

Pan Evaporation Modelling With Artificial Neural Network And Multivariate Non-Linear Regression Compared To Empirical Methods Under An Arid Environment

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Evaporation, as a key process in the earth's ecosystems, is a key factor in water resources and hydrometeorological research. Avoiding the expensive evaporation prediction methods, the pan evaporation technique is one of the most widely used and accepted methods. In this study, a multilayer neural network tool (ANN) and a multivariate non-linear regression technique (MNL) are utilized to estimate the daily and monthly pan evaporation in the arid environment of Kuwait. Estimation results are compared to two empirical methods, the Cuenca and Christiansen models, employing the so-called combination method FAO-56 PM for the same raw data and input variables, daily average air temperature, wind speed, relative humidity and solar radiation. Cross-validation, 10-folds for the daily time scale and 5-folds for the monthly time scale, procedures are implemented to examine the model's reliability and consistency. Evaluation metrics, like RMSE, R, MAE and NSE are applied to assess model performance. In general, it is demonstrated that the ANN model outperforms the MNL model, however, the standard deviation among the cross-validated k-folds of the MNL is lower than that of the ANN model. The monthly performance outperformed the daily output by achieving better statistical indicators with $R=0.9084$, 0.9092 , 0.8961 and 0.9002 than the daily ANN, monthly ANN, daily MNL and monthly MNL models, respectively.

KEYWORDS

Pan evaporation, Artificial neural network, Climate change, Environmental modelling, Water resources

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Removal Of Cutting Oil From Wastewater Through Novel Adsorbents Developed From Waste Coconut Fibres

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Oil contained wastewater discharged into the environment poses a serious threat. Removal of oil from wastewater is difficult mostly when the oil is present in a stable oil-in-water emulsion. Adsorption has emerged as a cost-effective technique due to the recent trend of developing adsorbents from agro-waste. This research focuses on developing novel adsorbents from waste coconut fibre in untreated raw coconut fibre (UCF), acid-alkali treated coconut fibre (ACF) and carbonized coconut fibre (CCF) form and comparatively evaluate the impact on oil adsorption capacity on these adsorbents developed through chemical and thermal treatment. Batch experiments were conducted to understand the influence of important operation parameter, namely pH (2-10), time of contact (10-150 min), adsorbent dose (0.5-7.5 g/L) and initial oil concentration (100-2000 mg/L). On comparison of equilibrium study, it revealed that thermo-chemically treated fibres (CCF) have higher adsorption capacity (16.22 mg/g) than chemically treated (8.81 mg/g) and raw coconut fibres (6.82 mg/g) and the present adsorption process fits Freundlich isotherm. The kinetic study indicates that it follows a pseudo-second-order kinetic model for UCF, ACF and CCF. Thermodynamically the process is endothermic and enthalpy value for CCF is 38.11 KJ/mol, ACF is 17.73 KJ/mol and UCF is 15.5 KJ/mol.

KEYWORDS

Oily wastewater, Adsorbents, Adsorption equilibrium, Kinetics, Thermodynamics

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Critical Analysis Of Electric Vehicle, Renewable Energy And Environment Policy With Particular Reference To India

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Energy is need of the hour and its demand is increasing day by day in the world. Emerging economies are demanding more energy for both industrial and financial growth. India with its ever-increasing population and rising electricity demand needs to address this. India's automotive market is fourth-largest in the world. Rise in alertness about protecting our environment and the support for the cause by all major economies of the world through the Kyoto Protocol and Paris Agreement, United Nations Framework Convention on Climate Change, the status of renewable energy has grown since it is free, clean and the most viable energy resource. As per extensive literature review, India is reported and having an enormous perspective as a superpower in terms of solar and wind energy. This paper analyses the role of government initiatives for switching from age-old petrol and diesel vehicles to electric vehicles, growth of sustainable energy and its impact on the environment. Developing countries and economics are demanding more power, putting an extra burden on fossil-based power plants to meet instant energy demand, thus increasing carbon emission.

