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MANZIL

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TECHNOLOGY FOR SUSTAINABLE DEVELOPMENT

**Sustainable
Development**

through Technological Innovation

**Technology and
"Divyangjan"**

for Inclusive Growth in India



सीधा, सटीक और निष्पक्ष

भारती News

सीधी, सटीक और निष्पक्ष खबरों
के लिए आज ही सब्सक्राइब करें

क्योंकि हम सिर्फ सच दिखाते हैं, शोर नहीं !!!



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Prof. M. N. Hoda
Director
BVICAM, New Delhi

EDITOR

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Associate Professor
Department of JMC
BVICAM, New Delhi

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BVICAM, New Delhi

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Assistant Professor
Department of MCA
BVICAM, New Delhi

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Editorial

Dear Readers,

As we approach the end of another year and anticipate the dawn of a fresh one, it brings me great joy to extend heartfelt New Year wishes to each one of you. With every passing year, we take one step closer to the grand vision of a Viksit Bharat @ 2047 a developed India that stands as a global beacon of progress, resilience, and innovation. The current issue of Manzil, is dedicated to exploring a core pillar of this journey: the transformative role of Information Technology (IT) in achieving Sustainable Development.



Prof. M. N. Hoda
Editor - in - Chief

Today, the pervasiveness of IT and its overall impact in our day to day life is undeniable. It has woven itself into the fabric of modern life, reshaping industries, enhancing connectivity, and driving efficiencies that were unimaginable, earlier. As we embrace this integration, we recognize that technology has become indispensable, especially in handling repetitive tasks, complex calculations, and other monotonous processes. IT serves as an extension of our abilities, allowing human intelligence to focus on more nuanced and creative endeavors.

This edition of Manzil provides readers with a variety of perspectives on how technology fuels sustainability. The contributors have deliberated on a range of issues, including environmental management, social structure, and economic resilience, demonstrating how digital innovation can support responsible growth. Through this exploration, they underscore the vital role of technology in fostering inclusive growth and sustainable development.

While IT will continue to facilitate a better quality of life in countless ways every day, it is also a fact that it will never surpass the unique capabilities of the human mind. Nevertheless, as this issue illustrates, technology serves as a powerful tool that complements human ingenuity.

I invite you to turn the pages of Manzil and immerse yourself in the thoughtful reflections shared by our readers. Together, let's celebrate the advances made so far and renew our commitment to the vision of Viksit Bharat with inbuilt sustainability.

Wishing you all a prosperous and fulfilling New Year ahead!

Warm Regards

Sustainable Development Through Technological Innovation

Dr. Rakhee
Assistant Professor, BVICAM, New Delhi

The pivotal role of technological innovation in promoting sustainable development by optimizing energy, agriculture, and digital infrastructures. Renewable energy systems, such as solar and wind power, provide cleaner alternatives to fossil fuels, reducing carbon footprints. In agriculture, smart technologies like AI, drones, and precision farming enhance productivity while minimizing environmental impact. Digital infrastructures, including smart cities and Internet of things (IoT)-enabled systems, further promote resource efficiency and lower emissions.

Together, these innovations offer transformative potential for addressing global challenges, advancing sustainability goals and fostering a more resilient future through eco-friendly practices across sectors.

In this article, the concept of smart grid has been discussed. The concept of the smart grid represents a transformative shift in the way electricity is generated, distributed, and consumed. Unlike traditional power grids, which operate on a one-way flow of energy from power plants to consumers, a smart grid integrates advanced digital technologies and bidirectional energy flow to enhance the efficiency, reliability, and sustainability of electricity networks. The image provided illustrates the key components of a smart grid environment, which encompasses various energy sources, storage systems, and consumers, all interconnected to create a more dynamic, responsive, and eco-friendly power system.

Key Components of a Smart Grid Environment

1. Renewable Energy Sources: Solar, Wind, and Hydroelectric Power

One of the most significant features of a smart grid is its ability to integrate diverse renewable energy sources. In the image, we see PV solar panels, wind turbines, and a hydroelectric dam contributing electricity to the grid. These renewable sources are essential for reducing greenhouse gas emissions and transitioning away from fossil fuels.

1.1. Solar Energy: PV solar panels harness sunlight to generate electricity, making it one of the cleanest energy sources. Solar power's intermittent nature (daylight-dependent) can be balanced in a smart grid by storing excess energy in batteries for use when the sun is not shining.

1.2. Wind Energy: Wind turbines generate electricity by converting wind's kinetic energy. As with solar, wind power is intermittent and location-dependent, but the smart grid can integrate wind-generated electricity seamlessly into the larger system.

1.3. Hydroelectricity: Dams generate power by using flowing water to turn turbines. Hydroelectric power is more consistent than wind and solar, and in a smart grid, it plays a critical role in maintaining grid stability during periods of high demand or when other sources are less available.



2. Traditional Power Sources: Nuclear and Fuel Power Plants

Despite the push toward renewables, traditional energy sources like nuclear and fuel power plants are still part of the energy mix in the smart grid environment. These plants provide baseline power, ensuring a steady supply of electricity, especially during periods when renewable sources are not generating enough energy.

2.1 Nuclear Power: While nuclear energy has its challenges, including safety and waste disposal, it produces a significant amount of electricity with minimal carbon emissions, making it a viable component of a low-carbon energy future.

2.2 Fuel Power Plants: Though fossil fuel plants are a major source of carbon emissions, they remain critical in many regions. However, the smart grid can reduce their usage by prioritizing cleaner energy sources when available, using fuel power plants as backup when needed.



3. Energy Storage Systems: Energy storage is a crucial element of the smart grid, as shown by the energy storage component in the image. Batteries and other storage technologies help balance supply and demand by storing excess electricity during low-demand periods and releasing it during peak usage. This capability is particularly important for integrating renewable energy sources, which are often intermittent. Advanced storage systems ensure that the grid remains stable and reliable, even when renewable energy generation fluctuates.

4. Electric Vehicles (EVs): Another critical aspect of the smart grid environment is the integration of electric vehicles (EVs). EVs can serve dual purposes in this system. First, they reduce dependence on fossil fuels by using electricity instead of gasoline. Second, they can act as mobile energy storage units, with the potential for vehicle-to-grid (V2G) technology. In this scenario, EVs can store energy when plugged in and send it back to the grid during times of high demand, further enhancing grid flexibility.



