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Modelling Nitrate Contamination In Groundwater Using Artificial Neural Network Combined With Principal Component Analysis In Nashik Region

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This paper presents the use of multiple linear regression (MLR) and two artificial neural networks (ANNs), namely radial basis function neural network (RBFNN) and generalized regression neural network (GRNN) for prediction of nitrate (NO_3) in selected villages of Nashik. The selected villages are found with high NO_3 content in groundwater needing effective prediction models to manage groundwater resources. Groundwater quality data is obtained from the National rural drinking water programme, India. Principal component analysis has been applied to select input variables for prediction modelling. The NO_3 is modelled using the three selected approaches for pre-monsoon and post-monsoon periods. Model comparison is carried out using performance measures, namely coefficient of determination, mean-square error and coefficient of efficiency. Both RBFNN and GRNN models are found superior to the MLR models. The RBFNN-4 model predicted NO_3 contamination in the pre-monsoon period with $R^2 = 0.750$ and GRNN-5 predicted better at $R^2 = 0.851$ in the post-monsoon period. For both the periods, MLR failed to achieve this accuracy. The principal component analysis provided significant input variables to models enhancing the model performance.

KEYWORDS

Nitrate, Modelling, Varimax rotation, Radial basis function neural network, Generalized regression neural network

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Eco-efficiency And Eco-design Improvement By Using Simplified Life Cycle Assessment And Simplified Life Cycle Costing: Case Study Of Park Bench In Sydney

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This paper addresses the question of what changes can be achieved when life cycle assessment (LCA) and life cycle costing (LCC) have been applied for a park bench. This can be done by identifying possible alterations which address environmental issues to alleviate the impact on the environment. The eco-design of park bench located in Sydney, Australia in this paper is chosen to improve the environmental performance and reduce costs. By considering the four-stage of the life cycle (raw material, manufacturing process, usage and end of life) of a park bench, that is cradle to grave, the LCC and LCA were calculated by employing simplified life cycle assessment (SLCA) as well as simplified life cycle costing (SLCC) methods. According to the hot spots identified for the bench, for product redesign, dematerialization of concrete was applied in raw material stage and transport mode of 28 truck from Brisbane to Sydney was replaced by sea shipping, as well as the ferrous and plastic recycling rate increased to 80%. Then using eco-efficiency to assess whether the redesign is much more environmentally friendly and less cost. The results show that eco-design has a significant impact on improving eco-efficiency, by increasing eco-efficiency from about 3.6 to 6.9. The total LCC decreases from 230.97 AUD to 120.52 AUD and the LCA from 63.86 points to 21.11 points.

KEYWORDS

Cleaner production, Cost reduction, ISO 14040, Life cycle costing, Eco-efficiency

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Evaluation Of RAP Content And Waste Cooking Oil Dosage As A Rejuvenator In The Stone Matrix Asphalt

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Reclaimed asphalt pavement (RAP) is the recycled pavement material, which consists of a stiffer binder and aggregates and a rejuvenating agent is added for moderating the stiffness and increasing the workability. Rejuvenators are expected to have a prodigious influence on the RAP and virgin binder to blend in the bituminous mixture. However, the production of the RAP is limited to the conventional dense graded bituminous mixtures and not extended much in the stone matrix asphalt mixtures (SMA). It is a gap-graded bituminous mixture which is more resistance to permanent deformation. In this study, an attempt is made to incorporate RAP in the SMA mixture with waste cooking oil (WCO) as a rejuvenator. From the test results, it is seen that the addition of the RAP reduced the optimum binder content and that provided an economic benefit. Marshall stability results showed that the 30% RAP content and 6% of WCO has the maximum value. Overall it is concluded that 30% of RAP content can be incorporated in the SMA mixtures without much changes in the mix design.