KEYWORDS

Energy, Pollution, Environment, Carbon emission, Charging, Combustion, National measures, Policies, Strategies

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Production Of Plastic Degrading Enzymes From Organisms Isolated From Plastic Polluted Areas

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Plastics have been a huge nuisance to the world. In order to degrade the most widely used polyethylene terephthalate (PET), this research has been conducted. Organisms were isolated using minimal media alongwith shredded PET plastic provided as the sole carbon source. Eight individual colonies were isolated and were named PET1 to PET8. Organisms were identified by Gram staining and biochemical assays. Thin layer chromatography was performed alongwith standard to check the presence of terephthalic acid produced as a result of PET degradation. High pressure liquid chromatography was performed to confirm the production of terephthalic acid. A colourimetric assay was standardized using bromocresol green to quantitatively measure the terephthalic acid produced following the degradation of the plastic. Lowry's method was performed to check the presence of protein. Since the enzyme is the only protein available in the media it is a confirmatory test used to check the presence of the enzyme. PETase theoretically being an esterase should utilize tributyrin as a substrate. Hence esterase activity was viewed by well diffusion method on tributyrin agar. A colourimetric assay was standardized using p-nitrophenyl acetate to analyze the amount of PETase produced by the organisms. The temperature, pH, shaking and static conditions were standardized and optimum characteristics for the production of the enzyme were determined. The highest producers were given for 16s rRNA sequencing. The weight of the plastic was determined before and after the degradation. The surface of the plastic was studied using scanning electron microscopy. The enzyme was purified and sodium dodecyl sulphate polyacrylamide gel electrophoresis was performed. Plasmids were isolated and then transformation was carried out into *E. coli* DH5 α . This analysis is the need of the hour and further the enzyme activity can be studied and the enzymes can be used to treat the plastic filled dump yards.

KEYWORDS

Polyethylenase, Plastic biodegradation, Polyethylene terephthalate, Microbial degradation, Esterase

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Adsorption Of Cefotaxime From Water Matrix By Using Hybrid Beads

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Adsorbents (beads) were prepared using chitosan and plant waste materials. The batch adsorption was conducted to investigate the adsorption of cefotaxime from water matrix by using these prepared beads. The effect of different adsorption parameters, such as pH (3-11), initial concentration (10-50 mg/L), reaction time (30-180 min) and adsorbent dosage (0.1-1 gm/50 mL) were evaluated. Inverse relation was found between adsorption percentage and antibiotic concentration in water, whereas direct relation was observed between adsorption percentage and adsorbent dosage. Maximum adsorption was found at pH 5 with different combination of beads-AWC beads (50% almond shell: 25% walnut shell: 25% chitosan), CAW (50% chitosan: 25% almond shell: 25% walnut shell) and WAC beads (50% walnut shell: 25% almond shell: 25% chitosan). Langmuir adsorption isotherm is well befitting in case of WAC beads and Freundlich adsorption for CAW beads whereas, ACW beads follow both Langmuir and Freundlich isotherm models. The rate of adsorption on beads follows Lagergren pseudo second order kinetics. The results indicated that beads in all the combinations can be used as a low-cost effective adsorbent in the treatment of wastewater.

KEYWORDS

Cefotaxime, Adsorption, Beads, Isotherms, Kinetics

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Growth And Physiological Responses Of Quinoa Plant In Saline-Sodic Soil With Humic Acid Under Drought Stress Conditions

