# SEMINAR PROCEEDINGS

## ALL INDIA SEMINAR ON

# "GREEN RENEWABLE ELECTRONICS FOR ENVIRONMENTAL NURTURING AND SUSTAINABILITY" (GREENS)

THINK GREEN, ACT CLEAN, GO TECH-GREEN!

**04 & 05 February, 2025**

***JOINTLY ORGANISED BY***

**The Institution of Engineers (India)**
**U.P. State Centre, Lucknow-226018**
**&**
**Institute of Engineering & Technology**
Sitapur Road, Lucknow-226021 (UP) India

**Venue :** Room No. LT-11, Old LT Building, I.E.T., Lucknow

# ABOUT THE SEMINAR

The All India Seminar on "Green Renewable Electronics for Environmental Nurturing and Sustainability" (GREENS) aims to address the urgent need for sustainable practices in electronics, amid rapid technological progress and environmental challenges. It will unite researchers, industry experts, policymakers and educators to collaborate and explore for advancements in green electronics. Key topics include Eco-Friendly Materials & Manufacturing, Energy Efficiency, Renewable Energy Integration, Lifecycle Assessment, and E-Waste Management. Additionally, it will examine policies and regulatory frameworks supporting sustainable practices and focus on incentives for Eco-Friendly Innovations. By fostering collaboration, GREENS seeks to drive the transition towards sustainable electronics, providing participants with insights into the practical steps needed to achieve environmental goals in the electronics industry. Through discussions on policies, case studies, and innovative solutions, the seminar aims to inspire actionable steps toward environmentally responsible electronics and foster collaboration for a sustainable future.

# SUB -THEME OF SEMINAR

- Sustainable Power Generation and Management
- Energy-Efficient Electronics Design
- Role of Microelectronics in sustainable technology
- Role of Communication in Design Energy Efficient Electronics
- Renewable Energy Integration and Storage Systems
- Green Materials and Recycling in Electronics
- Smart Grids and Micro Grids
- Use of AI/ML in Green Technology
- Al and IoT in Energy Conservation
- Electric Vehicles and Sustainable Transportation Systems
- Photovoltaic and Solar Power Systems
- Sustainable Electronics Manufacturing Processes
- Policy, Regulation, and Education for Green Electronics
- Green and Smart Cities

# THE INSTITUTION OF ENGINEERS (INDIA)

" The Institution of Engineers (India) or IEI is the largest multidisciplinary professional body that encompasses 15 engineering disciplines and gives engineers a global platform for sharing professional interest. IEI has membership strength of above 2.6 lakhs. Established in 1920, with its headquarter Kolkata, IEI has served the engineering fraternity close to a century. During this period of time, IEI has been inextricably linked with the history of modern-day engineering.

In 1935, IEI was incorporated by Royal Charter and remains the only professional body in India which has been accorded this honour. Today, its quest for professional excellence has given it a place of pride in almost every prestigious and relevant organization across the globe. It provides a vast array of technical, professional and supporting services to the Government, Industries, Academia and the Engineering fraternity, operating through its 124 Centres located across the country and 6 overseas chapters. Besides, IEI has bilateral agreements with about 31 international bodies and membership of another 8 international bodies of the developed nations across the globe.

Being recognized as a Scientific and Research Organisation (SIRO) by the Department of Scientific and Industrial Research, Ministry of Science and Technology, Government of India, IEI promotes the cause of research and development by providing Grant-in-Aid support to undergraduate, post graduate students and PhD Research Scholars of Engineering Institutions and Universities.

IEI has been recognized as Scientific and Industrial Research Organization (SIRO) by the Ministry of Science & Technology, Government of India and besides conducting its' own research, provides Grant-in-Aid to UG/PG/PhD students of Engineering institutes and Universities.

IEI holds the International Professional Engineers (IntPE) Register for India under the global International Professional Engineers Alliance (IntPEA). The institution also awards the Professional Engineers (PE) Certification.

IEI in collaboration with Springer regularly publishes peer-reviewed international journal in five series, namely, Series A, Series B, Series C, Series D and Series E covering fifteen engineering disciplines."

# A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY

Dr. A.P.J. Abdul Kalam Technical University (AKTU) is a renowned public state university established in 2000 by the Government of Uttar Pradesh. Named in honor of India's 11th President, Dr. A.P.J. Abdul Kalam, the university is committed to fostering excellence in technical education, research, and innovation.

The University is affiliating in nature and its jurisdiction spans the entire state of U.P. in affiliating B.Tech., M.B.A., M.C.A., B.Arch., B. Pharma., B.H.M.C.T., M.Tech. and Ph.D. programmes in 764 colleges/institutions imparting graduate, postgraduate and doctoral level training in all government and private institutions located all over U.P. in engineering, technology, architecture, pharmacy, hotel management and catering technology as well as M.B.A. and M.C.A. programmes.

# INSTITUTE OF ENGINEERING & TECHNOLOGY

The Institute of Engineering and Technology (IET), Lucknow, widely recognized as the "Engineering College" in Lucknow, is one of the premier and top-ranked institution among the technical colleges affiliated with AKTU, Lucknow. The institute was formerly affiliated (1984-1999) to The University of Lucknow, currently an Autonomous Institute and recognized by AICTE. The institute is a constituent college of AKTU, Lucknow.

# MESSAGE OF PRESIDENT

## THE INSTITUTION OF ENGINEERS (INDIA)

**(ESTABLISHED 1920, INCORPORATED BY ROYAL CHARTER 1935)**
**8, GOKHALE ROAD, KOLKATA-700020**

***"A CENTURY OF SERVICE TO THE NATION"***

**ER. V.B. SINGH, FIE**
**PRESIDENT**

**MESSAGE**

**It is my immense pleasure to note that Uttar Pradesh State Centre of The Institution of Engineers (India) in association with Institute of Engineering & Technology (IET) is organizing an All India Seminar on "Green Renewable Electronics for Environmental Nurturing and Sustainability" (GREENS) on 04-05 February, 2025.**

**I complement the organizers for choosing such a contemporary theme for the Seminar. I hope that the deliberations on the topic would cover all aspects of 'Green Renewable Electronics for Environmental Nurturing and Sustainability'. I am sure that the recommendations out of the deliberations at the Seminar will benefit the policy makers, implementing agencies and all concerned stake- holders.**
**I wish the Seminar a grand success and convey my hearty wishes to the organizers.**

**(V B SINGH)**
**PRESIDENT**

# MESSAGE OF CHAIRMAN

## MESSAGE

**I extend my heartfelt congratulations and best wishes for the success of the Two-Day All India Seminar on "Green Renewable Electronics for Environmental Nurturing and Sustainability" (GREENS) being organized by The Institution of Engineers (India), UP State Centre, Lucknow in association with Institute of Engineering & Technology (IET).**

**The seminar will focus on several key areas including eco friendly materials and manufacturing processes highlighting the latest advancements in the use of biodegradable recyclable and non toxic materials in electronics manufacturing discussions will include innovations in reducing e waste and the environmental impact of electronics production additionally energy efficiency and renewable energy integration will be explored with a focus on technologies that enhance energy efficiency in electronics device and the integration of renewable energy sources.**

**I commend the efforts of The Institution of Engineers (India), UP State Centre & Institute of Engineering & Technology (IET) for taking the initiative to address this critical issue by gathering experts from various fields and facilitating meaningful discussions, paving the way for effective strategies and policies that can make a significant impact on "Green Renewable Electronics for Environmental Nurturing and Sustainability" (GREENS).**

**Wishing all the best for success of seminar.**

**Satya Prakash**
**(FIE Chairman)**

# MESSAGE OF HON'BLE VICE CHANCELLOR


प्रो० जय प्रकाश पाण्डेय
कुलपति
Prof. Jai Prakash Pandey
Vice Chancellor

डॉ० ए०पी०जे० अब्दुल कलाम प्राविधिक विश्वविद्यालय
उत्तर प्रदेश, लखनऊ
Dr. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY
Uttar Pradesh, Lucknow


Dated: 01.02.2025

## MESSAGE

I am glad to know that the Institution of Engineers (India) is going to organize All India Seminar on **"Green Renewable Electronics for Environmental Nurturing and Sustainability" (GREENS)** in association with Electronics and Communication Engineering Department, Institute of Engineering & Technology, Lucknow on 04 & 05 Feb. 2025.

The All India Seminar on "Green Renewable Electronics for Environmental Nurturing and Sustainability" (GREENS) aims to address the urgent need for sustainable practices in electronics, amid rapid technological progress and environmental challenges. It will unite researchers, industry experts, policymakers and educators to collaborate and explore for advancements in green electronics. Key topics include Eco-Friendly Materials & Manufacturing, Energy Efficiency, Renewable Energy Integration, Lifecycle Assessment, and E-Waste Management. Additionally, it will examine policies and regulatory frameworks supporting sustainable practices and focus on incentives for Eco-Friendly Innovations. By fostering collaboration, GREENS seeks to drive the transition towards sustainable electronics, providing participants with insights into the practical steps needed to achieve environmental goals in the electronics industry. Through discussions on policies, case studies, and innovative solutions, the seminar aims to inspire actionable steps toward environmentally responsible electronics and foster collaboration for a sustainable future.

I extend my best wishes to the organizing committee and grand success to the Seminar.


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# MESSAGE OF DIRECTOR


इंस्टीट्यूट आफ इंजीनियरिंग एण्ड टेक्नोलाजी
**Institute of Engineering & Technology**
सीतापुर रोड, लखनऊ –226021 (उ. प्र.) भारत
Sitapur Road, Lucknow – 226021 (UP) India


**MESSAGE**

It is a great honour for the Institute of Engineering & Technology, Lucknow, to host the "Green Renewable Electronics for Environmental Nurturing and Sustainability" (GREENS) seminar, organized in collaboration with The Institution of Engineers (India), U.P. State Centre. I am truly delighted that we have come together with IEI to bring forward an event of such immense importance, addressing the intersection of technological innovation and environmental sustainability. In an era where the electronics industry plays a pivotal role in global development, it is vital that we focus on green practices that minimize environmental impact. This seminar provides an excellent platform to discuss the latest advancements in energy-efficient electronics, renewable energy integration, e-waste management, and sustainable manufacturing practices. The collaborative efforts of academia, industry experts, and policymakers will undoubtedly generate valuable insights and actionable strategies for creating a more sustainable electronics sector.

I extend my heartfelt thanks to The Institution of Engineers (India), U.P. State Centre for partnering with us on this initiative and bringing together such a distinguished group of professionals to explore and shape the future of green electronics.

Looking forward to a productive and inspiring seminar that will set the stage for sustainable innovations in electronics.

(Prof Vineet Kansal)
Director

# MESSAGE OF HEAD OF DEPARTMENT

## MESSAGE

It is my great pleasure to welcome you to the All India Seminar on "Green Renewable Electronics for Environmental Nurturing and Sustainability" (GREENS) jointly organised by Institute of Engineering & Technology (IET), Lucknow, in collaboration with the Institution of Engineers (India), U.P. State Centre, which takes place in beautiful city Lucknow, Uttar Pradesh on February 4- February 5, 2025. It has been a real honour and privilege to serve as the seminar co-convener & Head of the Electronics and Communication Engineering Department, IET, Lucknow.

I am particularly proud that Electronics and Communication Engineering department is playing a key role in organizing this All India Seminar at national level, which focuses on one of the most pressing issues of our time-creating a sustainable future through innovative advancements in electronics. These initiative aims to reduce pollution, lower energy consumption and create a circular economy where electronics devices designed, used and disposed of responsibly. The seminar will bring together thought leaders, researchers, and experts who will share their insights on energy-efficient designs, eco-friendly materials, and the integration of renewable energy systems in electronics. These are critical areas that our department is deeply committed to exploring and advancing. A reasonable motivation through the topic events of the All India Seminar may certainly enrich the skills of researcher.

We sincerely thank all the speakers and delegates for their participation and various organizations. Special thanks are due to the seminar chair, session chair and to all external referees for the quality and depth of the reviews, and their sense of responsibility and responsiveness under the tight deadlines. We also gratefully acknowledge the effects that have been put in by our Institute, The collaboration with IEI reflects our shared vision for fostering a greener and more sustainable electronics industry, and I am confident that this event will inspire new ideas, foster partnerships, and pave the way for impactful solutions in the field.