KEYWORDS

Reclaimed asphalt pavement, Stone matrix asphalt, Rejuvenator

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Removal Of Petroleum Hydrocarbon From Soil And Water Using Aloe Vera Powder

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A study was conducted to remove petroleum hydrocarbon from contaminated soil and surface water using aloe vera powder as it is having adsorbent and coagulant properties. The surface water and soil samples were collected from Manali, Chennai, Tamil Nadu and analysed for the presence of petroleum hydrocarbons. The petroleum hydrocarbon content of surface water samples and soil samples were found to be 26.9 mg/L and 260 mg/kg, respectively. Different concentrations of aloe vera powder were mixed with petroleum hydrocarbon contaminated water and soil. For water and soil, the maximum removal efficiency of 90% was achieved after 28 days when 100 g of aloe vera powder was added with 500 mL of water and soil, respectively.

KEYWORDS

Petroleum hydrocarbon, Removal, Aloe vera powder

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Factors Affecting The Sinkhole Formation In The Chitravathi River Bed, South India

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The present study intended to find out the possible causes for the formation of sinkholes by analyzing the lithological, structural and hydrological conditions in and around Chitravathi river bed. During 2015 and 2017, sinkhole collapses occurred in Chitravathi river bed in between Goddumarri and Lakshmumpalli villages of Yellanur Mandal in Anantapur district, Andhra Pradesh. Integrated field surveys carried out and various thematic maps, like geology, geomorphology, groundwater levels, rainfall, borehole and lineaments, prepared and analyzed to understand the factors affecting the sinkhole formation. Results revealed that the sinkholes in this area induced by extreme weather conditions, like prolonged drought as well as overexploitation of groundwater from the Chitravathi river bed, followed by heavy rains, thereby sudden recharge of water table within karst geological settings in the study area. Geological setting of the study area comprising of carbonate rocks with intercalations of quartzite and shales. This typical geological setting favoured the dissolution of bedrock and the water table fluctuations led to affect the mechanical strength and bearing capacity of the overlying strata, thereby cavity roof failure.

KEYWORDS

Sinkholes formation, Chitravathi river bed, Hydrogeology, Karst topography

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Performance And Emissions Characteristics Of Water Ingestion Into Inlet Manifold In CI DI Engine

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The objective of this work is to analyze the effect of water ingestion through a simple carburettor on the performance and emission parameters of a four stroke single cylinder constant speed diesel engine. Experimental work is carried out in a diesel engine running at a speed of 1500 rpm with varying water to diesel ratio (W/D) of 0.2, 0.3 and 0.4. The result indicated a significant reduction in NOx and smoke emissions. Emissions from diesel engines play a significant role in human health and environmental ecological balance. The result of the project indicates a reduction in NOx by 60% and smoke by 22% with water to diesel ratio of 0.4 compared to neat diesel. This reduction is due to the effect of water spray in heat release and cylinder pressure. There was a marginal drop in thermal efficiency, the HC and CO emissions are increasing with water ingestion.

KEYWORDS

NOx, HC, CO, Water injection, Smoke

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Decolourization Of Distillery Spent Wash Under Continuous Mode

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Even though significant development has happened in recent years for the treatment of spent wash, most of the technologies involve energy and cost, keeping this in mind, we present this paper where successful decolourization of the spent wash is carried out under continuous mode. The paper confirms the usability of low cost adsorbent materials, like sand, soil and bagasse for decolourization of biomethanated distillery spent wash. An experimental design using Minitab software was employed to investigate the biosorption of colour from the spent wash. Studies were conducted in continuous column resulting in a decolourization upto the tune of 70-80% within 12 hr. The soil was found to be the most important factor among all factors. An interaction between the factors was also influencing the process of decolourization but was not significant enough.

KEYWORDS

Decolourization, Distillery spent wash, Factorial design, Continuous column studies, Low cost adsorbents

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Environmental Impact Of Firecrackers During Diwali Festival On The Ambient Air Quality Of Kota City

