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ABOUT THE PROGRESS JOURNALS

'The Progress Journals' is a flagship initiative of The Progress, which belongs to one of the verticals of Sri Aurobindo Yoga & Knowledge Foundation with a mission of Sustainable & Holistic Development. Begun in 2023, the vision behind this publication is to create an international, cross-disciplinary, peer-reviewed and open-access journal that deals with issues of social, cultural, economic and ecological importance. This bilingual journal (with papers in English and Hindi) seeks to provide a platform for people engaged in innovative studies on subjects related to sustainability and sustainable development.

The journal also aims to highlight the significance of the Sustainable Development Goals (SDGs), also known as the Global Goals, which were set up by the United Nations in 2015. These goals were designed to be a "blueprint to achieve a better and more sustainable future for all." They comprise a universal call to action to promote individual and social well-being on a global scale. The 17 SDGs are (1) No Poverty, (2) Zero Hunger, (3) Good Health and Well-being,

(4) Quality Education, (5) Gender Equality, (6) Clean Water and Sanitation, (7) Affordable and Clean Energy, (8) Decent Work and Economic Growth, (9) Industry, Innovation and Infrastructure, (10) Reducing Inequality, (11) Sustainable Cities and Communities, (12) Responsible Consumption and Production, (13) Climate Action, (14) Life Below Water, (15) Life On Land, (16) Peace, Justice, and Strong Institutions, (17) Partnerships for the Goals.

This journal, which shall be published quarterly, will allow researchers from various backgrounds to share their opinions and findings on topics related to these goals. Through this exchange of knowledge, we hope to better understand how to implement these principles for the development of our communities, our nation and the world.

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EDITOR'S NOTE

THE PROGRESS, established in 2020, is one of four recent initiatives of Sri Aurobindo Yoga and Knowledge Foundation. The core objective of our organization is the transformation of consciousness in higher education. The inspiration for this goal is the philosophy of Sri Aurobindo and the Mother, especially the principles of Integral Yoga. We believe that true progress requires consciousness of one's role in one's family, community, nation and the world. We seek to create this distinctive awareness, especially among students, professors, researchers and other key stakeholders in the field of education. At present, we are associated with more than 28 higher education institutions, including IIT Delhi.

In Integral Yoga, it is written that there are five layers of the mind: Physical, Vital, Mental, Psychic, and Spiritual. In higher education institutes today, the teaching-learning process is such that it functions till the Vital layer. There is no formal curriculum for anything beyond that. That kind of learning only comes through community, social and spiritual initiatives. Most higher education institutions have already started different types of developmental projects, social work, etc. Our objective is to create an organization that can connect all these other institutions and then collectively, we can be a force for universal transformation. To the broad vision of progress, we each bring our own unique perspective. Together, we can refine our approach and make a difference globally, while being rooted in our regional heritage.

In 2023, we launched a new initiative, 'The Progress Journals' with a mission to highlight scholarly work on Sustainable Development in general and the significance of the Sustainable Development Goals (SDGs) proposed by the UN, specifically. This is our first issue and we are very grateful to all our contributors and supporters. We aim to release this bilingual journal on a quarterly basis and provide a space for new voices and fresh perspectives.

- *Dr. Samarendra Mohan Ghosh*

Editor-in-Chief

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Designing For Resilience: Innovative Approaches To Climate Change And Disaster Risk Management

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Abstract:

With evidenced by climate change impacts, novel approaches to sustainable management, design, and architecture are now essential. This paper investigates how resilient design is crucial to fighting climate change as well as disaster risk management. The resilience of communities to climate related disaster can be improved leveraging advanced technologies and adaptive strategies. This paper provides case studies, effective strategies and relevant policy recommendations highlighting the indispensable role that governments, organizations and communities play in building a sustainable future.

Some effective strategies highlighted by this research include promotion of circular economy practices (resource efficient with less use of waste) and the setting up of early warning systems that leverage real time data to communicate climate threats in advance to communities. The paper also emphasizes the importance of stakeholder engagement particularly of local knowledge and need during the resilience planning.

Keywords: ***Climate Change, Resilient Design, Disaster Risk Management, Nature-Based Solutions, Smart, Urban Planning.***

Introduction

With the rise of climate change throughout the world, urban areas experience unprecedented challenges that may give rise to urban areas going unsustainable and becoming less resilient. In view of escalating extreme weather — turfing, hurricanes and heat waves—innovative urban forms are necessary not only to lessen these threats but also to heighten neighborhood resiliency. In this paper, the "Sponge City Concept," a radical new approach to integrated nature-based solutions within urban planning to manage storm water while encouraging sustainability, is discussed. The Sponge City Concept uses green infrastructure—like vegetated swales, rain gardens, permeable pavements and larger amount of tree canopy cover—to capture extra rainwater and lower surface runoff. But they also go hand in hand combating storm water, enhancing biodiversity and air quality and providing aesthetically pleasing urban environments. Using these innovative approaches, cities can more resilience to climate related disasters while developing them in a sustainable paradigm. Of special significance is its potential to inform urban planning practice with

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resilience to climate change in mind. This research examines the application of community engagement strategies and nature-based solutions to guide policymakers and urban planners in taking action. This research seeks to identify the current limitations in how strategies for the Disaster Response are currently being executed, proposing novel solutions that utilize technology and good governance practices, and providing towards a more robust urban landscape resilient to the impacts of climate change disasters.

Problems Statement

Impervious surfaces—buildings and roads—plastered over much of urban areas make them especially susceptible to flooding. Current storm water management systems tend to rely on the drainage systems that can be overwhelmed during extreme weather events. However, this inadequacy can result in losses of significant economic magnitude, property damage, and threats to public safety. For example, the city of Bhubaneswar in Odisha has consistently encountered gluttony throughout cyclonic activities for example Cyclone Fani in 2019. The situation underscored that it was high time to adopt better urban planning strategies involving natural components in infrastructure design (SEOC, 2019).

The Sponge City Concept proposes means to address these challenges by mimicking respective natural hydrological processes in order to effectively absorb, hold and re-use rainwater. In the coastal region, cyclones threaten Bhitarkanika and the rise in the sea level. Community protection from storm surges could be significantly improved by mangrove forests integrated as natural barriers that also benefit local ecosystems (Examlife, 2024). The paper argues for an approach to resilience where an innovative combination of urban design and community engagement can be used to weather climates change impact.

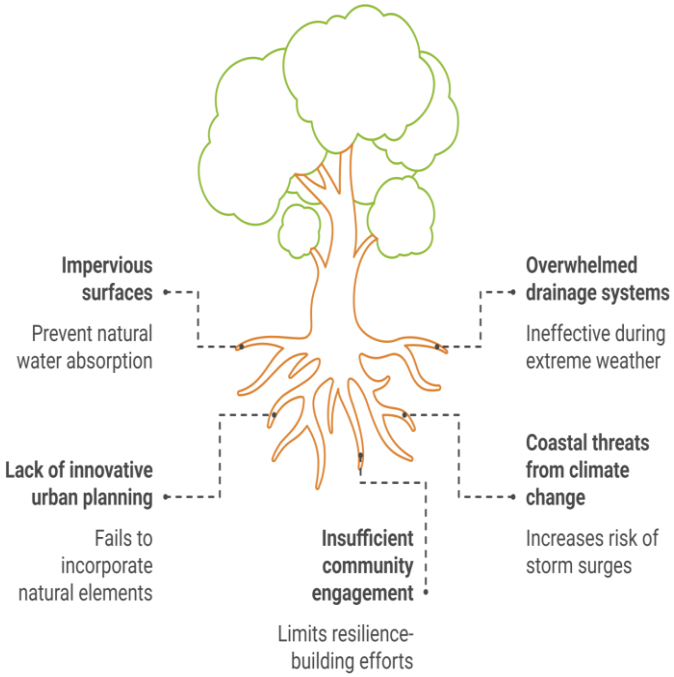

Figure 1: Urban Flooding Vulnerability & Inadequate Management

Literature Review

The urban resilience literature suggests a variety of approaches to prepare local communities to weather the consequences of disaster resulting from climate variability. Recent studies confirm the effectiveness of nature-based solutions in urban settings as well as sustainable architecture and smart infrastructure components. Not only do these strategies mitigate the impact of climate change but also they create a venue for community engagement in adaptive strategies needed for community building resilience.

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Figure 2: Nature Based Solutions

Vegetated Swales

The shallow channels that are vegetated swales are meant to capture storm water runoff and help infiltrate it into the ground. It means these swales filter pollutants from stormwater before it gets dumped in nearby waterways, helping to improve water quality (Urbanisten D., 2018). The research demonstrates that vegetated swales can significantly reduce peak runoff rates during heavy rainfall events, and therefore provide an effective tool for disaster risk management. Cities can make themselves more resilient against flooding, or even more generally improve their environmental health, by integrating features such as these into their urban planning.

Rain Gardens

Rain gardens serve a specific purpose of taking the rainwater from impervious surfaces, namely roads and parking lots. These gardens include native plants that flourish in the wet conditions, and within their confines is habitat for local wildlife (Khristodas, 2024). Research across several cities demonstrates that rain gardens can achieve up to 30% reduction of runoff volume, therefore mitigating risks of flooding in urban areas. As part of the larger work involved in the climate adaptation, rain gardens help with managing stormwater sustainably while improving community aesthetics and biodiversity.