I Congratulate and appreciate sincerely for all the efforts of Prof. Neelam Srivastava (seminar chair) and all those who may cooperate in making this occasion a grand success event. I look forward to the valuable discussions that will emerge from this seminar.

Best regards,

(Professor Subodh Wairya)
Head of Electronics & Communication
Engineering Department
Institute of Engineering & Technology,
Lucknow

# MESSAGE OF CONVENOR

## MESSAGE

It is a great privilege and honour for me to be the part of Executive committee of "Institution of Engineer's" as Member "Electronic and Telecommunication Division" , UP State Center, Lucknow. Under the ages of "Electronic and Telecommunication Division" we are Organizing All India Seminar "Green Renewable Electronics for Environmental Nurturing and Sustainability" (GREENS) with Electronics and Communication Engineering Department of Institute of Engineering &Technology, Lucknow at college premises.

This seminar aims to address the critical need for sustainable practices in the rapidly advancing field of electronics, with a focus on fostering solutions that balance technological progress and environmental responsibility.

We are at a crucial moment where technological advancements must go hand in hand with environmental responsibility. The focus of this seminar will be on promoting innovative solutions in key areas like energy-efficient electronics design, the integration of renewable energy, e-waste management, and the role of AI in driving green technologies. Through collaborative discussions, we hope to explore practical approaches to overcome the challenges and create a roadmap for sustainable electronics manufacturing and consumption.

The engagement of experts, researchers, industry leaders, and policymakers will help us shape future where green electronics can thrive, reduce environmental impact, and contribute to a more sustainable world. Our discussions on policies, regulatory frameworks, and educational initiatives will provide the necessary insights to propel the transition towards an eco-friendlier electronics industry.

It is blended mixture of experience of very senior IEI fellows and Innovative minds of young students and faculties of Engineering Colleges of Uttar Pradesh.

I am confident that this seminar will spark new ideas, foster collaborations, and inspire actionable steps towards a more sustainable and responsible future for the electronics sector.

I extend my sincere gratitude to all the stakeholders for their support and participation, and I wish all attendees a fruitful and engaging experience.

Srivastava

Best regards,
Prof Neelam Srivastava
Convener, GREENS 2025

## The National Advisory Committee

| | |
|---|---|
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| **Seminar Chair & Convenor:** | Prof. Neelam Srivastava, ECE Dept., IET Lucknow |

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Dr. Narendra Pal, Guest Faculty, IET, Lucknow.
Er. Shahneela Jamal Kidwai, Guest Faculty, IET Lucknow

# KEYNOTE SPEAKERS

| Sr. No. | Name | Topic | College |
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| 1 | Dr. Ritu Soryan | From Policy to Practice: Building a Sustainable World Through Education. | Dronacharya Group of Institutions, Greater Noida |
| 2 | Amitosh Verma | Grid Connected Solar PV Plant & Its components | Sr. Manager, Asset Management group NGEL, Bilhaur Solar Project, Kanpur |
| 3 | Prof. Harsh Vikram Singh | Green & smart cities | Head, Professor, Electronics Engineering Department, KNIT, Sultanpur |
| 4 | Dr. Vani Bhargava | Advancements in Multilevel Inverter Technology for Efficient Renewable Energy Integration and Sustainable Power Systems | Ajay Kumar Garg Engineering College, Ghaziabad, Department of Electrical & Electronics Engineering, Ghaziabad |
| 5 | Meenu Khare | Boondo ke na tute lari | AIR Lucknow |
| 6 | Beerendra Maurya | Green Telecom and *E waste Govt Initiative | BSNL Lucknow |
| 7 | Gaurav Dixit | Green IT Infrastructure: Sustainable Usage Effectiveness | Strategic Alliances and Service Delivery Manager at Lefdal Mine Datacenter, Norway |
| 8 | Sanjay Gahlot | Photovoltaic and solar power systems | Director, Raghav, Enterprises, Saharanpur |
| 9 | Dr. Seema Srivastava | E-Waste and Toxicology | Bennett University, Greater Noida. |
| 10 | Dr. Aditi Sharma | Unequal Cities-Bringing Balance through Development of Sustainable - Green IOT based Smart City Infrastructure and its application model | Associate Professor, Department of Computer science, Symbiosis Institute of Technology, Pune (India) |
| 11 | Dr. Khadim Moin Siddiqui | AI and IoT in Energy Conservation: Challenges, Opportunities, and Trends | Present Affiliation: S.R. Institute of Management & Technology, Lucknow |
| 12 | Dr. Yajnaseni Dash | Artificial Intelligence in Sustainability: Redefining Green Solutions | School of Artificial Intelligence, Bennett University, Greater Noida, UP, India |

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# Sub Theme-1
# Sustainable Power Generation and Management

**Paper Id-0101**

**Paper Title-Advancements and Challenges in Prepaid Energy Meter Systems for Sustainable use of Electricity**

Shahneela Jamal Kidwai, Prerana Singh, Ojas Mishra, Srishti Singh, Vipul Kumar, Aman Kumar

**Abstract:** As the world moves towards sustainability, energy management becomes crucial. In this evolving era there is a significant shift towards integrating advanced technologies into power distribution networks. This paper highlights the transformative impact of smart grids, particularly through the integration of sensors, which optimize energy distribution, enhance grid resilience, and ensure adaptive responsiveness. Another key innovation explored is the Internet-based prepaid energy meter, which utilizes the Internet of Things (IoT) and dual-core microprocessor units to create an automated system for energy measurement and billing. This system not only ensures precise energy sensing but also effectively manages network connectivity, storage, computations, and overall performance. The deployment of prepaid energy meters addresses electricity theft by requiring users to prepay for electricity, thereby reducing unauthorized usage. However, the implementation of smart meters also introduces challenges that necessitate innovative solutions to maintain energy system integrity. For instance, a GSM-based energy recharge system with tamper detection has been proposed to enhance security and provide real-time monitoring and access control. This study highlights the advancements in energy systems, emphasizing the integration of IoT and other technologies to improve efficiency, sustainability, and security in energy management. Research conducted shows combining IoT, microcontrollers, and web technologies to develop an interactive and automated prepaid energy metering system that addresses contemporary challenges such as energy theft and billing inaccuracies. This shift towards intelligent, adaptive, and interconnected systems marks a significant step towards achieving unprecedented efficiency and technological synergy in the energy sector.

## Paper Id-0102

## Paper Title- Smart Energy Management System for Institutional Buildings: An IoT-Based Approach to Energy Conservation

Abhijeet Singh, Pushpendra Singh, Shivam Chaurasiya, Shailendra Badal

**Abstract:** This study illustrates an innovative energy management system designed to reduce electricity waste in academic buildings using automated control and Internet of Things (IoT) monitoring. The system tackles the increasing problem of energy conservation in government and educational organizations. The proposed solution integrates three core components: a bidirectional counter utilizing IR sensors for precise occupancy detection, environmental sensors for contextual awareness, and IoT connectivity for comprehensive remote monitoring and control. An Arduino-based control unit is used in the system to regulate appliance operations in response to environmental factors, such as temperature and light levels and real-time occupancy data. While a smart energy meter interface offers comprehensive power consumption insights, integration with the Thing Speak platform allows for remote monitoring and control capabilities. The implementation consists of threshold-based environmental controls and automatic switching methods with a 5-minute timeout feature. Testing shows that automated appliance management may effectively save energy while preserving user comfort. The system can adapt to changes in the environment and occupancy patterns. Effective resource management through data-driven decision-making is made possible by the IoT integration, which is dependable for remote monitoring and control. With the possibility of future improvements through the integration of renewable energy sources and machine learning optimization, this solution provides a scalable and economical method of managing institutional energy.

## Paper Id- 0103

## Paper Title-Sustainable Power Generation and Management in India

Mr. Tanuj Kumar Gupta

**Abstract:** With the growing Population in India we need to increase the sources of Renewable energy like solar power, wind power with the goal of achieving a significant share of non-fossil fuel electricity generation by 2030.We have to see the other alternatives of nuclear power and hydropower and however we have to reduce dependence on fossil fuel. There are many key aspects of sustainable power generation and management in India like renewable energy dominance, hydropower utilization, grid integration and storage energy efficiency program, Government policies and targets. We are facing many challenges like fossil fuel dependence, grid infrastructure limitations, land acquisition and environmental concerns and cost competitiveness. In this paper we will discuss the key initiatives through we can promote sustainable power generation in India.

**Paper Id- 0104**

# Paper Title- Advancing Environmental Monitoring: A Multivariate Approach to Air Quality Assessment

Aditya Pratap Singh, BDK Patro

**Abstract:** The increasing concern over environmental pollution necessitates the development of advanced monitoring systems capable of providing real-time insights into gas concentrations. In response, this paper presents an innovative approach leveraging Internet of Things (IoT) technology for gas sensing and predictive analysis in environmental monitoring. Utilising Node MCU hardware integrated with MQ135 and MQ6 sensors, the system gathers real-time data on key gases including particulate matter (PM2.5, PM10), nitrogen dioxide (NO2), ammonia (NH3), sulfur dioxide (SO2), and carbon monoxide (CO). Employing a multivariate approach, the collected data undergoes comprehensive analysis including mean, median, standard deviation, and range calculations to discern gas concentration trends. visualisation techniques such as histograms, box plots, and time series plots offer deeper insights into gas distribution and temporal dynamics. The primary innovation lies in the development of a predictive model capable of estimating one gas's concentration based on the input of other gases, enhancing proactive environmental monitoring and management. Furthermore, the study computed Air Quality Index (AQI) values separately for various pollutants, then averaged them to classify the overall AQI level, providing insights into the current air quality status. This research contributes to advancing IoT-based environmental monitoring systems by providing a robust framework for gas sensing and predictive analysis, offering actionable insights for mitigating environmental pollution.

# Sub Theme-2
# Energy Efficient Electronic Design

**Paper Id-0201**

**Paper Title-Advanced Smart Stick for Navigation and Object Detection Using Raspberry Pi for Visually Impaired**

Abhishek Nigam, Shantanu Khare, Nikhil Agrahari, Adarsh Rai, Bhawana Singh, Sheetal Singh, Anurag Yadav, Subodh Wairya

**Abstract:** The present work is on an enhanced mobility and object recognition system with real-time location tracking for visually impaired that embodies a groundbreaking fusion of technology, designed to empower individuals facing visual impairments. At its core lies a Raspberry Pi controller, orchestrating a symphony of cutting-edge components. Sensors strategically placed alongside a sophisticated camera module meticulously detect and recognize objects in the user's path. This data undergoes seamless processing via state-of-the-art image recognition algorithms, culminating in informative auditory feedback delivered through a dedicated speaker. This real-time guidance significantly heightens the user's spatial awareness, fostering enhanced mobility and confidence. This work presents the Smart Stick Object Recognition System, a groundbreaking assistive technology designed to enhance the mobility and independence of visually impaired individuals. Leveraging advanced hardware components and sophisticated algorithms, this system achieved real-time object detection and recognition, facilitated by the integration of a Raspberry Pi Controller and OpenCV Object Recognition Module. Furthermore, the inclusion of auditory feedback and Global Positioning System (GPS) and Global System for Mobile Communication (GSM) based location tracking provided users with enhanced situational awareness and safety. The comparative results demonstrate the system's potential to revolutionize assistive technologies, offering users newfound autonomy and inclusivity in navigating their surroundings.

**Paper Id-0202**

# Paper Title-Efficient Design of a Compact Wideband Filtering Antenna using Fusion Technique for IoT Wireless Network

Maneesha Dwivedi, Jaspreet Kaur, Neelam Srivastava

**Abstract-** Sustainability and energy efficiency are becoming important pillars driving technological development in the rapidly evolving telecommunication sector. Responsible resource management and environment conservation are becoming increasingly important as the need for connectivity rises. As wireless services and technologies such as 5G and beyond, Li-Fi, GPS, next generation LANs etc, which are based on different frequency bands are becoming increasingly accessible. In order to reduce the interference among different services, antennas with customize performance that outperform conventional antennas are highly required. The one of the promising solutions is to integrate multiple Radio Frequency (RF) components into single structure. So, This paper presents the design and implementation of a compact defected ground structure based filtering antenna or filtenna with enhanced performance using Fusion Technique. A Pentagonal shape patch, Stepped Impedance resonator, and a feeding microstrip line are integrated to form the filtenna operating at 2.4GHz frequency. With greater frequency selectivity at the pass band edge, the proposed filtenna arrangement has a wider bandwidth of 195 MHz (2.3066-2.5013 GHz), return loss of -35.498 dB and near zero Insertion loss. The maximum gain of filtenna is 3.517 dB at 2.4GHz frequency. This integration of filter and antenna leads to miniaturized dimension (43mmx 34mm) of filtenna with stable radiation pattern suitable for IoT wireless devices. All of the numerical simulations and their optimizations were performed using CST Microwave Suite software.