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This paper is based on a study related to augmented ambient air quality parameters due to bursting of firecrackers during the festival of lights, diwali in Kota city during the year 2018. The three main air quality parameters, namely PM_{10}, NO_2 and SO_2 have been found during the dussehra and diwali festivals. The study focuses on the variations in the concentration of these pollutants at six sampling stations - Nayapura, Gumanpura, Aerodrome, Talwandi, Shrinathpuram and Dadabari in Kota city for the duration of pre-dussehra, dussehra, post-dussehra, pre-diwali, diwali and post-diwali. The results reflect a rise in the concentration of pollutants in the above areas due to bursting of firecrackers. The study indicates that at all six sampling stations, the concentrations of PM_{10}, NO_2 and SO_2 during dussehra and diwali festivals are many times higher than pre and post readings. Air quality index (AQI) has also been developed with the help of these calculated parameters at each station. The concentration of PM_{10} and values of AQI are much higher than the permissible limits notified under National Ambient Air Quality Standards (NAAQS) prescribed by the Central Pollution Control Board (CPCB) for the duration of dussehra and diwali at all sampling stations. Overall, the negative impact of firecrackers on air quality has been established in this study. Therefore, precautionary and preventive actions need to be taken for controlling the air pollution levels by adopting various control measures.

KEYWORDS

Firecrackers, Ambient air quality, Particulate matter, Sulphur dioxide, Nitrogen dioxide

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Physico-Chemical Characterization Of Leachate From The Oum Azza Technical Landfill Site

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Leachate from household wastes (HW) in Morocco is particular. These polluted waters are difficult to purify according to the experience of the operators of the Technical Landfill Centers (TLC) of the Pizzorno Environnement-Morocco Group (GPE-Morocco). Our main objective, through this article, is the physico-chemical characterization of leachate from the TLC of Oum Azza (TLC OA). This characterization can serve as a database for the design of purification processes (PP) whose objective would be the treatment of leachates of Moroccan typology. The parameters studied are organic matter (BOD_5, COD), concentration of NH_4^+ ions and organic nitrogen, conductivity and suspended solids (SS). The choice of these parameters is due to their extreme utility for the design and dimensioning of purification processes. The results show that leachates, in a storage basin, constitute a microbial ecosystem that allows the unfolding of a multitude of biological and physico-chemical reactions whose resultant is the degradation of organic matter (OM), the assimilation of mineral nitrogen and the bacterial multiplication (sludge). All the main parameters, namely organic matter, BOD_5, COD, NTK all have a tendency towards the decrease over time of the exploitation. Leachate changes in composition or identity as time passes. It would be extremely useful to take this into consideration when designing and dimensioning purification processes (PP). The operator of a TLC (such as that of Oum Azza), should not be limited to a single purification process leachate during the entire phase of operation (20 years). Where applicable, this purification process (PP) should be reviewed regularly.

KEYWORDS

Leachate, Household wastes purification, Physico-chemical analyzes, Oum Azza, Morocco

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Numerical Modelling And Laboratory Observation For Wave Attenuation By Coastal Vegetation

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Submerged coastal vegetation, such as seagrasses, has the main functions in the hydrodynamic aspects; wave attenuation, coastal area defence from wave attack, soil erosion and seabed stabilization. To simulate the interaction of wave –vegetation and research its phenomenon, a completely three dimensional numerical model has been created. This paper deals with the study of vegetation efficiency as a buffer device in attenuating the ocean waves of the incident. The results of numerical simulations were compared with the results of the experiments which show that the interaction of the waves in the presence of vegetation leads to a greater attenuation of the waves with 9% less than error.

KEYWORDS

Monotypic vegetation, Vegetation flow parameter, Wave height, Wave attenuation

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Renewable Energy As Green Energy To Achieve Sustainability - Case Study

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There is an intimate relationship between energy, environment and sustainable development. Energy harnessed from conventional sources emits carbon alongwith other harmful emissions which pollute the environment. A society seeking sustainable development must focus on renewable energy and technologies which cause no impact on the environment. Renewable energy sources, such as solar, wind, biomass, large hydropower and traditional fuels continue to make an important contribution to the economics of the countries where green energy is abundantly produced. The paper concentrates on utilizing solar energy for mass cooking at the large scale establishments. More elaboration on implementation and operation confirms multiple contributions to sustainable development.