5. Residential, Commercial and Industrial Consumers: The residential, commercial and industrial sectors are the primary consumers of electricity in the smart grid. However, unlike traditional grids where consumers only draw power, the smart grid allows these sectors to also produce energy. For example, homeowners with solar panels can generate their own electricity and even sell excess power back to the grid. Similarly, commercial and industrial buildings can implement energy-saving technologies, contributing to demand-side management and overall grid efficiency.

Bidirectional and One-Way Energy Flows

A distinguishing feature of the smart grid environment is the presence of both one-direction energy flow and bi-directional energy flow.

* One-direction flow refers to traditional power generation and distribution, where electricity flows from power plants to consumers without feedback.

* Bi-directional flow, on the other hand, allows for energy to move both ways from the grid to consumers and from consumers (like households with solar panels or EVs) back to the grid. This bi-directional capability is crucial for optimizing energy distribution, reducing waste, and integrating distributed energy resources (DERs) such as rooftop solar panels and small wind turbines.

“ These innovations offer transformative potential for addressing global challenges. ”

Benefits of a Smart Grid Environment

Enhanced Efficiency: By optimizing energy distribution and incorporating renewable sources, the smart grid minimizes waste and reduces reliance on fossil fuels.

Grid Resilience: The integration of energy storage and bidirectional flow improves the grid's ability to handle fluctuations in supply and demand, making it more resilient to outages or energy shortages.



Sustainability: The shift toward renewable energy sources, along with the ability to store and manage energy effectively, makes the smart grid a cornerstone of sustainable development.

Cost Savings: Consumers and utilities alike can benefit from reduced energy costs. Smart meters, real-time pricing, and the ability to sell excess energy back to the grid offer financial incentives.

The smart grid environment represents a leap forward in how energy systems are managed, integrating traditional and renewable sources, energy storage, and advanced digital technologies. By creating a more flexible, reliable, and sustainable energy network, the smart grid has the potential to meet the growing demands of modern society while addressing pressing environmental concerns. As technology continues to evolve, the smart grid will play an increasingly vital role in creating a cleaner, greener future for all.

सतत विकास के लिए प्रौद्योगिकी में अग्रसर भारत

राजेन्द्र सिंह ठाकुर एवं जयंत राठी
असिस्टेंट प्रोफेसर, बीवीआईकैम, नई दिल्ली

भारत एक विशाल और विविधता से भरा देश, आज सतत विकास के क्षेत्र में महत्वपूर्ण कदम उठा रहा है। 21वीं सदी में विकास की परिभाषा केवल आर्थिक प्रगति तक सीमित नहीं रह गई है, बल्कि इसमें पर्यावरण संरक्षण, सामाजिक समावेशन और तकनीकी नवाचार का भी समावेश हो गया है। इस संदर्भ में, प्रौद्योगिकी ने भारत को सतत विकास की दिशा में अग्रसर होने में एक महत्वपूर्ण भूमिका निभाई है। वैश्विक चुनौतियों जैसे जलवायु परिवर्तन, संसाधनों की कमी और जनसंख्या वृद्धि के बीच, प्रौद्योगिकी ने सतत विकास की इस यात्रा में महत्वपूर्ण भूमिका निभाई है। आज भारत नवीकरणीय ऊर्जा, स्मार्ट सिटीज़, कृषि नवाचार और डिजिटल इंडिया जैसी पहलों के माध्यम से सतत विकास के लक्ष्यों को हासिल करने की कोशिश कर रहा है। सतत विकास के इस सफर में, भारत एक प्रेरणादायक उदाहरण पेश कर रहा है, जो अन्य देशों के लिए भी एक मार्गदर्शक बन सकता है।

नवीकरणीय ऊर्जा की दिशा में कदम

भारत ने नवीकरणीय ऊर्जा के क्षेत्र में अपनी पहचान बनाई है। देश का लक्ष्य 2030 तक 450 गीगावाट नवीकरणीय ऊर्जा क्षमता स्थापित करना है। सौर ऊर्जा, पवन ऊर्जा और बायोमास जैसे स्रोतों का उपयोग बढ़ रहा है। उदाहरण के लिए, "सौर शक्ति" मिशन के तहत, विभिन्न राज्यों में सौर पैनल स्थापित किए जा रहे हैं। यह न केवल ऊर्जा की कमी को पूरा कर रहा है, बल्कि प्रदूषण को भी कम करने में मदद कर रहा है। सौर ऊर्जा की तकनीक में नवाचार के माध्यम से, भारत ने विश्व में एक नई मिसाल स्थापित की है।

जल प्रबंधन और प्रौद्योगिकी

जल संकट आज की एक गंभीर समस्या है, और भारत इस चुनौती का सामना करने के लिए नई तकनीकों का सहारा ले रहा है। स्मार्ट वाटर मैनेजमेंट सिस्टम और जल पुनर्चक्रण तकनीकों का उपयोग किया जा रहा है। वर्षा जल संचयन और ग्राउंडवाटर रिचार्ज जैसी परियोजनाएँ ग्रामीण और शहरी दोनों क्षेत्रों में लागू की जा रही हैं।



स्मार्ट सिटीज़ मिशन और तकनीकी सतत विकास

शहरीकरण की तेजी से बढ़ती दर ने भारत को स्मार्ट सिटीज़ मिशन की ओर अग्रसर किया है। इस योजना का उद्देश्य तकनीकी समाधान और स्मार्ट इंफ्रास्ट्रक्चर के माध्यम से शहरी जीवन को बेहतर बनाना है। स्मार्ट सिटीज़ में ट्रैफिक प्रबंधन, जल आपूर्ति, अपशिष्ट प्रबंधन और सुरक्षा जैसे क्षेत्रों में अत्याधुनिक तकनीक का उपयोग किया जा रहा है। इसके अंतर्गत, डिजिटल प्लेटफार्मों का उपयोग करके नागरिकों को आधुनिक सुविधाएँ उपलब्ध कराई जा रही हैं।

कृषि में तकनीकी नवाचार

कृषि भारत की अर्थव्यवस्था का एक महत्वपूर्ण हिस्सा है और यहाँ प्रौद्योगिकी का उपयोग कृषि उत्पादन में वृद्धि और संसाधनों के कुशल उपयोग के लिए किया जा रहा है। सटीक कृषि तकनीकों का प्रयोग, जैसे कि ड्रोन का उपयोग, फसल की स्थिति की निगरानी और फसल प्रबंधन में सुधार ला रहा है। इसके अलावा ई-चौपाल, मोबाइल एप्लिकेशन के माध्यम से किसानों को मौसम की और तमाम जानकारी, बाजार मूल्य और तकनीकी सलाह उपलब्ध कराई जा रही है।