## Paper Id-0203

### Paper Title-Design and Performance Evaluation of Energy efficient Base Station Antennas

Shiv Kumar Vishwakarma, Rajiv Kumar Singh

**Abstract:** The increasing demand for wireless communication necessitates the deployment of base station antennas with optimized designs to ensure efficient energy use while minimizing human exposure to electromagnetic fields. This study focuses on the design, simulation, and compliance analysis of base station antennas, including the calculation of Average Power Density, Peak Power Density, compliance distance (safe distance from base station antenna radiation) and exposure levels for both general and occupational scenarios. Using CST Microwave Studio Suite, a parametric analysis is conducted to evaluate antenna performance, focusing on radiation efficiency, directivity, and power. This work emphasizes the development of antenna designs with reduced energy consumption and enhanced radiation control, contributing to sustainable wireless communication infrastructure by adhering to safety and efficiency standards against guidelines provided by international organizations, such as the International Commission on Non-Ionizing Radiation Protection, Federal Communications Commission, and World Health Organization

## Paper Id-0204

### Paper Title-SAR-based Solutions for Oil Spill Detection: A Path to Sustainable Development

Amol Sharma

**Abstract-** Oil spill detection and monitoring are fundamental activities for the preservation of marine ecosystems, aquatic habitats, and coastal environments. With the advancing of remote sensing technologies, Synthetic Aperture Radar (SAR), especially Sentinel-1 data, is becoming one of the mainstays in meeting the challenges of oil spill detection and assessment. Because it has an all-weather, high-resolution, daynight operational capability, the Sentinel-1 SAR serves as a cornerstone in the formation of next-generation environmental monitoring systems. More recent breakthroughs, such as polarimetric decomposition, multi-physical feature extraction, and deep learning integration, are promising to revolutionise oil spill detection by improving accuracy, scalability, and adaptability, These state-of-the-art technologies enable the precise identification of oil slicks even in difficult conditions and support real-time trajectory modelling. Combined with ecological impact assessment and predictive frameworks, these technologies ensure unparalleled levels of robustness and efficiency in operational spill management. The integration of hydrodynamic models with intelligent algorithms allows for better forecasting, reduces environmental and economic damage, and protects marine biodiversity and coastal resources. Furthermore, SAR integration with emerging technologies opens up new horizons, such as oil spill data with green communication systems and sustainable development goals. The scope of SAR-based detection in this respect is therefore expanded, guaranteeing effective response in remote or highly ecologically sensitive regions. Through such innovation, SAR oil spill detection frameworks are placed strategically at the forefront to answer evolving demands from environmental conservation and disaster management. This progress paves the way for a resilient and sustainable future, ensuring the protection of marine and coastal ecosystems while addressing the burgeoning challenges presented by oil spills.

## Paper Id-0205

## Paper Title-Generating Point Cloud and 3D Models of Different Structures & Objects: A Comparison between LiDAR and Close-Range Photography (CRP)

Aishwarya Chandel, Rajiv Kumar Singh

**Abstract:** The generation of 3D models and point clouds has become a cornerstone in various fields, including construction, urban planning, heritage conservation, and environmental monitoring. LiDAR (Light Detection and Ranging) and close-range photography are two commonly used methods for this purpose. This paper explores the methodologies, benefits, and limitations of both techniques, providing a comparative analysis of their performance in generating renewable and reusable 3D models. The study highlights key metrics such as accuracy, resolution, cost, time efficiency, and suitability for different applications. The findings aim to guide professionals in selecting the most appropriate method for their specific needs.

## Paper Id- 0206

## Paper Title-Enhancing Sustainability: A Comprehensive Review on Green Wireless Communication Technologies and Trends

Sushil Kumar Gupta, Shreya Pandey, Siddharth Srivastava, Ashish Kumar Rao

**Abstract:** The rapid development of wireless communication technologies has sparked worries about environmental sustainability and energy use in recent years. Green wireless communication has become a crucial research topic for lowering energy consumption, increasing energy efficiency, and minimizing the carbon footprint of communication systems. This article thoroughly analyses current developments in green wireless communication, highlighting creative strategies, enabling technology, and system architectures. Some of the main subjects are energy-efficient hardware and software, wireless networks that integrate renewable energy, green Internet of Things (IoT) applications, and developments in green 5G and 6G technology. The paper also focuses on how edge computing, machine learning, and artificial intelligence (AI) might be used to maximize energy efficiency and better reliability. Issues including scalability, the economic feasibility of green technologies, and trade-offs between energy usage and performance are also discussed. The article concludes by outlining open research issues and future directions in green wireless communication, offering a road map for the industry's sustainable growth.

# Sub Theme-3

# Role of Microelectronic in Sustainable Technology

## Paper Id-0301

### Paper Title-Performance Analysis of Low Power Bulk Driven Current Conveyor Circuit for Energy Harvesting System

Priya Singh, Anurag yadav, Rahul Singh, Subodh Wairya

**Abstract:**This work presents a design of Bulk-Driven (BD) Current Conveyor of the second generation (CCII) tailored for ultra-low-power and ultra-low-voltage regimes, implemented in advanced 90nm CMOS technology and a comparison between a bulk driven and gate driven devices. Ultra-low-voltage (ULV) and ultra-low-power (ULP) CMOS circuits have become indispensable in modern portable and implantable electronic systems, where stringent power and energy constraints necessitate highly optimized designs for enhanced efficiency and prolonged operational lifetimes. The architecture leverages the bulk-driven approach to achieve superior input dynamic range, enabling rail-to-rail operation even under stringent supply voltage constraints. By biasing the MOSFETs in the subthreshold region, the design minimizes power consumption, aligning with the principles of energy efficiency and sustainable electronics. The circuit operates with a supply voltage as low as 0.3V, significantly below the threshold voltage of 0.5V of the transistors, underscoring its compatibility with modern low-energy systems. The utilization of the bulk terminal for signal manipulation not only enhances input voltage adaptability but also contributes to reduced energy dissipation, promoting environmentally responsible design practices. Such circuit designs are critical in advancing green technology solutions, particularly for applications requiring prolonged battery life or autonomous energy harvesting systems.

## Paper Id-0302

### Paper Title-Advancing Towards Sustainability: The Role of MTJs in Reducing Area and Boosting Efficiency in Electronic Design

Garima Singh, Shahneela J. Kidwai, Subodh Wairya

**Abstract: -** The advancement of modern electronics has demanded for energy efficient designs for sustainability. This can be improve by reducing power consumption without compromising its performance. As technology is increasing day by day, leakage power consumption and energy efficient logic circuits plays a vital role. Magnetic Tunnel Junctions (MTJs) have emerged as a promising technology. MTJ is a spintronic device that operates on spin of electrons. MTJ consist of two ferromagnetic layers which is separated by an insulating layer. It exhibits Tunneling Magnetoresistance (TMR) effect that occurs in MTJ i.e, change in resistance in Antiparallel magnetization to Parallel magnetization. MTJs are non-volatile in nature, such as Magnetic Random Access Memory (MRAM) due to its ability to retain data without power supply. MTJ devices have many advantages such as nearly zero leakage power, high integration density and it is easily compatible with CMOS circuits. Another one important principle of MTJ is Spin Transfer Torque (STT) with reduced energy consumption. This makes MTJs suitable for low power and high-speed applications in memories. This abstract highlight the increasing growth of sustainable electronic technologies. MTJs provides a path to enhance energy efficiency and well suited for next generation electronic systems. By meeting this criterion, MTJ need green and sustainable environment.

**Paper Id-0303**

# Paper Title-Performance analysis of Multi Logic Sense Amplifier for VLSI applications

Km. Akhya Pandey, Anurag Yadav, Subodh Wairya

**Abstract:** Microelectronics plays a vital role in advancement of sustainable technology by enabling energy-efficient, high-performance in memory architectures. The Von Neumann architecture faces a performance bottleneck due to data transfer between memory and computation units. This issue can be resolve using the concept of in-memory computing, including dynamic random-access memory (DRAM), static random-access memory (SRAM) and non-volatile memory (NVM). In this work SRAM-based computing architecture is analyzed which includes the concept of multi-logic sense amplifier. This makes design capable for performing multiple logic operations (OR/NOR, AND/NAND, XOR/XNOR) with enhanced efficiency. This makes design capable for performing multiple logic operations with enhanced efficiency. These logic operations are analyzed using 45 nm CMOS technology of Cadence software. This design developed and optimized using multi-logic sense amplifier for in-memory computing, emphasizing its role in advancing sustainable technology through the lens of microelectronics. By minimizing energy-intensive data movement and supporting parallel operations, the multi-logic sense amplifier significantly reduces the computational overhead associated with traditional computing systems.

# Sub Theme-4
# Role of Communication in Design Energy Efficient Electronics

## Paper Id-0401

## Paper Title-Energy Harvesting to Improve the Sustainability and Reliability of Green Communication in Next-Generation Wireless Systems

Ashish Kumar Rao, Siddharth Srivastava, Gajendra Singh, Sushil Kumar Gupta

**Abstract:** This study explores methods for integrating energy harvesting technology into future-focused wireless frameworks in order to provide dependable and ecologically friendly transmission. There is an urgent need to reduce the environmental impact as the demand for wireless access keeps growing. By using ambient natural energy sources like solar, wind, and kinetic energy to power wireless infrastructure and devices, energy harvesting presents a viable alternative. The main objective of this study is to explore the challenges in sustainability and reliability of green communication in next generation wireless system (NGWS). This includes developing efficient power management plans, flexible transmission schemes, and reliable error control systems. These developments are essential for preserving uninterrupted connectivity in the face of varying energy supplies. In terms of methodology, the study uses different survey to find how well wireless networks with energy-harvesting strategies operate in a variety of real-world situations. To evaluate the efficacy of the suggested approaches, key performance metrics such as energy efficiency, dependability, latency, and throughput can be carefully optimized. It is expected that the study's findings will greatly progress the development of environmentally friendly wireless communication technology. The goal of the study is to help create more durable and environmentally friendly next-generation wireless systems by efficiently utilizing energy harvesting technologies. By lowering the overall environmental impact of conventional wireless communication infrastructures, these technologies are well-positioned to satisfy the growing needs for connection.

## Paper Id-0402

## Paper Title-5G AND 6G COMMUNICATION SYSTEMS

Ayush Kumar

**Abstract:** The evolution from 5G to 6G represents a transformative leap in wireless communication technology, not only enhancing connectivity but also contributing significantly to environmental health and societal sustainability. This paper explores the prospects of 6G applications based on 5G technology, emphasizing their potential to address global challenges such as climate change, resource depletion, and public health. Through examining how 6G builds upon the foundations of 5G, this paper illustrates how these technologies can contribute to environmental sustainability by promoting energy efficiency, enabling smart
Infrastructure, and fostering sustainable economic practices.

## Paper Id-0403

## Paper Title-Energy Consumption Monitoring in Office Environment Using Sensor Network

Rupali Mahajan, Harsh Vardan Dubey, Anushka Jadon

**Abstract:** Energy consumption monitoring refers to the process of tracking, analyzing and managing energy usage to reduce wastage and lower electricity bills. It is an essential practice for households, offices and industries aiming to meet energy-saving goals. The energy monitoring system designed here aims to monitor the energy consumption in office environment in terms of power consumed (in watts) by the load, which may be an electric bulb, fan, electric kettle used in an office, determine the units of electricity used (in kWh) and predict electricity bill (in Rupees). These values can be viewed on serial monitor of Arduino IDE and also on the web page. The user can thus get an estimate of the bill, can optimize energy usage and reduce the amount of bill. The system consists of current sensor ACS712 that measures the current flowing through the load, send it to ESP32 which output power, number of units and bill amount. These values are displayed on the web page. Thus, the system is designed using few components, it is cost effective and beneficial for energy saving.

