

## Seasonal Variation And Enrichment Of Heavy Metals In Sediments Of Some Local Streams In Joda Area Of Odisha And Its Impact On The Environment

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In the present study, seasonal variation of heavy metals, such as Zn, Ni, Cu, Mn, Fe, Co, Cd, Cr and Pb in sediment samples of some local streams and Baitarani river in Joda area was assessed in pre-monsoon, monsoon and post-monsoon periods during the year 2014-2016. Average values of these metals were 0.077, 0.106, 0.125, 2.119, 49.03, 0.07, 0.004, 0.284 and 0.08 mg/g, respectively. Mn content was high and Fe content was very high and values of ISQG and USEPA in all sediment samples. Mostly, seasonal average of these heavy metals was maximum in post-monsoon period and minimum in monsoon period. A positive significant correlation between the metals Zn-Ni, Cu-Ni, Zn-Cu, Fe-Mn, Fe-Cr, Cr-Pb, Co-Cd and Mn-Cr indicates their similar source input mostly related to point sources. Geochemical parameters, like CF, DC, PLI and Igeo were of highest value in post-monsoon period in most of the samples. The average CF values reveals that the contamination of the sediment samples was in the order Cd > Pb > Mn > Fe > Cr = Co > Cu > Ni > Zn. The mean PLI values were in the range of 1.188-3.068 showing heavy pollution load in sediments. On the basis of Igeo values, the sediments are uncontaminated with Zn and Ni; uncontaminated to moderately contaminated with Cu, Mn, Fe, Co and Cr; moderately contaminated with Pb (mean Igeo of 1.491) and moderate to heavily contaminated with respect to Cd (mean Igeo of 3.138). Alongwith the natural weathering process, mining and industrial effluents, overburden and waste dumps, domestic waste and sewage are the major sources of heavy metals in the water bodies and sediments in the study area. Further, the above mentioned data indicate adverse effects on human population and fishes which was supported by the village level information and PHC data of the area.

### KEYWORDS

Heavy metal, Seasonal variation, Correlation, Geochemical parameters, Contamination, Pollution load, Natural weathering

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## Low Cost Adsorbent : Treated And Untreated Bael Leaves Powder For The Removal Of Congo Red Dye

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The present work deals with the efficient removal of highly toxic congo red (CR) using eco-friendly plant biomass material obtained from easily available Bael tree (*Aegle marmelos*) part, that is bael leaves (BL) as an adsorbent. The potential of bael leaves powder for the removal of congo red from aqueous solution was checked. The adsorption experiments were carried out in batch technique. It was found that the extent of CR adsorption by untreated and treated biomass increases with contact time, amount of adsorbent dose, temperature but decreases with increasing initial dye concentration, addition of salt and pH of the system. The bael leaves treated with 10% formaldehyde showed efficient activity than untreated bael leaves. Our findings also showed that untreated and treated bael leaves showed most efficient adsorption at pH 4. On the basis of kinetic study, pseudo-second order kinetics was the best for the adsorption of CR by bael leaves. Thermodynamic properties, like  $DG^0$ ,  $DS^0$  and  $DH^0$  was analyzed, indicated spontaneous and exothermic nature of adsorption for bael leaves powder adsorbents. Adsorption of CR was also described by the Freundlich and Langmuir isotherm models.

### KEYWORDS

Congo red, Bael leaves powder, Adsorption, Adsorption isotherms models, Kinetics, Equilibrium, Thermodynamics

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## Effect Of Diatomaceous Earth On The Growth And Physiological Criteria Of *Zea Mays* L

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Diatomaceous earth or diatomite is a sedimentary rock principally composed of the fossilized residue of single-celled aquatic algae. Diatomite is occurring in nature is porous, high surface area form of hydrous silica, that is used in hundreds of goods used as a filter aid and as a mineral filler. However, its usage in agriculture is not universal. This experiment was carried out to characterize important physico-chemical properties of diatomite and its probable use as a growing media for plants. Mineralogical specifics, elemental mapping and semi-quantitative mineral chemistry on various phases were carried out by scanning electron microscope (SEM) attached with energy dispersive spectroscopy (EDS). For this aim, a total six amendment levels 5, 10, 20, 30, 40, 50 gm/kg of soil were used in triplicate. The outcome of this study have made known that diatomite is an effective amendment to enhance the morphological parameters. The effect of diatomite is time-dependent as it became more efficient while the experiment continued and increased in a dose-related manner. Hence, the study highlighted the fact that diatomites can be used as mineral fertilizer and enhances crop production.

