

# 2<sup>nd</sup> International Conference on Renewable Energy and Environmental Engineering

**(ICREEE 2017)**

**Godavari Academy of Science and Technology, Khajuraho  
(UNESCO World Heritage Site)**

**09-11 December 2017**

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# **Program Schedule:**

## **SATURDAY, 09 DECEMBER 2017**

09:00 – 10:00 Registrations  
10:00 – 10:30 Opening Ceremony  
10:40 – 10:50 Group Photo  
10:50 – 11:00 Tea Break  
11:00 – 12:00 Plenary Talks  
12:00 – 13:00 Lunch  
13:00 – 15:00 Parallel Sessions  
15:00 – 15:15 Tea Break  
15:15 – 17:30 Parallel Sessions

## **SUNDAY, 10 DECEMBER 2017**

Field Visit to: UNESCO World Heritage Site  
Khajuraho City

# **Detailed Schedule:**

**Opening Ceremony:** SATURDAY, 09 DECEMBER 2017 Venue: Hotel Jhankar, Khajuraho

10:00 – 10:10 Welcome Address by: **Dr. Ashwani Kumar Dubey**,  
Director, Godavari Academy of Science and Technology, Chhattarpur

10:10 – 10:20 Address by Guest-of-Honour: **Dr. Krishan Kumar Sharma**,  
Former Vice-Chancellor and Campus Advisor (Hony.), MDS University, Ajmer

10:20 – 10:30 Address by Chief Guest: *Maharani* **Kavita Singh**,  
President, Nagar Panchayat, Khajuraho, Madhya Pradesh

10:30 – 10:40 Vote of Thanks by: **Dr. R. Hafeez Basha**,  
Chief Technology Officer, Basha Research Corporation, Hyderabad

10:40 – 10:50 Group Photo

10:50 – 11:00 Tea Break

**Plenary Session:** SATURDAY, 09 DECEMBER 2017 Venue: Hotel Jhankar, Khajuraho

Session Chair: **Dr. Ashwani Kumar Dubey**,  
Director, Godavari Academy of Science and Technology, Chhattarpur

Session Co-Chair: **Dr. R. Hafeez Basha**,  
Chief Technology Officer, Basha Research Corporation, Hyderabad

11:00 – 11:30 "Vrundavan Gaushala Biogas plant a success story of Renewable energy resources  
for Rural India" by **Dr. Krishan Kumar Sharma**,  
Former Vice-Chancellor and Campus Advisor (Hony.), MDS University, Ajmer

11:30 – 12:00 "Estimation of Performance of Proposed Room Designed on Solar Architectural  
Concepts" by **Dr. Ajay Bharti**, Department of Applied Mechanics,  
Motilal Nehru National Institute of Technology Allahabad, Uttar Pradesh, India

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12:00 – 13:00 LUNCH

Session Chair: **Dr. Krishan Kumar Sharma**,  
Former Vice-Chancellor and Campus Advisor (Hony.), MDS University, Ajmer

Session Co-Chair: **Dr. Ajay Bharti**, Department of Applied Mechanics,  
Motilal Nehru National Institute of Technology Allahabad, Uttar Pradesh, India

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- 13:00 – 13:15 "Studies of Physico-chemical Parameters of Garia Dam (Railway Dam) Jhansi" by **Mr. Hemant Kumar & Ms. Arti Rai**,  
Department of Zoology, Bipin Bihari (P.G.) College, Jhansi, Uttar Pradesh
- 
- 13:15 – 13:30 "Development of a new design of solar water purification system for urban and rural areas of India" by **Mr. Saurabh Kushwaha & Ms. Priyansha Kushwaha**,  
Godavari Academy of Science and Technology, Chhatarpur, Madhya Pradesh, India
- 
- 13:30 – 13:45 "Invasive alien species (IAS) *Perillus bioculatus* (Fabricius, 1765) (Insecta: Heteroptera: Pentatomidae) with one colour morph first time reported from India" by **Mr. Sandeep Kushwaha**,  
Zoological Survey of India, M Block, New Alipore Kolkata, West Bengal, India
- 
- 13:45 – 14:00 "Study of some edible plant and their ethno-medicinal importance in Tikamgarh district Madhya Pradesh, India" by **Mr. Raghvendra Prakash Ahirwar**,  
Department of Biotechnology, Unique College, Bhopal, Madhya Pradesh, India
- 
- 14:00 – 14:15 "Heavy Metal Concentrations In Water Body Fish Tissues And Macro Invertebrate from Shahpura Lake Bhopal (M. P.)" by **Ms. Pranita Verma**,  
P. G. College, Astha, Madhya Pradesh, India
- 
- 14:15 – 14:30 "Physico-chemical and bacteriological analysis in drinking water of Chitrakoot Nagar Panchayat area (M.P)" by **Ms. Amita Yadav**, Dept. of Energy and Environment,  
Faculty of Science & Environment, MGCGV, Chitrakoot, Madhya Pradesh, India
- 
- 14:30 – 14:45 Tea Break
- 
- 14:45 – 15:00 "Study on sustainable management of fish culture and environmental stress in a waste water body of Rewa Town, Dist. Rewa, (M .P.) India" by **Ms. Suman Singh**,  
Dept. of Zoology, Govt. Model Science College, Rewa, Madhya Pradesh, India
- 
- 15:00 – 15:15 "Evaluation of physio-chemical analysis of water sample in culture pond in Shri Ganeshan Fish Farm at Hoshangabad" by **Mr. Razda**,  
Institute for Excellence in Higher Education (IEHE), Bhopal, Madhya Pradesh, India
- 
- 15:15 – 15:30 "Traditional home made filter technique for drinking water purification in Chhattisgarh" by **Mr. P. Chandrakar**,  
Energy & Environmental Engineering, UTD, CSVTU Bhilai, India
- 
- 15:30 – 15:45 "Low cost bio fertilizer from biomass" by **Mr. Akshay Kumar Srivastava**,  
Dept. of Chemical Engineering, Madan Mohan Malaviya University of Technology, Gorakhpur, Uttar Pradesh, India
- 
- 15:45 – 16:00 "Status of Ground water Quality in Identified Areas of Karwi City, Uttar Pradesh, India" by **Mr. Arvind Prasad Dwivedi**, Department of Chemistry,  
Govt. Sanjya Gandhi Smrati Auto P. G. College Sidhi Madhya Pradesh, India
-

**Technical Session – 2**

SATURDAY, 09 DECEMBER 2017

Venue: Hotel Jhankar, Khajuraho

Session Chair: **Dr. R. Hafeez Basha**,  
Chief Technology Officer, Basha Research Corporation, Hyderabad

Session Co-Chair: **Dr. Raju Aedla**,  
Graduate School of Science and Technology, Kumamoto University, Japan

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|---------------|--|
| 13:00 – 13:15 | "Android Apps Controlled ROBO Car by Microcontroller using Bluetooth"<br>By <b>Dr. Ruma</b> , Department of EEE, Dhaka University of Engineering & Technology (DUET), Gazipur, Bangladesh  |
| 13:15 – 13:30 | "Impact of Urban Areas on Historical and Archaeological Buildings"<br>by <b>Dr. Mahmoud Ali Alsubeh</b> , Faculty of Environmental Design, King Abdulaziz University, Saudi Arabia   |
| 13:30 – 13:45 | "Expediency of renewable energy for environmental sustainability in Nigeria"<br>by <b>Dr. Alice M. Olagunju</b> , Dept. of Science, Technology and Mathematics Education, Faculty of Education, University of Ibadan, Ibadan                         |
| 13:45 – 14:00 | "Clean Development Mechanism in Indian Agriculture Sector: Benefits, Current Status, and Challenges" by <b>Mr. Nallapaneni Manoj Kumar</b> ,<br>Faculty of Electrical & Electronics Engineering, Universiti Malaysia Pahang, Malaysia                |
| 14:00 – 14:15 | "A Hybrid Framework Analysis of the Pedestrians' Decision among Multiple Choice Crossing Paths for an Urban Road" by <b>Mr. Arsalaan Khan</b> , Department of Civil Engineering, University of Engineering and Technology, Peshawar, Pakistan        |
| 14:15 – 14:30 | "A Study on a Typical Slum of Dhaka City" by <b>Mr. Md. Samdani Azad</b> ,<br>Dept. of Civil and Environment Engineering, Mahidol University, Thailand   |
| 14:30 – 14:45 | Tea Break  |
| 14:45 – 15:00 | "A review of the significance of public participation and effects on environment in the transportation planning process" by <b>Mr. Arsalaan Khan</b> , Department of Civil Engineering, University of Engineering and Technology, Peshawar, Pakistan |

**Closing Ceremony:**

SATURDAY, 09 DECEMBER 2017

Venue: Hotel Jhankar, Khajuraho

- |               |  |
|---------------|--|
| 16:00 – 16:15 | Closing Remarks by: <b>Dr. Ashwani Kumar Dubey</b> ,<br>Director, Godavari Academy of Science and Technology, Chhattarpur                  |
| 16:15 – 16:30 | Certificate Distribution by: <b>Dr. Krishan Kumar Sharma</b> ,<br>Former Vice-Chancellor and Campus Advisor (Hony.), MDS University, Ajmer |

# **Contents:**

A Green Corrosion Inhibitor for Carbon Steel in Aqueous Medium <i>Mary Anbarasi</i>	001-001
A Review of The Significance of Public Participation and Effects on Environment in The Transportation Planning Process <i>Arsalaan Khan</i>	001-001
A Tale of Two Countries- China and India: A Comparative Study in Wind Energy Harnessing <i>Nirmal Kundu</i>	002-002
Pore Size Control in Aluminium Foam <i>Avinash</i>	002-002
Nanomaterials for Better Environments <i>M A Shah</i>	003-003
Dye Sensitized Solar Cell- An Eco-Friendly Device <i>Mridula Tripathi</i>	003-003
Energy Crops <i>Archana Nigam</i>	004-004
Managing Technology in Wind Energy in India <i>Nirmal Kundu</i>	004-004
A Study on A Typical Slum of Dhaka City <i>Samdani Azad</i>	005-005
Microalgae: Eco- Friendly Source for Bioenergy and Environmental Sustainability <i>Ravindra Singh</i>	005-005
Solar Light Assisted Photocatalytic Degradation of Carbaryl Pesticide <i>Brijesh Pare</i>	006-006
Techno-economic analysis of autonomous solar-biomass-wind integrated renewable energy system <i>Vijay Mudgal</i>	006-006
Analysis of Building Roof Integrated Phase Change Material for Improvement of Energy Efficiency in Built-Environment <i>K S Reddy</i>	007-007
Studies of Physico-chemical Parameters of Garia Dam (Railway Dam) Jhansi <i>Hemant Kumar</i>	007-007
Application of Solar Energy and Nanotechnology for Photocatalytic Degradation of Calmagite <i>Brijesh Pare</i>	008-008
Development of A New Design of Solar Water Purification System for Urban and Rural Areas of India <i>Saurabh Kushwaha</i>	008-008
Impaired Oxidative Metabolism in <i>Poecilia sphenops</i> : Water Quality Deterioration <i>Deepali Jat</i>	009-009