स्वास्थ्य सेवाओं में तकनीकी सुधार

स्वास्थ्य क्षेत्र में भी तकनीकी नवाचार का बड़ा योगदान है। टेलीमेडिसिन, ई-हेल्थ सेवाएँ और मोबाइल स्वास्थ्य एप्लिकेशन स्वास्थ्य जैसी सुविधाएँ, सेवाओं को नागरिकों के दरवाजों तक लाने में मदद कर रहे हैं। विशेषकर ग्रामीण क्षेत्रों में, जहाँ चिकित्सा सुविधाएँ सीमित हैं, ये सेवाएँ अत्यधिक उपयोगी साबित हो रही हैं। इसके अलावा, डेटा एनालिटिक्स और आर्टिफिशियल इंटेलिजेंस का उपयोग कर बीमारियों की पहचान और प्रबंधन में तेजी लाई जा रही है।



स्टार्टअप इकोसिस्टम में प्रौद्योगिकी विकास

भारत का स्टार्टअप इकोसिस्टम तेजी से विकसित हो रहा है, जो सतत विकास के लिए नए विचारों को जन्म दे रहा है। विभिन्न क्षेत्रों में स्टार्टअप्स नई तकनीकों का उपयोग कर समस्याओं का समाधान निकाल रहे हैं। जैसे कि कृषि, स्वास्थ्य और शिक्षा में कई स्टार्टअप्स काम कर रहे हैं, जो समाज के विभिन्न पहलुओं में सुधार लाने का प्रयास कर रहे हैं। इन स्टार्टअप्स को सरकार की ओर से भी समर्थन मिल रहा है, जिससे उद्यमिता को बढ़ावा मिला है।



सतत विकास के लिए प्रौद्योगिकी में अग्रसर भारत ने एक नई दिशा अपनाई है, जहाँ आर्थिक विकास, पर्यावरण संरक्षण और सामाजिक समावेशन का समावेश है। नवीकरणीय ऊर्जा, स्मार्ट सिटीज़, कृषि नवाचार, जल प्रबंधन, स्वास्थ्य सेवाएँ, डिजिटल इंडिया और स्टार्टअप्स जैसे क्षेत्रों में प्रौद्योगिकी के माध्यम से भारत एक नई पहचान बना रहा है। यह समग्र विकास की दिशा में एक सकारात्मक कदम है, जो न केवल वर्तमान पीढ़ी के लिए बल्कि भविष्य की पीढ़ियों के लिए भी एक स्थायी और समृद्ध समाज की ओर ले जाएगा। भारत का यह प्रयास वैश्विक स्तर पर भी एक मिसाल स्थापित कर रहा है, जहाँ सतत विकास और प्रौद्योगिकी का समन्वय एक नई संभावना को जन्म दे रहा है।

The Future of Sustainable Living: A House of Tomorrow

Preeti Rai

Teaching Assistant, BVICAM, New Delhi

As the world grapples with climate change and resource depletion, the need for sustainable solutions has become paramount. The World Economic Forum's 2023 report highlights the urgent need for innovation in renewable energy, revealing only marginal growth in energy transition over the past three years. With the Intergovernmental Panel on Climate Change warning that greenhouse gas emissions must be halved by 2030 to limit global warming to 1.5°C, it's clear that innovative approaches are essential for a sustainable future.

Imagine a house designed with cutting-edge technology that embraces renewable energy, water conservation, and smart living as an ideal model for sustainable development. This house represents not just a shelter, but a paradigm shift in how we live harmoniously with our environment.

The Sustainable Home of the Future

1. Solar and Wind Energy Integration

At the core of this futuristic home is an integrated energy system that combines solar and wind power. Rooftops are equipped with turbine-solar panel units developed by the innovative company Unéole. These units harness both sunlight and wind, generating 40% more energy than traditional solar systems while operating silently.

In addition, Aeromine's compact wind generators, strategically placed on the roof's edges, utilize natural airflow to produce energy without external moving parts. This dual energy approach ensures that the house can operate entirely on renewable resources, reducing reliance on the grid.

2. Smart Energy Management

A state-of-the-art smart home system manages energy consumption efficiently. This system monitors energy usage in real-time, optimizing the use of generated energy. If excess energy is produced, it can be stored in high-capacity batteries or fed back into the grid, further enhancing sustainability.

3. Water Conservation and Generation

In a world where water scarcity is becoming a pressing issue, this house employs innovative solutions to manage water use effectively. SolarAquaGrid's canal-covering solar panels are mimicked in the home's landscape design, where water features are integrated with solar panels to minimize evaporation while generating electricity.

Additionally, hydropanels from Source convert moisture from the air into drinking water, providing a sustainable water source. This technology can produce sufficient water for a household, reducing the need for single-use plastic bottles and promoting environmental responsibility.



4. Energy-Generating Windows

The house features solar power windows created by Ubiquitous Technology. These windows not only provide natural light but also generate up to 30% of the home's energy needs by converting invisible UV and infrared light into electricity. This innovation seamlessly integrates energy production into the home's structure without compromising aesthetics.

5. Smart Appliances and IoT Integration

Every appliance in the home is equipped with IoT capabilities, allowing for remote monitoring and control. This includes energy-efficient appliances that adapt their operation based on energy availability, reducing consumption during peak hours. Residents can track their energy and water usage via an app, promoting conscious consumption habits.

6. Sustainable Materials and Design

The construction of the house prioritizes sustainable materials. From recycled steel to reclaimed wood, every component is selected to minimize environmental impact. The design incorporates passive solar principles, maximizing natural light and reducing the need for artificial heating and cooling.

7. Vertical Gardens and Urban Farming

To promote biodiversity and food sustainability, the house features vertical gardens and hydroponic systems for growing vegetables and herbs. This not only provides fresh produce but also enhances air quality, contributing to a healthier living environment.

8. House of future:

The house of the future is a beacon of sustainable living, exemplifying how technology can facilitate a harmonious relationship with our planet. By integrating renewable energy, water conservation, smart technology, and sustainable materials, this home not only meets the needs of its inhabitants but also serves as a model for future developments.