Permeable Pavements

Permeable pavements have a surface that allows the rainwater to percolate beneath the soil or gravel below. It reduces surface runoff and improves the groundwater recharge (Odisha BR, 2020). The research also showed that they can reduce surface temperatures during heat waves while improving water quality by passing pollutants. Permeable surfaces are an important tenet of the resilient design, because they facilitate the implementation of sustainable urban drainage systems while fostering the overall well-being of urban ecosystems.

Tree Canopy Cover

Increasing tree canopy cover in urban areas provides multiple benefits: it improves air quality by facilitating the absorption of carbon dioxide and release of oxygen, reduces the urban heat island effect, and enhances biodiversity with the provision of habitat for many species (United Nations Office for Disaster Risk Reduction, 2020). Analysis shows that cities with greater tree canopy have lower temperatures in summer months compared with those with little greenery. This strategy acts as a model for how community engagement in urban greening projects can deliver substantial positive impacts on urban residents' public health and environmental quality.

Mangrove Conservation

Natural barriers against storm surges, mangrove forests in coastal regions such as in Odisha (Examlife, 2024) are important to mitigate the cyclone impacts. Studies have demonstrated that areas that have healthy

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mangrove ecosystems have significantly less damage during cyclone events than non-mangrove ecosystems areas. Conservation of the mangroves protects coastal communities and, in addition, enhances the livelihoods of local people through sustainable resource management. What this shows is that it is essential that ecological strategies are integrated into the urban planning planning as part of a comprehensive disaster risk reduction agenda. Taken together, these nature-based solutions augment a more resilient urban environment that can better withstand the impacts of climate, while simultaneously enhancing urban design innovation and sustainability. Cities that do so can increase their adaptive capacity and secure a future that's safer and more sustainable for its residents.

Framework

Several critical components, which will help in applying Sponge City strategies in Bhubaneswar to enhance urban resilience against climate related disasters are proposed in the framework. This framework utilizes innovation in designing, collaborative engagement with local stakeholders and effective governance to enable development of sustainable urban environment that is flood and cyclone resilient.

Infrastructure Integration

Integration of green infrastructure elements into new constructions is a fundamental component of the Sponge City framework. It includes cheap permeable pavements, green roofs, bio retention systems, vegetated swales, etc. These are important features for the effective capturing and managing of stormwater runoff. Permeable pavements allow for rainwater to infiltrate reducing surface runoff and increases groundwater recharge, while green roofs provide insulation, rainwater harvesting, and reduced urban heat island effect. Stormwater is also filtered through bio-retention systems in order to improve water quality once the pollutants are removed before it reaches local waterways. The element can combine these to strengthen Bhubaneswars resilience to flooding and improve environmental health as a whole, by incorporating them in Public Infrastructure projects and Private Developments.

Financial Incentives

It is important to set up financial incentives to spur developers and homeowners to use sustainable practices. Suggesting tax reductions or grants for projects with flood mitigating features, the framework will catalyze investment in green infrastructure (Bhubaneswar Municipal Corporation, 2024). Also, subsidies to homeowners who put in solutions like rain gardens or vegetated swales in their own yards. With financial support the city will spur sustainable practice adoption to reduce disaster risks among most people.

Public Awareness Campaigns

It is important to inform citizens about the advantages of using and applying sustainable materials and techniques for flood control in order to promote the community involvement in protecting it. Successful cases of implementation of Sponge City should be publicised with a focus on the tangible benefits brought from adoption of such strategies, as well as highlight other regions' Sponge City implementations. So they can be targeted through multiple media, including social media, community workshops, or informational brochures, reaching a large audience. Bhubaneswar can increase awareness and create understanding of climate adaptation strategies so its residents can be linked to resilience building initiatives.

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Building Regulations

The price of this longterm resilience must be stringent building regulations. Bhubaneswar Municipal Corporation (2024) argues for minimum regulations requiring that new constructions must be raised at least 0.6m above existing drainage lines, plinth levels. Acting as a protective barrier against possible floodwaters, this elevation greatly minimizes the likelihood of water in structures during heavy rainfall or cyclonic events. New developments that take account of climate related challenges will be able to meet local topography and flood risk assessment resulting in tailored regulations.

Community Engagement

The proposed framework contains a critical component, namely, engaging local stakeholders through participatory workshops. The purpose of these workshops will be to have dialogue between residents, urban planners, and policymakers to discuss our community needs for flood resilience. Such a participatory approach allows for creating solutions that fit local contexts without fostering residents feeling like they own them. Bhunaneswar can foster social cohesion through stronger involvement of communities in the planning process, while developing community preparedness for future disasters that are climate related.

Hypothesis

This research hypothesis claims that the implementation of Sponge City strategies will greatly improve community resilience to the disasters resulting from the climate while encouraging sustainable development practices in urban settings. When these creative solutions are taken up by cities, they can simultaneously approach stormwater management, mitigate flood risks and enhance environmental quality. While similar to each other, each nature-based solution will integrate to not only mitigate the impacts of extreme weather events, but also promote community engagement and social cohesion.

Since situations in urban areas are becoming increasingly more problematic thanks to climate change, the need for adaptive strategies becomes exacerbated. The Sponge City initiatives lay out of a vision of creating urban landscapes that mimic the natural hydrological processes, so that cities can absorb excess rainwater during heavy rainfalls and slowly release it when dry. This approach mitigates short term floods risks and provides long term sustainability by increasing groundwater recharge and promoting local biodiversity.

Also, the hypothesis puts a strong emphasis on integrating this strategies into urban planning frameworks aiming at resilience and sustainability. Such work allows communities to better prepare for future climate related challenges in ways that support ecological principles in development.

Methodology

This study uses a mixed methods approach to understand effectiveness of disaster risk management strategies in Bhubaneswar with respect to their effect in climate adaptation and resilience. The case study part in the first component involved analyzing successful implementation of Sponge City strategies in robotics such as Rotterdam and Singapore. The case studies present valuable examples of integrating nature-based solutions to manage storm water, while improving urban residents' well-being (Urbanisten D., 2018), and the second part of the research involved surveys of urban planners and community members to find out what the proposed strategies are effective in their context. By surveying perceived benefits, challenges encountered during the implementation and

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suggestions for improvement, we can get a more subtle picture of local needs and views. Data analysis will also be used to assess the historic data for flood to find the vulnerability of various wards in Bhubaneswar as well as other cities which are subjected to climate threats (Khristodas, 2024). The analysis will be used to develop regulatory measures related to the building elevations according to the specific flood risk identified by the historical patterns. Through case studies and surveys, combined with data analysis the aim of this methodology is to present a comprehensive framework for disaster preparedness and disaster resilience in Bhubaneswar.

Implementation

The implementation phase involves several key actions:

a) **Establishing Minimum Plinth Levels**
New constructions must adhere to minimum plinth level requirements set at least 0.6 meters above established drainage lines (Bhubaneswar Municipal Corporation, 2024). Local authorities should conduct assessments to identify vulnerable wards prone to flooding based on historical data analysis.

b) **Conducting Vulnerability Assessments**
Comprehensive vulnerability assessments should analyze historical flood data alongside topographical information within each ward (Odisha BR, 2020). By identifying high-risk areas accurately through data-driven approaches such as GIS mapping regulations can be tailored accordingly.

c) **Engaging Local Stakeholders**
Workshops involving local stakeholders including residents can provide valuable insights into community needs regarding flood resilience planning efforts (United Nations Office for Disaster Risk Reduction, 2020). Engaging citizens fosters collaboration between authorities and residents while ensuring solutions are contextually relevant.

Results

Preliminary findings indicate that cities adopting Sponge City strategies experience reduced flooding risks alongside enhanced community engagement in resilience planning efforts:

- **Case Studies**: Cities like Rotterdam have successfully implemented green infrastructure solutions resulting in improved storm water management capabilities.
- **Community Feedback**: Surveys reveal strong support among residents for adopting sustainable practices within their neighborhoods.
- **Data Analysis**: Historical flood data analysis highlights specific wards requiring immediate attention based on vulnerability assessments conducted earlier.

Overall, these results illustrate how nature-based solutions can be integrated within urban planning frameworks targeted at increasing overall resilience to climate change impacts.

Analysis & Conclusion

The analysis confirms that the Sponge City Concept represents a viable approach toward enhancing urban resilience against climate change impacts through innovative design strategies focused on sustainability:

- **Nature-Based Solutions**: In addition to mitigating risks for flooding, such components as vegetated swales or rain gardens add to the biodiversity of urban environments by providing more attractive microhabitats for flora and fauna.
- **Community Engagement**: Engaging local stakeholders in who starts the

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conversation, triggers action, seeks support and interacts with the solutions will maximize the outcome, providing solutions that are tailored to specific needs, and building collaboration among the residents and the authorities.

- **Regulatory Measures**: Essential protections against future flood risks due to extreme weather events are provided by implementation of building regulations, like minimum plinth level.