Chromosomal Aberrations in <i>Allium cepa</i> : An Indicator of Water Pollution <i>Deepali Jat</i>	009-009
Invasive Alien Species (IAS) <i>Perillus bioculatus</i> (Fabricius, 1765) (Insecta: Heteroptera: Pentatomidae) With One Colour Morph First Time Reported from India <i>Kailash Chandra</i>	010-010
A Study on Thermal Performances of Historic Buildings – A Review <i>Supriya Patil</i>	011-011
Ground Water Quality of Chitrakoot District <i>Sadhana Chaurasia</i>	011-011
Highly Sensitive Ag Nanrods Based Surface Enhanced Raman Scattering (SERS) Substrates for Rapid and Sensitive Detection of Pathogens <i>J P Singh</i>	012-012
Study of Some Edible Plant and Their Ethno-Medicinal Importance in Tikamgarh District Madhya Pradesh, India <i>Raghvendra Prakash Ahirwar</i>	012-012
Effect of Environmental Degradation on Natural Regeneration of Red Listed Species “ <i>Boswellia serrata</i> Roxb.” in Bundelkhand Region, India <i>Radha Rajpoot</i>	013-013
A Hybrid Framework Analysis of the Pedestrians' Decision among Multiple Choice Crossing Paths for an Urban Road <i>Arsalaan Khan</i>	013-013
Ground Water Quality of Lucknow City <i>Sadhana Chaurasia</i>	014-014
Scientific Confluence of River Narmada Using Benthos for Environment and Human Welfare <i>Arjun Shukla</i>	014-014
Electrocatalytic Oxidation for The Treatment of Toluene Contaminated Waste Water on High Oxygen Overpotential Anodes <i>Bokam Rajasekhar</i>	015-015
Vrundavan Gaushala Biogas Plant a Success Story of Renewable Energy Resources for Rural India <i>K K Sharma</i>	015-016
Study on Lac Production by <i>Kerria lacca</i> (Kerr) On <i>Cajanus cajan</i> Under Varying Cultivation Conditions in Shahpura, Jabalpur (M.P.) <i>Nisha Dehariya</i>	017-017
Heavy Metal Concentrations in Water Body Fish Tissues and Macro Invertebrate from Shahpura Lake Bhopal (M.P.) <i>Pranita Verma</i>	017-017
Scientific Approaches and Folk Nomenclature on Taxonomic Studies of Freshwater Mollusca In Jabalpur Region (M.P.) <i>Shivani</i>	018-018
Lipase and Its Immobilization: An Important Tool for Biofuel Technology <i>Sancharini Das</i>	018-018

Physico-Chemical and Bacteriological Analysis in Drinking Water of Chitrakoot Nagar Panchayat Area (M.P)	019-019
<i>Amita Yadav</i>	
Assessment of Water Quality Parameters: A View	019-019
<i>Bhoopendra Kumar Ahirwar</i>	
Study on Sustainable Management of Fish Culture and Environmental Stress in A Waste Water Body of Rewa Town, Dist. Rewa, (M.P.) India	020-020
<i>Suman Singh</i>	
Wind Renewable Energy Development in Rajasthan: A Green Energy Approach	020-020
<i>Ashok Kakodia</i>	
Evaluation of Physio-Chemical Analysis of Water Sample in Culture Pond in Shri Ganeshan Fish Farm at Hoshangabad	021-021
<i>Razda</i>	
Pore Size Control in Aluminium Foam by Controlling Bubble Rise Velocity	021-021
<i>N Gupta</i>	
Optimisation of Process Parameters for Ultrasonic Pretreatment of Rice Straw and Dairy Waste Water for its Conversion to Biogas and Ethanol Using Cow Dung and Soil as Mixed Microbial Source	022-022
<i>Dolly Kumari</i>	
Effect of Heat Shock on Biohythane Production from Benincasa Hispida Waste and Petha Waste Water	022-022
<i>Pooja Chahar</i>	
Extraction, Characterization and Optimization of Violacein From Chromobacterium Violaceum and Their Prospective Applications	023-023
<i>Neethus Asokan</i>	
Experimental Investigations on Performance of Karanja Green Diesel with Petro-Diesel Blends in A Compression Ignition Engine	023-023
<i>Pramod Kumar</i>	
Stochastic Models for Solar Energy	024-024
<i>Sumanta Pasari</i>	
Impact of Coastal Vegetation on Wave Intensity Using Open-Source CFD Tool REEF3D	024-024
<i>Abhijith</i>	
Clean Development Mechanism in Indian Agriculture Sector: Current Status and Barriers	025-025
<i>Nallapaneni Manoj Kumar</i>	
Understanding Economics of Energy Labels in Indian Domestic Sector	025-025
<i>Vandana Maurya</i>	
Traditional Homemade Filter Technique for Drinking Water Purification in Chhattisgarh	026-026
<i>Chandrakar</i>	
Estimation of Performance of Proposed Room Designed on Solar Architectural Concepts	026-026
<i>Rahul dev, Ajaya Bharti</i>	



Role of Electrolyte Molarity During Treatment of Tannery Sludge by Electrokinetic Process <i>Prem Prakash</i>	027-027
Low Cost Bio Fertilizer from Biomass <i>Akshay Kumar Srivastava</i>	027-027
Expediency of Renewable Energy for Environmental Sustainability in Nigeria <i>Alice M Olagunju</i>	028-028
Status of Ground Water Quality in Identified Areas of Karwi City, Utter Pradesh, India <i>Arvind Prasad Dwived</i>	028-028
Impact of Urban Areas on Historical and Archaeological Buildings <i>Mahmoud Ali Alsubeh</i>	029-029
Sustaining and Retaining Students' Interest in Science, Technology, Engineering, And Mathematics Education (Stem) Through Motivation and Incentives <i>Adedibu Aderemi Abass</i>	029-029

## A Green Corrosion Inhibitor for Carbon Steel in Aqueous Medium

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**Abstract:** Corrosion is commonly known as rust, an undesirable phenomenon, which destroys the lustre and beauty of objects and shortens their life. The use of organic inhibitors is one of the most practical methods for protection against corrosion of metals and their alloys. In aqueous solutions, the inhibitory action of organic inhibitors is due to their physical (electrostatic) adsorption onto the metal surface, depending on the charge of the metal surface, the electronic structure of organic inhibitor and the nature of the medium. The present study is carried out to discuss the inhibitive effect of an aqueous extract of papaya leaves on the corrosion of carbon steel in dam water using weight loss method, electrochemical studies and surface analysis techniques like Fourier transform infrared spectroscopy (FTIR), Scanning electron microscopy (SEM). Results of weight loss method indicated inhibition efficiency (IE) increased with increasing inhibitor concentration to a particular extent and then it decreases. Polarization study reveals that the inhibitor system controls the anodic reaction predominantly. AC impedance spectra reveal that a protective film is formed on the metal surface. The above results have been supported by surface morphology study using Scanning electron microscopy carried out on the carbon steel samples in the absence and presence of inhibitor.

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## A Review of The Significance of Public Participation and Effects on Environment in The Transportation Planning Process

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**Abstract:** This review paper studies the transportation planning process in the context of public participation and the effects of this process on the environment. These two factors are one of the key stakeholders of the transport facility that results from the planning process. This paper reviews different case studies and the techniques have been evolved in the developed countries for active citizen involvement in the in-transportation planning decision making process, as well as its effect on the environment in the context of fuel emissions which is a main cause of air pollution in urban cities, and energy demands that were foreseen for future.

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## A Tale of Two Countries- China and India: A Comparative Study in Wind Energy Harnessing

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**Abstract:** There is a general agreement that a global shift of economic power is under way from developed to developing countries. As China and India are making the transition from users to producers, and producers to innovators, this has increasingly important implications on global economy, technology and trade policy. China and India are moving beyond catch up and setting the rule of the game in wind energy harnessing. While China's growth in wind energy is just more than "spectacular" and at the same time for India it is no less than "impressive". The objectives of this paper is to study the strategy, policy and framework adopted by these two Asian tigers for the historical growth in the wind energy and also to analyze their relative strength, weakness, opportunity and threats in wind industry. The research methodology used in this study is a combination of literature review, case studies and key informant interviews. In case of key informant interviews, informal telephonic discussions have been carried out with the key executives of the organizations who are actively engaged in the wind energy industry and taking lead role in the development of wind energy in India and China.

It has been observed that China's approach in wind energy harnessing is more aggressive and focus is on building manufacturing capacity, its utilization and technology creation whereas for India, it is more on energy utilization, certification and product reliability. The world is approaching towards sustainable development. This real life example of growth in wind energy harnessing need to be understood and can be used as a role model to be implemented elsewhere and everywhere in related industries.

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## Pore Size Control in Aluminium Foam

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**Abstract:** In recent years, aluminium metal foams have been one of the promising materials in aerospace industry because of their high heat transfer performance due to high surface area. Usually, foaming techniques viz direct and indirect are used for the production of foamed metals. Direct foaming involves blowing of gas to create gas bubbles in the melt whereas in indirect foaming technique, a blowing agent, generally metallic hydrides, are added to the melt which create hydrogen bubbles. The most important parameter affecting the properties here are porosity, size and distribution of pores. In this work we have studied the effect of melt viscosity, gas bubble size, shape and size of blowing agent, on foam pore size and pore distribution. A 15 PPI aluminium foam is prepared using indirect foaming technique having porosity ~85 % for this purpose.

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## Nanomaterials for Better Environments

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**Abstract:** Environmental nanotechnology will play key role in shaping environmental engineering and science in near future. The humanity is facing some crucial problems despite the fact that technology is at its limit. Among the top problem which the humanity is facing across the globe is of water and air pollution. It is of incredible magnitude. Technologies based on Nanomaterials have effective technologies for monitoring and remediation of pollutants. Global consumption of water is doubling every 20 years, more than twice the rate of human population growth. If current trends persist, by 2025 the demand for fresh water is expected to rise by 60 percent above the amount currently available. New approaches are continually being examined to supplement traditional water purification methods. These need to be lower in overall cost, durable and more effective than current options for the removal of contaminants from water. It is in this context that nano-enabled technologies are being considered. Nanostructure membranes are being developed to separate toxic gases from the industrial plants or vapors escaping from cars. It is only a matter of time that this technology will help in cleaning water and air either with nanocatalysts or with smart materials.