## Paper Id-0404

## Paper Title-Energy Harvesting using SWIPT in Multi-User Cooperative NOMA Systems

Nimisha Srivastava, Jaspreet Kaur, Pallavi Pant, Amit Kumar, Neelam Srivastava

**Abstract:** The integration of Simultaneous Wireless Information and Power Transfer (SWIPT) in Non-Orthogonal Multiple Access (NOMA) overcomes the challenges posed by traditional NOMA as it combines energy harvesting and data communication into a single system., By using energy gathered from base station signals, the proposed approach allows near users to serve as cooperative relays for far users, ensuring effective communication in situations when there are physical barriers or shadowing. According to simulation results, SWIPT-assisted cooperative NOMA outperforms traditional Orthogonal Multiple Access (OMA) systems in terms of energy consumption and spectrum efficiency. The results show how SWIPT can help with communication and energy issues, opening the door for scalable, energy-efficient, and sustainable networks of the future.

## Paper Id-0405

## Paper Title-Greener Cognitive Radio Networks: The Synergy of Energy Harvesting and Cooperative Spectrum Sensing

Pallavi Pant, Neelam Srivastava

**Abstract:** Sustainable development is the need of the hour as it focuses on present needs without hampering the needs of the future generation. Power consumption leads to greenhouse gas emissions and costs energy for the operators. Cognitive radio(CR) is one of the most prominent energy-saving techniques for networks and devices. Green cognitive radio is a wireless technology that uses techniques that are energy efficient as well as reliable. The energy consumption of CR technologies, as intelligent systems, must be evaluated to achieve the objective of green networks. In the paper we have analysed the energy efficiency for cognitive Radio Network. The energy efficiency and throughput is measured for cooperative spectrum sensing(CSS) using energy harvesting(EH). EH in CSS significantly enhances the energy efficiency of the system at low SNR. EH techniques improves the efficiency and throughput of CR. The energy efficiency analysis focuses on achieving green communication objectives.

## Paper Id-0406

## Paper Title-Future Directions of Massive MIMO: Paving the Way to 6G

Siddharth Srivastava, Neelam Srivastava

**Abstract:** Massive multiple-input multiple-output (MIMO) technology is expected to be crucial in forming next-generation communication networks as wireless systems develop towards the sixth generation (6G). Massive MIMO's outstanding performance, scalability, and adaptability have cemented its place as a key component of future wireless infrastructure, building on its successful implementation in 5G and beyond. A slew of cutting-edge technologies and approaches have emerged recently, promising to revolutionise huge MIMO systems and open up hitherto unheard-of possibilities and uses. The efficiency and performance of massive MIMO are anticipated to be enhanced by important disruptive technologies like Terahertz communications, intelligent omni-surfaces (IOSs), intelligent reflecting surfaces (IRSs), and artificial intelligence. These developments open the door to previously unheard-of levels of system robustness, spectrum efficiency, and energy efficiency when combined with cell-free architectures. Additionally, the spread of varied applications across multiple domains, such as wireless localization, vehicle communications, non-terrestrial networks, and inter-planetary communications, is facilitated by the integration of these technologies. Additionally, massive MIMO has the potential to serve new use cases such as improved wireless sensing applications and remote sensing, guaranteeing smooth communication in difficult-to-reach places. Its combination with THz spectrum utilization and AI-driven optimization offers a way to get around the drawbacks of current networks and make ultra-reliable, low-latency, high-capacity communication a reality. The revolutionary potential of massive MIMO as it moves from 5G to 6G is examined in this article. It offers information on the new applications, architectural developments, and supporting technologies that will propel its advancement. Massive MIMO is well-positioned to meet and beyond the requirements of next-generation wireless systems by using these advancements, guaranteeing a stable and sustainable future for worldwide connectivity.

## Paper Id-0407

## Paper Title-Energy efficient Communication using Intelligent reflecting Surfaces (IRS) for Next Generation Networks

Jaspreet Kaur, Maneesha Dwivedi, Neelam Srivastava

**Abstract:** The deployment of intelligent reflecting surfaces (IRS/RIS) to reflect signals from a source to a destination has emerged as a promising approach to enhance the data rate and energy efficiency of wireless communication channels, particularly in scenarios where the direct line-of-sight path is obstructed or weak. This paper presents a comparative analysis of the proposed IRS-based method against traditional decode-and-forward (DF) relaying and SISO channel. Unlike previous studies that primarily focused on optimizing reflection coefficients for improved signal quality, our work emphasizes the comprehensive evaluation of energy efficiency Through theoretical analysis and simulation, it is clear that IRS maintains a constant efficiency even at higher rates. The emphasis on frequencies close to 3 GHz is consistent with 5G networks use of mid-band spectrum, which is crucial for striking a balance between capacity and coverage. Efficiency of 36Mbits/Joule is achieved for IRS scheme. Also, IRS becomes more competitive, requiring the least power when the destination is close to the source at Rate (8bits/s/Hz). This paper also highlights the trade-offs of integrating IRS into next-generation wireless networks, offering insights into their deployment feasibility and potential applications in energy-efficient communication systems.

## Paper Id-0408

## Paper Title-Enhancing Security in Next-Generation Wireless Networks: A Comprehensive Overview of PLS Assisted NOMA Systems

Kirti Prakash, Ram Chandra Singh Chauhan

**Abstract:** Non-orthogonal multiple access (NOMA) is a popular technology for next-generation wireless networks, designed to allow multiple users to share the same radio resources simultaneously. While this improves efficiency, it raises concerns about maintaining the confidentiality of information, as multiple users operate on the same time frequency resources. To address these security challenges, physical layer security (PLS) has emerged as a complementary approach to traditional encryption methods. PLS leverages the unpredictable nature of wireless transmission channels to enhance communication security. In recent years, there has been significant interest in applying PLS techniques to NOMA systems, particularly to tackle threats posed by both active and passive eavesdroppers. This work provides a detailed overview of the latest advancements in PLS-enabled NOMA systems. It explores different types of eavesdropping threats, key security features, and physical layer performance metrics. Additionally, it examines critical challenges in the physical layer and discusses potential solutions to improve the security of NOMA networks.

## Paper Id-0409

**Paper Title-Performance Evaluation of Energy Efficient RIS-assisted Wireless Communication System**

Aparna, Bhawna Trivedi, Dr. Himanshu Katiyar and Prof. Neelam Srivastava

**Abstract:** In the present world of digital advancements, 6G technology aims to transform the physical world by offering integrated services such as sensing, communication, and computing in real-time. New technologies are required to meet the target of high capacity, ultra-reliable links, and minimal latency in communication systems with an emphasis on sustainability and increased quality-of-service. With advancement of technology and growing demand we move towards higher frequency ranges. Signals in higher frequency have shorter wavelength and suffer path blocking and signal loss due to various parameters. The use of Reconfigurable Intelligent Surfaces (RIS) in wireless communication is widely considered a promising technology to address these challenges by enabling network operators to dynamically manipulate propagation environments overcoming negative influences of natural wireless propagation, and improving signal quality by controlling the reflection, refraction, scattering and absorption characteristics of the radio waves. The optimization of energy consumption of RIS-assisted communication systems, an important parameter in green wireless communications has received significant interest from researchers. Driven by the possibilities of this developing technology, this article presents the readers with an overview of the state-of-the-art works on the use of RIS in wireless communication systems from the perspective of energy efficiency. Also, this article analyzes the energy efficiency performance of RIS in comparison to traditional wireless communication systems by placing RIS at different locations between the transmitter and receiver. A log-distance path loss model is employed to address the impact of large-scale fading. This work aims to contribute to advancing energy-efficient solutions for green energy initiatives. Further, we highlight the various technical issues and challenges faced by RIS-assisted communication systems and the potential use cases of RIS from future wireless communication systems perspectives.



## Paper Id-0410

**Paper Title-Consumption and Energy Efficiency in 5G Networks: A Literature Review**

Pooja Nishad, R.C.S Chauhan

**Abstract:** The deployment of fifth-generation (5G) wireless networks; Promises substantial improvements in connectivity, data throughput, and application performance. This advancement brings significant challenges, those terms of energy consumption and environmental impact, particularly as energy usage in 5G networks. Exceeds that of previous generations, This review examines the growing body of research on energy efficiency (EE) in 5G, addressing the increasing power demand associated with 5G infrastructure, Its implications for the information and communications technology (ICT) sector's carbon footprint. We explore key factors contributing to higher energy consumption, including network architecture, device capabilities, and evolving traffic patterns. In addition, this review analyses various mitigation strategies, highlighting energy-efficient techniques at both the network and device levels. We also discuss the effectiveness of different modelling, simulation approaches used to evaluate energy consumption in 5G networks. By synthesizing the existing literature, we aim is to identify research gaps and suggest future paths to support the construction of sustainable 5G networks by synthesizing the body of existing material. The ultimate objective is to provide a thorough summary of the state of the art on 5G energy efficiency and to direct future research in order to achieve 5G deployments that are more environmentally friendly and energy-efficient.

# Sub Theme-5
# Renewable energy integration and storage systems

**Paper Id- 0501**

## Paper Title-ADVANCING RENEWABLE ENERGY INTEGRATION IN POWER SYSTEMS FOR ENHANCED SUSTAINABILITY IN INDIA

Pooja Singh

**Abstract:** Renewable energy is the major source for the economic development of any country. It has taken most importance role in planning and designing for the sustainable future or the mankind in whole world. India is making significant progress in the renewable energy sector, driven by the need to meet growing energy demands and reduce carbon emissions. As of 2023, India ranks among the top countries globally in renewable energy capacity, with over 170 GW of installed capacity, primarily from solar, wind, biomass, and hydropower. Solar energy, in particular, has emerged as a key focus, with India's vast geographical advantage and decreasing technology costs driving rapid growth. The country has set an ambitious target to achieve 500 GW of non-fossil fuel-based energy by 2030, with 280 GW a substantial portion coming from solar and wind power. This study examines the advancements in green energy integration, emphasizing key technological innovations, challenges, policy frameworks, and solutions that enable the transition to a sustainable, low-carbon power grid. It also highlights the importance of energy storage systems, demand-side management, and digitalization in improving the efficiency of power systems.Looking ahead, India's renewable energy potential is immense. Technological innovations, falling costs, and increasing investment in grid modernization and energy storage solutions can help overcome current challenges. Moreover, India's growing emphasis on clean energy is likely to create new job opportunities and drive economic growth. With continued policy support, India is well-positioned to become a global level in renewable energy, significantly contributing to global climate goals in near future.

# Sub Theme-6
# Green Materials and recycling in Electronics

## Paper Id- 0601

**Paper Title-Triboelectric Materials for Sustainable Energy Harvesting: Advancing Green Energy Solutions**

Antriksh Singh Rathore

**Abstract:** The global energy crisis and environmental degradation necessitate the exploration of sustainable energy sources. Triboelectric nanogenerators (TENGs) have emerged as a promising solution for harvesting mechanical energy from natural and human activities. The efficiency of energy generation in TENGs is highly dependent on the choice of triboelectric materials, making material selection a crucial factor in enhancing energy output and durability. This study presents an in-depth investigation of various triboelectric materials, focusing on their energy-harvesting potential, material composition, and environmental sustainability. Through systematic material characterization, different categories such as polymers, composites, and biodegradable natural materials are analyzed to identify optimal charge transfer properties. The influence of surface morphology, dielectric properties, and electron affinity on triboelectric performance is examined. Furthermore, potential applications of TENGs in self-powered wearable electronics, environmental sensing, and smart city infrastructure are explored. The integration of these materials into hybrid energy systems is also evaluated to enhance overall energy efficiency and storage capabilities. By employing experimental analysis and computational modeling, this study quantifies the energy output of triboelectric materials and assesses their practical feasibility for large-scale deployment. The findings emphasize the role of sustainable triboelectric materials in addressing global energy demands while promoting environmental conservation, making them a viable alternative for next-generation green energy technologies.