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Water deficient is one of most important issue in food security, especially arid and semiarid environment. The aim of this study was to evaluate the humic acid application in combination with irrigation levels on quinoa growth parameters, chlorophyll pigment and physiological traits under saline- sodic soil. A field experiment, consisting Three levels of humic acid (HA) treatments as control, HA1 and HA2 (0, 0.5 and 1 mg HA/kg soil, respectively) and three drought stress treatments (50%, 75% and 100%) water field capacity (FC) in a randomized complete block design (factorial) with three replications, was carried out in Khorasan Razavi provinace, Iran, during the dry season of 2019. The results showed that water stress decreased the chlorophyll a, chlorophyll b, total chlorophyll and carotenoids, but proline and protein contents increased with intensity of water deficient. Application of HA improved chlorophyll a, chlorophyll b and total chlorophyll and carotenoids in plant under three moisture levels. Proline and protein contents also increased with HA application. Plant height and total dry matter of quinoa increased in treatments with HA1 and HA2 application compared to control in all water stress during the growing season. The current study showed that HA were effective in alleviating drought stress and improving growth parameters.

KEYWORDS

Chlorophyll pigment, Carotenoids, Water deficient, Oxidative stress

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A Study On Leachability And Removal Of Chromium From TCCL Site At Ranipet, Vellore District

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The unscientific disposal of chromium ore processing residue (COPR) in Ranipet area, contaminate the groundwater in the vicinity. Due to the continuous leaching of Cr(VI) from the COPR, the removal of chromium from the groundwater alone is a challenging task. Though several works of literature have confirmed the presence of Cr(VI) in the vicinity, none of them has reported a technology for the removal of Cr(VI) from the contaminated groundwater in this site. This report highlights a recorded value of Cr(VI) as 2018 mg/L in the groundwater and soil contamination in the range of 18-26.2 mg/g within the site. The analysis of water samples collected within 3.0 km from downstream of the dumpsite has revealed the presence of Cr(VI) in the range of 0.053 to 2018 mg/L. Experiments have shown the result of 100% removal of Cr(VI) upon the usage of SnCl₂ and Na₂S₂O₅ from the groundwater containing 2000 mg/L of Cr(VI). The report suggests that no acid was required for the reduction of Cr(VI) on the usage of tin chloride and the dosage required for complete removal of Cr(VI) is compared with sodium metabisulphite. As the rate of removal of Cr(VI) is faster in the chemical treatment, the reduction and precipitation method is recommended for treating the contaminated groundwater at this site.

KEYWORDS

COPR, Cr(VI) treatment, SnCl₂, Na₂S₂O₅, Reduction and precipitation, Sludge disposal

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Envisaging Variance Amid Indian Floras Owed To Contaminates Via SSIM Technique

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Earth's atmosphere contains 20.9% of oxygen among all components (nitrogen, argon and other gases). But due to several factors, such as pollution, global warming, fuel burning, etc., the level of oxygen is degrading. Several researchers have reported that pollution is the main cause for degradation of oxygen levels. People are struggling with several health issues, like asthma, lung cancer and skin problems, like atopic dermatitis, eczema, psoriasis or acne, skin cancer, etc. Due to pollution plants are also getting affected in addition to human beings. Henceforth, numerous researches are in an improvement to overcome the existing challenges. In order to detect the changes in plants due to pollution the current research proposed a structural similarity index methodology (SSIM). All the samples (*Ocimum tenuiflorum*, *Sansevieria trifasciata*, *Chlorophytum comosum*, *Azadirachta indica*, *Aloe vera*) were stipulated from the Indian species of plants that are rich in oxygen. The structural similarity index (SSIM) is calculated from the input sample images with the help of image processing by using MATLAB 2019a. Further, we have shown the effect on plants due to pollution by contrasting the structural similarity index (SSIM) value with the pollution index. This pollution index was measured from the air quality checker system situated near the target site at the time when the sample images were collected. Many analyses are done and the results were evaluated by plotting graph. This graph depicts that when structural similarity index value increases with respect to pollution index, the image quality of the sample decreases and vice versa.