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## Dye Sensitized Solar Cell- An Eco-Friendly Device

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**Abstract:** The conventional solid state silicon based solar cells with high conversion efficiency have dominated the photovoltaic market from last many years but are yet to become popular for mass applications as the manufacturing of these silicon based solar cells are highly expensive. Therefore developing low cost devices with environmentally friendly materials for harvesting solar energy is very much desirable. Dye-sensitized solar cells (DSSCs) have been considered as one of the most promising photovoltaic technologies because they are generally made from inexpensive components, and have simple designed structure. A DSSC is composed of following components nanocrystalline porous semiconductor based working electrode, sensitizer, counter electrode and an electrolyte. The researchers and scientist working in the field of DSSCs are concentrating their work on improving the one or the other component so that highest efficiency comparable to traditional silicon based solar cells can be achieved. In our present research work we are concentrating on developing DSSCs using natural components in place of synthetic dyes based on novel metals like ruthenium and osmium we will be using natural dyes like anthocyanin, betacyanin, chlorophyll etc. Generally liquid electrolytes are used for making DSSCs but the leakage and the valorisation of the liquid electrolyte limiting the long-term durability and the practical use of DSSCs. Therefore, the solidification of the electrolytes used in these devices has been one of the most crucial research directions in the field of DSSCs. In order to fabricate highly efficient and cheap DSSCs we will replace Platinum based counter electrodes with efficient electrodes based on natural carbon materials. As the counter electrode made up of platinum are very costly and greatly hindered the commercial application of DSSCs. Currently, efforts are directed to develop low cost materials with good chemical stability and high catalytic activity to replace Pt. Therefore in the present research proposal we will focus our attention towards carbonaceous materials such as graphite, carbon blacks, activated carbons, carbon nanotubes, graphene, and mesoporous carbons as they offer various advantageous over platinum like low-cost, high conductivity, excellent chemical/thermal stability, and superior corrosion resistance against redox electrolyte.

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## Energy Crops

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**Abstract:** Plant species that are efficient user of solar energy for converting CO<sub>2</sub> into biomass, which can be used as a source of energy, are called energy crops. The nature of biomass obtained from these crops is of the following types: (1) Wood (2) Sugar and starch, and (3) hydrocarbons. It has been estimated that the ratio between the energy produced by and the energy used for the production of energy crops should be 5 or above for the crops to be used efficiently. It is obtained from fast growing trees like Butea, Casurina, Eucalyptus, Melia etc. The predominant mode of utilization of wood as an energy source is in the form of firewood, which is rather inefficient. It is estimated that about 50% of the total wood harvested each year is consumed as firewood.

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## Managing Technology in Wind Energy in India

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**Abstract:** Growth of civilization demands high energy use. Conventional energy resources are being depleted at enormous high rate, causing immense negative impact on environment. Renewable energy sources are the only alternative for sustainability and survival. Most abundant renewable resources are sun and wind. The Onshore wind energy has already gained momentum and attained technological maturity although offshore wind energy harnessing is still in conceptual stage in India. The objective is to study the issues associated with managing technology, capability development and effective economic growth of wind energy technology in India. Research methodology used is a combination of literature review, case studies and key informant interviews. The literature review includes both published and unpublished sources of literature. Case studies and examples are taken from China and India. In case of key informant interviews, informal telephonic discussions have been carried out with the key executives of the organizations in wind industry. Both China and India started their journey in wind energy harnessing almost at same time and from similar economic and technological background through technology transfer mode but China is now undisputed leader. This study explains how managing technology like focused technology policy, stress on higher capacity wind generator, better incentives on manufacturing, collaborative R & D practices, capability building could bring better result for wind energy harnessing in India. This paper establishes that economic growth depends not necessarily on the stock of technology but practically on how effectively and efficiently the technology is managed.

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## A Study on A Typical Slum of Dhaka City

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**Abstract:** Majority of slum people are living in poor water quality where the absence of basic services and facilities are not rich. The aim is to evaluate the existing housing condition, to identify the present condition of sanitary facilities as well as to evaluate the present condition of drinking water quality. So, this study focuses on the overview of living standard, water supply and sanitary condition of a slum in Dhaka city. Agargaon radio office (north side) slum has been selected here. Besides, the condition of located area is not good. They used to manage their basic needs with this low income and at the last of the month they do not have any money left. Their profession includes garments worker, rickshaw or van puller, day labor, petty business man, construction worker and boatman. On the other hand, a large amount of people are unemployed. So, the people of this area are very low paid worker. Their living standard and water supply system is correlated and is needed to improve according to this study. Moreover, huge crowds of population create an adverse effect.

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## Microalgae: Eco- Friendly Source for Bioenergy and Environmental Sustainability

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**Abstract:** The decline of fossil fuel resource, increasing oil prices and more complicated environmental concern have led to an increase attention towards Biofuels worldwide. Due to its concerns over climate change and also energy security. Bioenergy from various feedstock such as dairy digesters, landfills and cultivation of microalgae can be a reliable source of renewable fuels, that can power the cleanest and most efficient energy generation as well as transportation in India. The cost of microalgae cultivation is the central challenge of microalgae bioenergy development. The cost of nutrients and biomass harvesting are two major factors that limits the algal biofuels from being economically feasible. These factors are reduced by integrating the Photo-bioreactors and the anaerobic digestion of waste water. Biomass potential of selected algae under outdoor conditions was performed under natural lights and temperature conditions. With the growth of *Chlorella pyrenoidosa*, the percentage of Nitrate nitrogen decrease. The NO<sub>3</sub> nitrogen in waste water was eliminated by 93% within 15 days. In order to keep the nitrogen in anaerobic digestion, the released nitrogen could be recycled either for the growth of microalgae as nutrient or as fertilizer. From the experimental studies, problems related to the removal of toxic contaminants and availability of raw water and energy were solved by the microalgae. Waste water and nutrient recycling from the anaerobic effluents make anaerobe digestion the best technology for removal and energy production from microalgae.

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## Solar Light Assisted Photocatalytic Degradation of Carbaryl Pesticide

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**Abstract:** In the present study we have investigated the photocatalytic degradation of Carbaryl pesticide in the presence of as-synthesized flowerlike nano BiOCl under solar light. The flowerlike nano BiOCl was prepared by a simple hydrolysis method at room temperature, and characterized by XRD, SEM, DLS, UV-DRS and IR techniques. The photocatalytic degradation studies showed that the degradation depends on some reaction conditions like pH, catalyst loading, initial dye concentration, oxidants etc. and these conditions have been optimized. The results illustrated that Carbaryl pesticide can be efficiently degraded at pH- 8.2 and 40 mg/50 ml catalyst amount. 10<sup>-4</sup> mol dm<sup>-3</sup> carbaryl pesticide degraded in 150 min. under chosen condition.

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## Techno-economic analysis of autonomous solar-biomass-wind integrated renewable energy system

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**Abstract:** A hybrid renewable energy system provides a viable solution for electrification of remote location where grid extension is difficult or is uneconomical. Integrated renewable sources are attractive because they are non-depleting, non-polluting and have minimum environmental impact compared to fossil fuel. In present study design and optimization of an autonomous integrated renewable energy system consisting of wind turbine, solar Photovoltaics (PV), and biogas run generator with battery storage. The output of the integrated system is utilized to meet electric load demand of solar research laboratory at IIT Madras. A parallel-type integrated renewable energy system model is designed to have maximum contribution from wind and solar energy with minimum net present cost of the system. Simulations were carried out using MATLAB Simulink to determine the optimal contribution of the combined system. HOMER software was used to optimize the performance of overall system. The result shows that solar-wind is able to supply about 70% of the total load demand. The results obtained from these simulations suggest that a combination of 10 kW of wind turbine, 6.0 kWe of solar PV and 5.0 kWe of biogas generator with a battery storage of 3.5 hours is most feasible system with net present cost and cost of energy equal to Rs 50,12,328 and Rs 12.38/kWh respectively. It was also found that the system operates efficiently when the biomass run generator automatically starts at 35% of battery rated capacity.

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## Analysis of Building Roof Integrated Phase Change Material for Improvement of Energy Efficiency in Built-Environment

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**Abstract:** Thermal energy storage of renewable energy such as solar heat and night cold using phase change material play an important role in maintaining thermal comfort, reducing environmental emission and energy consumption in building. This is because of phase change material (PCM) ability to absorb/release heat within small temperature variation. In present work, thermal performance of roof with and without PCM layer has been carried out by developing and numerically solving heat transfer model using ANSYS FLUENT version 15.0. The result shows that PCM layer can significantly reduce heat gain in building and result in energy conservation throughout the year. The maximum average temperature attained by gypsum board in PCM integrated roof is approximately 4oC lesser than roof without PCM layer for climatic condition of Chennai. Study has also been carried out with different PCM layer thickness, which show that with increase in PCM thickness there is reduction in indoor temperature fluctuations. The selection of PCM with suitable phase change temperature is important. Comparison are also made with PCMs with different phase change temperature and latent heat of fusion. With PCM 307K the gypsum layer is able to maintain almost constant temperature of about 32oC throughout the day. The analysis also shows that there is reduction in heat gain by 17 to 26 % for PCM layered roof compared to the roof without PCM layer for the different months of the year.

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## Studies of Physico-chemical Parameters of Garia Dam (Railway Dam) Jhansi

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**Abstract:** Water quality is an index of health and being of a society. Physico-chemical parameters are important criteria for determining the suitability of water for irrigation and drinking purpose. The study area selected were the Garia dam (Railway dam) Jhansi District. Garia dam have been studied through monthly survey in six month from January 2017 to June 2017. The water remain moderately Air temperature (31.28oC) and Water temperature (27.03oC), Transparency (123.8 cm), pH (7.5) while Electrical Conductivity of water (0.395 mS/cm), TDS (237.5 mg/l), Chloride (176 mg/l) and Alkalinity (207.16 mg/l) showed main value. Average Dissolve Oxygen (DO) level were 5.75 mg/l while average Nitrates and Phosphates level were 3.70 mg/l and 2.79 mg/l respectively. On the basis of water quality parameters in general Garia dam was found to be eutrophic.