## Paper Id-0602

**Paper Title-From waste to Fuel- Fabrication of Sawdust and Coal fines Briquettes and its Analysis**

Kripa Sindhu , Shivam Singh Yadav, Vijay Singh

**Abstract:** Biomass is solid energy made from organic material or waste of living organisms that can be used as renewable source of energy. Biomass is excellent resource for preparing a carbon material. Cellulose, hemicellulose, and lignin are three major factors of biomass. Cellulose, the most abundant renewable organic resource, is set up in shops, bacteria, and marine algae. generally, 35%- 50% cellulose is present in biomass. Hemicellulose, a crucial element in biomass materials, is deduced from factory polysaccharides. generally, 35%-50% hemicellulose is present in biomass. Lignin is a complex organic polymer set up in the biomass; lignin makes up 20%-40% of biomass. Briquetting is a process that involves compressing biomass materials into solid blocks known as briquettes which can be used for heating, cooking, and power generation, replacing fossil energies. Its purpose is to reduce waste and produce a usable energy source from biomass remainders. This can be done using different materials, including agrarian waste, forestry waste, coal dust, etc. Pollution is a significant issue caused by the disposal of coal fines during mining and processing. Briquettes made from sawdust and coal fines are a creative solution to resource conservation. This studies focuses on the development and evaluation of briquettes made by mixing these two materials and applying a simple hand compression method. The moisture content, compressive strength, density and calorific value of the briquettes were considered as important properties. These results make it evident that employing these briquettes can provide a green energy source, cut waste and protect natural resources.

## Paper Id-0603

## Paper Title-Green Chemistry and Sustainable Development: Pathways to a Better Future

N K Nishad, Neelam Srivastava, Pallavi Pant

**Abstract:** Green chemistry and sustainable technologies are crucial in solving global environmental challenges and promoting the United Nations Sustainable Development Goals. This paper discusses the interlinkages between green chemistry, renewable energy solutions, and emerging innovations such as green hydrogen and energy-efficient semiconductors. Green chemistry focuses on waste prevention, renewable feedstocks, and energy-saving technologies to promote environmentally friendly industrial practices. This new versatile solution of energy storage, transportation, and industrial decarbonization is through green hydrogen produced by renewable-powered electrolysis. Meanwhile, smart grids integrate renewable energy, improve energy efficiency, and support urban sustainability. Altogether, these technologies pave the way for sustainable development through minimal environmental impact, economic growth, and public health improvement. Cases studies and policy frameworks are presented, illustrating successful implementation and the challenge that remains towards realizing a green and resilient future.

## Paper Id- 0604

## Paper Title-Sustainable Use of Fly Ash as a Seepage Controlling Material by reducing fly ash into Nano-particle size

M.M.Raza , Anurag Singh , Harshit and Pragya Gupta

**Abstarct:** Fly ash, the fine particulate waste material produced by pulverized coal-based thermal power station, is an environmental pollutant. It has a potential to be a resource material. The types and relative amounts of incombustible matter in the coal used indicate the chemical composition of fly ash. Therefore safe and efficient use of fly ash is the requirement of the hour. On the other hand Seepage is also a big problem through hydraulic structures such as embankments and canal. Therefore seepage control is paramount importance in planning and design of such structures. A lot of money is generally invested to control the seepage losses in India. Recently development and possible application of Nano-particles of various materials in different fields of Engineering and science are reported in literature. The main object of the present study is to make use of fly ash as a Nano-particle. In this work an effort has, therefore, been made to reduce the permeability of fly ash with Nano-particles. Some of the salient features of the study are presented in the present paper.

## Paper Id- 0605

## Paper Title- RE-PURPOSING OF PLASTIC WASTE A CASE STUDY

Sachin Ranjan Kushwaha, Priya Mishra, Akash Kumar, Abhishek Kumar, Satyam Singh, Shashank Srivastav, Prasant Anand

**Abstract:** Plastic waste is a significant environmental issue in India, often polluting the environment due to ineffective waste management systems. However, recycled plastic can be a valuable resource, particularly in improving construction materials like paving blocks and roofing tiles. This project focuses on re-purposing plastic waste trapped in drainage systems to create durable and sustainable paver blocks.

Our initiative not only addresses the drainage problem by ensuring proper leveling through the use of plastic-cement paver blocks but also enhances road construction in Mahigawa Village, Tehsil BKT (BAKSI KA TALAB), Lucknow, under the MNREGA (Mahatma Gandhi National Rural Employment Guarantee Act) initiatives.Incorporating plastic waste into concrete has shown promising results. When 5% of the sand in the mix is replaced with plastic, the compressive, tensile, and flexural strength of concrete. initially decreases by 12.81% and 10.71%, respectively, at 7 days of curing. However, it later increases by 4.1%, showcasing its potential for lightweight construction applications. Such a mix is particularly suitable for use in infrastructure designed for lightweight vehicles. India's rural villages generate approximately 0.3-0.4 million metric tones of waste per day. This method of utilizing plastic waste in construction offers an environmentally friendly and sustainable alternative to traditional materials, significantly reducing production costs and environmental impact.By adopting this approach for future construction projects in villages, we can contribute to environmental protection while improving rural infrastructure. This initiative not only promotes sustainability but also offers a scalable solution to one of India's pressing waste management challenges.

## Paper Id: 0606

## Paper Title- Experimental Analysis Thermal Energy Storage Using Molten Salt Containing Nano-particles

Vikash Dwivedi, Ashutosh Mishra, Kaushal Pratap Singh

**Abstract:** Molten salt is used as a thermal energy storage medium and it can also be used as a heat transfer fluid, but due to their poor thermo-physical properties its application is limited. New methods have been established to enhance the thermo-physical properties, by adding a minute concentration of nanoparticles (range of 0.5 to 1.5 wt %) in the salts. The present study aims to investigate the above thermal properties through experimentation while using molten salt (a binary nitrate salt NaNO3:KNO3 in 60:40 wt %) with dispersed nano particles. The intent is to formulate and test the thermal storage potential of this mixture, with emphasis on developing a novel type of nano heat transfer and storage fluid. In this study heat transfer rate and heat storage capacity of the molten salt with various concentration of the aluminium oxide nanoparticles (alpha) having size of 30 to 50 nm have been investigated.

# Sub Theme-7

# Smart Grids an Micro grids

## Paper Id-0701

### Paper Title-Smart Grid Management System with Internet of Things (IoT)

Atul Kumar Verma

**ABSTRACT:** The integration of the Internet of Things (IoT) with smart grid management systems is transforming traditional power grids into highly efficient, automated, and intelligent energy distribution networks. This research focuses on the development and implementation of an IoT-enabled smart grid management system to enhance energy efficiency, ensure real-time monitoring, and optimize energy distribution. The proposed system leverages IoT devices such as smart meters, sensors, and actuators to collect, process, and analyze data in real time. Advanced communication protocols, including MQTT and Zigbee, enable seamless connectivity and data exchange between devices and control centers.

# Sub Theme-8
# Use of AI/ML in GREEN Technology

## Paper Id-0801

### Paper Title-Secure and Reliable Vitamin Deficiency Detection using Convolutional Neural Network

Eiba Khan, Pranjal Gupta, Pranjal Yadav, Ujjawal Mishra, Jaspreet Kaur, Neelam Srivastava

**Abstract:** Vitamin deficiencies often manifest through visually detectable symptoms in various parts of the human body, such as the eyes, lips, tongue, and nails. This application leverages advanced deep learning techniques, specifically Convolutional Neural Networks (CNNs), to enable non-invasive and eco-friendly diagnostic solutions. By analyzing images of these body parts, individuals can identify potential vitamin deficiencies without the need for invasive blood tests, promoting both health and sustainability. The dataset includes images of eyes, lips, tongue, and nails. After dataset acquisition, preprocessing is conducted to ensure reliable input quality, followed by training the CNN model to achieve high diagnostic accuracy. The trained model is stored efficiently, and the testing phase confirms its robustness. Aligned with GREENS principles, the application is designed to be environmentally sustainable, reliable in performance, cost-efficient, and secure, offering a practical tool for accessible and green healthcare solutions.

## Paper Id-0802

### Paper Title-AI's Hidden Carbon Footprint: Evaluating Machine Learning Energy Consumption

Prerana, Shahneela J Kidwai

**ASTRACT:** The swift incorporation of Artificial Intelligence (AI) and Machine Learning (ML) across many sectors has yielded dramatic progress while also presenting considerable environmental issues. A significant worry is the considerable carbon footprint linked to these technologies, especially owing to their elevated energy consumption during model training, deployment, and operation. This research analyzes the environmental consequences of AI and ML, highlighting the indirect but widespread greenhouse gas emissions resulting from energy-intensive data centers and computational activities. Although AI holds potential for enhancing sustainability via improved resource management in sectors like agriculture and manufacturing, the ecological impact of AI systems, particularly large-scale models, is yet inadequately examined. Confronting these difficulties necessitates a comprehensive strategy, encompassing the shift to renewable energy sources, the creation of energy-efficient algorithms, and the implementation of sustainable AI practices. Model improvement and sustainable infrastructure solutions are emphasized as crucial measures for mitigating AI's environmental impact. Moreover, the document promotes enhanced openness in carbon accounting and the creation of industry-wide standards to offset the environmental consequences of AI. It is crucial to balance the advantages of AI with proactive environmental initiatives to prevent new technologies from worsening global climate issues.

## Paper Id-0803

## Paper Title-Robert Multistage Classification of Eye Disease Using MATLAB

Shivam Mishra, Asiya Siddiqui, Aditya Khevaria, Divyanshu Rai, Jaspreet Kaur, Neelam Srivastava

**Abstract:** This research introduces a MATLAB-based system using DenseNet and CNNs for automated classification and staging of eye diseases like Diabetic Retinopathy (DR), Macular Edema, Glaucoma, and Exudates. Input images are analyzed to detect diseases, classify severity, and stage conditions. Results are shared via ThingSpeak for real-time monitoring, while treatment advice is emailed to users. The system's accuracy, sensitivity, specificity, and other metrics ensure reliability in early diagnosis and monitoring. It provides a scalable, accessible solution for automated eye disease detection, aiding healthcare professionals and patients in timely interventions. The system prioritizes energy efficiency by incorporating lightweight models, edge computing, and renewable-powered IoT devices, minimizing its environmental impact.

## Paper Id-0804

## Paper Title-A Survey on Assistive Systems for Visually Impaired Persons

Alka Srivastava, R.C.S. Chauhan, Roopali Agarwal

**Abstract:** Blind assistance technologies have evolved significantly with advancements in computer vision, deep learning, and sensor integration. This survey provides a comprehensive review of state-of-the-art solutions aimed at empowering visually impaired individuals with enhanced independence and mobility. The paper categorizes assistive technologies into wearable devices, smartphone applications, and autonomous navigation systems, highlighting their design principles, functionalities, and limitations. Innovations in object detection, text recognition, obstacle avoidance, and scene understanding are explored, with a focus on methods leveraging convolutional neural networks (CNNs), transformer models, and multimodal sensor fusion. Additionally, the survey addresses the integration of haptic feedback, audio guidance, and augmented reality for effective user interaction. Challenges such as affordability, adaptability, and accessibility are discussed, along with emerging trends like real-time processing, edge computing, and user personalization. This survey aims to guide researchers and practitioners in developing inclusive and scalable technologies for visually impaired individuals, ultimately contributing to a more accessible and equitable society.

## Paper Id-0805

**Paper Title-Load Controlling using Deep Learning: A User-friendly Environment for Disabled Persons.**

Pushpendra singh, Abhijeet Singh, Pawan Diwakar, Rohit Kumar, Akhilesh Yadav, Karan Kumar

**Abstract:** Home automation has transformed interactions with everyday appliances, but accessibility remains a key challenge for individuals with disabilities. This paper presents a gesture-based load control system designed to offer an intuitive solution for controlling devices such as lights, fans, and door locks. The system uses a USB camera for gesture recognition, with a Raspberry Pi serving as the central processor. A 4-channel relay module facilitates seamless control of connected loads.The system employs advanced libraries like OpenCV and MediaPipe to ensure accurate, low-latency gesture detection, with response times under one second. Real-time testing demonstrates the system's effectiveness in recognizing gestures and controlling devices.The implementation aligns with sustainability by optimizing energy use. Users can activate only necessary devices, contributing to energy conservation. The compact Raspberry Pi design supports a sustainable approach. Additionally, the system fosters inclusivity by offering an accessible solution for people with disabilities.The system's modularity allows for potential integration with renewable energy sources such as solar power, further promoting eco-friendly energy management. Overall, this gesture-based load control system provides a cost-effective, scalable, and sustainable solution that enhances both accessibility and environmental management.