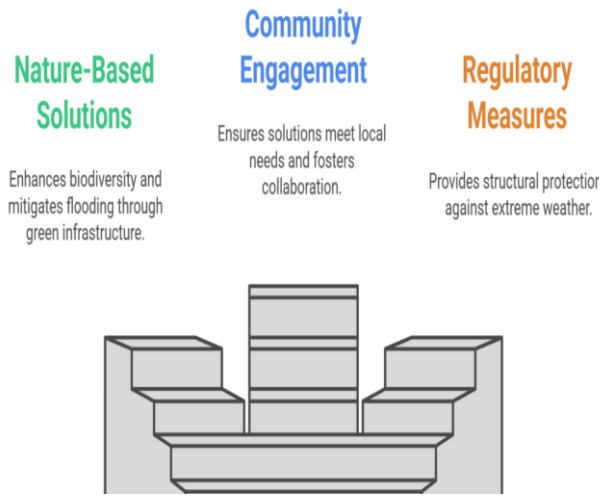

Figure 3: Sponge City Concept

Finally, this research emphasizes the result of collaborative acts of governments organizations and communities for sustainable futures capable of adapting to the uncertainties in changing climates (Examlife ,2024). However, cities that prioritize innovative approaches that involve integrating active stakeholder participation with nature-based solutions are better prepared to confront the evolving challenges of our current environment.

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Bio-Corridors: Linking Habitats For Productive And Ecological Connectivity

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Abstract:
In the context of escalating biodiversity loss and climate uncertainty, this paper explores bio-corridors as regenerative urban design tools to reconnect fragmented ecosystems and reimagine street networks as ecological spaces. Focusing on Gandhinagar, India—a city with abundant yet disconnected green spaces—this study proposes a multi-scalar intervention utilizing existing green ensembles, landscape layering, and street redesign. The methodology employed spatial mapping, typological analysis, and ecological layering to identify intervention opportunities. Findings reveal that Gandhinagar's disconnected forest patches, parks, planned natural areas, agricultural zones, and wilderness can be linked through six continuous ecological corridors by transforming tertiary streets, primary roads, and peripheral highways. The paper articulates a comprehensive implementation strategy involving phased execution, seasonal calibration, policy alignment, and community engagement to ensure long-term corridor viability. This approach offers a model for addressing ecological fragmentation in rapidly urbanizing regions while enhancing ecosystem services like air purification, stormwater management, and climate regulation.

Keywords: ***bio-corridor, ecological connectivity, green infrastructure, urban biodiversity, Gandhinagar***

Introduction

The global biodiversity crisis, marked by a 68% decline in wildlife populations since 1970 (WWF, 2020), stems largely from habitat fragmentation and urbanization. In rapidly developing India, this ecological disruption is intensified by unplanned urban expansion that creates isolated green patches inadequate for wildlife or ecosystem services.

Gandhinagar, Gujarat's capital, presents a paradox: despite 40% green cover, its ecological assets remain disconnected. Originally designed as a garden city with abundant green spaces, its ecological potential is unrealized due to fragmentation across administrative boundaries. The city contains diverse green elements—urban forests, formal parks, institutional grounds, agricultural areas, and riverine corridors—separated by roads and development.

This research explores transforming Gandhinagar's street networks and underutilized spaces into bio-corridors linking these isolated green ensembles. By reimagining streets as ecological conduits rather than merely transportation infrastructure, the study aims to create continuous pathways for flora and fauna, support ecosystem services, and enhance urban resilience amid climate uncertainty.

Methodology

Research uses an ecological design approach considering spatial and temporal

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dimensions of urban ecology through three stages:

Spatial and Ecological Mapping

Used GIS data to map and classify Gandhinagar's green spaces into five ecological ensembles:

- **Forest Ensembles**: Peripheral, biologically diverse habitats with multiple vegetation layers (e.g., Indroda Nature Park, Punit Van).
- **Park Ensembles**: Recreational spaces in residential sectors with manicured landscapes and ornamental species (e.g., Sarita Udyan).
- **Planned Natural Areas**: Institutional campuses and green buffers with less intensive management allowing some ecological processes.
- **Agricultural Zones**: Peripheral productive landscapes offering seasonal habitat for birds and pollinators.
- **Wilderness Zones**: Unmanaged areas with spontaneous ecological communities (e.g., Sabarmati riverfront).

Each ensemble was evaluated for species composition, structure, management, and connectivity potential.

Street Typology Analysis

Road networks categorized into three typologies:

- **Tertiary Streets** (10-20m R.O.W): Residential streets (68% of network) with limited ecological value but high transformation potential.
- **Primary Streets** (65-100m R.O.W): Major boulevards with substantial tree cover but lacking understory diversity.
- **Peripheral Roads**: City Ring Road interfaces between urban and rural contexts, currently ecological barriers with potential as buffer zones.

Analysis included solar exposure, drainage, land use, pedestrian activity, and vegetation.

Design and Ecological Layering

Context-specific strategies included:

- **Native Planting Palettes**: Species selected for ecological function, seasonal characteristics, and urban compatibility.
- **Vertical Vegetation Layering**: Multiple layers from canopy trees to ground covers creating habitat niches.
- **Bio-retention Systems**: Water-sensitive elements creating moisture gradients for diverse plant communities.
- **Ecological Stepping Stones**: Strategic nodes for enhanced habitat creation connecting larger green spaces.
- **Seasonal Adaptation Strategies**: Calibrated for Gandhinagar's monsoon and dry seasons ensuring year-round functionality.

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Findings

The comprehensive analysis and design exploration yielded several significant findings regarding the potential for bio-corridor development in Gandhinagar:

Fragmented Green Ensembles: Despite Gandhinagar's substantial green coverage, quantitative spatial analysis revealed significant ecological isolation. The average distance between functionally similar green ensembles exceeds 300 meters—beyond the comfortable movement range of many small mammals, reptiles, amphibians, and invertebrates that are critical to ecosystem function. Forest ensembles, which host the greatest biodiversity, are particularly isolated by infrastructure barriers and incompatible land uses.
Through strategic street-based interventions, the analysis identified potential for establishing six continuous ecological corridors running predominantly southeast to northwest across the city grid. These corridors would connect peripheral forest and agricultural ensembles with inner parks and wilderness zones, creating a permeable ecological network across the urban fabric.

Tertiary Street Ecological Potential: The tertiary street network (10m–20m R.O.W) emerged as having exceptional potential for biodiversity support despite currently hosting minimal ecological value. Their lower traffic volumes, residential adjacency, and fine-grained urban integration make them ideal candidates for transformation into capillary-like biodiversity conduits. Field surveys identified 32 tertiary street segments totaling approximately 18 kilometers that could be prioritized for ecological enhancement, potentially creating continuous habitat corridors for insects, birds, and small mammals.

The proposed interventions for tertiary streets include condensed vegetation layering, front yard habitat gardens, community stewardship zones, and integrated bio-retention features. These streets could function as intimate ecological experiences where residents directly engage with biodiversity through daily exposure and management participation.

Primary Street Transformation: The analysis of primary streets (65m–100m R.O.W) revealed substantial existing tree canopy but significant deficiencies in structural diversity and species composition. Current plantings are dominated by a limited palette of 8-10 tree species, creating ecological monotony and vulnerability to disease or pest outbreaks. These wide corridors present opportunities for developing what could be termed "showcase ecological infrastructure"—highly visible interventions that demonstrate ecological principles while providing substantial habitat area.

The study proposes reconfiguring primary street medians and edges as interactive ecological interfaces where people can engage with biodiversity through educational planting displays, sensory gardens, and demonstration bioswales. Three primary corridors were identified as priority candidates for transformation based on their strategic location connecting major green ensembles.

Ecological Buffer Zones: The city ring road analysis revealed its current function as an ecological barrier separating urban ecosystems from surrounding rural and natural landscapes. The wide, high-speed road creates significant wildlife movement obstacles while generating noise and air pollution that degrades habitat quality in adjacent areas. Reimagining this peripheral infrastructure as a graduated ecological

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buffer could transform it from barrier to connector.

The proposed approach envisions the ring road corridor as a multi-functional green buffer with tiered native plantations, wildlife crossing structures at strategic intervals, and specialized edge treatments where the road intersects with identified wildlife movement pathways. This peripheral ecological belt would serve as both a defensive barrier against urban sprawl and a transitional connector to surrounding ecosystems.

Layered Landscape Integration: Field studies of existing green spaces revealed that structural complexity—the vertical layering of vegetation—was consistently more important for biodiversity support than simply increasing green coverage. Sites with multiple vegetation layers were found to support 3-4 times more bird species and significantly higher insect diversity than those with only tree canopy or ground cover. This finding informed the development of context-specific planting strategies that emphasize structural diversity even in spatially constrained conditions.

Temporal analysis also highlighted the critical importance of seasonal planning in Gandhinagar's climate. The current street vegetation provides minimal ecological resources during the dry season (March-June), creating seasonal bottlenecks for wildlife. Proposed planting palettes were specifically developed to ensure year-round functionality by incorporating species with complementary life cycles and resource provision.