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## Application of Solar Energy and Nanotechnology for Photocatalytic Degradation of Calmagite

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**Abstract:** The present study is focused on synthesis of a novel photocatalyst and utilization of natural solar energy for environmental significance. In this era of energy crisis, it is a topic of interest to utilize renewable energy in various fields. In this study we have investigated the wastewater remediation with the help of nanoparticles as semiconductor photocatalyst utilizing solar light. BiOCl nanoparticles have been synthesized by a green technique through hydrolysis method. The synthesized BiOCl was characterized by XRD, and it suggested the high purity and crystallinity of nano BiOCl. The photocatalytic activity of synthesized nano BiOCl was confirmed by the efficient solar photocatalytic degradation of calmagite dye. The synthesized BiOCl also showed the significant reusability even after the third cycle of reuse.

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## Development of A New Design of Solar Water Purification System for Urban and Rural Areas of India

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**Abstract:** Given that the future of our planet is intricately entwined with the future choices of energy, effective exploitation of non-conventional energy sources is becoming increasingly essential for modern world as fossil fuels are hazardous to environment and cannot sustain supply for long time as they are not renewable. Therefore, the need for the era is the use of renewable sources of energy, not just to meet the current energy demands but also targeting rapidly increasing hunger for energy. In this seminar work, effort has been made to demonstrate the design and development of a low cost solar powered water purifier for personal use in a small house or apartment. Apart from fresh water this personal water purifier can be optimized and used for cooking, or as room heater, or as wheat dryer and so on. The idea for such a design came up after traveling around India's various towns & village where we found that there is shortage of fresh water which is rarely being used in lower class family because of their economic status. These people mostly depend on wells or rivers for everyday water supply. All design decision will be made to address the above objective statement for this design.

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## **Impaired Oxidative Metabolism in *Poecilia sphenops*: Water Quality Deterioration**

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**Abstract:** The opercular movement considered to be as the indicator of respiratory stress. Change in fish behavior like opercular movement indicates deterioration of water quality parameters, since fish are one of the good indicator of water quality. Pollutants in the environment enter into fish by means of their respiratory system. Respiratory activity of a fish is the first physiological response to be affected by the presence of the pollutants in the aquatic environment. Abnormal opercular movement and quantification of oxygen consumed by the fish are some of direct measurements of stress in fish, and also the deterioration of water quality. During this study we have measured opercular activity of fish under three aquatic media viz; I, control : distilled water is taken as control, II : Tap water and III : water is taken from Sagar lake, Madhya Pradesh. Fishes (*Poecilia sphenops*) were kept under all three aquatic media 7, 15 and 21 days. Experimental fish showed increased opercular movement and oxygen consumption during the initial time of exposure and a gradual decrease during in subsequent study period. Alteration in oxygen consumption and opercular activity may be due to respiratory distress as a result of impaired oxidative metabolism.

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## **Chromosomal Aberrations in *Allium cepa*: An Indicator of Water Pollution**

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**Abstract:** Various pollutants in water have been studied for observing their deleterious changes in the genetic material. *Allium cepa* test is one of the potential indicator used for biomonitoring water quality deterioration and to evaluate the effects of pollutants present in aquatic environment. This study aimed to perceive the potential effect of water pollutants on root growth and chromosomal aberrations in *Allium cepa*. The buds of onion are prepared first by removing some layers of its skin. After sun drying material were kept in different aquatic media for experimentation. The group I, served as control containing distilled water. Group II, contained tap water and the group III, served as treatment group containing water obtained from Sagar Lake, Madhya Pradesh. In macroscopic examination root length of onion buds were measured from different groups. Cells during interphase and undergoing divisions were probing the presence of chromosomal aberrations. The results of the study showed changes in the root length i.e., shortening of the root length of *Allium cepa* grown into water obtained from Sagar lake. In the microscopic examination arrested cell division has been observed in the root tip cells. The finding entails the effect of water pollutants on the local biota exposed to the effluent discharge in the water bodies.

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## **Invasive Alien Species (IAS) *Perillus bioculatus* (Fabricius, 1765) (Insecta: Hemiptera: Pentatomidae) with one Colour Morph First Time Reported from India**

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**Abstract:** Alien species are non-native or exotic organisms that occur outside their natural adapted ranges and dispersal potential. Many alien species support our farming and forestry systems in a big way. However, some of the alien species become invasive when they are introduced deliberately or unintentionally outside their natural habitats into new areas where they express the capability to establish, invade and compete to native species. International Union for Conservation of Nature and Natural Resources (IUCN) defines Alien Invasive Species as an alien species which becomes established in natural or semi natural ecosystems or habitat, an agent of change, and threatens native biological diversity. During the several faunistic surveys by Zoological survey of India, Jabalpur has collected few specimens of *Perillus bioculatus* by hand picking, net trap and light tarp methods, collected from various localities of Jabalpur, district of Madhya Pradesh. Specimens were sorted out and different specimens of *Perillus bioculatus* (Fabricius, 1765) were pinned, dried and were identified with the help of literature available in ZSI library and Fauna of British India. Three basic colour morphs were identified and sorted out from collected specimens. The precision in identification of an organism formulates the fundamental step for most aspects of biological science. In Hemiptera as well as in most of the insect groups, traditional taxonomic research is practiced with morphology as a fundamental, which sometime have great variations in members of a species dealing with a number of characters i.e. polymorphism. There are about 3 colour morphs present in all over the world; two of them are mentioned yellow and black and white form. This predator occurs throughout the Northwest and is a predator of the Colorado potato beetle. Occasionally this predator may provide control of the Colorado potato beetle, but it rarely occurs in large enough numbers to provide adequate control. This species has both a red and yellow form, and both are slightly more robust around the pronotum and posterior abdomen thus giving them a very subtle hourglass shape as opposed to *P. exaptus* distinct oval shape. The colouring of the red form is primarily in the pronotum and scutellum. In these structures the colouring appears only around the margins, except that in the pronotum a medial red strip separates two large black spots, and on the scutellum the basal margin remains black. The characteristic black spots on the pronotum also aid in distinguishing this species from *P. exaptus*. The margins of the connexivum and basal portions of the hemelytra are also red coloured. In the yellow form, slight differences occur in the location of the colouring. The pronotum still has a thick red bar along its posterior margin; however the black spots are surrounded by yellow. Additionally, the margins of both the corium and scutellum are completely lined with yellow enclosing blackened regions in the centres of these structures. As in the red form, the margins of the connexivum and basal portions of the hemelytra are yellow as well. The fore-femora of both forms have a ventral, elongated spine contrasting the stubby tubercle present in *P. exaptus*. The white and yellow form had been described in this study.

## A Study on Thermal Performances of Historic Buildings – A Review

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**Abstract:** The thermal comfort conditions inside the buildings are very much important for the occupants. This comfort condition depends upon the various factors of the design. To achieve this condition proper designing of elements of climate like air temperature, humidity, and air movement is needed. From the past literature we can say that the vernacular buildings are more climate responsive as compared to the modern buildings. Thus, the study of the vernacular buildings is necessary to find out the micro climatic performance of them. In this paper three different research papers are selected for the study. The detail study of the research papers is done here. And it is found that by using vernacular architectural techniques, thermal comfort can be achieved inside the buildings. Sometimes not only the techniques but materials also play an important role in the thermal comfort conditions. Some field measurements and survey techniques can also help to formulate the thermal comfort conditions.

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## Ground Water Quality of Chitrakoot District

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**Abstract:** Water represents the basic element of supporting life and the natural environment and is a vector for domestic and industrial pollution. Water quality is a major concern of developing countries, where existing conditions of water supply infrastructure is poor and financial resources for construction and maintenance of infrastructure are inadequate. Water has a great role to play in socio-economic development of human population. Much of ill health that affects humanity can be traced to lack of safe and wholesome water supply. Therefore, present study was carried out in Chitrakoot. The study was aimed to examine various physico-chemical and biological quality as it is related to public health. The parameter investigated were pH, EC, TDS, DO, BOD, Hardness and total coliform etc. and results were compared with WHO and IS standard. It was observed that few ground water samples were in acceptable limit while few were found unfit for drinking propose and needs proper disinfection or treatment before consumption.

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## Highly Sensitive Ag Nanrods Based Surface Enhanced Raman Scattering (SERS) Substrates for Rapid and Sensitive Detection of Pathogens

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**Abstract:** Surface enhanced Raman spectroscopy (SERS) has emerged as a promising technique for chemical and biosensing applications as it combines molecular fingerprint specificity with potential single-molecule sensitivity. Although SERS has emerged as a potential technique for chemical and biological sensing it has few limitations like all the other techniques. Silicon wafers and glass slides are two of the most common substrates used for the growth of SERS active layers. However, these substrates are rigid and brittle and hence, limit some applications such as packaging or tracking where a flexible SERS substrate would be more appropriate. Another limitation of these SERS substrates lies in a fact that they are mostly two-dimensional (2D) planar systems. In 2D ordered substrates the number of hotspots is limited to only one Cartesian x-y plane. Due to their one-time use, and considering the valuableness of the noble metals, these SERS substrates cannot be completely explored as a routine analytical technique. Therefore, research has been focused on developing reusable SERS-active substrates. A simple and elegant method to produce highly uniform and arrays of nanostructures is glancing angle deposition (GLAD). This is a physical vapor deposition process, which utilizes the self-shadowing effect that appears at highly oblique particle incidence angles to create highly porous nanostructures. We have formed buckled AgNRs-PDMS SERS substrates, which provide better entrapment and increased contact area for *P. aeruginosa* bacteria onto the AgNRs giving rise to enhancement in the Raman signal. We have also demonstrated a simple and facile method to fabricate a highly sensitive, flexible and robust SERS active substrate. The AgNRs arrays on these flexible substrates retain their SERS activity after repeated cyclic tensile tests. As a proof of concept, thiram pesticide with concentrations value 1000-fold lower than the level currently permissible in farming has been detected on apple peels. Photocatalytic recyclable SERS substrates were fabricated by combining plasmonic metal (Ag) with semiconductor TiO<sub>2</sub>. The Ag-TiO<sub>2</sub> SERS substrates recovered after 150 min in presence of UV light illumination. These revived substrates have shown to be successfully reused for further SERS analyses with a correspondingly small decrease (on average 5% for each cycle) in the Raman intensity. A simple method of chemical etching to create nanogaps in a zig-zag AgNR arrays which act as SERS active hot spots for increased SERS detection sensitivity is also demonstrated. It was found that SERS intensity increases with increase in the number of arm of zig-zag structure. The extremely high electric field at the nanogap hot spots is responsible for enormous enhancement in SERS intensity.