KEYWORDS

Structural similarity index methodology, Air quality index, Image processing, Pollution, Oxygen, Plants

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Evaluation Of Noise Pollution In The Classrooms Of The Physical Education And Sports Science College At The University of Samarra, Iraq

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In this research, noise pollution and its impact on vocal comfort and speech clarity were evaluated in several classrooms at the Faculty of Physical Education and Sports Science at the University of Samarra, where the study has included three halls. The variables studied are the internal and external noise of the halls and the calculation of equivalent noise (Leq) and the ratio of the speaker to noise (signal to noise ratio (SNR)) and the frequency of reverberation time (RT). The study showed a noticeable increase in the internal noise that affects the acoustic comfort and the decrease in ratio of the speaker to the noise in the back seat areas. The frequency of the reverberation was found to fall within the required limits and a significant decrease was observed to dampen the external noise infiltrated into the classroom. A questionnaire was conducted for a random number of students of the college to indicate the noise assessment in the classrooms. Most of the answers were consistent with the results of the research and the few were somewhat different with the study.

KEYWORDS

Equivalent noise, Signal to noise ratio, Frequency of reverberation time

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Development Of Bio-Nanofertilizers From Oil Cakes

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Nanotechnology has opened up a number of scopes for novel application in the field of agriculture industries, because of several physico-chemical properties of nanoparticles (NPs), that is high surface area, high reactivity, tunable pore size and particle morphology. Nanoparticles provide smart delivery of fertilizers. Some of the nano polymers that are used in biofertilizers are albumin, alginate or chitosan. Chemical fertilizers resulted in higher productivity as well as caused environmental hazards. To overcome these drawbacks, nanotechnology can be a ray of hope. Nanofertilizer improves crop growth, yield and quality parameters with increased nutrient use efficiency, reduction in wastage of fertilizer and cost of cultivation. It promotes direct entry of nutrients into the plant system, to reduce wastage. Some crops may have protein deficiency, to overcome all these drawbacks. The extraction of protein was carried out according to the method of Maronach and Diosady. The extracted protein sample was coated with nanopolymers. Through Foliar application, bio-nanofertilizers provide proteins to the crops (Foliar application – A technique of feeding plants by applying liquid fertilizer directly to the leaves. Plants are able to absorb essential elements through their leaves). Foliar application of nanofertilizer leads to higher nutrient efficiency (NUE) and gives rapid response of growth.

KEYWORDS

Nanotechnology, Bio-nanofertilizers, Foliar application, Oil cakes, Protein extraction

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A Study On Efficiency Of Constructed Wetlands In Removal Of Pathogenic Bacteria

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Water pollution has become a perennial concern all over the world especially in developing countries due to rapid urbanization and increased industrialization. This polluted water is of great concern which impacts our social life, health and environment. There are various conventional wastewater treatment methods available, like activated sludge, trickling filters, slow sand filtration, UV radiation, etc., but they have certain limitations, like expensive equipment requirement, skilful manpower requirement and formation of carcinogenic byproducts. Constructed wetlands are effective and environmental friendly ecosystems that are applicable for the reduction of pathogens from wastewater apart from the removal of chemical pollutants. There are many types of pathogens found in wastewaters that originate from human and animal activities. It is practically impossible to identify all the microbial species present in a wastewater sample due to technical difficulties, complexity and expense. Also, due to the complexity of pathogen removal mechanisms and various influencing factors, the knowledge on the fate and removal of bacteria in constructed wetlands (CWs) is still not sufficient. The main objective of our study was to test the efficiency of constructed wetlands in the reduction of pathogens from wastewater. The inlet and outlet water samples were collected from the constructed wetlands, serially diluted and spread plated on specific media plates. The colonies obtained were identified as well as enumerated using viable count technique and percentage reduction in pathogens was determined. The results showed that there is a 60-80% reduction in the number of different bacterial pathogens in the wastewater samples treated by CW systems.