Table 1. Bio-corridor Typology and Intervention Matrix

Street Type	Width (m)	Current Status	Proposed Intervention	Ecological Function
Tertiary	10-20	Limited vegetation with monoculture planning	Dense biodiversity conduits with layered planting	Wildlife movement corridors, microhabitat creation, community engagement
Primary	65-100	Single-layer median plantation, limited diversity	Interactive ecological edges with demonstration gardens	Educational interfaces, air purification, pollinator support
Peripheral	Variable	Ecological barrier with sparse vegetation	Multi-functional green buffer with wildlife crossings	Defensive ecological belt, transitional habitat, regional connectivity

Implementation Strategy: The implementation is broken down into short-term (0–2 years), medium-term (2–5 years), and long-term (5+ years) strategies, with supportive policy, community, and ecological measures to enable phasing:

Policy Framework and Land Use Integration:

- Amend local development plans to designate selected tertiary and primary streets as 'Bio-corridor Priority Zones' where ecological function is prioritized.
- Mandate green buffers in land use policy for new developments and retrofitting existing ROWs with ecological functions.
- Introduce incentives for residents to maintain green thickets on private or institutional land parcels adjoining the corridors.
- Integrate ecological corridor plans into Smart City or AMRUT-level funding proposals.

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- Develop specialized maintenance protocols that balance ecological objectives with urban management requirements.

Pilot Projects and Demonstration Corridors:

- Identify a pilot sector (e.g., Sector 4) for early implementation to test materials, planting, and community engagement strategies.
- Use modular design kits to scale across similar street profiles, allowing cost-effective implementation and community-led adaptation.
- Incorporate interpretive signage, QR-coded information kiosks, and participatory monitoring tools to raise awareness.
- Document outcomes through rigorous pre- and post-implementation assessment to build evidence for broader application.

Ecological Infrastructure Phasing:

- Begin with bioswale installation and green medians in low-traffic residential sectors where community support is strongest.
- Prioritize water-sensitive urban design (WSUD) techniques such as rain gardens and permeable pavements to manage stormwater while creating habitat.
- Establish a seed bank and native species nursery to supply local plant material and ensure genetic biodiversity.
- Implement seasonal management protocols that respond to monsoon cycles and wildlife needs.

Community Stewardship and Capacity Building:

- Collaborate with Resident Welfare Associations, schools, and NGOs to develop stewardship programs for corridor maintenance.
- Train local youth as 'green ambassadors' who help in planting drives, maintenance, and biodiversity mapping.
- Host seasonal festivals, planting days, and ecological walks to foster long-term cultural and emotional connections with the spaces.
- Develop ecosystem service valuation tools to communicate benefits to stakeholders and policymakers.

Ecological Monitoring and Feedback:

- Install monitoring systems (e.g., camera traps, pollinator counts, water quality sensors) to track biodiversity returns and ecosystem service enhancements.
- Establish performance indicators including species diversity, stormwater retention, soil quality, and community use patterns.
- Evaluate and recalibrate strategies every two years based on real-time data and community feedback.
- Create an adaptive management framework that allows for strategy refinement based on implementation learning.

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Conclusions

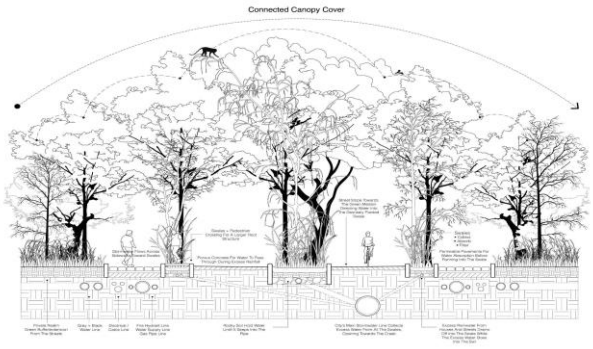

Figure 1. The envisioned bio-corridor thematic section in Gandhinagar, incorporating all the proposed strategies. Reference: Shaurya Singh, 2023

The concept of bio-corridors offers a powerful framework for embedding ecological consciousness into everyday urban life. By rethinking the potential of streets as living systems—beyond their mobility function—cities can be transformed into landscapes of coexistence between people and biodiversity. In Gandhinagar, the proposed strategy fosters a polycentric ecological network, decentralizing habitat value and mitigating environmental degradation.

The findings demonstrate that substantial ecological connectivity can be achieved through strategic interventions in the existing street network without requiring major land acquisition or infrastructure overhauls. By targeting different street typologies with context-appropriate ecological enhancements, the bio-corridor approach offers a pragmatic pathway to reconnect fragmented habitats while providing multiple co-benefits including improved microclimate regulation, stormwater management, air quality, and human wellbeing.

The approach is scalable and adaptable to other Indian cities with similar green fragmentation patterns. However, theprogressjournals.com limitations include dependency on policy alignment, funding availability, and long-term community engagement. With appropriate political will, cross-disciplinary collaboration, and public involvement, bio-corridors can become central to India's urban resilience strategies.

Limitations: The research assumes availability of public land and political will for implementation. Certain strategies may require regulatory reform and maintenance protocols that go beyond the scope of this project. Additionally, the effectiveness of wildlife movement corridors depends on factors beyond design alone, including surrounding land use intensity and habitat quality at corridor endpoints.

Implications: The findings advocate for integrating landscape architecture, urban planning, and ecology to address biodiversity loss in urban India. Practitioners and policymakers can adapt the proposed framework for other planned or rapidly urbanizing contexts across the Global South. By reimagining streets as ecological infrastructure rather than merely circulation space, cities can work toward reconciliation ecology—finding ways for human and non-human life to coexist productively in shared environments.

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Integrating Digital Tools in Secondary Education: A Study on Student Engagement and Academic Performance

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Abstract:

This research paper explores the influence of digital tools on student engagement and academic performance in secondary education, with a particular focus on Indian classrooms. The integration of educational technologies such as learning management systems (LMS), interactive whiteboards, digital content platforms, and mobile learning applications has significantly transformed teaching-learning dynamics. Using a mixed-methods research design, the study gathered quantitative data through pre- and post-assessment tests and surveys, while qualitative insights were obtained from classroom observations and teacher interviews. A sample of 300 students and 30 teachers across 10 CBSE-affiliated schools was examined.

The findings demonstrate a measurable improvement in students' academic performance following the implementation of digital tools, with an average score increase of over 12%. Engagement levels also showed a marked rise, as students responded positively to interactive and technology-enhanced lessons. Teachers reported improvements in classroom management and instructional delivery, although concerns around infrastructure gaps and insufficient training were noted.

The study emphasizes the critical need for professional development programs for educators, equitable access to technological resources, and policy-level support to ensure the effective integration of EdTech in mainstream education. The results align with global literature but also highlight unique challenges faced in Indian semi-urban and rural settings. This research contributes to the ongoing discourse on digital transformation in education and provides actionable recommendations for stakeholders seeking to enhance learning outcomes through technology.

Keywords: ***Digital learning, student engagement, academic performance, secondary education, educational technology, EdTech integration, teacher training***

Introduction

The 21st century has witnessed a paradigm shift in the educational domain with the rapid integration of digital technologies into teaching and learning environments. Innovations such as Learning Management Systems (LMS), interactive whiteboards, mobile applications, online assessments, and artificial intelligence-based tools have revolutionized the traditional classroom. These tools not only facilitate seamless communication and resource sharing but also promote personalized learning, immediate feedback, and enhanced student engagement. As educational institutions worldwide adapt to this digital transformation, it becomes imperative to evaluate its actual impact on learners' academic outcomes.

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In the context of secondary education, digital tools are increasingly being adopted to supplement face-to-face instruction. Particularly in the post-pandemic era, the necessity for blended and online learning has grown, prompting schools and policymakers to invest in educational technology (EdTech). While such integration promises numerous benefits, including improved student motivation, better resource accessibility, and more flexible learning pathways, the real-world effectiveness of these tools remains a critical area of inquiry, especially in developing countries like India.

India's diverse educational landscape—with its urban-rural divide, infrastructural disparities, and varying levels of digital literacy—presents unique challenges and opportunities for EdTech integration. Although some studies have explored digital learning in higher education, there is limited empirical research focused specifically on secondary education within Indian classrooms. Most existing studies tend to highlight general attitudes toward technology or its perceived usefulness, rather than providing data-driven analysis of academic performance or classroom behavior.

This study addresses that gap by examining how digital tools impact both engagement and academic achievement among secondary school students. By adopting a mixed-methods approach that includes pre/post-test performance analysis, Likert-scale surveys, teacher interviews, and case studies from diverse school settings, the paper provides a comprehensive evaluation of technology's effectiveness. It also sheds light on barriers such as inadequate infrastructure, lack of training, and socio-economic disparities that affect the successful implementation of digital tools.