## Paper Id-0806

**Paper Title-Advancing Green AI in India: Achievements, Challenges, and Future Directions**

Avneesh Mishra, Mayur Srivastava, Jaspreet Kaur

**Abstract:** In today's rapidly evolving technological landscape, the impact of Green Artificial Intelligence (AI) is becoming increasingly significant in fostering sustainable development and environmental conservation. The growing demand for green technologies highlights the crucial role of Green AI in driving innovative solutions to mitigate environmental challenges. This paper explores the concepts, applications, and challenges of Green AI with a primary focus on creating a sustainable environment. Our research investigates the advancements in Green AI in India over the period from 2016 to 2024, providing insights into its applications in key domains such as renewable energy, waste management, and energy efficiency. Additionally, we examine various techniques that have contributed to the progress of Green AI, emphasizing their role in addressing critical environmental issues. Despite these advancements, challenges remain, particularly in the area of pollution control. This paper identifies gaps in current research and proposes directions for future studies, aiming to address these challenges. Key points added to this paper include the integration of AI with existing environmental technologies, potential policy frameworks, and methods to improve public awareness and adoption. By addressing these challenges, Green AI has the potential to make a significant contribution to environmental sustainability, ensuring a cleaner, greener future.

## Paper Id- 0807

## Paper Title-Advancing Circular Economy through AI-Driven E-Waste Management: A Comprehensive Review of Current Research, Challenges, and Future Directions

Kartik Bhardwaj, Ritu Soryan

**Abstract:** Electronic waste (e-waste) has emerged as one of the fastest-growing waste streams globally, posing significant environmental, economic, and public health challenges. The circular economy paradigm provides a holistic framework for managing e-waste through resource recovery, recycling, and the reduction of landfill disposal. Recently, Artificial Intelligence (AI) and Machine Learning (ML) have shown transformative potential in addressing critical bottlenecks in e-waste handling, such as precise materials identification, automated disassembly, enhanced recycling efficiency, and predictive logistics. This review critically evaluates 70 peer-reviewed studies published from 2010 to 2025 in top-tier journals and conference proceedings, focusing on AI- and ML-driven technologies for e-waste management within the circular economy context. The article synthesizes evidence from real-world implementations, systematically discussing how AI and ML algorithms enhance e-waste sorting accuracy, increase the recovery of high-value materials, reduce environmental impact, and improve cost-effectiveness. We identify current research trends, highlight notable achievements, and analyze key challenges—such as data privacy, regulatory gaps, heterogeneous waste streams, and issues related to algorithmic bias. The review culminates in policy recommendations and offers a research roadmap delineating technological, regulatory, and socio-economic considerations to expedite the adoption of AI-enhanced e-waste management. By presenting an up-to-date, critical, and thematically focused synthesis, this paper provides a scholarly foundation for future advancements, positioning AIbased e-waste solutions as a linchpin for the circular economy and sustainable development.

## Paper Id-0808

### Paper Title-ARTIFICIAL INTELLIGENCE IN MANAGING E-WASTE: A SUSTAINABLE SOLUTION FOR THE DIGITAL AGE

Vandana Agarwal, Navnish Goel

**Abstract:** In the digital age, electronic waste (e-waste) has become a significant environmental concern due to the rapid pace of technological advancement and the short product lifecycle and so the consequent increase in discarded electronic devices. Electrical and electronic waste is also budding as a key component of health issues globally due to fast advancements in technology leading to the production of vast amount of wastes. Managing this waste efficiently is crucial for environmental sustainability and human health. Artificial Intelligence (AI) presents innovative solutions for this pressing issue by efficiently managing e-waste, mitigating environmental impact, and promoting sustainable practices and thereby to tackle the challenges associated with e-waste management. By adopting AI-driven technologies, municipalities and recycling facilities can optimize waste collection, enhance sorting accuracy, predict waste generation patterns, educate the public, detect illegal dumping, and promote a circular economy. AI algorithms can identify and categorize different types of electronic components more efficiently than manual sorting, leading to increased recycling rates and reduced environmental impact. Additionally, AI-powered systems can optimize logistics for e-waste collection and processing, making the entire process more cost-effective and sustainable. This paper explores the potential of AI and the various roles AI plays in managing electronic waste, including sorting, recycling, and resource recovery to mitigate the environmental impact of electronic consumption.

## Paper Id-0809

## Paper Title- Integrating AI/ML for Environmental Sustainability: Innovations in Green Technology

Khadim Moin Siddiqui, Dimpal Verma, Nidhi Gupta,
Anshika, Mamta Yadav, Beer Singh

**Abstract:** The growing urgency to address environmental challenges has underscored the need for innovative technologies that promote sustainability. Artificial Intelligence (AI) and Machine Learning (ML) are emerging as transformative tools in green technology, offering novel solutions for environmental monitoring, resource optimization, and sustainable development. This paper explores the integration of AI/ML into various aspects of environmental sustainability, including renewable energy optimization, waste management, precision agriculture, and urban development. Key applications such as predictive analytics for climate change, intelligent energy management systems, and AI-powered recycling technologies are highlighted. The paper also discusses the challenges and ethical considerations of implementing AI/ML in green technology, including data privacy, algorithmic bias, and equitable access. Through case studies and real-world examples, the paper illustrates how AI/ML can drive significant advancements in achieving global sustainability goals. Finally, it identifies emerging trends and research directions to guide future efforts in leveraging AI/ML for a greener, more sustainable future.

## Paper Id-0810

## Paper Title- Integrating Artificial Intelligence with Green Technology: Pathways to a Sustainable Future

Alka Verma, Neelam Srivastava

**Abstract:** This paper explores the convergence of Artificial Intelligence (AI) and green technology as a transformative force in tackling sustainability challenges. By examining a variety of initiatives and case studies, we underscore AI's role in optimizing energy efficiency, reducing carbon footprints, and fostering the development of smart urban ecosystems. Drawing from academic literature and technological advancements, we propose pathways for integrating AI with environmentally conscious solutions, demonstrating its potential to revolutionize sustainability practices.

# Sub Theme- 9
# AI and IoT in Energy Conservation

## Paper Id-0901

## Paper Title- Integration of Artificial Intelligence and the Internet of Things, Powered by Renewable Energy Sources to Revitalise Urban Agriculture

Neha Singh, Ritesh Pratap Singh, Aman Raj

**ABSTRACT:** The agricultural sector is confronting new and unprecedented threats from climate change, rising energy prices, and the need to guarantee food security; as a result, new and creative technologies are being developed to address these issues sustainably and efficiently. With AI and IoT, agricultural technology provides a sustainable solution to land and water shortages. Modern farming like polyhouse, hydroponics, aquaponics, and vertical farming methods are adopted to utilize the maximum farm area for agriculture. The integration of IoT and renewable energy sources is shown by smart agriculture systems in urban farming, which enable productive agricultural operations. These technologies lower agricultural operations' error margins by automating irrigation based on real-time data and giving farmers remote monitoring and control. Additionally, by automating vital chores like weeding, spraying, and crop monitoring, AI-powered robots and drones are transforming conventional agricultural landscapes, saving resources, and improving overall production and production quality. The incorporation of Artificial Intelligence (AI) and the Internet of Things (IoT) in urban agricultural practices is the primary focus of this paper, which reviews the latest developments in smart agriculture technologies. The evaluated papers establish the groundwork for further research in this multidisciplinary field by revealing a movement towards data-driven automated, and sustainable agricultural techniques that are essential for ensuring food security in expanding urban populations

## Paper Id-0902

## Paper Title- AI and IoT in Energy Conservation

Aditya Kumar, Aftab Alam, Akash Ranjan

**Abstract:** Artificial Intelligence coupled with the Internet of Things has shown great promise to today's world in terms of energy conservation. The increasing demand for energy efficiency in both residential and industrial settings requires advanced, scalable, and autonomous management systems. This study introduces a novel architecture leveraging the Internet of Things (IoT) and machine learning to optimize energy usage across distributed sub-networks of electric devices. The proposed system autonomously extracts behavioural patterns from consumption data, identifies best practices, and adapts to infrastructural changes without manual intervention. Key applications include smart industries, enabling energy managers to oversee remote divisions effectively, and smart homes, where automated systems minimize energy waste for users with varied capabilities. This work demonstrates the potential of combining IoT and artificial intelligence to achieve centralized, intelligent, and adaptive energy management.

## Paper Id- 0903

## Paper Title- Leveraging AI and IoT for Energy Efficiency in the Industrial Sector: A Comprehensive Review

Rachit Sehgal, Ritu Soryan

**Abstract:** Energy consumption in the industrial sector accounts for a substantial share of global energy usage, leading to increasing interest in solutions that can optimize efficiency and reduce operational costs. Advances in the Internet of Things (IoT) and Artificial Intelligence (AI), including Machine Learning (ML), offer powerful ways to monitor industrial systems, perform predictive analytics, and integrate renewable resources into manufacturing and power distribution processes. This paper reviews the state-of-the-art in AI and IoT for energy conservation within industrial settings. It discusses key applications such as real-time monitoring and control, AI-based optimization, predictive maintenance, and energy theft detection. The review concludes by highlighting challenges, including data heterogeneity and scalability, and proposes future directions such as federated learning, quantum-enhanced optimization, and robust ethical frameworks.

## Paper Id-0904

## Paper Title- AI and IoT in Energy Conservation: Challenges, Opportunities, and Trends

Khadim Moin Siddiqui,Vidushi Singh and Shivam Kumar,Harsh Shukla
Surya Bhushan Dubey, Beer Singh

**Abstract:** The rapid advancements in Artificial Intelligence (AI) and the Internet of Things (IoT) have paved the way for innovative solutions to address global energy challenges. This paper explores the integration of AI and IoT in energy conservation, focusing on their combined potential to optimize energy consumption, enhance system efficiency, and support sustainable development.AI-driven predictive analytics and machine learning algorithms enable accurate energy demand forecasting and real-time decision-making, while IoT devices facilitate seamless data collection, monitoring, and control of energy systems. The synergy of these technologies has been instrumental in transforming energy management across various sectors, including smart grids,industrial automation, and smart buildings. However, their adoption comes with significant challenges, such as data security,interoperability, and the high cost of deployment. This review discusses the current state of AI and IoT in energy conservation,identifies key challenges, highlights emerging opportunities, and examines future trends, such as the role of blockchain and edge computing in decentralized energy systems. The paper concludes by emphasizing the need for interdisciplinary research and collaboration to unlock the full potential of AI and IoT in creating sustainable energy solutions.

# Sub Theme-10
# Electric Vehicles and Sustainable Transportation Systems

## Paper Id-1001

### Paper Title-Drone Sense: A YOLO-Driven Real-Time Crowd Monitoring System Using ESP32-Cam

Anurag Yadav, Sheetal Singh, Kirti Prakash, Pushpendra Babu, Shivam Sharma, Shivansh Yadav, Abhishek Nigam, Subodh Wairya

**Abstract:** As the utilization of drones continues to proliferate across various industries, the integration of artificial intelligence (AI) becomes pivotal for enhancing their capabilities. This research investigates the innovative domain of Drone AI Head Tally, a cutting-edge technology designed to facilitate automated head counting using drones equipped with advanced AI algorithms. The primary objective of this study is to explore the potential applications, challenges, and efficiency gains offered by Drone AI Head Tally in diverse scenarios, such as large-scale events, disaster response, and security surveillance. Through a combination of theoretical analysis and practical implementation, the study aims to contribute insights into the optimization of drone-based head counting systems, addressing accuracy, real-time processing, and scalability. By leveraging the synergy between drone technology and artificial intelligence, this research endeavors to provide a foundation for the development of robust and intelligent solutions that can redefine the landscape of crowd monitoring and management. The findings presented herein aspire to guide future advancements in Drone AI Head Tally, fostering a safer, more efficient, and technologically advanced environment across various domains.