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## Study of Some Edible Plant and Their Ethno-Medicinal Importance in Tikamgarh District Madhya Pradesh, India

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**Abstract:** Tikamgarh district is the important part of Madhya Pradesh. It is dominated by tribal population since ancient time. They are dependent on forest for fiber, food, fuel, fodder, medicine. Present study has been made to enumerate the edible plant used by the tribal person with their ethno medicinal importance for making good health. During survey 60 plant species of angiosperm has been enumerated which are being used by the tribal person of Tikamgarh district.

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## Effect of Environmental Degradation on Natural Regeneration of Red Listed Species “*Boswellia serrata* Roxb.” in Bundelkhand Region, India

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**Abstract:** Today Salai (*Boswellia serrata* Roxb.) has become more important in the global context because of its anti-cancer, anti-inflammatory, analgesic and immunomodulatory properties in Pharmasciences. Although since last many decades It has been used as ayurvedic medicine for Rheumatic arthritis in renowned ancient texts Charaka's Charaka Samhita (c.B.C. 700), the first fundamental medical text; Susruta's Susruta Samhita (c.B.C. 600). Although, all over the world studies were conducted for the conservation of this genera. In India, sporadic studies were also conducted on a different aspect of medicinal use and ex-situ conservation. But now the species is listed as “Vulnerable” in Madhya Pradesh, India. Therefore, in the current situation, there is urgent need to focus on its natural regeneration, sustainable use, conservation and proper management of this species in the natural habitat. For population estimation, quantitative ecological analysis, Research was conducted in eleven selected *B. serrata* natural forest located in respectively Shivpuri, Ashoknagar, Jhansi, Sagar districts of Bundelkhand region, India. Different phonological events were recorded according to Opler et al. (1980). Vegetation sampling was done by quadrat method. The density–diameter class distribution (individuals per hectare) follows the trend: seedlings < saplings < trees in all the three stands. This clearly indicates the population of the young tree plants of *B. serrata* is shrinking due to habitat fragmentation, invasion by *Lantana camara*, *Parthenium hysterophorus*, *Hyptis suaveolens*, over-exploitation for its oleo-gum-resin, and an ever-increasing anthropogenic activities-the most important being the increasing demand on land for agriculture, mines, industries and the urbanization.

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## A Hybrid Framework Analysis of the Pedestrians' Decision among Multiple Choice Crossing Paths for an Urban Road

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**Abstract:** Due to high exposure and vulnerability of pedestrians to traffic accidents, urban planners frequently propose alternatives to improve their safety. However, some solutions, such as pedestrian bridges, underpasses, and crosswalks at signalized intersections usually imply longer walking distances compared to the direct crossing alternative which in turn, results in a wide scenario of choices based on various direct and indirect variables. In this project, a hybrid framework is proposed to analyze the pedestrians' choice on how to cross an urban road where three crossing options are available: crossing directly, crossing by using a pedestrian bridge, or by using an underpass. The decision process is modelled as a discrete choice model incorporating latent variables to consider perceptions and psychological factors, using data coming from a survey applied in the region around Islamia College, Peshawar. Studies show that the latent variables, security/safety, and attractiveness of each crossing alternative are relevant to understand the pedestrian crossing behaviour. These latent variables are strongly determined by socioeconomic characteristics of the individual (age, gender, level of study) and conditioned by the circumstances of the trip (main mode of transport, walking with/without children). For instance; a longer walking distance to a pedestrian bridge or an underpass increases the probability of direct crossing or a high volume of traffic increases the probability of crossing the road through an overhead bridge.

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## Ground Water Quality of Lucknow City

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**Abstract:** Water is essential for life on surface of earth. Primarily the ground water was safe to drink but after the time was passed it became polluted due to huge discharge of untreated industrial effluent and other human activities. Polluted water is mostly responsible for diseases like jaundice, hepatitis, typhoid dysentery and diarrhoea etc. Surface water and Ground water both are the source of drinking water in the Lucknow city, the capital of Uttar Pradesh. The aim of this study is to know the current situation of ground water quality of Lucknow city. In this study 5 location at Lucknow city have been selected for collecting ground water samples and comprehensive physico-chemical analysis was conducted. Physico-chemical Parameters like temperature, turbidity, conductivity, TDS, chloride, fluoride, total hardness, alkalinity, nitrate and phosphate were measured according to the standard method. The results were compared with IS drinking water standard 10500 and observed that most of parameters in all sampling station were found within acceptable limit while few parameters like TDS, total hardness, alkalinity and sulphate were found higher than standard limit at some of the location.

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## Scientific Confluence of River Narmada Using Benthos for Environment and Human Welfare

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**Abstract:** Linnaeus discovered about 1000 species in his life time. Beggad Ji has gone through the Narmada Parikrama three times to show the significance of holy river Narmada. Then it also becomes our duty to do some research in this direction and pay the value of human Life. Narmada River, a mighty west flowing river is the fifth largest and the oldest river in India. At present pollution load of river increases rapidly. Benthic Macro invertebrates are used as pollution indicators that live on or inside the river bed of a water body. This study aims to reduce such problems. The whole Narmada valley of Jabalpur region was selected as study site for the collection of sample. The present study was carried out from January 2014 to December 2016. Three study sites had been selected for the investigation of benthos were Bargi dam, Gwarighat and Bhedaghat. Organisms were identified by using standard identification keys provided by Fraser (1933, 1934 and 1936); Mitra (2006); Subramanian (2005, 2009); Tonapi (1980); Adoni et al., (1985); SubbaRao (1993). In present study total 75 species of various fauna have been recorded viz., Odonata 37 species (7 Families), Lepidoptera 25 Species (5 Families), Mollusca 13 Species (2 Class). The whole study on benthos encircles around environment and human welfare and through this research we can solve these problems.

- To assess biological parameters by identifying some macro invertebrate's Species.
- To determine the extent of pollution and suggest a possible remedy.
- To award Specific diversity and Current status of Benthos.
- To attempt for new record.

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## Electrocatalytic Oxidation for the Treatment of Toluene Contaminated Waste Water on High Oxygen Overpotential Anodes

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**Abstract:** Toluene is a hazardous aromatic compound, exposure to which can cause health effects like damage to kidneys, central nervous system disorders, impaired speech, hearing, and vision. Water bodies like rivers and groundwater can be contaminated with toluene due to the leakage of petroleum fuels from the storage tanks, pipelines, as well as the discharge of untreated refinery effluents etc. Toluene is one of the main constituents of the petrol, a widely used fuel in India. Electrocatalytic oxidation experiments were conducted to treat the toluene contaminated wastewater under various conditions. Linear sweep voltammetry and cyclic voltammetry were used to illustrate the electrochemical activity of the electrode. Degradation studies focused on the effect of electrolyte (NaCl and Na<sub>2</sub>SO<sub>4</sub>) and effect of applied current density (20mA/cm<sup>2</sup> and 30mA/cm<sup>2</sup>) under the two electrolytes. High Performance Liquid Chromatography (HPLC) and Total Organic Carbon (TOC) were used to analyze the amount of degradation of toluene. Results showed that more than 90% removal of toluene was observed. The phenomenon of degradation involves the oxidation of the toluene by the hydroxyl radicals which was generated at the anode. Hydroxyl radicals were trapped and quantified using the HPLC. Toluene degradation was found to be greater in Na<sub>2</sub>SO<sub>4</sub> system than NaCl system. This could be due to the enhanced formation of hydroxyl radicals and better current transfer in Na<sub>2</sub>SO<sub>4</sub> system than NaCl system. Analysis of treated water samples in HPLC results revealed the formation of intermediates suggesting that mineralization of toluene is not a direct step by the process of electro-catalytic degradation.

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## Vrundavan Gaushala Biogas Plant a Success Story of Renewable Energy Resources for Rural India

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**Abstract:** When Homo sapien the present species of man started his life from arboreal to land dwelling creature, started need of energy in its mind. Ancient man found fire as strange source of energy when two objects collided and as a result fire was produced which he initially used for protection from wild animals and occasionally for cooking purposes. When man started civilized and socialized life energy became the need of everyday life. Man as explorer, technologist and scientist started search of various energy sources on lithosphere, atmosphere and hydrosphere. Today, we have reached to a state that life becomes very inconvenient and uncomfortable if energy is not there. Nature has provided us two important energy sources (1) conventional like petroleum, Coal, Natural gases etc and (2) non-conventional including Solar cells, fuel cells, wind power, tidal power, geo thermal etc. We are still dependent on fossil fuel, coal, gases in most of the energy utility sectors but these are non-renewable energy sources which will last someday. If the demand for energy remains at its current state, majority of our fossil fuels will be exhausted soon. As a result production of energy will