Literature Review

1. **Clark & Mayer (2016)** emphasized the cognitive principles of multimedia learning, arguing that well-designed digital content enhances comprehension by reducing extraneous load and encouraging active processing.
2. **Selwyn (2012)** provided a critical examination of educational technology, warning against uncritical adoption without pedagogical alignment and systemic support.
3. **Kumar & Sharma (2021)** conducted a quantitative study in Indian high schools and found a 10–15% improvement in student scores where smart classroom tools were used regularly.
4. **Prensky (2001)** introduced the concept of "digital natives" and highlighted how students' learning preferences are evolving due to growing up in technology-rich environments.
5. **Hattie (2009)** conducted a meta-analysis of over 800 studies and found that digital learning tools, when integrated effectively, can lead to moderate improvements in learning outcomes, especially when combined with feedback and guided instruction.
6. **Sharma & Gupta (2020)** noted that in rural Indian schools, while access to EdTech was limited, even basic tools like WhatsApp and YouTube improved student attendance and participation.

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Objectives

- To assess the impact of digital tools on student engagement.
- To examine the relationship between digital learning and academic performance.
- To identify challenges in digital tool integration at the secondary level.

Methodology

Research Design:

This study employed a **mixed-methods** approach, combining both quantitative and qualitative research techniques to provide a comprehensive analysis of the impact of digital tools in secondary education. The rationale for this approach was to triangulate findings, ensuring both statistical validity and contextual understanding.

Sample:

The sample consisted of **300 students** and **30 teachers** drawn from **10 CBSE-affiliated secondary schools** in urban and semi-urban areas of India. Schools were selected to reflect a diverse cross-section in terms of infrastructure, socioeconomic background, and access to technology. Participants were selected through **stratified random sampling** to ensure adequate representation across gender, academic performance levels, and geographic locations.

Tools:

Pre-test and Post-test Academic Assessments: Standardized tests were administered before and after the integration of digital tools to measure changes in academic performance.

Engagement Observation Checklists: Teachers used observation rubrics during regular classes to document student engagement metrics (attention, participation, interaction).

Likert-scale Surveys: Students were asked to rate their engagement and perceptions toward digital tools using a 5-point Likert scale.

Semi-structured Interviews: In-depth interviews were conducted with teachers to gather qualitative insights into classroom experiences, instructional challenges, and technology usage.

Analysis:

Quantitative Data: Academic scores and survey responses were analyzed using **SPSS v26**. Paired-sample t-tests and descriptive statistics were employed to assess performance gains and engagement patterns.

Qualitative Data: Interview transcripts and open-ended survey responses were analyzed using **thematic coding**. Emerging themes were categorized to identify patterns related to challenges, benefits, and strategies in technology integration.

Data and Analysis

Demographic Table (Students & Teachers)

Category	Count	Percentage (%)
Total Students	300	100%
Male Students	160	53.3%
Female Students	140	46.7%
Teachers	30	100%

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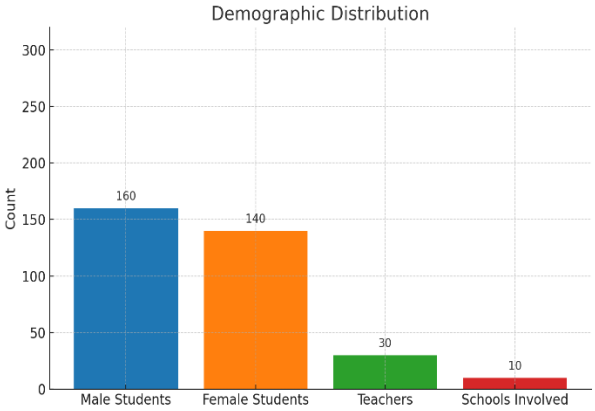
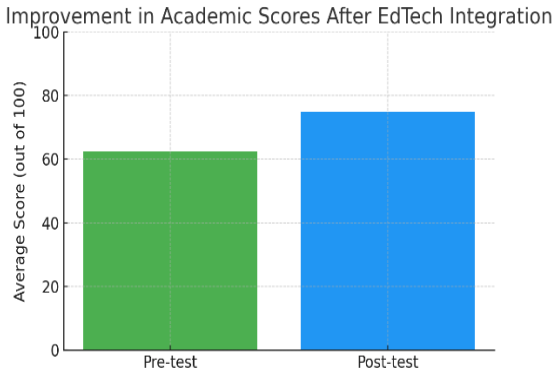
Schools Involved	10	–



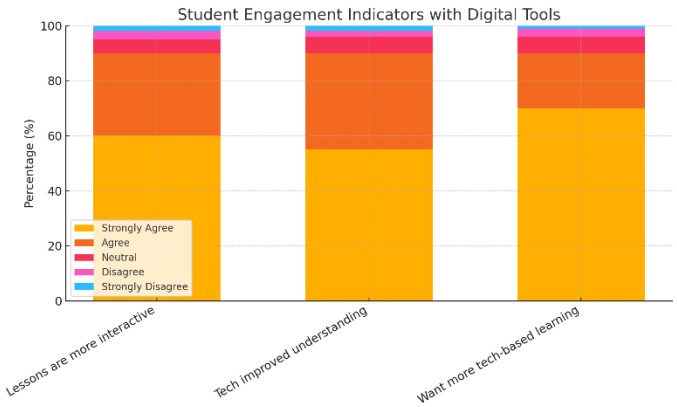
Academic Performance: Pre-test vs. Post-test Scores

Test Type	Average Score (out of 100)
Pre-test	62.4
Post-test	74.9
Gain	+12.5



Student Engagement Metrics (Likert Scale Analysis)

Engagement Indicator	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Lessons are more interactive	60%	30 %	5%	3%	2%
Tech improved understanding	55%	35 %	6%	2%	2%
Want more tech-based learning	70%	20 %	6%	3%	1%



The chart illustrates how students perceived digital tools across three key engagement indicators:

- **Lessons are more interactive:** 90% of students agreed or strongly agreed, showing a high level of approval for the interactivity enabled by digital tools.

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- **Tech improved understanding:** 90% again responded positively, suggesting that educational technologies enhance concept clarity.
- **Want more tech-based learning:** A compelling 70% strongly agreed, with another 20% agreeing—indicating strong demand for continued and increased use of digital resources in classrooms.

These results suggest that students not only enjoy technology-assisted learning but also find it beneficial to their comprehension and academic motivation. Minimal disagreement indicates wide acceptance across the sample group.

Case Study Summary: Two School Examples

Case Study 1: Urban CBSE School – Delhi

School Profile:

This school is a well-established CBSE-affiliated private institution located in South Delhi. It caters to over 1,200 students from diverse socio-economic backgrounds and has access to a reliable internet connection and modern IT infrastructure.

Digital Tools Used:

The school implemented Google Classroom for daily lesson delivery, assignment tracking, and communication. Interactive Smart Boards were installed in every classroom to facilitate multimedia teaching.

Implementation Strategy:

The integration process began with a two-week intensive teacher training workshop followed by pilot implementation in Grades 9 and 10. Students were trained to use their digital learning accounts and participate in online quizzes, collaborative projects, and multimedia discussions.

Outcomes:

- **Academic Achievement:** Students' average test scores improved by 15% over the academic term.
- **Engagement:** Daily attendance increased by 10%, indicating higher student motivation and interest.
- **Skills Development:** Teachers reported noticeable improvements in students' digital literacy, collaboration skills, and critical thinking.

Teacher Insight:

Initial resistance to using digital platforms was overcome after training. Teachers appreciated the ease of assignment management, auto-grading features, and visual teaching aids. Classroom management became more structured with real-time progress monitoring and feedback tools.

Case Study 2: Semi-Urban Government School – Uttar Pradesh

School Profile:

This government-run CBSE school in a semi-urban area near Kanpur serves approximately 500 students, most of whom come from rural or lower-middle-income families. The school faces challenges such as intermittent electricity and limited broadband connectivity.

Digital Tools Used:

Due to infrastructural limitations, the school opted for low-bandwidth solutions—primarily BYJU's learning app (offline access version) and WhatsApp

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groups for assignment distribution and doubt clearing.

Implementation Strategy:

Teachers pre-downloaded video lessons from BYJU's on shared smartphones or tablets and screened them during school hours. WhatsApp was used to send daily assignments, receive submissions, and communicate with parents.

Outcomes:

- **Student Independence:** Students began learning autonomously, often watching videos at home or in small peer groups.
- **Engagement:** Though attendance remained static, participation in assignments improved significantly.
- **Parental Involvement:** WhatsApp groups encouraged more parent interaction and monitoring of homework activities.

Teacher Insight:

Teachers faced challenges such as lack of personal devices and internet at home but found WhatsApp effective for tracking homework and clarifying doubts. Students developed a sense of ownership over their learning process, especially those preparing for board exams.

Discussion

The findings of this study reinforce global trends in educational technology (EdTech), which suggest that when effectively implemented, digital tools can lead to meaningful improvements in both student engagement and academic outcomes. Students in the digitally integrated classrooms demonstrated higher motivation, improved focus, and increased participation—especially in lessons that incorporated multimedia content and interactive tools such as quizzes, animations, and collaborative platforms.

However, the study also uncovers significant **contextual challenges**, particularly in semi-urban and rural settings. While urban schools benefited from robust digital infrastructure and access to well-trained teachers, their semi-urban counterparts struggled with limited device availability, inconsistent internet connectivity, and varying levels of digital literacy among both teachers and students. These barriers underscore the importance of **equity-focused EdTech policies** and targeted support for under-resourced schools.