### KEYWORDS

Diatomite, Growth performance, Mineral fertilizer, Mineralogical aspect, Nutrients

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## Behaviour And Attitude Farmers Pro-Environmental: Confirmatory Factor Analysis

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The most important goal in this study is to look at the most dominant factors that influence attitudes and behaviour in using chemical fertilizers and pesticides by farmers. The study was in Maros Regency, South Sulawesi Province. The population in this study was the farming community, especially soybean farmers, the number of samples used was 200 respondents. Confirmatory factor analysis (CFA) is an analysis used in research with the IBM AMOS programme. From the results of the study, it found that the habits of using chemical fertilizers and pesticides were still being carried out by farmers in farming, even though they had cultivated for generations. The action or behaviour of this farmer's culture is based on the desire of farmers to meet the needs, as well as the drive to achieve the maximum target for the quantity of products produced. Therefore, the use of chemical pesticides to eradicate pests will still use. Land processing behaviour and affective attitudes of farmers are the most significant factors that influence the behaviour and attitudes of farmers in determining their way of farming.

### KEYWORDS

Agroecology, Chemical fertilizers and pesticides, Pests and diseases, Sustainable agriculture

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## Ambient Air Quality Monitoring And Modelling In Coimbatore City

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The atmosphere, which makes up the largest fraction of the biosphere, is a dynamic system that continuously absorbs a wide range of solids, liquids and gases from both natural and artificial sources. Therefore, the estimation of such gaseous air pollutants in the ambient air in the urban area of Coimbatore becomes important. In this study, it is proposed to perform the distribution of wind speed and direction at a particular location graphically using wind rose diagram. Sampling locations are selected based on vehicle density. The samples were collected and the concentrations of gaseous air pollutants were estimated, the results were compared with National Ambient Air Quality Standards (NAAQS). In addition to this, traffic survey was conducted in the selected locations to determine the density of vehicles. From the selected locations ambient air quality being monitored, from this monitoring data, artificial neural network (ANN) and CALINE-4 has to be created. Integrated sensor suite (ISS) was used to observe and record the meteorological parameters such as wind speed, wind direction, rainfall intensity, ambient temperature and relative humidity. ANN model has been used to predict the future air quality by giving the traffic as well as a meteorological parameter as an input. CALINE-4 model has been used to simulate the site specified dispersion of NO<sub>x</sub> along the roadways.

### KEYWORDS

Air quality index, Monitoring, Modelling software such as CALINE-4 and ANN

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## Study On Sewage Water Treatment By Organic And Inorganic Coagulant

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In the present study, we investigate the reduction of sludge in sewage water treatment using low cost chemicals method. The main objective of the sewage treatment process is to remove the various contaminants or pollutants, like solids, organic carbon, nutrients, inorganic salts, metals, pathogens, etc. The sewage water was treated using polymeric coagulant (cationic polymer) and inorganic salts, such as ferric chloride ( $\text{FeCl}_3$ ) and calcium hydroxide ( $\text{Ca(OH)}_2$ ). Jar testing is employed at different pH and coagulant and flocculant dosage. The supernatant layer of effluent was analyzed under various parameters, like biological oxygen demand (BOD), chemical oxygen demand (COD), total dissolved solids (TDS), colour, odour and turbidity. From the results, it has been indicated that chemical coagulant treatment methods were very effective than polymeric coagulants for the quality of the reusable wastewater.