become extremely expensive and the depletion of non-renewable resources will lead to sudden collapse of economic development. In this context, it is the need of present to propose better solution for the future as renewable energy sources to combat with the problem of ultimate disappearance of fossil fuels. In such a situation with growing need of the energy resources we must think for renewable energy sources like Biogas. Biogas, a clean and renewable form of energy, could very well be a substitute for conventional energy sources, such as fossil fuels. Generation of a combustible and inflammable gas from anaerobic biomass digestion, is a well-known technology, called Biogas technology. This is a natural phenomenon in an ecosystem that is destined a role for decomposition. Nature provided this facility on the earth crust initially for recycling but later become useful for removal of organic debris through microorganisms to create clean environment on the surface of earth. Biogas is an environment friendly renewable green energy source which cover both industrial and domestic requirements. The domestic energy requirements cater for activities such as cooking, heating, lighting and other similar domestic uses. Biogas is produced by means of a process known anaerobic digestion by using any organic matters that is broken down by mixed population of microorganisms in the absence of air. Biogas popularly known as gobar gas because gobar (cattle dung) as initially raw material has been in use as an alternative energy source that began to be utilized both in rural and industrial areas since 1958. The anaerobic treatment system is a complex three-step process that produces methane gas in addition to other products from the biological digestion of organic waste. The first stage of this process is the hydrolysis of lipids, cellulose, and protein. Extracellular enzymes produced by the bacteria, breakdown these macromolecules into smaller units easy to be digested. These molecules are decomposed into fatty acids such as propionic, acetic, and butyric acid. Several facultative and anaerobic bacteria such as Bifidobacterium Clostridium, Desulphovibrio, staphylococcus and Actinomyces are involved in this process of decomposition. Methanogenic bacteria such as Methanococcus, Ethanolobacterium, Methanosarcina and Methanobacillus digest these fatty acids, resulting in the formation of methane gas. The biogas produced in this process contains about 50-75% methane, 25-45% carbon dioxide, 2-8% water vapour and traces of O<sub>2</sub>, N<sub>2</sub>, NH<sub>3</sub>, H<sub>2</sub>, H<sub>2</sub>S. The percent of methane in natural gas is about 80-90. The energy content of the gas depends mainly on its methane content. High methane content is, therefore, desirable. A certain carbon dioxide and water vapour content is unavoidable, but Sulphur content must be minimized as far as possible for other commercial purposes. The average calorific value of biogas is about 21-23.5 MJ/m<sup>3</sup>, so that 1 m<sup>3</sup> of biogas corresponds to 0.5-0.6 ltr diesel fuel. Since the process of digestion involves specific microorganisms, therefore, efficiency of system depends on several factors such as temperature, pH, retention time, C/N ratio, particle size of the material being digested etc. Methane gas production is the slowest and most sensitive process. Methanogenic bacteria have a limited temperature range (32-40 °C). Pre heating of the slurry before digestion gives better results. We have observed that mixing of slurry thoroughly and micro aeration in the pre stage digestion improves efficiency of the system. These parameters should be controlled within a desirable range to operate the biogas plant efficiently. In view of these technical inputs we established Vrundavan Gaushala Gobar gas plant recently (2016) at Jasdan (Rajkot) in the Gujarat State of that is providing kitchen gas facilities to about 250 persons. A success story of Bio gas plant at Vrundavan Gaushala, Jasdan (Rajkot) as a renewable energy resource for the rural India. Bio gas plant at Vrundavan Gaushala, Jasdan (Rajkot): Jasdan is located at 22.03°N 71.2°E. The average elevation is 193 metres (633 feet). Jasdan is the biggest Taluka in Rajkot district with 102 villages. It is very important geographically as heart of the Madave Hills from where most of the rivers of Saurashtra originate and then flow to the Arabian Sea and Gulf of Kutchh and Gulf of Khambhat. Jasdan has a Gaushala caring about 1000 cows in very good health under the JeevDaya Trust. The total covered area of the trust is about 150 acre in which Gaushala area is about 10 acre on a hill top in the vicinity of Shree Vrundavan Polytechnic College. It has about 500 kg production of cow dung per day. Institutional Biogas plant was established in the year 2016 with partial support from the Gujarat Energy Development Agency with 75% financial assistance and Vrundavan Gaushala Jiv Daya Trust 25 %. Institutional Biogas plant owned and managed by the volunteers and experts at Shri Vrundavan Gaushala Jivdaya Trust at Jasdan. The total plant capacity is 85 m<sup>3</sup>. The model supporting production of bio gas from Gobar (cow dung) is a floating Domvritica model HRT 40 days. Daily dung requirement is 2125 kg. Daily water requirement is 2300 ltr. Total gas connection is meant for mess and public kitchen. The Plant came in operation w.e.f. 15/04/2016 and functioning with full efficiency with about 73% methane. Initially plant requirement is 7000kg cow dung to support kitchen requirement of 250 persons, mean 1/4th of its capacity and the same can be enhanced as per the requirement. Inlet system of the plant includes a water tank, dung mixing tank. Inlet pipes, platform for dung. Outlet system includes a waste channel, slurry tank and outlet pipes. Total diameter of plant is 7 meter and depth of the plant is 15'9". How to enhance system efficiency and scopes, challenges and opportunities in the field of biogas as renewable energy resource shall be discussed during the International conference.

## Study on Lac Production by *Kerria Lacca* (Kerr) on *Cajanus cajan* under Varying Cultivation Conditions in Shahpura, Jabalpur (M.P.)

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**Abstract:** Madhya Pradesh is the third largest Producer of Lac in India while Seoni is the largest producer in the state contributing almost 75 percent together with Balaghat district. Lac cultivation is one of the important secondary sources of income for villages and this is particularly more in the tribal districts. Important lac producing areas in the states are South Bastar, Kanker, Korba, Rajanandgaon and Bilaspur. Pigeon pea (*Cajanus cajan*) is a widely grown important pulse crop on India and especially in Madhya Pradesh. The area under C. cajan in M.P. is 5.32 ha. Fortunately C. cajan is also a host of lac insect. Lac production on C. cajan can exert an extra stress on the production due to the load of lac insect. Lac insect is a phloem feeder and drawn out phloem sap from its host. A field trial in Randomized Block Design format on the effect the different combination of Bio-fertilizers (Rhizobium+PSB, Rhizobium+PSB+Mycorrhiza, Mycorrhiza, Rhizobium+PSB+ Humic acid, Rhizobium+PSB+Mycorrhiza+Humic acid, Mycorrhiza+Humic acid, Humic acid and Control) on lac production on pigeonpea was survey area Shahpura during 2014-2015. The study reveals that the foliar application of humic acid influences the lac production of pigeonpea.

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## Heavy Metal Concentrations in Water Body Fish Tissues and Macro Invertebrate from Shahpura Lake Bhopal (M.P.)

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**Abstract:** Shahpura lake Bhopal (Latitude 23°12'00"E Longitude 77°25'30"N) is situated of Madhya Pradesh. The present study was carried out to know status of Heavy Metals concentration in water body, fish & macro invertebrate of Shahpura lake Bhopal. It has been known for some time that metals affects aquatic organisms to various degrees. Fresh water environments world-wide have been contaminated by heavy metals result of this animals living in contaminated water showed high metal concentration. It is well known that metals accumulate in tissues of aquatic animals and therefore heavy metals measured in tissues can reflect the past exposures also be a reasonable measurement for public standards and for animals health point of view. The aim of research work to determine heavy metals (Cu, Pb) concentration and toxic effects of fish gill and liver (*Labeo rohita*, *Tilapia*) and meals effects of zoo benthic community. Thus this study was conducted heavy metal distribution among the tissue for various fish and macro invertebrates species also the intended to investigate the potential for an overload of metals in food chain of aquatic animals.

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## Scientific Approaches and Folk Nomenclature on Taxonomic Studies of Freshwater Mollusca In Jabalpur Region (M.P.)

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**Abstract:** More aware of the animals and plants of our backyard can lead to good health of our planet and spirit. Taxonomy is the science of naming, describing and classifying organisms which provides basic understanding about the components of biodiversity for effective decision-making about conservation and sustainable use. Folk taxonomy allows popular identification leads to aware the local people about importance of diversity conservation. Globally 876 species of freshwater Mollusca are known while in Indian subcontinent 34.24 percent i.e., 300 species are present. The communication enumerates a review on freshwater Mollusca and also states biodiversity and conservational approaches. Works on freshwater mollusca in river Narmada at Jabalpur region have been surveyed and analyzed to identify the problems related to taxonomy. The freshwater mollusca biodiversity indices are mainly associated with patterns of changing environmental features. The relative contribution of these groups is to decompose organic matter in rivers. Mollusca communities possess many attributes as biological indicators of spatial and temporal environmental changes. An opportunistic survey and study shows the systematic account of mollusca, their diversity in world, India, Madhya Pradesh and Jabalpur. The present study was carried out at three selected sites (Bargi Dam, Gwarighat and Bhedaghat) in the River Narmada at Jabalpur region located between 23°10'N latitude and 79°56'E longitude from January 2014 to December 2016. Specimens were collected, sorted, preserved and identified by using standard identification keys provided by Fauna of British India (1908), Needham and Needham (1962) and SubbaRao (1993). In present study total 284 specimens of fresh water mollusca have been studied under 18 species of 2 classes namely Gastropoda and Bivalvia. The research provided a first hand and base line information about the existence of Mollusca in the River Narmada. There is a significant scope for new records of new taxa in phylum mollusca. Folk taxonomy can study with scientific taxonomy which aware the people in simple ways.

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## Lipase and Its Immobilization: An Important Tool for Biofuel Technology

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**Abstract:** Lipase (E.C. 3.1.1.3) is a hydrolase group of biocatalyst or molecular scissor for biodiesel production. Lipase acts on ester bond of the lipid molecules. Thus, lipids to glycerides and free fatty acids productions are taken places by different kinds of lipases. Transesterification process is used to biocatalyst or chemical catalysts based conversion of different lipid from animal, plant and microbial sources to fatty acid methyl ester (FAME) or biodiesel. To have the cost effective biodiesel production, different types of lipases are immobilized in different types of matrices. However, lipase based biodiesel production is still observed as costly one in comparison with chemical based process. There is a great challenge for cost effective biocatalyst based biodiesel production by the modification of upstream and downstream part of the process. It has been observed in some recent researches that, use of immobilized lipase in newly designed bioreactor leads to improve the overall process through optimization of different process influencing parameters. Commercially available immobilized lipases are mostly adsorbed in polymeric substances; which makes part of the process costly. So, development of immobilized lipase in a cost effective matrix without losing a significant catalytic activity, is also found as a challenging part of bio-fuel research for current green technology. Use of proper solvent minimizes the alcohol inhibition during transesterification process and improves the downstream part of the biodiesel production. Thus, an overall process integration can be done by optimization of whole process through economical and environmental evaluation.

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## Physico-Chemical and Bacteriological Analysis in Drinking Water of Chitrakoot Nagar Panchayat Area (M.P)

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**Abstract:** Physicochemical and bacteriological analyses of drinking water samples were carried out from the four types drinking water sources namely, Public Health Engineering (Water Supply), handpump, river Mandakini and dug wells. Total sampling sites were 17 all from Chitrakoot nagar panchayat area, M.P. parameters investigated were physico-chemical and bacteriological parameters i.e pH, temperature, turbidity, conductivity, TDS, dissolved oxygen (DO), biochemical oxygen demand (BOD) and chemical oxygen demand(COD). The pH value of water sample was recorded between 7.1-7.7. Minimum pH of water observed was 7.1 at S-13, while maximum 7.6 at S-8 in pre-monsoon. Minimum temperature of water noticed was 270C at S-10 while maximum 300C at S-3 in pre-monsoon. The minimum value of turbidity recorded was 2.8 mg/l at S-3 while maximum 3.5 mg/l at S-13 in pre-monsoon the minimum value EC recorded was 380 mg/l at S-4 while maximum value 790 mg/l at S-16 in pre-monsoon. Minimum value of TDS was observed 274 mg/l at S-3, while 640 mg/l maximum at S-7. The minimum value of DO was found 4.4 mg/l at S-13, while maximum 5.6 mg/l at S-3. Minimum value of BOD was found 4.6 mg/l.at S-3 and maximum value 5.3 mg/l S-S-11. Lowest value of COD was 23 mg/l at W-6 while highest value was 45 mg/l at W-7 in pre-monsoon. The resulted bacterial isolates viz. E. coli, Salmonella, Vibrio cholera are highly pathogenic. Poor quality of drinking water was recorded as the major risk factor for the large-scale water borne diseases in the area.

