

5. Stop ChatGPT from training AI on your data: Check your ChatGPT version and disable model training, which can help reduce the risk of data exposure or leaking sensitive information.

The importance of ChatGPT can be broken down into four key areas:

1. The "Productivity Engine" for Business

For many companies, ChatGPT has become the "OS for office work." It is used to automate the "middle 60%" of tasks—the routine drafting, summarizing, and data organizing that used to consume hours.

a. Operational Savings: Businesses have reported saving tens of thousands of dollars annually by using AI to handle FAQs, draft internal reports, and manage routine emails.

b. Speed to Market: Marketers and developers use it to generate 1.0 drafts of code and copy in seconds, allowing them to focus on high-level strategy and "human-in-the-loop" refinement.

c. 24/7 Accessibility: It has democratized high-level customer support for small businesses, providing instant, multilingual assistance that was previously only affordable for large corporations.

2. Personalizing Global Education

In education, ChatGPT has broken the "one-size-fits-all" lecture model. It serves as a private, 24/7 tutor that can explain complex concepts (like quantum physics or tax law) in whatever style the learner needs—whether that's "explain like I'm five" or "compare this to a Shakespearean sonnet."

a. Research Acceleration: Researchers use it to synthesize massive amounts of medical or scientific literature, helping to identify patterns and drug interactions at a pace impossible for humans alone.

b. Teacher Support: Educators use it to generate lesson plans and rubrics, freeing up their time to mentor students rather than just grade papers.

3. Democratizing Technical Skills

One of its most important roles is lowering the barrier to entry for technical fields.

a. Coding for Everyone: People with no formal computer science background are now building apps and automating their personal workflows by "describing" the code they need to ChatGPT.

b. Data Literacy: It can take a messy spreadsheet and turn it into a clean analysis with visualizations, allowing non-experts to make data-driven decisions.

4. Innovation and Creative "Sparring"

ChatGPT acts as a tireless brainstorming partner. It doesn't get "writer's block," making it invaluable for:

a. Ideation: Generating hundreds of product names, gift ideas, or plot twists in seconds.

b. Reframing: Helping users see an argument from a different perspective or simplifying "jargon-heavy" text for a general audience.

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MOTIVATIONAL VALUES AND SOCIAL CONSCIOUSNESS IN SELECTED WORKS OF SUDHA MURTHY

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ABSTRACT

This research paper examines motivational values, ethical awareness, and social consciousness in selected works of Sudha Murthy including How I Taught My Grandmother to Read, The Day I Stopped Drinking Milk, Mahashweta, Dollar Bahu, Wise and Otherwise. The study employs qualitative textual analysis to explore narrative strategies, representation of human values, and inspirational storytelling techniques. Murthy's works reveal strong emphasis on compassion, humility, social responsibility, and cultural continuity. The analysis demonstrates that her literature functions not only as artistic expression but also as motivational discourse encouraging ethical living and social awareness.

KEYWORDS

Motivation, Human Values, Social Consciousness, Indian English Literature, Ethical Narratives

INTRODUCTION

Indian English literature reflects cultural traditions, moral dilemmas, and social transformations in modern India. Sudha Murthy's writings are widely appreciated for their simplicity, clarity, and ethical depth. Her narratives often emerge from real life experiences and social observations. Through relatable characters and accessible language, Murthy communicates powerful moral lessons and inspirational ideas. This paper analyses selected works to understand how Murthy integrates motivational discourse within narrative storytelling.

Textual Analysis and Discussion

Murthy's narrative style is characterized by simplicity, emotional resonance, and moral clarity. Her storytelling reflects real life situations where ordinary individuals face ethical choices and social challenges. Through these narratives, readers are encouraged to reflect on values such as empathy, honesty, humility, and responsibility. The selected texts reveal Murthy's commitment to presenting literature as a medium of inspiration and moral reflection. Characters in her stories often undergo emotional transformation that leads to greater self-awareness and compassion. Such narrative strategies strengthen the motivational dimension of her literature.

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CONCLUSION

The analysis of the selected works demonstrates that Sudha Murthy's writings combine literary expression with motivational insight. Her narratives encourage readers to cultivate ethical awareness, compassion, and social responsibility. Through simple storytelling and realistic characters, Murthy successfully promotes human values and moral reflection. Therefore, her works occupy an important place in contemporary Indian English literature.

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