As we move towards a more sustainable future, innovative designs like this will be crucial in reducing our carbon footprint and ensuring a healthy environment for generations to come. The path to sustainable development is challenging, but with continued innovation and commitment, the dream of living in a fully sustainable home is within our reach.

By embracing these advancements, we can pave the way for a brighter, greener future - one home at a time.



The Role of EdTech in Building a Sustainable Learning Ecosystem

Dr. Divyshikha

Assistant Professor, BVICAM, New Delhi

As the world faces growing environmental challenges, education technology (EdTech) is increasingly seen as a vital tool in building a sustainable learning ecosystem. Leveraging digital platforms, online learning, and interactive software, EdTech offers ways to minimize resource usage while improving education accessibility and quality. Understanding how EdTech contributes to sustainability requires us to look at how it reduces traditional educational impacts and promotes more environmentally friendly learning methods.

One of the main environmental benefits of EdTech is its potential to reduce physical resource consumption. Traditional education often requires substantial use of paper, as well as resources for physical facilities, which all add to carbon emissions. According to the Environmental Paper Network, a reduction in paper use could significantly cut down deforestation rates, and adopting EdTech is one practical way to address this issue. Additionally, digital learning platforms allow for repeated access to study materials and resources, minimizing the need for printed materials and thus supporting resource efficiency.

The energy efficiency of online education compared to conventional classroom setups is also notable. A study by Open University in the UK found that distance learning courses use 87% less energy and produce 85% fewer carbon emissions than traditional campus-based programs. This reduction is largely due to the decreased need for students and teachers to commute, as well as less dependence on physical infrastructure, lighting, and other energy-demanding facilities. These findings suggest that integrating online and hybrid models within education can play a significant role in reducing the carbon footprint of educational institutions.



EdTech also promotes sustainability through the flexibility of learning at any place and time, which is especially beneficial for underserved and rural communities. A UNESCO report revealed that globally, over 244 million children are still out of school due to various barriers, such as geographical isolation or lack of resources. EdTech enables these communities to access quality education without the need to travel long distances. In turn, this access helps lower indirect environmental costs, like transportation, and supports a more inclusive and equitable learning model for sustainable development.



Moreover, major EdTech companies are committing to environmentally friendly practices. For example, Google has committed to running its data centers on 100% renewable energy and making their products more sustainable by designing them to last longer and reducing e-waste. Dell Technologies is similarly committed to sustainability, implementing practices like using recycled materials in its products and packaging. These corporate initiatives showcase the possibilities of integrating sustainable principles within EdTech, allowing education providers to align with environmentally responsible partners and models.



Despite these advantages, EdTech does come with environmental costs, such as the energy consumption of data centers and the e-waste generated from devices. Data centers, essential to online learning platforms, require significant power, contributing to greenhouse gas emissions. Therefore, managing these impacts calls for conscious efforts in energy optimization, like using renewable energy sources and promoting device recycling and reuse. Tools like Open University's SusTEACH Carbon Calculator allow students and educators to assess and understand their digital learning impact, which raises awareness and encourages more sustainable practices in education.



EdTech has demonstrated a significant capacity to support a sustainable learning ecosystem by reducing traditional educational resource demands and increasing accessibility. However, to maximize its environmental benefits, it's essential for EdTech initiatives to continuously innovate with sustainability in mind. From the adoption of energy-efficient technology to supporting sustainable product lifecycles, EdTech offers a promising path toward greener education. By adopting these approaches, the educational sector can play a vital role in building a sustainable future, empowering learners and educators to contribute actively to environmental conservation efforts.



SDGs:

Shared Commitment for a Better Tomorrow

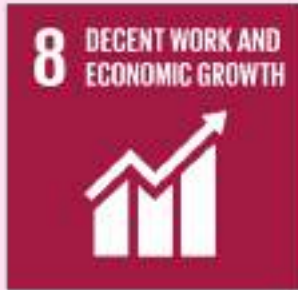
Dr. Sheel Nidhi Tripathi
Associate Professor, BVICAM, New Delhi

Sustainability is more than just a buzzword. It's a call to action for a future that respects our planet and ensures the well-being of all its inhabitants. Central to this mission are the **Sustainable Development Goals (SDGs)**, a set of 17 global objectives outlined by the United Nations to end poverty, protect the planet, and ensure prosperity for all by 2030.

India, as a rapidly developing nation, has emerged as a beacon of hope in achieving these goals. Aligned with the vision of **Viksit Bharat @2047**, the country is channeling its efforts to build a sustainable, inclusive, and resilient future. Educational institutions play a pivotal role in fostering awareness and action. At **Bharati Vidyapeeth's Institute of Computer Applications and Management (BVICAM)**, the commitment to sustainability and the vision of **Viksit Bharat @2047** is unwavering. Management, faculty, and students work in unison to inspire action, organize discussions, and implement practices that resonate with the SDGs.



ICSSR Conference on Viksit Bharat @2047 at BVICAM



17 SDGs

One notable contribution from **BVICAM** is the **2nd ICSSR National Conference on 'India Towards Viksit Bharat @2047'**, held over two days. This event brought together experts, researchers, and students to discuss themes of economic growth, environmental responsibility, and governance reforms in line with SDGs. The conference showcased the institute's dedication to advancing India's sustainable growth story.

Faculty members also actively participate in national campaigns, such as NDTV's **India Sustainability Mission**. This initiative fosters conversations on managing e-waste, reducing consumption, and promoting eco-conscious production and consumer behavior. BVICAM students share this enthusiasm and have visited NDTV for hands-on learning about sustainability practices. Such experiences instill in them a sense of responsibility, encouraging them to become future ambassadors of sustainable development.

The pursuit of sustainability is not a solo mission; it requires the collective will of governments, institutions, and individuals. Together, we march toward a future where the principles of sustainability environmental balance, economic equity, and social justice form the foundation of a truly developed nation. The time to act is now, and as India shows the world the way, BVICAM stands proud, contributing its part in this transformative journey.



BVICAM at NDTV's India Sustainability Mission

Technology and “Divyangjan” for Inclusive Growth in India

Shubham Mishra

Assistant Professor, BVICAM, New Delhi

Prime Minister Narendra Modi clarified the nation’s stance on inclusivity by introducing the term “Divyangjan” (meaning “divine body”) to refer to persons with disabilities, replacing the term “Apang,” which carried a connotation of limitation or inability. This respectful language shift underscores the importance of recognizing the abilities and contributions of individuals with disabilities rather than focusing on their limitations. In recent years, technology has become a transformative force in making society more inclusive and accessible for people with disabilities. For a long time, physical disabilities posed significant barriers to education, employment, and active participation in the social, political, and economic spheres. But in recent years technological advancements are steadily reshaping this narrative, especially in India. From assistive devices to inclusive digital platforms, technology is making it possible for persons with disabilities (PwDs) to fully participate in mainstream society.