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## Assessment of Water Quality Parameters: A View

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**Abstract:** Water resources are equally important for natural ecosystem and human development. It is essential for agriculture, industry and human existence. All life on earth depends on water. The quality of water usually described according to its physical, chemical and biological characteristics. Rapid industrialization and indiscriminate use of chemical fertilizers and pesticides in agriculture are causing heavy and varied pollution in aquatic environment leading to deterioration of water quality and depletion of aquatic biota. Due to use of contaminated water, human population suffers from water borne diseases. It is therefore necessary to check the water quality at regular interval of time. It is necessary to know details about different physico-chemical parameters such as Temperature, pH, chloride, DO, BOD, COD, Nitrogen, Phosphate, alkalinity used for testing of water quality. The quality of water can be assessed by studying its physical and chemical characteristics. The present review paper describes about the importance of different parameters of water quality.

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## **Study on Sustainable Management of Fish Culture and Environmental Stress in A Waste Water Body of Rewa Town, Dist. Rewa, (M.P.) India**

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**Abstract:** Conservation, up-gradation and utilization of natural resources such as land, water, plant, animal and human resources in a harmonious and integrated manner with simple low cost and elective technology with employment generation is need of the hour in reference to explosion of population and scarcity of food availability and poverty alleviation. This study was for water resource management with modified technology for fish culture in an abandoned stone quarry, Bansagar colony pond (24°32'N 81°18'E / 24o.53' N/ 81o.3'E) having 1.5 ha area within municipal area of Rewa town by utilization of rain water collected from catchment area of nearby agriculture field and town, drainage discharge from Bansagar colony through marginal littoral vegetation in summer season for conserving fish population used for fish culture. Here fish seeds of indigenous major carps (Catla catla, Labeo rohita, Cirrhina mrigala) and exotic carps (Cyprinus carpio and Hypophthalmichthys molitrix) were used for fish culture with relay fish cultivation technique and maintenance of DO in the range of 4.67-7.54 mg/l through pumping and netting in the water body with biomass of harvested fish of 3786 kg/ha/yr till 2014 adopting semi intensive, intensive and integrated techniques by fish farmer. Significant findings were that the enormous growth of noxious Pistia stratiotes in the pond damaged whole fish and fisheries of the water resource from 2014.

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## **Wind Renewable Energy Development in Rajasthan: A Green Energy Approach**

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**Abstract:** Energy is the most essential element of socio-economic development and economic growth. Renewable energy sources can play a huge role to fulfill this need of energy. Wind energy is indeed a form of solar energy produced by differential heating on the earth surface. Wind's kinetic energy can be captured and converted in to electricity via wind turbines. In this paper, the status of wind energy is explored in Rajasthan context. The status, different challenges, issues, barriers, wind power development and policies are discussed in detail.

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## Evaluation of Physio-Chemical Analysis of Water Sample in Culture Pond in Shri Ganeshan Fish Farm at Hoshangabad

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**Abstract:** Mahseer is a commercially important group of fresh water cyprinids and have high - value food fish as well as sport fish but they are endemic to Asia. The growth of Mahseer is depends on the physio-chemical qualities of water. Hence for successful culture of Mahseer in a pond requires analysis of water parameters. Water quality is determined by various parameters such as temperature, transparency, turbidity, water colour, pH, free carbon dioxide, alkalinity, hardness, dissolved oxygen, BOD etc. In this paper analysis of water parameters have been reviewed to make aware the fish culturist about important water quality parameters for enhancement of fish production and to conserve the fish.

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## Pore Size Control in Aluminium Foam by Controlling Bubble Rise Velocity

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**Abstract:** In recent years, aluminium metal foams have been one of the promising materials in aerospace industry because of good structural strength with less weights. Usually, foaming techniques viz direct and indirect, are used for the production of foamed metals. Direct foaming involves blowing of gas to create gas bubbles in the melt whereas in indirect foaming technique, a blowing agent, generally metallic hydrides, are added to the melt which create hydrogen bubbles. The most important parameter affecting the properties here is porosity; its size and distribution of pores. In this work we have studied the effect of gas bubble size and its rising velocity, on foam pore size and pore distribution. A 15 PPI aluminium foam prepared using indirect foaming technique having porosity ~85 % is used for this study.

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## Optimisation of Process Parameters for Ultrasonic Pretreatment of Rice Straw and Dairy Waste Water for its Conversion to Biogas and Ethanol using Cow Dung and Soil as Mixed Microbial Source

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**Abstract:** Waste generation and energy consumption is increasing continuously depending to increase in population so we should be concern about conservation of our environment. This can be done by utilisation of waste for energy production as it is well known that dependency on fossil fuels for energy diminishing. The present study describes a novel approach of waste to energy generation without use of any chemical in the pretreatment process. In the study lignocellulosic waste Rice Straw (RS) was taken as substrate and dairy waste water (DWW) was used for pretreatment of RS. Cow dung (CD) and soil (S) were used as mixed microbial sources. Batch reactors were set up without ultrasonication, and 5, 10 and 15 minute Ultrasonicated RS with CD and S. Biogas was analysed by gas chromatograph (GC) equipped with thermal conductivity detector (TCD) and ethanol was analysed using chromic acid method by UV spectrophotometer (584 nm). Various physical parameters like COD degradation, pH, TS, TDS, TSS, VS were also analysed as per standard methods to check the feasibility of the process. Maximum biogas yield was obtained with S culture which was about 85.99 % and maximum ethanol yield was obtained for the reactors without ultrasonication with CD which was about 0.1429 g/L.

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## Effect of Heat Shock on Biohythane Production from Benincasa Hispida Waste and Petha Waste Water

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**Abstract:** Petha sweet (famous in Agra) is prepared from the fruit commonly known as bottle gourd (Benincasa hispida) and a large amount of solid and liquid waste is generated during the processing of this sweet. These wastes are problematic for the locality. The biodegradable waste can be utilised for energy generation. In the present study solid and liquid petha wastes generated from petha sweet industry has been used as the substrate for biohythane production. Mixed microbial source cow dung (CD) was used for the dark fermentation of the substrate. Biohythane production is carried out by two step reaction dark fermentation reaction followed by anaerobic digestion process. Heat shock pretreatment of CD was done to reduce the methanogenic activity of methanogens for maximum hydrogen production in the dark fermentation process whereas untreated bacterial consortia of CD was used for anaerobic digestion process. Solid to liquid ratio 60:40 (optimised in previous study) was taken in the study for optimum biohythane production. Various physical parameters like chemical oxygen demand (COD), total solids (TS), volatile solids (VS), total dissolved solids (TDS) and total suspended solids (TSS) were also studied for all batch reactors.

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## Extraction, Characterization and Optimization of Violacein From Chromobacterium Violaceum and Their Prospective Applications

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**Abstract:** Green technology is leading all producers to go towards ecological and less polluted products with fewer by-products; in the case of synthesized dye and colours, natural pigments can be considered as an ideal alternative. Natural pigments and synthetic dye are extensively used in various fields of everyday life such as food production, textile industries, paper production, and agricultural practices. Violacein a purple coloured pigment produced by microbes like Chromobacterium violaceum, Janthinobacterium lividum and Pseudomonas tunicata. The pigment is found to have a broad spectrum antibacterial activity, strong bactericidal property, antiviral, antitumor, antioxidant and antiprotozoan activity. Violacein produced by Chromobacterium violaceum was characterized using chemical method, FTIR and UV spectrophotometer and extracted using acidified methanol. This study demonstrates optimization of violacein production from Chromobacterium violaceum using RSM-CCD. C. violaceum grew optimally at pH 7 in Luria Bertani broth which been cultivated for 24 hours at 35°C. Addition of yeast extract (3 g/L) and Glucose (2 g/L) increased the production of violacein. It was observed that after optimization the production of pigment increased from 0.66g/L to 0.85g/L with a crude concentration of 0.35g/L. The pigment was evaluated for application study as anti-bacterial agent against clinical pathogens Staphylococcus aureus (20mm), Enterococcus sp (15mm), and E.coli (18mm) followed by its use as a better textile dye showed less decolourization after two weeks of dying and after the use of detergents. It is recommended that the optimization of the C. violaceum can be done by using other substrates like industrial or agricultural wastes to obtain higher pigment production and reduce the cost of production.

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## Experimental Investigations on Performance of Karanja Green Diesel with Petro-Diesel Blends in A Compression Ignition Engine

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**Abstract:** As fossil fuel crises and environmental issues, bio-fuels are going to play a very important role in order to fulfil the country's energy needs. Green diesel is an alternative fuel for fossil derived liquid fuels that can run a CI engine either directly or in blended proportions efficiently. Green diesel is also eco-friendly in nature. This study was emphasized on the optimum production of green diesel using non-edible Pongamia pinnata (karanja) oil via Hydro-processing. High cetane index renewable diesel can be obtained by hydro-processing of karanja oil using conventional hydro-treating catalyst (CaO). At 5.5–120 bar hydrogen pressure crude Karanja oil can be deeply converted into paraffins in the diesel range. Then an experimental investigation on engine performance, and emissions with Karanja green diesel fuels was conducted in a compression ignition engine under six different load operations. The test fuels included a conventional diesel fuel and two different fuel blends of Karanja Green diesel (G20, G30). Tests were carried out for engine operation and engine performance parameters such as Brake specific energy consumption, brake thermal efficiency, and exhaust emissions (CO, HC, NOx, and CO<sub>2</sub>) were recorded. Among the blends G20 has shown a better performance with respect to BTE and BSEC. NOx emission for all blends was lower and G30 blend achieved a 35% reduction in NOx emission. G30 has an overall better performance with regards to both engine performance and emission characteristics.

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## Stochastic Models for Solar Energy

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**Abstract:** Use of renewable energy is inevitable to reduce the environmental footprint for any developing country like India. As solar energy is abundantly available in daytime throughout the year, it has become the most reliable source of renewable energy. While the characteristics of solar radiation (irradiation) depend on many unobserved meteorological events, the solar radiation can be accurately measured and observed from time to time at a given solar park. In this study, we develop a methodology to analyze the solar power from a spectrum of eight probability distributions. These include exponential, gamma, Gaussian, logistic, log-logistic, lognormal, Rayleigh and Weibull distributions. We estimate model parameters from maximum likelihood estimation, and examine their relative suitability from various goodness-of-fit tests. Illustrative results corresponding to the Charanka Solar Park, Gujarat data reveal that Gaussian, logistic, and Weibull distributions usually provide the best fit to the observed data. However, comprehensive studies encompassing multimodal distributions are recommended to retrieve some physical correspondence of the empirical modelling results.