### Keywords

Sewage water, Polymeric coagulant,  $\text{FeCl}_3$ ,  $\text{Ca(OH)}_2$ , Jar test

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## Techno-Economic Renewable Power Solutions For Audio Recording Studio Laboratory In A Remote Education Institution

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This paper was intended towards evaluating the electricity availability, demand and alternate power solutions on the operation of a laboratory in a remote institution of India. Electricity access in the institution is currently inadequate. So the needs of the laboratory are met by conventional approaches, like diesel generators (DG), battery, etc. Electricity becomes the source of CO<sub>2</sub> emission, for instance when fossil fuel is combusted in power plants. Increasing consumption of conventional fossil fuel coupled with environmental degradation has led to the attention towards green energy sources. The purpose of this paper is to find the best hybrid renewable power combination from various renewable energy resources to satisfy the electrical needs of audio studio labs in Karunya Institute of Technology and Sciences (KITS), Karunya Nagar, Coimbatore in the state of Tamil Nadu. Hybrid optimization model for electric renewables (HOMER) software is used to find out the finest technically, economically and environmentally viable renewable based energy efficient system. The solution obtained shows that a hybrid combination SPV/WES/battery sources can be a cost effective, techno-economically viable sustainable and environmentally sound.

### KEYWORDS

HOMER software, Hybrid renewable power, Audio recording studios, Grid extension, Energy efficiency

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## Corporate Social Responsibility For Sustainable Development

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Corporate social responsibility (CSR) can be a good tool for sustainable development in the mining regions of the country. Like all processes of management, CSR has evolved over a period of time and now is the buzzword in the business fraternity. Though numerous definitions can be seen for this term the central meaning, however, remains the same and goes like 'the impact that the businesses have on the society and in turn the expectations of the society from them'. The companies nowadays seriously undertake corporate social responsibility activities as they feel their responsibility towards the society where it operates. This paper aims to have a close look at the community development initiatives of a few large-scale coal mining companies in India. With a few case studies, an attempt is being made to understand the term corporate social responsibility and its role in sustainable development. Case studies of a few coal mining companies, namely Eastern Coalfield Limited, Central Coalfield Limited and Northern Coalfield Limited have been considered here. These examples show how the businesses have realised their existence in economic, social and environmental terms and as such, they are equally showing their inclination for environment and the society besides looking for the profit.

### KEYWORDS

CSR, Sustainable development, Sustainability, Environment, Social and economic

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## Biogenic Iron Oxide Nanoparticles As Green Catalyst For Reduction Of Vat Red Dye

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In this investigation, a simple and pollution free technique belonging to nano-biotechnology and green chemistry approach is adopted using a green catalyst for the sustainable environment in future. The biogenic *Eichhornia* mediated iron oxide nanoparticles (EFeONPs) were used as a green catalyst for decolourization of vat red dye. The different parameters (dye concentration, dose of catalyst, pH and reaction time) were assessed for decolourization of vat red dye using EFeONPs. The 80-90% dye removal was observed in optimum conditions (pH at 6.5, 20 ppm, 0.2 mg /100 mL and 50 min). FTIR analysis confirmed that the degradation of aromatic compounds from treated dye water using EFeONPs. The technique of decolourization of vat red dye using phylogenetic mediated green catalyst was safe and non-hazardous. EFeONPs exhibited excellent catalytic properties in the reduction of harmful dyes.

### KEYWORDS

Iron oxide nanoparticles, Catalytic action, Red dye, Catalyst

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## Parametric Analysis And Thermodynamic Optimization Of Organic Rankine Cycle For Low Grade Waste Heat Recovery

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The system consists of a low temperature heat source coupled to an organic rankine cycle (ORC) system. The working fluids used are R245fa, R123, isobutane and R134a. The ORC model is developed in EES by adopting zero-dimensional energy and mass balance approach. A parametric investigation has been carried out to study the impact of few thermodynamic parameters on the performance of the system. Genetic algorithm optimization technique is adopted to find the optimal parameters at which the system can be operated with maximum exergy efficiency. Maximum exergy efficiency of 45.53% was obtained with R123 followed by R245fa (44.98%), isobutane (42.89%) and R134a (41.91%). The optimal turbine inlet pressure for R245fa, R123, isobutane and R134a was 6.07 bar, 3.66 bar, 10.36 bar and 19.94 bar, respectively. Sensitivity analysis showed that the turbine inlet pressure has the highest sensitive degree with respect to all performance indicators when compared with other system parameters. Variation in pinch point temperature difference showed no impact on thermal efficiency. R245fa and R123 are better suited for low temperature ORC systems compared to R134a and isobutane due to their efficient system performance and low operating temperatures and pressures.