KEYWORDS

Scheffler reflector, Solar concentrator, Steam, Cooking, Tracking mechanism, Sustainability

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Assessment Of Coagulation Process For The Distillery Spent Wash Using Alum Polyelectrolyte And Fenton

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All over the world, around 61% of distillery industries utilize sugarcane molasses to produce the ethanol and rectified spirit. Gradually demand of ethanol, alcohol and rectified spirit increases on a large scale. Ethanol rectified spirit and alcohol production in distillery industries in India is 8-15% by quantity, it illustrates that 85-92% distillery spent wash (wastewater) generated by volume. As a result, distillery industries comprise an enormous unpleasant impact on the surroundings. Numbers of clean up techniques have been worked out to competently treat the distillery spent wash (DSW). Coagulation processes were carried out using alum polyelectrolyte and advanced oxidation process, such as fenton were implemented to treat the DSW. Polyelectrolyte Magnafloc 1011, Magnafloc 1997, Zetag 63 and Zetag 7650 were implemented. Treatment with alum cum polyelectrolyte (Magnafloc 1011, 1 mg/L) gave 29% COD removal at pH 8. Fenton reduces maximum of COD to 79%. Maximum decolourization achieved was 98% by application of hydrogen peroxide dose in the ratio of 4:1 at 45°C. At higher peroxide dose, the effect of temperature on COD removal efficiency is very small.

KEYWORDS

Distillery spent wash, Electrocoagulation, Biomethanation

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Air Quality Assessment Of Dehradun City Using Air Quality Index And Arc-GIS Method

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In this paper, the air quality assessment of Dehradun city has been done through various frameworks. Air quality index (AQI) is a uniform value calculated for all pollutants into a single number with different parameters, mentioned in the National Air Quality Index (NAQI) 2014-15, Central Pollution Control Board (CPCB), Delhi. Air monitoring has been carried out at three locations and their respective names are Clock Tower, Raipur Road, ISBT which comes under the commercial, residential and industrial area, respectively of Dehradun city. The pollutants - PM_{10}, NOx and SO_2 have been estimated and they exceed AQI limit given by CPCB. AQI level of Dehradun over 2016, 2017 and 2018 year found mostly moderate. AQI has also been assessed through colour coding given by CPCB, Delhi for the health concern from good to severe. Although the concentration of PM_{10} in Dehradun has found poor to severe while the concentration of gaseous pollutants (NOx and SO_2) are under the limit given by CPCB. The calculation of AQI in this paper has been done with IND-AQI method and breakpoint concentration of USEPA mentioned in NAQI, CPCB and also a representation of pollutants concentration through Arc-GIS (version 10.2).

KEYWORDS

National air quality index, USEPA, PM_{10}, SO_2, NOx, IND-AQI, Arc-GIS

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Phytoremediation Of Some Heavy Metals In The Soil Of General Company For Tire Industry In Najaf Governorate By Wild Plant Species

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The concentration of 7 metals (Pb, Cu, Zn, Mn, Ni, Cr and Cd) in the samples of soil and some plant species collected from the general company for the tire industry in Najaf were determined. The mineral ions were assayed using the acid digestion method and atomic absorption spectrophotometry (AAS). Physico-chemical parameters (pH, EC, bulk density, water holding capacity and total nitrogen) of the soil samples were also determined. Of the 7 metals determined in the soils samples, the concentration of Pb (15.25 ± 5.79 mg/kg) was the highest compared to the concentrations of other metals. Physico-chemical parameters were within the range that allows effective phytoremediation. Cu showed the lowest concentration (0.65 ± 1.78 mg/kg). Ni was below the detectable limit in most of the samples. Similarly, concentrations of Pb (12.35 mg/kg) in the shoot of *Sonchus asper* (L.) Vill., among other metals were higher than those of the other metals in the plant tissues. The concentration of Cd (0.01 mg/kg) in the root of *Rumex cyprius* Murb was the lowest. Generally, metal ion concentration in the soil and plant samples of the general company for the tire industry in Najaf (polluted site) significantly differed from those of the non-polluted site ($P<0.05$). *Plantago boissieri* Hausska and Bornm among the plant species had the highest translocation factor (TF = 2.91). Although the translocation factor (TF) was higher in the plant of the polluted site (TF >1), a reasonable amount of them was retained within the underground tissues (roots).