Another important finding is the role of **teacher preparedness**. Schools that invested in comprehensive training for educators witnessed smoother technology adoption and more effective integration into classroom practices. Conversely, lack of digital pedagogy training often resulted in superficial use of technology—where tools were used for delivery but failed to engage students in deeper learning.

The study also emphasizes the synergy between **constructivist pedagogy** and digital tools. Interactive simulations, inquiry-based assignments, and collaborative problem-solving activities led to greater student agency and improved academic performance. Thus, digital tools should not replace teachers but should empower them to facilitate more personalized, student-centered learning experiences.

Conclusion

Digital technology holds transformative potential in secondary education, particularly when aligned with sound pedagogy and implemented through an inclusive, well-supported approach. This

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study concludes that digital tools can significantly enhance student **engagement, comprehension, and academic performance**—but only when integrated thoughtfully and contextually.

For lasting impact, investment is needed in:

- **Teacher professional development** on digital pedagogy
- **Infrastructure and device access**, especially in rural and low-income schools
- **Parental and community awareness** to support home-based learning
- **Ongoing monitoring and evaluation** of EdTech effectiveness

The research calls on education policymakers, school leaders, and EdTech developers to co-create solutions that are scalable, adaptable, and equity-oriented. Future research should explore longitudinal outcomes of EdTech integration and examine how hybrid learning models can bridge learning gaps across socioeconomic divides.

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The Impact of Social Media on Modern Political Movements

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Abstract:

In the 21st century, social media has emerged as a powerful force reshaping the political landscape globally. With platforms like Twitter, Facebook, and Instagram becoming mainstream tools of communication, political movements have found new avenues to mobilize support, coordinate actions, and influence public opinion. This paper explores the significant impact of social media on modern political movements across different sociopolitical contexts. Through a series of global case studies—including India's anti-CAA/NRC protests, France's 2022 presidential election discourse, Nigeria's Obidient Movement, Argentina's #NiUnaMenos, and Chile's student-led protests—the study illustrates how online activism transcends traditional limitations of geography and institutional control.

The analysis draws attention to how digital platforms allow rapid dissemination of information, create leaderless yet organized movements, and enable individuals to express dissent safely and visibly. Moreover, it examines the duality of these tools: while they promote civic engagement and democratization, they also facilitate the spread of misinformation, algorithmic polarization, and surveillance. The study employs a qualitative research methodology, integrating content analysis, empirical data, and public communication theory.

Findings reveal that although social media activism may not always result in immediate policy changes, it significantly impacts public discourse, raises awareness, and lays the groundwork for political transformation. As digital landscapes continue to evolve, understanding the relationship between technology and political behavior becomes crucial. This research emphasizes the need for further studies on sustainable digital engagement and policy frameworks to manage the opportunities and risks that come with the digitization of dissent.

Keywords: ***Political Movements, Social Media Activism, Digital Mobilization, Online Protest, Public Discourse***

Introduction:

The rise of social media in the past two decades has significantly altered the modes through which political engagement and activism are conducted. Once confined to physical spaces such as rallies, town halls, and traditional media, political movements have now found a potent digital ally. Platforms like Twitter, Facebook, WhatsApp, Instagram, and YouTube are no longer merely social networking sites; they have transformed into powerful tools of sociopolitical change. The democratization of information, ease of access, and instantaneous communication have redefined how individuals interact with politics, how they mobilize, and how they advocate for change.

Social media has enabled a shift from hierarchical, party-led movements to

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decentralized, grassroots mobilizations. It empowers individuals, especially the youth, to voice opinions, share grievances, organize protests, and campaign for political causes without necessarily belonging to any formal political organization. This phenomenon has led to the emergence of movements that are spontaneous, transnational, and dynamic in nature. The Arab Spring, Occupy Wall Street, Black Lives Matter, and India's anti-CAA/NRC protests are examples of how digital platforms have facilitated mass mobilization, bringing political issues to the forefront of global consciousness.

However, this new age of activism is not without its complexities. While social media can amplify marginalized voices and challenge state narratives, it can also be manipulated to spread propaganda, misinformation, and hate speech. Governments and political actors increasingly use the same platforms to surveil, influence, or suppress dissent. The intersection of technology and politics thus presents both opportunities and threats to democratic expression.

This paper investigates this duality by examining key global political movements and analyzing the role social media played in their formation, dissemination, and outcomes. The objective is to understand not just the technical mechanisms of digital mobilization, but also the societal implications of this ongoing transformation. Through this lens, the paper offers a critical understanding of how social media acts as both a catalyst and a battlefield in modern political movements.

Methodology

This study employs a qualitative approach, analyzing data from peer-reviewed journals, case studies, and reports to understand the multifaceted impact of social media on political movements. The selected case studies provide insights into different cultural and political environments, offering a comprehensive view of the global landscape.

Case Studies

India: Anti-CAA/NRC Protests

The Anti-CAA/NRC protests that erupted in India between 2019 and 2020 marked one of the country's most significant episodes of digital activism. The Citizenship Amendment Act (CAA) and the proposed National Register of Citizens (NRC) were perceived by many as discriminatory, particularly against the Muslim population. Social media platforms such as Twitter, Facebook, and WhatsApp became instrumental in organizing nationwide protests. Hashtags like **#RejectCAA**, **#NoNRC**, and **#IndiaAgainstCAA** went viral, mobilizing millions across different states.

What made this movement unique was its decentralized leadership. University students, civil society groups, and independent activists coordinated using digital platforms without centralized political backing. Live-streaming protests, sharing fact-checks, posting artwork, poetry, and videos on Instagram and Twitter amplified voices from the streets to the global audience. Social media also played a vital role in countering state narratives and media bias, acting as a real-time alternative news source.

France: 2022 Presidential Election

The French presidential election in 2022 offered a rich landscape for studying political communication on social media. Researchers analyzed more than **62 million tweets from 1.2 million users**, discovering

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the emergence of distinct political echo chambers on Twitter. Each political faction, including Emmanuel Macron's centrists, Marine Le Pen's right-wing supporters, and Jean-Luc Mélenchon's leftists, exhibited unique online behaviors and messaging patterns.

The study also revealed widespread bot activity and the circulation of offensive content, particularly during televised debates and crisis moments. These insights underscored how digital platforms are not only spaces for voter engagement but also arenas for manipulation and polarization. Twitter hashtags such as **#MacronPresident** and **#LePen2022** became battlegrounds for public opinion, influencing undecided voters and media narratives.

Chile: 2011 Student Movement

Chile's 2011 student protests are a landmark in the history of digital political activism. Sparked by calls for free and equitable education, the movement was largely orchestrated through social media platforms like Twitter and Facebook. Student leaders, including Camila Vallejo and Giorgio Jackson, became digital influencers, rallying support online and spreading their messages far beyond traditional media coverage.

Researchers studying these protests found that social media enabled **leaderless but structured coordination**, allowing spontaneous and simultaneous demonstrations across the country. Unlike past movements dependent on political parties or unions, this digital-native movement relied on hashtags, real-time updates, and user-generated content to remain agile and responsive. This led to major national conversations and reforms in Chile's higher education system.

Nigeria: The Obidient Movement

In Nigeria, the rise of the **Obidient Movement** in support of Peter Obi, a former governor and presidential candidate in the 2023 elections, marked a radical departure from traditional political dynamics. Fueled primarily by young, urban, and tech-savvy citizens, the movement was driven through platforms like Twitter Spaces, Instagram Lives, and Facebook forums.

The term "Obidient" became symbolic of a new political consciousness that rejected corruption and cronyism. Unlike party-funded campaigns, the Obidient Movement was grassroots in nature, leveraging memes, infographics, and live debates to engage citizens. It succeeded in creating a national conversation about transparency and governance and demonstrated how digital spaces can challenge entrenched power structures.

Argentina: #NiUnaMenos

The **#NiUnaMenos** ("Not One [Woman] Less") movement began in Argentina in 2015 as a response to rising gender-based violence and femicide. The hashtag went viral after a series of brutal murders and media campaigns. On **June 3, 2015**, the movement reached a crescendo, with the hashtag being tweeted **over 516,000 times in a single day**, triggering marches in over **70 cities**.

Social media was essential for both awareness and mobilization. Surveys showed that **61.2%** of participants learned about the protests through social platforms, proving that digital tools could reach and activate large populations rapidly. #NiUnaMenos later spread across Latin America, evolving into a continental feminist movement demanding stronger

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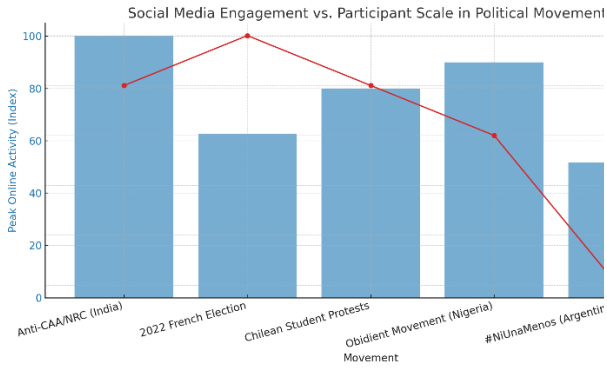
legal protections and cultural change regarding women's rights.