According to the world health organization, India is home to over 1.36 billion residents, over 2.2 percent of this population endures some form of severe mental or physical disability. Among these, physical disabilities constitute a significant percentage. While newer data is expected from future censuses, the figure highlights the large population segment that stands to benefit from accessible technology.

Assistive Technology for Mobility and Communication

Mobility Aids: Innovations in mobility devices are helping people with physical disabilities navigate daily challenges. Motorized wheelchairs and advanced prosthetic limbs are providing greater independence and freedom of movement. For instance, Jaipur Foot, a well-known Indian organization, provides affordable prosthetics that have restored mobility to thousands. Further, the integration of IoT in wheelchairs, allowing users to control movement through mobile apps or voice commands, is on the rise, promoting autonomy.

Communication Tools: For individuals with speech and hearing impairments, tools like Augmentative and Alternative Communication (AAC) devices are bridging communication gaps. Popular apps like Avaz, developed in India, have been groundbreaking for children with speech difficulties, enabling them to communicate through text and symbols. Avaz has been used by state governments in schools, proving its widespread impact.



Smartphone Accessibility Features: Smartphones have become essential tools for inclusion, with accessibility features such as screen readers (VoiceOver on iOS, TalkBack on Android) enabling visually impaired users to navigate apps, browse the internet, and access educational resources. Companies like Apple and Google have made significant strides in ensuring these devices are accessible to users with various disabilities.

Digital Accessibility for Education and Employment

Accessible Educational Platforms: According to the National Statistical Office (NSO), only about 54.4% of person with disabilities are literate which accounts to 1.46 crore of total population in India. However, the advent of accessible digital learning resources aims to boost this number by reaching more students in remote regions. Online education platforms like Byju's and Unacademy are now incorporating features like video captions and screen reader compatibility, ensuring that students with disabilities can access learning materials. Inclusive online classrooms are bridging the gap for students with disabilities, allowing them to pursue higher education and skill development courses, even from rural areas.



Employment Opportunities through Digital Platforms: Technology is playing a pivotal role in integrating persons with disabilities into the workforce. Platforms like LinkedIn, Upwork, and specialized job portals such as Enable India offer resources and employment opportunities tailored for PwDs. Digital accessibility in workplaces, like screen readers, braille keyboards, and remote work setups, is furthering employment prospects for many. Telecommuting and work-from-home options are opening new avenues for individuals with disabilities to join the workforce.

Government Initiatives and Technology-Driven Policies

Accessible India Campaign (Sugamya Bharat Abhiyan): Launched in 2015, this campaign aims to make public spaces, transportation, and information accessible to PwDs. This includes digital accessibility for government websites and mobile applications. This campaign has been instrumental in raising awareness about accessibility in both public and private sectors.



Support from Startups and NGOs: A new wave of Indian startups, such as Trestle Labs, are developing products specifically for PwDs. Trestle Labs has introduced Kibo, a device that allows people with visual impairments to read any printed or handwritten text. Similarly, NGOs like NCPEDP (National Centre for Promotion of Employment for Disabled People) are advocating for inclusive policies and encouraging corporate sectors to adopt accessible technologies.



The Rights of Persons with Disabilities Act (RPwD), 2016: This act mandates that educational institutions, workplaces, and public services make accommodations for PwDs. The legislation covers aspects of digital accessibility and the implementation of assistive technologies in public spaces, educational institutions, and employment settings. The Department of Empowerment of Persons with Disabilities (DEPwD) had announced 1% interest rate rebate to “Divangjan” borrowers under National Scheduled Castes Finance and Development Corporation (NDFDC) loan.



Digital Payments and Accessible Banking: The rise of digital payments and accessible banking apps is helping persons with disabilities manage their finances independently. Several Indian banks now offer mobile apps with built-in accessibility features, allowing visually impaired customers to check balances and make payments. Initiatives like the Unified Payments Interface (UPI) have further simplified transactions, enabling persons with disabilities to make payments with ease.



The integration of technology into the lives of people with disabilities has undoubtedly brought about transformative changes. However, achieving full inclusivity will require continued innovation, investment, and policy support. India’s government, corporations, and startups must continue to work collaboratively to ensure that technology empowers all individuals, regardless of physical limitations, to participate meaningfully in society. With increased awareness, innovative solutions, and continued commitment, technology can break down the barriers that have long hindered people with disabilities, enabling a truly inclusive India.



सतत विकास के लिए प्रौद्योगिकी: सौर और वैकल्पिक ऊर्जा

राघव त्रिवेदी

असिस्टेंट प्रोफेसर, बीवीआईकैम, नई दिल्ली

जलवायु परिवर्तन के कारण आज सभी देशों के सामने ऊर्जा सुरक्षा एक बड़ी चुनौती बन गई है। सतत विकास के लक्ष्यों को प्राप्त करने के लिए नवीकरणीय ऊर्जा, विशेष कर सौर ऊर्जा और वैकल्पिक ऊर्जा, एक महत्वपूर्ण भूमिका निभा रही हैं। भारत ने इस दिशा में कई कदम उठाए हैं, जिससे ग्रामीण और शहरी दोनों क्षेत्रों में ऊर्जा के नए विकल्प उत्पन्न हुए हैं। इस लेख में हम सौर और वैकल्पिक ऊर्जा के द्वारा किए जा रहे प्रयासों, योजनाओं, और उनके वास्तविक उदाहरणों पर विस्तृत चर्चा करेंगे।

भारत में सौर ऊर्जा की क्रांति

सौर ऊर्जा ने भारत में ऊर्जा उत्पादन को नया आकार दिया है। देश की विशालता और भौगोलिक विविधता इसे सौर ऊर्जा उत्पादन के लिए एक उपयुक्त स्थान बनाती है।

बड़े सौर प्रोजेक्ट्स भदला सोलर पार्क (राजस्थान):