KEYWORDS

Wastewater treatment, Constructed wetlands, Pathogenic microorganisms, Bacteria isolation

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Generation, Composition And Management Of Waste Generated Along The Riverfronts (Ghats) Of River Ganga In Varanasi City, India

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Varanasi is one of the most famous cities for its riverfronts and religious and cultural activities carried on there in India. There are 86 riverfronts (ghats). This research work assessed the sources, composition, effects, management and disposal aspects of solid waste produced at nine selected most prominent riverfronts of Varanasi. It has been seen that nine selected riverfronts generated 1880.7 kg waste per day in which flower waste was highest, that is 893.4 kg (47.5%) followed by plastic 499.4 kg (26.55%), paper 305.2 kg (16.22%), cloths 98.7 kg (5.24%) and glass 84 kg (4.46%) wastes. Whereas Manikarnika generated 6000 kg ash and Harishchandra 850 kg ash per day, respectively. At 86 ghats, the number of shops, temples and dustbins is 158, 113 and 244, respectively. To clean 86 ghats, 600 workers work regularly from 6 AM to 10 PM and 20 supervisors supervise them. Management potentials include the production of vermicomposting, composting, extraction of natural dyes, essential oils, biogas generation, incense sticks, rose water and handmade paper. Most of the waste is disposed of at the Karsada waste processing plant.

KEYWORDS

Riverfront (Ghats), Solid waste management, River pollution, Religious waste

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Assessing The Environmental Pollution Due To The Presence Of Fluoride And Nitrate In The Groundwater Of Some Rural Parts Of Sirsa District, Haryana

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The present analysis was carried out to assess the suitability of groundwater for drinking with respect to fluoride and nitrate. Excessive intake of fluoride and nitrate may cause human health risks. A total of 30 representative groundwater samples were collected during pre-monsoon of 2017 from different rural locations in Ellenabad area and analyzed for various quality parameters. The fluoride concentration ranged from 0.6-7.2 mg/L and the nitrate concentration ranged from 6.8-45.2 mg/L. A total of 22 samples out of 30 have high concentrations of nitrate and 8 samples out of 30 have high concentrations of fluoride exceeding the permissible limits of WHO (10 mg/L and 1.5 mg/L, respectively). The human health risk associated with the intake of fluoride and nitrate was calculated for infants, children and adults separately. The present study clearly suggests that prior treatment of water is necessary to prevent people from health issues by the intake of fluoride and nitrate via drinking water.

KEYWORDS

Fluoride, Groundwater, Health issue, Nitrate, Quality, WHO

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Effect Of Coconut Shell Activated Charcoal Immersion On Iron, pH And Total Dissolved Solids Levels in Dugwell Water

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High iron (Fe) content provides fishy metallic taste and odour to water, causes brown stains on clothes, on the walls of the tub, pipe blockage and disrupt public health. High levels of iron and total dissolved solids (TDS) also affect the degree of acidity (pH) and the quality of clean water, therefore appropriate but effective technology is required to reduce the levels of iron and TDS in water. The objective of the present work is to evaluate the effect of duration of coconut shell activated charcoal immersion on iron (Fe) content, pH and TDS levels in dugwell water. Six durations of immersion treatment were established in this study, namely 5 min, 10 min, 15 min, 20 min and 25 min. The study treatment used 0.5 g of coconut shell activated charcoal which was immersed in 1000 mL of dugwell water. Data analysis was performed using the statistical package for social sciences (SPSS/version 22) programme. One-way ANOVA test was used to find significant differences between the experimental groups followed by the Post Hoc least significant difference (LSD) test to compare the significance between each experimental group at a significance level of 0.05. The results obtained show a highest mean decrease in Fe level in the 25 min immersion of 0.718 mg/L or 79.249%, the greatest increase in the pH was found in 25 min immersion of 0.63 or 9.62% and the highest decrease in total dissolved solid (TDS) was found in 25 min immersion of 109 mg/L or 26.5%. From results, it can be said that duration of coconut shell activated charcoal immersion have an affect on Fe, pH and TDS levels in dugwell water. It is expected that the community can use coconut shell activated charcoal as a media for dugwell water processing to gain most effective Fe, pH and TDS levels.