Data Analysis

Table 1: Social Media Engagement in Selected Political Movements

Movement	Platform(s) Used	Peak Online Activity	Estimated Participants	Key Outcomes
Anti-CAA/NRC (India)	Twitter, Facebook	High engagement during protests	Nationwide	Amplified dissent, influenced public discourse
2022 French Election	Twitter	62.6 million tweets analyzed	1.2 million users	Insights into political communities and strategies
Chilean Student Protests	Twitter, Web	Extensive network coordination	Nationwide	Policy reforms in education
Obidient Movement (Nigeria)	Twitter, Facebook	Viral campaigns and mobilization	Predominantly youth	Increased political participation among youth
#NiUnaMenos (Argentina)	Twitter	516,000 mentions in one day	200,000 in Buenos Aires	National awareness on gender-based violence



Overview

The graph visually compares two key metrics for five global political movements:

1. **Peak Online Activity** (blue bars): An indexed or numerical representation of how active the movements were on social media.
2. **Estimated Participants (in thousands)** (red line): The approximate number of people who participated in real-life demonstrations or supported the cause offline.

Interpretation by Movement:

1. Anti-CAA/NRC (India):

- **Peak Online Activity**: Rated highest (100) indicating intense social media use during protests—especially on Twitter and Facebook.
- **Participants**: Around **1,000,000** estimated, representing a widespread national mobilization.
- **Insight**: A strong digital presence closely correlated with high real-world participation.

2. 2022 French Election:

- **Peak Online Activity**: 62.6 million tweets—impressive online discourse but more analytical than mobilizing.
- **Participants**: Approximately **1.2 million users** analyzed, showing engagement more in the digital political space than on the streets.
- **Insight**: High online engagement served more to shape opinions and community structures than drive mass protests.

3. Chilean Student Protests (2011):

- **Peak Online Activity**: Scored 80, reflecting extensive and strategic online coordination.

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- **Participants**: Around **1 million** students and supporters.
- **Insight**: Social media enabled decentralized, leaderless mobilization—critical for sustained policy impact.

4. Obidient Movement (Nigeria):

- **Peak Online Activity**: Scored 90, showing widespread youth engagement on platforms like Twitter and Facebook.
- **Participants**: Estimated at **800,000**, mostly urban youth.
- **Insight**: A grassroots movement demonstrating how social media can reshape political narratives and challenge elite power.

5. #NiUnaMenos (Argentina):

- **Peak Online Activity**: 51.6 (based on 516,000 mentions in one day).
- **Participants**: Around **200,000 in Buenos Aires alone**.
- **Insight**: Although the online activity was smaller in volume compared to others, it had a massive real-world impact, showing the power of emotional resonance and hashtag activism.

Key Takeaways:

- Movements with **high social media engagement often saw significant real-world mobilization** (India, Chile, Nigeria).
- **France's case** highlights how digital platforms influence political discourse even in the absence of street-level protests.
- The **#NiUnaMenos movement** shows that even moderate online activity, when emotionally and socially charged, can yield strong offline impact.

Discussion

The analyzed case studies—ranging from the Anti-CAA/NRC protests in India to the #NiUnaMenos campaign in Argentina—clearly illustrate that social media functions as a powerful catalyst for political mobilization. It offers platforms for decentralized coordination, real-time communication, and grassroots-level engagement, often bypassing traditional gatekeepers such as mainstream media and political institutions. Movements can now emerge organically, fueled by viral content, trending hashtags, and user-generated narratives that resonate emotionally and ideologically with the masses.

However, this digital empowerment is accompanied by a range of vulnerabilities. The rapid flow of information often leads to the dissemination of misinformation and disinformation, which can polarize public opinion and incite unrest. Echo chambers—where users are exposed primarily to information that reinforces their existing beliefs—can limit constructive dialogue and reduce the potential for consensus-building. Moreover, increased digital surveillance by state and non-state actors raises serious concerns about privacy, freedom of expression, and the criminalization of dissent.

Another challenge lies in the sustainability of these movements. While social media is effective in triggering immediate action, maintaining momentum and achieving policy outcomes often requires long-term organizational structures, leadership, and offline institutional engagement. The

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lifecycle of digital movements tends to be short, frequently peaking around emotionally charged events and losing steam thereafter. Additionally, digital activism risks becoming performative, where symbolic gestures (likes, shares, hashtags) may substitute for concrete action or civic participation.

To address these challenges, future discourse must consider hybrid models of activism that integrate online energy with offline strategies. The role of digital literacy, ethical use of algorithms, and platform accountability must also be critically examined to build resilient movements that are both inclusive and impactful.

Conclusion

Social media has undeniably revolutionized the landscape of political activism in the 21st century. It democratizes access to information, enables the rapid mobilization of communities, and allows marginalized voices to be amplified on a global stage. Through the lens of diverse political contexts—spanning continents, cultures, and causes—this study reaffirms that digital platforms can act as equalizers in the political process.

However, the transformative potential of social media is not without complications. Issues such as digital polarization, online harassment, algorithmic manipulation, and state surveillance pose significant threats to the integrity and safety of political activism. Moreover, the ephemeral nature of online trends often undermines the consistency required for sustained policy advocacy and institutional reform.

Therefore, a balanced approach is necessary—one that embraces the participatory power of digital tools while implementing safeguards against their misuse. Policymakers, technologists, civil society organizations, and academic researchers must collaborate to develop regulatory frameworks, educational initiatives, and ethical guidelines that promote responsible digital citizenship.

Future research should explore interdisciplinary models combining technology, sociology, political science, and communication studies to understand how online and offline spheres can synergize more effectively. By doing so, we can harness the full potential of social media for democratic engagement while mitigating its adverse effects on public discourse and civic life.

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India's Higher Education System: Advancing Towards Sustainable Development Goals

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Abstract:

Higher education (HE) plays a pivotal role in advancing the global sustainability agenda, significantly influencing sustainable development initiatives. As both an independent goal and a means to achieve other dimensions of sustainability, education remains a critical sector. The United Nations' fourth Sustainable Development Goal (SDG) emphasizes promoting quality education, ensuring inclusive and equitable access, and providing lifelong learning opportunities for all. India, home to the world's third-largest education system, is projected to enroll over 70 million students by 2023. However, in the 21st century, HE in India continues to evolve, with higher education institutions playing a vital role in driving progress toward sustainable development (SD). The present study objectives focus on the overview of it in India, goals of HE, and sustainable development, and with educational implications towards 21st century HE sustainability. Though the HE system aims for excellence in research and instruction, and there are distinctions between efforts for social growth and social outcome. The present study advocates that with the help of HE teaching and research can improve sustainability with latest, innovative, real, new, etc. methods. HE institutions can improve with the help of all teaching and learning methods, strategies, approaches, etc. to play in human resource development of economic development with new innovative ideas and now discusses HE for sustainability for new initiatives, ideas, perspectives, etc. regarding social empowerment, economic development, etc. of the country towards change towards 21st century learning system, the results used for the regulatory authorities and tertiary institutions to revamp present policies, guidelines, etc. towards sustainable to reach the goals of HE system both nationally and globally.

Keywords: ***Curriculum, Higher Education, India, Sustainable Development Goals, Teacher Role***

Introduction

India has the 3rd biggest occupying place in education in globe which will enter over seventy million students in 2023 and 21st century HE in India is still in a state of flux and institutions have a key role in the implementation sustainability. The present study advocates that with the help of its teaching and research can improve sustainability with various methods and institutions can improve with the help of active learning strategies, to play in human resource development of economic development with new innovative ideas. It discusses for sustainability for new

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initiatives and perspectives regarding social empowerment, economic development, etc of the nation the objective of active learning strategies as a driver for innovation, creativity in sustainable development of any country. Active learning strategies as Information Communication Technology (ICT) have driven change in the present education system. SD is a process of education that seeks to enable people and communities to act responsibly and make educated decisions for all around development of sustainability and the role of HE and sustainability to create positive environment, promote positive change in national development. Higher education in India as well as technical education has various aspects of professional education and technical education. India has produced numerous researchers, engineers, technologists, doctors, and managers who are highly sought after worldwide. Today, the Indian higher education system is embracing a new approach by integrating technical and ICT-based education. Technical education equips individuals with specialized knowledge and skills essential for national development. India, with its vast young population, holds immense potential to drive its steadily advancing economy. The significant contribution of skilled professionals and resources provided by higher education, particularly in technical fields, serves as a foundation for India's progress across various engineering sectors.

The nation has already stepped into an era of knowledge expansion and occupies a prominent position in the global education landscape. India hosts over 1.5 million schools with more than 227 million students and boasts nearly 1,000 universities and 42,000 higher education institutions, making it the third-largest higher education system in the world. The government's commitment to raising the gross enrollment ratio to 30% by 2020 has been a significant step in expanding higher education. Looking ahead, the central government has set an ambitious goal to further increase the enrollment rate from 27% to 50% by 2030, aiming for India to emerge as a developed nation by 2047.