यह पार्क 2245 मेगावाट की क्षमता के साथ दुनिया का सबसे बड़ा सोलर पार्क है। इसका निर्माण 2015 में शुरू हुआ और 2019 में पूर्ण हुआ। यह पार्क करीब 20 लाख टन कार्बन उत्सर्जन को कम करने में मदद करता है और हजारों लोगों को रोजगार प्रदान करता है।

रीवा सोलर प्लांट (मध्य प्रदेश): 750 मेगावाट की क्षमता वाला यह प्लांट दिल्ली मेट्रो को ग्रीन एनर्जी प्रदान करता है। यह सार्वजनिक और निजी क्षेत्र के सहयोग से विकसित किया गया है, जो इसे एक सफल मॉडल बनाता है।

सरकारी योजनाएं और पहलें

भारत सरकार ने सौर ऊर्जा के विकास के लिए कई महत्वपूर्ण योजनाओं की घोषणा की है:

राष्ट्रीय सौर मिशन:

2010 में शुरू की गई इस योजना का उद्देश्य 2022 तक 100 गीगावाट सौर ऊर्जा उत्पादन करना है। यह योजना सौर ऊर्जा को राष्ट्रीय ग्रिड में जोड़ने के लिए प्रोत्साहन प्रदान करती है।

प्रधानमंत्री कुसुम योजना:

इस योजना का उद्देश्य किसानों को सौर पंप और सौर पैनल उपलब्ध कराना है, जिससे उन्हें अपनी कृषि के लिए ऊर्जा मिल सके। इससे न केवल उनकी लागत कम होगी, बल्कि अतिरिक्त ऊर्जा को ग्रिड में बेचने का भी अवसर मिलेगा।

सौर शहर योजना:

इस योजना के तहत शहरों में सौर ऊर्जा के उपयोग को बढ़ावा दिया जा रहा है। इसमें सौर प्रकाश, सौर पंपिंग, और अन्य सौर सुविधाएं शामिल हैं।



नए परिवर्तन:

सौर ऊर्जा से बदलते गाँव सौर ऊर्जा के उपयोग से ग्रामीण क्षेत्रों में व्यापक बदलाव आ रहा है। किसान अब सौर ऊर्जा का उपयोग करके न केवल अपनी जरूरतों को पूरा कर रहे हैं, बल्कि अतिरिक्त ऊर्जा भी बेच रहे हैं।

प्रमुख उदाहरण:

1. मोधेरा (गुजरात):

यह गाँव भारत का पहला सौर ऊर्जा संचालित गाँव है। यहां के सभी घरों में सौर पैनल लगाए गए हैं, जिससे पूरे गाँव की बिजली की जरूरतें बिना किसी बाहरी स्रोत के पूरी होती हैं।

2. बरसाना (उत्तर प्रदेश):

अक्षय पात्र फाउंडेशन के सहयोग से यहां के विद्यालयों और सामुदायिक रसोईयों को सौर ऊर्जा से संचालित किया जा रहा है। इससे न केवल ऊर्जा लागत में कमी आई है, बल्कि बच्चों को पौष्टिक भोजन भी उपलब्ध कराया जा रहा है।

3. करनाल (हरियाणा):

यहां के किसान सौर पंपों का उपयोग कर रहे हैं, जिससे उन्हें अपनी फसलों के लिए पानी उपलब्ध कराने में मदद मिल रही है। यह न केवल उनकी उत्पादकता बढ़ा रहा है, बल्कि जल संरक्षण में भी सहायता कर रहा है।



सूत्रधार की कहानी: ग्राम पंचायत धनेरा का अनुभव

ग्राम पंचायत धनेरा, जो कि मध्य प्रदेश के एक छोटे से गाँव में स्थित है, सौर ऊर्जा की एक प्रेरणादायक कहानी प्रस्तुत करता है। धनेरा गाँव, जहां पहले बिजली की उपलब्धता सीमित थी और अंधेरे में जीवन यापन करना पड़ता था, अब एक सौर ऊर्जा संचालित गाँव बन चुका है। यहां की महिलाएं और पुरुष, जो पहले अंधेरे में काम करते थे, अब सौर ऊर्जा का उपयोग करके अपनी खेती और छोटे व्यवसाय कर रहे हैं।

परियोजना की शुरुआत

2019 में, एक गैर-सरकारी संगठन (NGO) ने इस गाँव में सौर पैनल स्थापित करने की योजना बनाई। गाँवासियों को पहले इसकी उपयोगिता और लाभ समझाए गए। इसके बाद, गाँव के 100 घरों में सौर पैनल लगाए गए।

परिवर्तन का प्रभाव

शिक्षा में सुधार:

पहले, बच्चों को शाम के समय पढ़ाई करने में कठिनाई होती थी, लेकिन अब वे दिन के समय भी पढ़ाई कर सकते हैं। स्कूल में सौर ऊर्जा से चलने वाले लाइट्स ने शिक्षा का स्तर बढ़ा दिया है।

आर्थिक लाभ:

कई किसान अब अपने खेतों में सौर पंपों का उपयोग कर रहे हैं, जिससे उन्हें अपने फसलों की सिंचाई के लिए किसी बाहरी स्रोत पर निर्भर नहीं रहना पड़ता। उन्होंने अपनी फसल उत्पादन में 30% की वृद्धि देखी है।

स्वास्थ्य में सुधार:

गाँव में सौर ऊर्जा से चलने वाले स्वास्थ्य केंद्र ने स्वास्थ्य सेवाओं को बेहतर बनाया है। अब ग्रामीणों को इलाज के लिए दूर नहीं जाना

पड़ता है। धनेरा गांव की पंचायत ने आगे बढ़कर सौर ऊर्जा के उपयोग को बढ़ावा देने का निर्णय लिया है। वे योजना बना रहे हैं कि अगले चरण में गांव के सभी घरों में सौर पैनल लगाए जाएंगे, जिससे यह गांव पूरी तरह से सौर ऊर्जा पर निर्भर हो सके।

वैकल्पिक ऊर्जा के अन्य स्रोत

1. पवन ऊर्जा (Wind Energy):

भारत में पवन ऊर्जा के क्षेत्र में भी तेजी से विकास हो रहा है। तमिलनाडु, गुजरात, और महाराष्ट्र जैसे राज्यों में बड़े पैमाने पर पवन ऊर्जा परियोजनाएं संचालित की जा रही हैं।

तमिलनाडु का मुप्पंडल विंड फार्म:

यह एशिया का सबसे बड़ा पवन ऊर्जा संयंत्र है, जिसमें लगभग 3000 मेगावाट की क्षमता है। यह क्षेत्र ऊर्जा उत्पादन में एक महत्वपूर्ण योगदान देता है।

2. हरित हाइड्रोजन (Green Hydrogen):

भारत सरकार ने हरित हाइड्रोजन उत्पादन के लिए राष्ट्रीय हरित हाइड्रोजन मिशन की शुरुआत की है।

गुजरात और राजस्थान में:

बड़े हाइड्रोजन प्लांट स्थापित किए जा रहे हैं, जहां सौर और पवन ऊर्जा से हाइड्रोजन का उत्पादन किया जाएगा। यह परियोजना न केवल ऊर्जा सुरक्षा को बढ़ावा देगी, बल्कि औद्योगिक उपयोग में भी मदद करेगी।

ऊर्जा भंडारण और स्मार्ट ग्रिड्स

नवीकरणीय ऊर्जा के विस्तार के लिए बैटरी स्टोरेज सिस्टम और स्मार्ट ग्रिड्स का विकास आवश्यक है।

लिथियम-आयन बैटरी:

ये बैटरी सौर और पवन ऊर्जा को संग्रहीत करने के लिए व्यापक रूप से उपयोग की जा रही हैं।



स्मार्ट ग्रिड्स:

ये ग्रिड रियल-टाइम में ऊर्जा के प्रवाह को प्रबंधित करने में सक्षम हैं। उदाहरण के लिए, कर्नाटक में स्मार्ट ग्रिड परियोजना बिजली की खपत को कुशलता से प्रबंधित करती है।

सौर और वैकल्पिक ऊर्जा ने भारत को न केवल ऊर्जा उत्पादन में आत्मनिर्भर बनने की दिशा में आगे बढ़ाया है, बल्कि ग्रामीण और शहरी जीवन में सुधार भी किया है। मोधेरा जैसे गांवों में सोलर ऊर्जा का प्रयोग ग्रामीण विकास का नया मॉडल प्रस्तुत करता है। हरित हाइड्रोजन और पवन ऊर्जा जैसी पहलें भारत को एक स्थायी और स्वच्छ ऊर्जा भविष्य की ओर ले जा रही हैं।

भारत सरकार की नीतियों और योजनाओं के माध्यम से, भारत एक ऐसा देश बनने की दिशा में अग्रसर है जहां ऊर्जा उत्पादन और पर्यावरण संरक्षण एक साथ चलते हैं। आने वाले वर्षों में, सौर और वैकल्पिक ऊर्जा के माध्यम से भारत न केवल अपनी ऊर्जा जरूरतों को पूरा करेगा, बल्कि विश्व के सामने एक उज्ज्वल और हरित भविष्य का उदाहरण प्रस्तुत करेगा।

The Role of Vertical Farming in Sustainable Urban Agriculture

Sumit Singh

Assistant Professor, BVICAM, New Delhi

As cities grow and available land becomes increasingly limited, innovative solutions are needed to address food production in urban areas. Vertical farming, a method of growing crops in stacked layers or vertical spaces, is gaining attention as a sustainable agricultural practice that could help meet the challenges of urban food production. By utilizing indoor, controlled environments, vertical farming minimizes land use, maximizes resource efficiency, and offers a promising approach to sustainable agriculture. This article explores how vertical farming is becoming an integral part of urban agriculture, its benefits, potential challenges, and its future role in shaping food systems.

What is Vertical Farming?

Vertical farming is a modern farming technique that involves cultivating crops in vertically stacked layers, typically within controlled indoor environments. These systems often use soil-less farming methods like hydroponics, aeroponics, or aquaponics, which enable plants to thrive without traditional soil. Vertical farms can be established in repurposed urban buildings such as warehouses, rooftops, or unused factory spaces transforming underutilized urban areas into productive food sources. Unlike traditional farming, which requires large expanses of land, vertical farming makes it possible to grow food in smaller spaces, often within the city itself.

The Growing Demand for Sustainable Urban Agriculture

As more people move into cities, the global urban

population is expected to reach over 68% by 2050, according to the United Nations. This mass urbanization leads to increased pressure on agricultural land, forcing cities to find creative ways to feed their growing populations. Urban agriculture, particularly vertical farming, offers a solution by producing food in the cities themselves, reducing reliance on rural farming and the associated transportation costs. Vertical farming not only ensures fresher produce but also contributes to environmental sustainability, offering a local food production model that can meet the needs of urban dwellers without contributing to land degradation or deforestation.



Challenges of Vertical Farming

Despite its potential, vertical farming faces several challenges. The most notable of these is the high initial cost of setting up a vertical farming operation. Building or retrofitting a facility to accommodate vertical farming requires significant investment in infrastructure, climate control systems, and specialized equipment like hydroponic setups or LED lighting. However, as the technology matures and economies of scale come into play, these costs are expected to decrease, making vertical farming more economically viable.

Energy consumption is another challenge. Vertical farming requires substantial energy for lighting, temperature control, and irrigation, especially in large-scale operations. However, innovations in energy-efficient lighting, such as LEDs, and the integration of renewable energy sources are helping to address this issue. Moreover, the energy efficiency of vertical farming can be significantly improved by optimizing production systems and using energy storage solutions.

Smart Cities to Eco-Villages: The Future of Sustainable Urban Development

Adarsh Singh

Assistant Professor, BVICAM, New Delhi

Urban development is undergoing a fundamental transformation, driven by the urgent need to address the pressing challenges of climate change, resource depletion, and rapid population growth. The future of urban spaces hinges on balancing technological innovation with ecological sustainability, a task that has given rise to two distinct yet complementary models: smart cities and eco-villages. Together, they represent a forward-thinking approach to creating urban environments that can meet the needs of future generations while ensuring long-term environmental health and social well-being.

Smart cities are at the forefront of technological integration in urban development. These cities leverage cutting-edge technologies, including big data, artificial intelligence (AI), and the Internet of Things (IoT), to enhance the quality of urban life and optimize the use of resources. By embedding sensors and connected devices throughout urban infrastructure, smart cities can monitor and manage transportation systems, energy grids, and public services in real time. For instance, smart traffic management systems use AI to analyze traffic patterns and reduce congestion, leading to decreased fuel consumption and lower emissions. This not only improves air quality but also saves time and reduces stress for commuters.