## Paper Id-1002

### Paper Title-Demand Response Management in an EV Integrated Environment for Distribution System

Filza Alam , Seethalekshmi K, Nitin Anand Shrivastav, Arvind Kumar

**Abstract:** This paper proposes an optimization framework for the operation of a community-based microgrid integrating photovoltaics, energy storage systems (ESS), and electric vehicles (EVs).Utilizing IBM ILOG optimization software, the model incorporates bidirectional power flow strategies for Vehicle-to-Grid (V2G) and Vehicle-to-Home (V2H) energy exchanges to minimize operational costs and battery degradation. A Markov model predicts EV availability based on real-world travel data, enabling dynamic scheduling of EV and ESS charging/discharging.

## Paper Id-1003

## Paper Title- Assessment of Electric Busses: A Comprehensive Comparison with Traditional Diesel Busses

Devina Gandhi, Diya Joshi

**Abstract:** Public transport is the primary means of transport for the majority of public of India and it is the lifeline urban transportation. Using public transportation helps in reducing air pollution and also create many employment opportunities for the people of our country. In India, especially cities like Delhi have major air pollution issues and traffic congestion. Using busses and trains reduced carbon emission and helps manage the traffic due to the convenience of multiple people being able to use same vehicle instead of using private cars. In this paper we will be discussing the impacts and benefits of electric busses in comparison to the traditional diesel busses in Delhi. We will be analyzing the contribution of electric busses in improving the quality of air in Delhi and the socioeconomic impact like the adaptability for the economically weaker class as well as the impact on livelihood of bus drivers by adopting the electric busses. This research will provide more valuable insights and data about the benefits of switching to electric busses instead of the traditional diesel busses and help in making informed future policies and contribute to a more sustainable and user-friendly public transportation.

## Paper Id-1004

### Paper Title-Design & Development of Cost-Efficient Light EV GO KART for High Performance

Anuj Kumar, Pravind Maurya, Deepak Singh, Abhishek Kumar

**ABSTRACT:** The transition to electric vehicles (EVs) has created significant opportunities for innovation in the automotive sector, particularly in the development of cost-effective and efficient vehicles. This project focuses on designing and constructing an EV Go-Kart that addresses key challenges, including high production costs and limited efficiency, while maintaining superior performance and safety standards. The Go-Kart incorporates a 1500-watt BLDC Motor paired with advanced control systems, ensuring high durability and optimal performance. The design emphasizes cost reduction, achieving a 40% decrease in overall production costs without compromising build quality. Simultaneously, the vehicle weight has been reduced by 20% while adhering to stringent safety requirements. Powered by a 38Ah, 48V Lithium-ion battery, the EV Go-Kart aims to deliver a range of 60 km per charge in its initial phase, with a future goal of reaching 100 km per charge. The current vehicle weight stands at 133 kg, optimized for enhanced mobility and endurance. Testing and validation of the vehicle will take place at the Kari motor speedway Coimbatore, Tamil Nadu, during the ISNEE GKDC event. These trials will evaluate its performance under real-world conditions, ensuring reliability and robustness. This project underscores the potential of EV technology to transform the automotive landscape by offering sustainable and affordable solutions. The innovations presented here contribute to advancing research in electric mobility, addressing industry challenges, and paving the way for widespread EV adoption.

## Paper Id-1005

## Paper Title-Eco-Friendly Solar Sprint Car with Remote Control

Kaushal Pratap Singh, Tanuj Gupta

**Abstract:** Currently, dealers of natural resources such as fuel and coal are struggling to meet the rising demand. To address this issue, this is essential to explore new findings of energy and power. As a result, sunlight is increasingly being recognized as a viable energy source for various every day applications. Solar energy is harnessed to generate electricity from sunlight. In our manuscript, we aim to develop a solar-powered car using this technology. The key component for constructing a solar car is the solar panel, which captures a part of the energy comes from and collected it in the batteries. The power trackers convert the kind of energy the solar array to the system voltage for the purpose of batteries and motor. Once the energy is stored, the car will run with the help of stored energy to operate the motor and motor controller. Initially, our goal is to present this concept on a toy car fitted with solar panel and operated by remote and subsequently, we plan to use this prototype as a foundation for developing a full-sized solar-powered vehicle in the future.

## Paper Id- 1006

## Paper Title- Revolutionizing Crop Protection: A Review of Advancements in Drone-Based Pesticide Sprinkling Systems

Jitendra Kumar Srivastava, Jay Bahadur Singh, Md.Moosi Raza, Anurag Singh

**Abstract:** With the growing global demand for food and the increasing challenges posed by pests and diseases in agriculture,innovative technological solutions are essential for enhancing crop yield and sustainability.This article reviews the existing advancements in drone-based pesticide sprinkling systems assessing their effectiveness,efficiency,impacts on the environments and farmer acceptance.The potential of these systems to revolutionize agricultural practices through precision agriculture is explored,along with case studies highlighting successful implementations.

**Title Id- 1007**

# Paper Title- Energy Efficiency through Communication: Innovations inElectronics Design

Pallavi Bhargav, Vandana Gautam, Aditya Kashyap, Sachin Pal, Khadim Moin Siddiqui

**Abstract:** The growing demand for electronic devices and interconnected systems has significantly increased the global energy footprint,emphasizing the need for energy-efficient solutions. Communication processes, integral to modern electronics, account for a substantial portion of energy consumption, especially in devices like IoT systems, wearables, and industrial networks. This paper explores the critical role of communication in achieving energy efficiency in electronics design. It reviews low-power communication protocols such as Bluetooth Low Energy (BLE), Zigbee, and LoRa, highlighting their. advantages and use cases.Innovations in adaptive techniques, including dynamic power scaling and energy-aware protocols, as well as advancements in energy-efficient hardware, are also examined. Case studies of energy-efficient IoT devices, wearables, and industrial applications illustrate the practical impact of these innovations. The paper further addresses key challenges such as balancing energy efficiency with performance and ensuring compatibility across communication standards. Finally, it identifies future opportunities, including the integration of artificial intelligence and the development of ultra low-power communication systems for next-generation networks like 6G. By presenting a comprehensive analysis, this study aims to contribute to the design of sustainable, energy-efficient electronic ecosystems.

# Sub Theme- 11
# Photovoltaic and solar power systems

## Paper Id-1101

## Paper Title-River Cleaning BOT Using Arduino and Powered by Solar Energy

Navya Singh, Dheeraj Upadhyay, Rahul Kumar

**ABSTRACT:** Water pollution in rivers is a significant environmental concern, posing threats to aquatic life and human health. The project "River Cleaning BOT Using Arduino and Powered by Solar Energy" aims to address this issue by developing an autonomous, eco-friendly robot capable of collecting floating waste from rivers and other water bodies. This BOT is designed to be energy-efficient, cost-effective, and scalable for large-scale deployment. The core of the system is an Arduino microcontroller that controls the BOT's operations, including movement, waste collection, and obstacle detection. The BOT is equipped with a dual-motor propulsion system for navigation and a conveyor or net mechanism to collect debris. Ultrasonic sensors detect obstacles and ensure smooth movement in the water. The robot can operate in either autonomous mode, using pre-programmed instructions, or be manually controlled via a remote interface for specific tasks. A key feature of the BOT is its solar power system, which allows it to harness renewable energy. Solar panels mounted on the BOT provide continuous power to its components, ensuring prolonged operation without reliance on external power sources. This sustainable energy model not only reduces operational costs but also enables the BOT to function in remote or off-grid locations. The project incorporates modular design principles, allowing for easy maintenance and upgrades. The BOT's structure is built from lightweight, corrosion-resistant materials to enhance durability in aquatic environments. The use of IoT integration is also considered, enabling real-time monitoring of the BOT's performance and data collection for analysis. Overall, the "River Cleaning BOT" provides a practical solution for maintaining cleaner rivers, thereby supporting environmental conservation efforts. By leveraging solar energy and automation, the BOT minimizes human intervention and promotes a greener, more sustainable approach to water management.

## Paper Id-1102

## Paper Title- Addressing the issues of solar photovoltaic systems under varying Irradiations

Vijay Laxmi Mishra

**Abstract:** Global maximum power point (GMPP) and local maximum power point (LMPP) are often visualized on the power-voltage (P-V) plot of the solar arrays. This disturbs the maximum power production from the solar arrays leading to power losses. To overcome this complex issue reconfiguration of the solar modules within the solar arrays is done to harvest maximum power under the shading cases. This work mathematically analyses the degraded power contributed by each cell in solar arrays both horizontally and vertically. Thus, contributes towards the optimal selection of rows-columns for hybrid shading. The traditional Total cross-tied (TCT) model under several shading cases using MATLAB tool is implemented in this work. A comparative analysis of benchmark TCT with an advanced Jig-saw puzzle (J-SP), Ken-ken puzzle (K-KP), and L-shape reconfiguration (L-SR) isperformed in this work. Further, performance parameters like GMPP, efficiency (ɳ), power loss (PL), and performance enhancement ratio (PER) are evaluated under realistic shading cases. Supremacy in GMPP at 53.93W, 63.82W, 60.22W, and 42.8W, smooth P-V plot, and higher ɳ of 14%, 15.75%, 16.1% for the considered shading cases confirms that reconfiguration (L-SR) of solar modules successfully addresses the issues of solar photovoltaic systems under varying irradiations.

## Paper Id-1103

## Paper Title-Green Disposal Solutions: Sustainable handling of Solar Panel E-Waste

Shivam Singh Yadav, Kripa sindhu, Vijay Singh

**Abstract:** Solar cells play a vital role in our global society, which are used as a non-conventional form of energy, and it is a green revolution in the energy sector minimising the uses of non-renewable energy. Solar cells are classified as 4th types of generation that are used in various energy sectors.

Solar cells have different layers and these layers contains silicon wafers, glass substrates, aluminium wafers, and various metals, such as silver, copper, and tin. The exposure of solar cells to the various ways of use and their lifespan continues to about 20 to 25 years, these are green energy, but after completion of their lifespan, its EOL (end-of-life) could not be extended and they can be the red signal for our environmental impact during decomposing the materials and they are discarded. These discarded materials start reacting with the nature, and it causes natural impact like environmental issues due to their presence in elemental gases, and it also causes health issues, and react releases hazardous gases; it can react with the atmosphere and affects it as a breathtaking problem and can cause skin problems. Pyrolysis method can reduce the hazardous gases due to their closed-loop cycle process, and it doesn't react with oxygen; the elemental composition and gases can be characterised, and their morphology structure can be determined by scanning electron microscopy (SEM), elemental dispersive X-ray (EDX), and Fourier transform infrared spectroscopy (FTIR). The materials from pyrolysis can be used in bricks and concrete materials.

## Paper Id-1104

**Paper Title-Highly Efficient CIGS tandem photo-voltaic cell: Design, Simulation and Performance**

Deepak Kumar Singh, B B Tiwari, Jyoti Prashant Singh

**Abstract:** Among the various renewable energy resources, the most abundantly available, everlasting and pollution free large energy source is the solar energy. Solar cells, a key technology in harnessing this energy, are among the most promising solutions within the renewable energy sector. Presently, photovoltaic technologies primarily rely on monocrystalline and multi-crystalline silicon based solar cells, which are widely used around the world-wide. Thin film solar cells hold significant potential to meet the energy demands of large-scale world-wide applications. Copper Indium Gallium Selenide (CIGS) solar cells, which utilize thin film technology, have gained considerable attention within the photo-voltaic research area due to their outstanding opto-electronic features. The CIGS layer can be deposited on both flexible and rigid substrates using various fabrication techniques. This study presents the design and simulation of a highly efficient tandem solar cell using SCAPS-1D software. The tandem solar cell is configured with a higher bandgap CIGS absorber as the top cell and a lower bandgap Single Wall Carbon Nanotube (SWCNT) absorber as the bottom cell, arranged in a series-connected alongwith multi-junction design. The study has been investigated the impact of doping density, absorber thickness and bandgap on the solar cell's output characteristics. Current matching between the two cells is achieved by adjusting the bandgap as well as thickness of the absorber in the top cell. Tandem structural designs enhance solar spectrum utilization by integrating materials with varying bandgaps. The proposed tandem design of CIGS/SWCNT achieves a significant efficiency of (, and with band gap of and for absorber) at a thickness of and for absorber of top and bottom cell respectively. Therefore, CIGS tandem solar cells with multi-junction design have demonstrated the potential to achieve higher efficiencies than single-junction CIGS solar cells.