KEYWORDS

Activated charcoal, Coconut shell, Iron, pH, Total dissolved solids

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Start-Up Phase And Stability Of Expanded Granular Sludge Bed Reactor To Treat Slaughterhouse Wastewater

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A laboratory-scale anaerobic expanded granular sludge bed reactor (EGSBR) was designed and fabricated to treat slaughterhouse wastewater. The reactor was continuously run at an organic loading rate of 0.013 and 0.014 kgCOD/m³/day, below the mesophilic level. The result showed that the extended granular sludge bed reactor was stable. The period was determined to be between the 54th day and the 61st day and these days showed maximum removal efficiency. The volatile fatty acids started to accumulate during the start-up era, from the 18th day to the 27th day. The pH level also declined during these stages. The stabilization phase was started at the end of the 52nd day onwards with the help of bacterial consortium. An initial organic loading rate proved useful for the propagation of anaerobic active sludge and reduced organic chemical oxygen demand loading resulted in lower gas production and higher wastewater upflow velocity.

KEYWORDS

Chemical oxygen demand, Expanded granular sludge bed reactor, Mesophilic, Organic loading rate, Slaughterhouse wastewater, Volatile fatty acid

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Evaluation Of Cationic And Anionic Polyelectrolytes As A Coagulant Aids In Turbidity Removal From Surface Water

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Coagulation-flocculation is an important technique used for removal of turbidity from water. The study aims to investigate effect of alum as coagulant in conjunction with polyelectrolytes as coagulant aids for removal of turbidity from surface water (pond and river water). Water was collected in March, June, September and December 2018 from both pond and river. Turbidity for pond water was 174 NTU, 192 NTU, 101.5 NTU and 147 NTU and for river water, it was 92 NTU, 251 NTU, 121 NTU and 161 NTU for March, June, September and December 2018, respectively. Conventional jar test was done for removal of turbidity by determining the pH, electrical conductivity, temperature, optimum mixing intensity and proper dosage. The two polyelectrolytes used were organopol 5470C and chemfloc 430A. Research aims to evaluate effect of organopol 5470C and chemfloc 430A used as coagulation and flocculation aids in different surface water and to examine their effectiveness for treatment of water. For pH range of 7.0-8.0, organopol 5470C shows better flocculation strength than chemfloc 430A in pond and river water, while, chemfloc 430A has better results at pH more than 8.0. The objective of work is to assess performance of two synthetic polyelectrolytes on turbidity of surface water.

KEYWORDS

Coagulant, Coagulation, Electrical conductivity, Flocculation, Polyelectrolytes, Turbidity

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Noise Exposure And Associated Health Effects Among People Working Near Traffic Junctions In Mysuru, India: An Evaluation Using GIS

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Noise pollution is a rising risk factor leading to the development of auditory and non-auditory health effects of various kinds. The modern man is exposed to various degrees of noise throughout the day. Occupational exposure to noise is a significant yet neglected challenge in developing countries. This study attempts to map the distribution and relationship of traffic noise and its health effect among people exposed to it in major junctions of Mysuru city in India using geographic information system (GIS). A cross-sectional study was conducted in 70 systematically selected major traffic junctions in Mysuru city. The average noise level was assessed using sound level meter during peak traffic hours and 280 individuals working adjacent to the localities were evaluated for health effects. The data was analyzed using QGIS and SPSS software. The mean noise level recorded in the traffic areas of Mysuru city was 72.89 ± 8.37 decibels and 61.4% of locations assessed in the city showed noise levels above the recommended maximum limits. Among the workers exposed to traffic noise in the city, 26.1% had atleast one health effect of high noise exposure. The proportion of workers with auditory effects of noise was 6.1% and 22.5% showed non-auditory health effects of constant noise exposure. The results were suggestive of the presence of noise pollution in the majority of the traffic areas in Mysuru city. The proportion of study participants with auditory or non-auditory health effects were higher in areas with noise levels exceeding the recommended maximum limits.

KEYWORDS

Noise pollution, Noise-induced health effects

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