### KEYWORDS

Organic rankine cycle, Genetic algorithm, Parametric, Thermodynamic efficiency, Exergy, Pinch point

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## Studies On Thermal Decomposition Of Biomass Wastes Of *Sterculia foetida L* Tree

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The present study aims to explore the physico-chemical and pyrolysis characteristics of biomass wastes obtained from the *Sterculia foetida L.* tree. The biomass wastes investigated in this work include empty fruit bunch (SEFB), seed (SS) and de-oiled seed cake (SDC). The proximate compositions, elemental composition of the biomass wastes were measured. The pyrolysis behaviour was investigated by thermogravimetric analysis. The functional groups in the biomass wastes were measured using FTIR spectroscopy. The thermal decomposition studies showed that the empty fruit, seed and de-oiled seed cake obtained from *Sterculia foetida L.* can be used as feedstock for pyrolysis process.

### KEYWORDS

*Sterculia foetida* tree wastes, Empty fruit, Seed, Deoiled cake, TG and DTG, FTIR

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## **Delineation Of Groundwater Potential Zones Of Velpula-Vempalli Area**

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An integrated survey based on satellite image interpretation corroborated with limited field checks were carried out with a view to delineating the groundwater potential of Velpula-Vempalli area, Kadapa district, Andhra Pradesh falling in Survey of India toposheet no. 57J/07. Under this study six thematic maps-lithological, structural, geomorphological, hydromorphological map, landuse - land cover map, lineament and lineament density map were prepared covering an area of about 3600 km<sup>2</sup>. The lithological and structural map constitutes the geological map. The geological map portrays the area being covered by peninsular gneissic complex comprising mainly granite gneisses and granitoids intruded by basic dolerite dykes and acidic intrusives. The lineaments are associated with late acidic intrusives, fracture filled basic dykes, faults and alignment of stream segments, tanks, topography, etc. The geomorphological map depicts various landforms, such as denudational hill (DH), residual hills (RH), structural hills (SH), structural valley (SV), intermontane valleys (IV), pediment (PD), pediplain (PP) and flood plain. The area has been classified into high potential, moderate potential, low potential and non potential for ground- water development on the basis of hydromorphological studies. Some of the favourable locations have been suggested to impound the excessive runoff so as to augment the groundwater resources of the area.

### **KEYWORDS**

Delineation, Groundwater potential zones, Velpula-Vempalli area, Y.S.R district

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## Role Of International Instruments On Environmental Protection

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In the present global scenario, people have become more snobbish, sophisticated and self-centric showing least interest in their surroundings. Men started making wealth, exploiting all natural resources around him, sans thinking about future generations. By this, the environment started degrading and has led to the current noxious atmosphere. And with the advent of science and technology, growth in population, urbanization and agricultural development, the traditional concern towards environment and ecology started eroding twisting the development process into a threat to environmental protection. And this gained much importance and has amplified the concept of sustainable development. There exist a plethora of legislation enacted by the Indian legislature in-line with the international instruments, affixing commitment towards the environment. The World Trade Organisation and TRIPS has played a significant role in fixing responsibility on the governments, preserving and protecting the environment. This work aims to bring out the magnitude of transformation, effectiveness and efficiency, the international instruments have brought into the Indian soil. By discussing the relevant international instruments, their objectives and provisions and the respective interface with the Indian legislation, the author intends to bring out an interesting, insightful analysis on the role played by these authorities to preserve and protect the environment.

### KEYWORDS

Environment protection, Sustainable development, WTO, TRIPS, Legislation, Impact

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