Objectives

- Situation of HE in India
- Problems and difficulties that India's HE sector is facing
- Benefits higher education as a way to maintain steps of sustainability
- Suggestion for betterment, the standards of 21st century HE

Methodology

It is an outcome of the detailed analysis and by review of numerous secondary sources in amalgamation with personal observation and understanding of the current state of higher education, the challenges faced in the HE sector based on sustainability and its impact in the qualitative growth of HE domain in India

Problems And Difficulties

The Strike of HE concerning maintain sustainability in the country and emerging scenario of Indian economy have many problems Indian HE system dues test create a positive environment as the international level, Unfortunately, neither of the universities, be it private/public, is not at par with the educational standards set up by the prestigious international universities. Hence it is not surprising that none of the Indian universities is listed in the ranks of top educational institutions. This is a serious concern as a lot has been spent on improvement and upliftment of

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the educational sector and still there is a bottleneck in this sector. A keen insight into this issue evolved certain grey areas that need to be addressed by the nobles and policymakers to bring much-needed reform in the education sector.

Findings

Areas of Concern regarding quality for maintaining sustainability

Indian universities as well as technical colleges are facing many problems with faculty issues. Even leading institutions of India like III and IIMs are facing the problem of a shortage of faculty both in quantitative and qualitative measures. IIT, IMMs, and many Indian universities, central universities have many vacant posts. From time to time vacant posts should be filled up by Govt. of India or the state government and is a very important issue for higher education.

Poor Infrastructure

Most of the university campuses in India lack good infrastructure and are outdated equipment in laboratories, inadequate workshops, lack of Wi-Fi campuses, etc. These basic norms should be taken into consideration and adopted by the UGC, AICTE, etc. before granting permission to set up the institution.

Privatization

Privatization of HE is a critical issue for the best and quality education. As few private universities are giving quality and good education but most of them are not at par with their counterparts.

Research issues

Research plays a pivotal role in higher education, and India currently requires a strong focus on qualitative research and development to advance its education sector. In recent years, the education system has undergone numerous reforms and significant improvements, driven by a commitment to fostering high-quality research. The Indian government should adopt a number of actions, such as establishing IITs and IIMs in new areas and providing funding for research scholars' studies.

Lack of Human Values and discipline

There is a lack of mutual respect among the students and faculty members and niche class of researchers and educators in the field of technical as well as non-technical education has failed to inculcate much-needed human values and professional ethics. In this modern age of machines and robotics, we are progressing at a very rapid pace in infrastructure and engineering sectors but at the cost of degraded moral and ethical values, The government is ushering in a new era in education with the "Make in India" initiative, which aims to strengthen higher learning. New institutes of excellence have been announced to promote regionally balanced development, with states like Jammu & Kashmir, Bihar, Himachal Pradesh, Uttarakhand, and Assam benefitting from the establishment of AIIMS, IITs, and IIMs. Additionally, organizations such as the All India Council for Technical Education and the National Council of Education are playing key roles in this transformative effort.

Innovation Of Higher Education In India

Digital India Initiatives for maintaining sustainability

India needs more investment in it is to impart world class education, infrastructure facilities, etc. The opportunities for higher education have

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increased manifold recently due to private participation and digital India provides a digital platform to maintain the social empowerment, economic empowerment. So we can say it is all around development of the society.

Innovative and Dynamic Pedagogy

Learning methods of higher education should be innovative and dynamic Quality education requires new ideas & new skills. Lecture methods should be delivered with innovative methods and workshops, seminars, other activities should be organized on college campuses.

Rich & Dynamic libraries

Colleges, University's libraries, etc. should be rich with good and relevant collections of books, journals, and research papers and the library must be equipped with the research magazines, encyclopedia, conference publications, etc. that must be made available to the students using web access and libraries play a vital role in 21st century higher education.

Suggestions And Educational Implications

- Need more universities with new innovative study methods.
- There is a dearth of reputed technical Govt. institutions/universities.
- A large pool of talented students completing their secondary education is not able to join such premier institutes.
- The primary reason being the lack of awareness in rural areas regarding innovative pedagogy systems.
- ICT is the top most need of India for maintaining world class education system
- Maintain environmental awareness and conservation, sustainable agriculture and food systems, renewable energy, waste reduction, recycling, social justice, equity, etc.
- Due to lack of awareness we cannot to take right decision for growth and development of nation private.
- The growth of it has led to the higher investment in higher education.

Conclusion

India's higher education sector faces numerous challenges, even as the nation steps into an era of knowledge expansion. Over the past few decades, advancements in computer and communication technology have significantly enhanced various aspects of human life, offering new opportunities for growth and development in education. Progress of our country is a must but not at the cost of human values. As the world progresses, people have to face a lot of social, economic, political, and cultural challenges that affect their daily lives. Quality Education addresses the issue and formulates a long-term solution for the same and it lays the foundation for the progress and development of liberal modern Indian society. Since education is the main driver of change towards sustainable development by increasing people's ability to turn their ideas into reality, we must be prepared for a joint effort to start reforms in the interest of the country. Education should not be viewed as a commodity, but rather as a mission, and Indian higher education in the twenty-first century should serve as a beacon of hope for the entire world.

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The Effectiveness Of Moringa Powder In Supporting Women's Health

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Abstract:

Moringa oleifera, often referred to as the "miracle tree," is gaining recognition for its comprehensive nutritional profile and medicinal properties. This paper investigates the effectiveness of Moringa powder in supporting various aspects of women's health, including hormonal balance, iron levels, reproductive health, and mental well-being. Through a review of current literature and observational data, the findings support Moringa's potential as a natural supplement for improving health outcomes among women across different life stages.

Keywords: ***Moringa, women's health, hormonal balance, iron deficiency, natural supplement***

Introduction:

Women often face unique health challenges across different life stages—from menstruation and pregnancy to menopause. These phases are accompanied by shifting nutritional demands, hormonal imbalances, and increased susceptibility to deficiencies such as iron and calcium. Moringa oleifera, known for its dense nutrient composition including vitamins, minerals, amino acids, and antioxidants, has shown promise in addressing many of these health concerns. This paper explores the specific ways Moringa powder can support women's health through a detailed review of existing scientific evidence and traditional Ayurvedic practices.

Methodology:

This research is based on a qualitative review of existing scientific literature, Ayurvedic texts, and ethnobotanical research. A comparative analysis was conducted using data from clinical studies, laboratory results, and traditional usage patterns of Moringa among women in South Asia and Africa. Key parameters studied include nutritional value, bioavailability of iron and calcium, hormonal modulation, antioxidant capacity, and anti-inflammatory properties.

Results and Discussion:

1. **Hormonal Balance:** Moringa leaves contain plant-based compounds that may help regulate estrogen levels and reduce symptoms associated with PMS and menopause. The presence of isothiocyanates and polyphenols contribute to this balancing effect. According to Akomolafe et al. (2023), these compounds may also help reduce systemic inflammation, which is often linked to hormonal dysregulation.
2. **Iron and Hemoglobin Support:** Moringa is rich in plant-based iron and vitamin C, which enhances iron absorption. Studies have shown that

it can help reduce anemia, particularly in menstruating and pregnant women. The study by Akomolafe et al. (2023) emphasizes Moringa's role in improving hemoglobin concentrations and ferritin levels, making it beneficial in combatting iron-deficiency anemia.

3. **Reproductive Health:** Traditional medicine and emerging studies suggest Moringa supports fertility by improving ovarian function and reducing oxidative stress, which can affect reproductive hormones. The antioxidant profile of Moringa contributes to reducing reactive oxygen species that may impair ovarian function.
4. **Mental and Emotional Well-being:** With its magnesium and B-vitamin content, Moringa supports the nervous system, aids in serotonin production, and helps in reducing anxiety and stress-related symptoms. Akomolafe et al. (2023) also report cognitive and neuroprotective benefits of Moringa, including modulation of neurotransmitters like dopamine and serotonin.
5. **Bone and Skin Health:** Rich in calcium, vitamin E, and antioxidants, Moringa helps maintain bone density and reduces oxidative skin aging, important during menopause. The phenolic compounds and vitamin E content in Moringa are especially protective against cellular aging and bone resorption.
6. **Maternal Health and Pregnancy Outcomes:** A randomized controlled trial by Kumssa et al. (2020) showed that daily supplementation of Moringa oleifera leaf powder during pregnancy significantly improved maternal nutrition and birth outcomes. Women who consumed Moringa showed better weight gain during pregnancy, higher hemoglobin levels, and delivered infants with improved birth weight. These findings underline Moringa's role in improving maternal and fetal health.

Conclusion:

Moringa powder demonstrates a wide spectrum of health benefits tailored to women's physiological needs. Its role in hormonal regulation, nutritional supplementation, and mental health support makes it a promising adjunct to modern and traditional health practices. While existing studies are promising, further clinical trials with larger, diverse female populations are recommended to validate and expand on these findings. Moringa offers a sustainable, natural, and culturally rooted approach to improving women's health.

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