Energy management is another crucial aspect where smart cities excel. The implementation of smart grids allows for more efficient energy distribution by matching supply with demand and integrating renewable energy sources seamlessly. Such grids can adapt to fluctuations in energy production, especially from sources like solar and wind power, ensuring that the city remains powered

while minimizing waste. Additionally, smart building technologies enable structures to optimize energy use through automated lighting, heating, and cooling systems, which contribute to significant reductions in overall energy consumption.

Public safety and healthcare are also enhanced in smart cities. Advanced surveillance systems, emergency response networks, and predictive analytics help prevent crime and respond swiftly to incidents. Furthermore, digital health services powered by telemedicine and wearable devices provide residents with real-time access to medical care, reducing the burden on physical healthcare facilities and improving overall health outcomes. These advancements contribute to a safer, more connected, and resilient urban environment.

While smart cities emphasize technological prowess, eco-villages offer a contrasting yet equally important vision for sustainable living. Eco-villages are typically smaller, community-focused developments that prioritize ecological balance and human well-being over technological integration. These villages are built around principles of self-sufficiency, renewable energy use, and minimal environmental impact. The residents of eco-villages often engage in sustainable practices such as organic farming, permaculture, and natural building techniques that use local, eco-friendly materials.



Water conservation is a key focus in eco-villages, where rainwater harvesting systems and greywater recycling are commonly employed to reduce dependence on external water sources. Composting toilets and waste management systems are used to minimize waste and create nutrient-rich compost that supports local agriculture. By fostering a circular economy within their communities, eco-villages ensure that resources are reused and recycled, fostering a culture of sustainability and reduced ecological footprint.

Social cohesion and community participation are also integral to eco-village life. Unlike the often-anonymous existence in larger urban areas, eco-villages encourage residents to collaborate in decision-making processes and communal projects. This collaborative lifestyle enhances social bonds and promotes a sense of belonging, which can improve mental health and overall life satisfaction. The emphasis on a slower, more mindful way of living attracts those who seek an escape from the hustle and stress of conventional city life.

Although smart cities and eco-villages may appear to be different approaches to sustainable urban development, they share common goals and can complement each other. The integration of technology from smart cities into the eco-village model can create a hybrid approach that maximizes the strengths of both. For example, eco-villages can incorporate smart grid technology to manage their renewable energy systems more effectively, ensuring a stable and efficient energy supply without compromising their core principles of sustainability and minimalism.



Similarly, smart cities can draw inspiration from the community-centric and environmentally conscious design of eco-villages. Urban planners can integrate green spaces, community gardens, and local food production into cityscapes to create healthier, more vibrant living environments. These green elements not only improve air quality and biodiversity but also offer residents opportunities for recreation and relaxation, enhancing their quality of life.

Policymakers and urban developers are increasingly recognizing the value of a combined approach to sustainable urban development. By leveraging technology to optimize resource use while fostering community-led, nature-centric practices, cities can become more resilient to climate change and better equipped to handle the challenges of the future. This dual strategy promotes a balanced lifestyle where people benefit from modern conveniences without sacrificing their connection to the environment.



The convergence of smart city and eco-village principles holds immense potential for redefining urban living. As the world faces growing ecological and social pressures, the need for a harmonious blend of high-tech solutions and low-impact living becomes more pressing. Urban spaces that integrate both approaches can provide residents with the best of both worlds: the convenience and safety offered by advanced technologies, and the well-being and environmental harmony promoted by sustainable, community-oriented practices.

For future generations, this means access to cities that prioritize cleaner air, efficient energy use, and robust public services alongside nurturing environments that encourage a deep connection with nature and a sense of belonging. Urban development must move beyond the one-size-fits-all model and embrace diversity in its approaches. By adopting a dual approach that values both technological innovation and ecological wisdom, the cities of tomorrow can become beacons of sustainability, resilience, and quality of life.



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Voices of BVICAM



Dr. Ritika Wason, Associate Professor

"I believe technology holds the key to tackling climate change by providing cleaner energy solutions and reducing our carbon footprint."

Dr. Parul Arora, Associate Professor

"With advances in green technology, we can create sustainable agricultural systems that boost food security without harming the environment."



Dr. Saumya Bansal, Assistant Professor

"Renewable energy technologies like solar and wind are critical if we want to reduce our reliance on fossil fuels and combat global warming."

Dr. Rakhee, Assistant Professor

"Smart cities and IoT (Internet of Things) can help optimize resource use and reduce waste, making urban areas more sustainable and livable."



Ms. Ayushi Chopra, Associate Professor

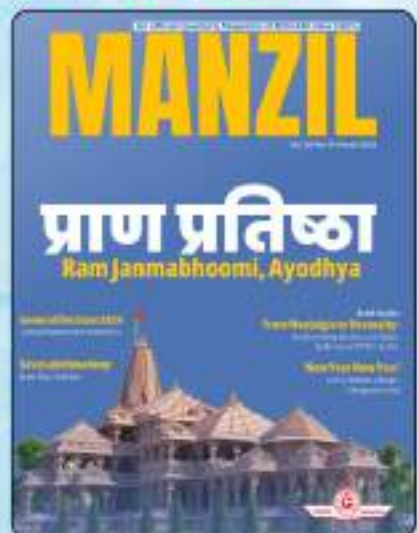
"Through data analytics and artificial intelligence, we can monitor environmental changes in real time, allowing for faster and more effective conservation efforts."

Mr. Shubham Mishra, Assistant Professor

"Digital platforms can play a significant role in promoting education and awareness about sustainable practices across communities."



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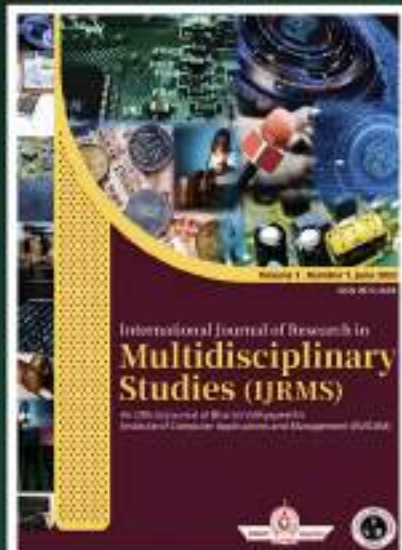
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Bharati Vidyapeeth's
Institute of Computer Applications and Management (BVICAM)
A-4, Paschim Vihar, Rohtak Road, New Delhi-110063
Tel: +91-11-25275055, 25255056