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## Impact of Coastal Vegetation on Wave Intensity Using Open-Source CFD Tool REEF3D

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**Abstract:** Coastal vegetation is of premium importance in coastal protection due to the adverse effects of the rigid coastline protection structures. Coastal Vegetation interacts with the near shore and on shore waves thereby decreasing its intensity and reducing the coastline erosion. Though being an environmental friendly and cost effective system for the coast-line protection, the behaviour of coastal vegetation with wave is very complex and not completely understood. In the present study, numerical model of artificial vegetation is placed in a three-dimensional numerical wave flume to determine the effect of coastal vegetation on wave attenuation using the open source computational Fluid Dynamics (CFD) software REEF3D. The performance of this numerical model is validated with the experimental results, and is further used to study their interaction at miscellaneous wave parameters.

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## Clean Development Mechanism in Indian Agriculture Sector: Current Status and Barriers

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**Abstract:** Considering Indian scenario, agriculture is one of the biggest contributors to nation's gross domestic product and can easily take advantage of the Clean Development Mechanism (CDM) under the Kyoto Protocol to earn carbon credits and generate an additional revenue source. But however, the progress in agricultural projects under CDM are quite less as of now. This paper focus on the role of CDM in developing the eco-friendly projects in agriculture sector and also clearly explains the benefits of the registering such projects under CDM by considering the few case studies. Also, the current status of such projects in India is studied. Barriers that led to decline of project development in agriculture are also discussed. In the end few suggestions were framed to promote the CDM in agriculture sector.

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## Understanding Economics of Energy Labels in Indian Domestic Sector

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**Abstract:** It is assumed that new knowledge results in changes in attitudes, which in turn affect behavior. Studies suggest that it is possible to decrease energy consumption through information projects. Energy consumers may be influenced by antecedent (general) and consequences (feedback) information. Energy savings can be done by providing antecedent information about methods of energy conservation. Energy Labels are one of many ways to provide information about the efficient technology. They are benchmark for quality, efficiency; performance etc. and empowers consumers to make informed choices and reduce the energy consumption. But, consumers may not always be capable of fully understanding the "label" information and often requires "technical" competency to understand. This study aims to understand economics of energy labels in Indian Domestic Sector. Also, it tries to understand the institutional framework which derives energy labeling and how these labels are shifting the market towards the sustainability. This study heavily relies on secondary literature and also includes interviews of few stakeholders. This study proposes various policy recommendations which can be helpful in driving low-carbon transition.

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## Traditional Homemade Filter Technique for Drinking Water Purification in Chhattisgarh

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**Abstract:** Raising the problem of pollution, the quality of water is down and it is difficult to find pure water which is drinkable as well as cost effective and traditional Matka filter can be use in Chhattisgarh to solve this problem. In earlier Matka filter programmed successively done in Bihar state. We made a different layer of physical particle (coal, sand, pebble, small pebble, lime) in definite thickness of layer in Matka. Matka is a pot made by mixture of clay and sand. We compared the different types of water at filter in before and after filtration. This method is very effective in rural as well as urban area which is affected by ground water contamination. It is possible to replace the electronic purifier with Matka filter because of cost effective, easy to maintenance (does not require skilled person). The many problems worldwide associated with the lack of clean, fresh water are well known: 1.2 billion people lack access to safe drinking water, 2.6 billion have little or no sanitation, millions of people die annually—3,900 children a day—from diseases transmitted through unsafe water or human excreta. Now we are looking at improved service and improved quality of water. So there's been a huge improvement from the last three decades, when the government started giving priority to drinking water and sanitation. For generations, earthen pots or Matka have been used to store water and keep it Cool. Water stored in Matka is cooled at about 10<sup>0</sup> c and 14<sup>0</sup> c and is said to have a refreshing flavor. Many find the temperature of the water not too warm and not too chilled makes it ideal for drinking.

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## Estimation of Performance of Proposed Room Designed on Solar Architectural Concepts

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**Abstract:** Energy efficiency and thermal comfort are the essential parameters for buildings which leads to energy saving, carbon mitigation and protection of our environment. Energy efficiency and thermal comfort of any existing or planning stage building, can be improved using technology and concepts of solar architecture. In the present work, a building is designed with a major focus on concepts of solar architecture as well as use of photovoltaic system (for electricity generation to be used during day/night) for maintaining the inside temperature of a chamber of dimensions 5 × 6 × 6 ft<sup>3</sup>. The dimensions of the chamber are taken for small scale applications such as designing the security guard's chamber, outdoor laboratory room, farmer's field room. Whereas depending upon the capacity and activity, the dimensions can be varied. The walls of the chamber are made of fibre reinforced plastic and thermocol. The support structure for walls and roof is made of iron angles to prevent bucking of walls and to protect walls from bearing the load of the roof. The walls thickness including thicknesses of material used for fabricating walls and roof are calculated and considered with a criterion of equivalent thickness compared to brick-cement wall. Some provisions for daylighting and ventilation are also given in the walls and roof to provide proper illumination and air circulation in the chamber. A thermal model has been developed and predicted values of inside temperature for the climatic condition of Allahabad, are discussed for the performance of the designed room.

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## Role of Electrolyte Molarity During Treatment of Tannery Sludge by Electrokinetic Process

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**Abstract:** Now days electrokinetic (EK) process is well known for metal removal from soil and sludge, but this EK process required acidic form of electrolyte, which degraded the soil/sludge quality after the treatment. To overcome this issue, the performance of Saponin as a bio-surfactant electrolyte was assessed for removal of Cr(III) from tannery sludge. The performance of Saponin was assessed at different molarity i.e. 0.001 M, 0.01 M and 0.1 M and at 0.01 M the Saponin exhibited Cr(III) removal efficiency, i.e. 74.18 %. The possible mechanistic approach for the highest removal efficiency of Saponin at 0.01 M may be attributed, because of sufficient contact time of electrolyte with ions causes the higher micelle formation and subsequent complexation and sorption of chromium ions. Therefore, saponin at 0.01 M can be considered as a promising electrolyte for electrokinetic treatment of tannery sludge.

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## Low Cost Bio Fertilizer from Biomass

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**Abstract:** Agriculture is the main economy in the eastern Uttar Pradesh. Due to availability of biodegradable waste (from the agricultural activity), it can be used as bio fertilizer by applying biological, physical and chemical treatment processes. Bio fertilizers have emerged as a highly potent alternative to chemical fertilizers due to their eco-friendly, easy to apply, non-toxic and cost-effective nature. In this paper double chamber closed reactor is used to produce low cost bio fertilizer in which biodegradable waste was degraded at high pressure, moderate temperature ( $40 \pm 5$  °C) in the presence of nitrogen gathering microbes collected from the soil. Bagasse from cane sugar, rice husk, wheat straw and plant leave were used as biomass materials. The quality of bio fertilizer generated was studied in term of yield of crops. Prepared bio fertilizer was used on the crop cultivation and it was noted that the crop fraction yield was increased by 45-50 %. Also, it was noted that use of pressurized column decreases the Bio fertilizer preparation time by 60-70 %.

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## Expediency of Renewable Energy for Environmental Sustainability in Nigeria

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**Abstract:** The global environment is in perennial need of energy without which life cannot be sustained. Noted is the fact that those with energy possess the power and the control of productivity. This persistent, upsurge need of energy has made undue demand on man's environment, over-exploitation of oil rich zones, deforestation of mass of forest land with attendant degradation, denudation and pollution of the environment that hampers natural environmental productivity and environmental sustainability. The challenge of Green House Gases (GHGs), smog effects, ozone layer depletion, climate change and global warming concerns coupled with high oil prices increases governmental supports and driving increasing renewable energy legislation, incentives and commercialization. Therefore, an urgent shift in paradigm from conventional energy generation which are non-renewable to naturally renewable energy generation becomes expedient. The array of non-fossil fuels like bioenergy (biogas, biofuel), solar energy (photovoltaic), nuclear energy (atomic power), water power, wind power, geothermal and hydrogen generated energy which are renewable need exploration to downplay environmental degeneration, increases job creation, enhances economic buoyancy which invariably enables environmental sustainability.

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## Status of Ground Water Quality in Identified Areas of Karwi City, Utter Pradesh, India

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**Abstract:** Ground water is the primary source of water for human consumption, as well as for agricultural and industrial uses in many regions all over the world. District Chitrakoot lies between Lat. 24° 48' to 25° 12' N and Long. 80° 58' to 81° 34' E. Distance covered by district from east to west is 62 Km and North to South is 57.5Km. In the present study some sampling areas include residential area, as Purani Bazar, Nayee Bazar, Sankar Bazar, Sonapur, Allahabad Road Civil Lines, Laxmanpuri and Purani Kotwali. To effectively regulate potential sources of contamination, we must understand the behavior of contaminations in the surface. We can predict the environmental impact. pH, Chloride, Sulphate and Nitrate are found at all the sampling stations were found below the limit but color is not found in any of the samples.

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## Impact of Urban Areas on Historical and Archaeological Buildings

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**Abstract:** The present paper is talking about the recent situation of the archeological buildings which are existed through modern urban environments. Urban expansion has a large effect on the archeological buildings continuity since such type of development impress several serious challenges which conservation plans as well as preservation polices must deal with. A number of that main challenges are mega-constructions (tunnels, dams, roads, etc.), pollution, socio-cultural impacts and traffic. Within Um Qias, the archeological buildings face similar challenges consistent with the urban environment where it is presented and that challenges are reviewed in the local community behavior.

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## Sustaining and Retaining Students' Interest in Science, Technology, Engineering, And Mathematics Education (Stem) Through Motivation and Incentives

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**Abstract:** The implementation of STEM education in schools across the globe is to prepare the future workforce with strong scientific and mathematical backgrounds to enhance skills development across STEM disciplines. However, for STEM education to achieve its goals and objectives, there has to be some commitment on the part of students to the course offerings. In many nations including Nigeria, there is a low representation of students in STEM when compared with other fields and this raises concerns about how more students could be encouraged commit to STEM education especially at the junior, middle and higher basic levels which constitute the building blocks for STEM education in higher institutions of learning. This paper discusses some of the issues influencing students interest in STEM and makes propositions on how students interest in STEM could be initiated and sustained with a bid to increasing the number of students retained in this field.

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