KEYWORDS

Heavy metals, Translocation, Phytoremediation, Physico-chemical parameters

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Assessment, Analysis And Evaluation Of Noise Level Of Steel City Rourkela

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In this present study, an attempt is made to estimate and analyse noise pollution level at different areas of steel city Rourkela, Orissa and the health hazard effect produced by it. We measure the noise level at sixteen different places within the city at different time intervals. The different descriptors, like traffic noise index, noise climate, L_{eq}, noise pollution level, L_{day}, $L_{evening}$, L_{night}, L_{den} are calculated and the calculated data obtained is much beyond the permissible limit (in the day time, it is 70 dB and in the night time is 59 dB). The increase in noise level at different places is primarily attributable to motor vehicular traffic, marriage and festival season noise and industrial noise of Rourkela Steel Plant (RSP) alongwith many small and medium scale industries. The noise levels of most of the analysed area exceed the permissible limit during day time. The different vehicles that contribute to increasing the noise level are heavy engine, trucks, tractors, dumpers, motorcycles, night coach buses, pickup van and tempo, etc. This study gives certifications for consideration of all forms of people affecting the problem of noise pollution in the steel city Rourkela, Odisha.

KEYWORDS

Noise level, Health hazard, Noise pollution, Urban area

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A Survey On Sewage And Borewell Water Quality Of Vrishabhavathi River Basin

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The present work aims to study the contamination status of the Vrishabhavathi sewage water and also the deterioration of surrounding groundwater quality. An erstwhile freshwater stream, now carrying huge amounts of industrial, agricultural and domestic effluents from the western part of Bangalore metropolis. There are three sewage water and the same number of groundwater samples of three different locations were collected from the Vrishabhavathi basin during post-monsoon season 2018. All the six samples were analysed for around 16 physico-chemical parameters. Both the categories of samples exhibit slightly alkaline pH with high dissolved solids and turbidity. The high level of chloride, phosphate, BOD, COD concentration in sewage water clearly indicating the extensive influx of water pollutants from both point and non-point sources leading to further deterioration of sewage water. The total hardness, total alkalinity, turbidity and phosphate concentration of borewell samples were exceeding the standard limits of BIS, revealing that the leaching of sewage into groundwater aquifers is at an alarming rate in Vrishabhavathi basin. The dissolved solids concentration and alkaline state of the borewell water may become unfit for irrigation in Vrishabhavathi river stretch, since it may lead agricultural soil to be saline and toxic over a period of time.

KEYWORDS

Physico-chemical, Vrishabhavathi, Sewage, Borewell, Concentration

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A Study On Impact Of Demographic Factors On Eco-friendly Buying Decision

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The environmental issue is a sizzling topic nowadays. Not only the government, non-government organizations or research organization but almost everyone is terrified with its upcoming danger. The broad objective of the study is to find the relationship and impact of demographic characteristics on influential factors of eco-buying decisions. The study is based on exploratory and descriptive design where relationships are measured through non-parametric chi-square test. The analysis was done taking about 100 data. Further, the study intends to find the relationship between gender, occupation and education with factors, such as environmental concern, product category and pricing in eco-fast moving consumer goods (FMCG) products. From the analysis, we conclude that there is an association between gender and environmental concerns, a significant relationship is found between occupation and product category, whereas there is no association between education and pricing.

KEYWORDS

Eco-consciousness, Non-parametric test, Eco-buying behaviour, Demographic factors

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Water Quality Status Of Girna Dam Project, Panzangaon

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Girna dam is a big project at Nandgaon tehsil of Maharashtra state in India. Most of the water used for drinking, agriculture and industrial purposes. It changes with the climate, agricultural practices in the region. The water body faces pollution problem due to urbanization, domestic and slaughter waste discharges into the adjoining rivers. The investigation of water quality parameters, like pH, electrical conductivity (EC), hardness, chloride, dissolved oxygen (DO), total dissolved solids (TDS), biological oxygen demand (BOD), chemical oxygen demand (COD) level in water were analyzed using standard procedures at selected stations. The change in rainfall is one such important parameter governing the hydrological processes, which is not safe for drinking purpose directly or indirectly.

KEYWORDS

Dam, Water quality, Agriculture, Electrical cond-uctivity, Dissolved oxygen, Total dissolved solids, Chloride

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