## Paper Id-1105

**Paper Title- Maximum Power Point Tracking (MPPT) for Solar Photovoltaic (PV) Systems: A Comprehensive Review**

Akhilesh Kr. Gupta , Jitendra Kr. Srivastava, Alok Kumar , Sushil Kumar

**Abstract:** The rising energy demand has driven the adoption of eco-friendly solutions, resulting in increasing interest in integrating renewable energy into the grid. The photovoltaic (PV) system primarily contributes to this evolution by converting sunlight into electricity. PV systems generate power through solar radiation throughout the year, enabling them to directly supply electricity to nearby distribution grids, strengthen the grid, or provide power to remote locations where grid access is unavailable. The renewable The increasing adoption of solar photovoltaic (PV) systems as a sustainable energy source has necessitated the development of efficient techniques to maximize energy harvest. Maximum Power Point Tracking (MPPT) algorithms play a crucial role in optimizing the power output of PV systems under varying environmental conditions. This paper comprehensively reviews MPPT techniques, categorized into conventional, intelligent, and hybrid methods. Each technique's advantages, limitations, applications and insights into emerging trends and future research directions are discussed

# Sub Theme-12
# Sustainable electronics manufacturing process

**Paper Id-1201**

**Paper Title- Green Renewable Electronics for Environmental Nurturing and Sustainability(GREENS)**

D.V. Mahindru, Priyanka Mahendru

**Abstract:** Green renewable electronics represent a transformative step in achieving sustainability in technology. By integrating advanced technological innovation with environmentally conscious principles, this field addresses the urgent need to reduce electronic waste and carbon emissions. With over 50 million metric tons of e-waste generated annually, the environmental impact of traditional electronics has reached alarming levels. Green renewable electronics focus on employing renewable energy sources, utilizing biodegradable and recyclable materials, and enhancing energy efficiency to minimize ecological damage. These innovations not only mitigate environmental harm but also contribute to a circular economy by promoting reuse and recycling. The scope of this paper extends to exploring the fundamental principles behind green electronics, highlighting groundbreaking innovations such as organic semiconductors and energy harvesting technologies, and examining challenges like high costs and limited recycling infrastructure. Case studies from leading companies, such as Fairphone and Tesla, illustrate the practical applications and success stories of green renewable electronics. By fostering collaboration among governments, industries, academia, and consumers, the vision of a sustainable, eco-friendly future becomes achievable. This paper aims to provide a comprehensive overview of the potential of green renewable electronics to revolutionize the industry while contributing to environmental nurturing and global sustainability goals.

# Sub Theme-13
# Policy, regulations and education for GREEN electronics

**Paper Id- 1301**

## Paper Title- HOW TECH COULD SHAPE GEOPOLITICS

Pratiksha Kumari, Harsh Vardan Shukla, Divya Sharm, Anurag Yadav,
Neelam Srivastava

**Abstract :** Technology has become a powerful force shaping the future of geopolitics, influencing the balance of global power and altering international relations in profound ways. The rapid advancement of technologies such as artificial intelligence (AI), cybersecurity, biotechnology, and space exploration are redefining traditional concepts of national security, economic competitiveness, and global governance. These technologies enable new forms of warfare, surveillance, and diplomacy, while also empowering non-state actors and reshaping power structures. AI and machine learning, for instance, are driving military advancements in autonomous weapons and cyber defence, with countries racing to secure dominance in these areas. Cybersecurity and digital infrastructure have become critical elements of national defence, as state and non-state actors increasingly engage in cyberattacks, espionage, and disinformation campaigns. Biotechnology, including gene editing and synthetic biology, is transforming both public health and military capabilities, with implications for both bioweapons' development and the enhancement of human capabilities.

**Paper Id-1302**

# Paper Title- GREEN TECHNOLOGY AND CIRCULAR ECONOMY IN INDIAN PERSPECTIVE: ADDRESSING E-WASTE MANAGEMENT AND ITS ENVIRONMENTAL CHALLENGES

Amit Kumar, Neelam Srivastava, Pallavi Pant

**Abstract:** The exponential growth of digital technologies and electronic devices has created abnormal challenges in electronic waste (e-waste) management, particularly in developing nations like India. This comprehensive study examines the critical intersection of green technology and circular economy principles to address the growing issues of e-waste management within the Indian context. The research analyzes how the increasing dependence on electronic devices, both in professional and personal domains, has led to a substantial surge in e-waste generation and demand for innovative and sustainable management solutions. Through extensive analysis of current practices and emerging technologies, we demonstrate that integrating circular economy principles with green technology offers a promising framework for sustainable e-waste management.Our investigation reveals several critical factors influencing effective e-waste management: the need for robust collection and segregation systems, the importance of technological innovation in recycling processes, and the crucial role of policy interventions in creating a sustainable ecosystem. The study particularly emphasizes the significance of public-private partnerships in developing and maintaining efficient recycling infrastructure while also addressing the issue posed by the informal sector in e-waste processing. We identify key barriers to implementation, including limited awareness among stakeholders, inadequate infrastructure for formal recycling, and the need for more strict enforcement of existing regulations.The research adds to the functioning body of knowledge by proposing an integrated framework that combines technological solutions with policy measures, emphasizing the importance of extended producer responsibility and stakeholder engagement across the value chain. Our findings indicate that successful e-waste management requires a complex approach incorporating advanced recycling technologies, comprehensive policy frameworks, and active participation from all stakeholders, including manufacturers, consumers, and recycling enterprises. The paper concludes by offering specific recommendations for policy enhancement and technological innovation, highlighting how these measures can contribute to India's broader environmental sustainability goals while supporting economic development through resource recovery and waste minimization.

# Sub Theme-14
# Green and Smart cities

## Paper Id- 1401

## Paper Title- MOTIVATIONAL FACTORS FOR BUYING GREEN KITCHEN PRODUCTS: A STUDY ON WORKING WOMEN'S IN KANPUR DISTRICT

Shweta Dubey

**Abstract:** This study explores the motivational factors influencing the purchase of green kitchen products among working women in Kanpur District. As environmental sustainability and health consciousness become increasingly important, working women are emerging as a significant demographic in the adoption of eco-friendly kitchen solutions. The research examines key motivators such as environmental concerns, health benefits, cost-effectiveness, convenience, and social influences that drive the purchasing behaviour of working women in relation to green kitchen products. A structured survey was conducted with working women in Kanpur, gathering data on their awareness of eco-friendly kitchen products, the factors that motivate their purchase decisions, and barriers that may hinder adoption. The study reveals that working women are primarily motivated by health considerations and environmental impact, with a strong preference for products that are non-toxic, energy-efficient, and durable. While cost remains a concern due to higher initial prices, many respondents perceive green products as a long-term investment in both health and financial savings. Furthermore, the influence of family and social circles, along with growing media coverage of sustainable living, significantly contributes to shaping their purchasing decisions.The findings suggest that while working women in Kanpur are increasingly inclined towards green kitchen products, challenges such as higher upfront costs and limited availability may hinder widespread adoption. The study concludes with recommendations for manufacturers and retailers to improve product accessibility, educational efforts, and pricing strategies to promote sustainability in the kitchen product market.

## Paper Id-1402

## Paper Title- Possibilities to living under sea

Anuj Yadav, Ayush Pratap, Divya Sharma, Anurag Yadav, Subodh Wairya

**Abstract:** Living under the sea offers a fascinating and innovative approach to overcoming terrestrial challenges such as overpopulation, resource depletion, and climate change. The possibilities of underwater habitation span from the construction of self-sustaining, eco-friendly communities to the exploration of new ecosystems and scientific advancements. Key considerations include advancements in marine architecture, such as the development of pressure-resistant habitats and energy-efficient systems powered by renewable sources like tidal and solar energy. These underwater colonies could provide a new frontier for human habitation, offering the potential for research on marine life, sustainable aquaculture, and the discovery of novel resources.

## Paper Id- 1403

## Paper Title- Microelectronics in Smart City Infrastructure for Sustainability

Aarvi Shanu, Shantala Jain, Manoj Kumar Jain

**Abstract:** Smart city infrastructure is essential for addressing urbanization challenges while fostering sustainability and enhancing the quality of life. Microelectronics plays a critical role in developing intelligent systems that optimize resource utilization, reduce environmental impact, and improve urban efficiency. This paper explores the application of microelectronics in sustainable smart city technologies, emphasizing innovations in sensor networks, communication systems, and energy management. Microelectronic sensors enable real-time monitoring of air and water quality, waste management, and traffic flow, supporting data-driven decision-making. Energy-efficient and low-power devices facilitate large-scale Internet of Things (IoT) networks, which are central to smart city operations. Advanced microcontrollers and processors further enhance energy management by integrating renewable energy sources into urban grids, ensuring efficient energy distribution. The study also examines the role of microelectronics in smart transportation systems, including vehicle-to-infrastructure (V2I) communication, intelligent traffic management, and public transport electrification. In addition, microelectronic-enabled smart buildings improve energy efficiency through automated lighting, heating, and cooling systems. Despite its transformative potential, challenges such as data security, scalability, and electronic waste remain significant. Emerging technologies, including flexible electronics, neuromorphic chips, and energy harvesting systems, offer promising solutions. This paper underscores the pivotal role of microelectronics in creating smarter, greener, and more resilient urban environments, advancing the vision of sustainable living.

## Paper Id- 1404

## Paper Title- Smart Cities for a Green Future: Innovations and Challenges

Khadim Moin Siddiqui, Ajay Kumar, Shivansh Srivastava, Srasti Singh, Anshiv Rathaor, Beer Singh

**Abstract:** The rapid urbanization of the 21st century presents significant challenges, including environmental degradation, resource depletion, and increased carbon emissions. Smart cities, powered by advanced technologies such as the Internet of Things (IoT), artificial intelligence (AI), and big data, offer transformative solutions to these challenges by seamlessly integrating sustainability and innovation. This paper explores the concept of green smart cities and highlights the key innovations driving their development, including smart energy systems, efficient transportation networks, advanced waste and water management, and urban planning solutions optimized for environmental sustainability. Case studies from leading smart cities demonstrate the tangible benefits of these innovations in reducing ecological footprints and improving quality of life. However, the journey toward green smart cities is fraught with challenges, including technological limitations, financial constraints, social resistance, and regulatory hurdles. This research emphasizes the importance of collaborative efforts, innovative public policies, and emerging technologies to address these challenges and foster sustainable urban development. By aligning technological advancements with environmental objectives, smart cities hold the potential to redefine urban living and ensure a greener, more resilient future for generations to come.

**Paper Id- 1405**

# Paper Title- INTEGRATION OF URBAN NATRUAL RESOURCES IN GREEN AND SMART CITIES

Tanuj Kumar Gupta, Vikash Dwivedi, Ashutosh Mishra

**Abstract :** The integration of green and smart cities combines sustainability and technology to create efficient, eco-friendly, and livable urban spaces. This requires a holistic approach that merges green infrastructure with smart technologies to optimize resource use, improve quality of life, and reduce environmental impact .In this literature review we have discussed an analytical and descriptive method to integrate green and smart cities for sustainable environmental practices with cutting-edge technology to improve urban life. Technologies like AI-driven water management, smart meter, smart waste collection, and energy-efficient buildings contribute to sustainability while enhancing the overall quality of life. Creating green and smart cities requires a strategic combination of sustainability, technology, urban planning, and citizen participation. Here's a roadmap for building cities that are both eco-friendly and technologically advanced.

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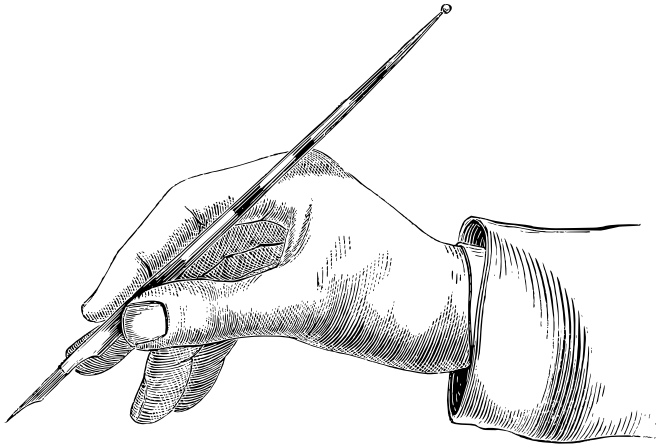

# THANK YOU