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GIS Based Assessment Of Hydrochemical Characteristics Of Groundwater In DOAB Of Krishna Basin

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The hydrochemical analysis of groundwater samples from a DOAB, situated in Bagalkot district, northern part of Karnataka, which falls in a semi-arid zone was considered to characterize the groundwater quality and its suitability for drinking and irrigation uses. The study area is surrounded by three river basins namely Krishna, Ghataprabha and Malaprabha, making it unique for study. Some studies regarding the quality of groundwater have been done in different parts of one of the river basins but not concerning the particular DOAB region. Totally 19 groundwater samples spread throughout the study area were collected. The suitability for drinking was assessed by analyzing the anions and cations alongwith pH, electric conductivity and salinity parameters. The suitability for agricultural usage is verified by sodium absorption ratio (SAR), permeability index, sodium percentage, magnesium hazard and residual sodium carbonate (RSC). The spatial distribution of the parameters is studied using GIS. The results of the chemical analysis indicate that the study area consists of hard alkaline water and major ions include Na+ and SO42-. Based on TDS values, 32% of the samples are not suitable for drinking, 52.63% of samples fall under hard water category, whereas 47.37% fall under very hard water category. 58% of the samples have sulphate concentration beyond recommended limits. Based on electric conductivity, 15.78% of the sample fall under hazardous category. Pearson's correlation and factor analysis were used to distinguish the statistical relationship between ions. Na+ and Cl-, Na+ and SO42-, Mg2+ and Cl- and Ca2+ and Cl- show a strong positive correlation with high values of adjacent R2 and statistically significant p-values. The spatial distribution mapping of all parameters except pH and potassium indicate the values beyond permissible limit spread more towards Ghataprabha river, indicating more contamination near Ghataprabha river. The dominant hydrochemical facies for groundwater are Na-Cl, Ca-Cl and Ca-Mg-Cl type. The United States Salinity Laboratory (USSL) graphical geochemical representation of groundwater quality indicates that 63% of the samples fall under high salinity with low alkali and 32% fall under high salinity with medium to high alkali indicating unsuitability of water for irrigation.

KEYWORDS

Groundwater, Hydrochemistry, Irrigational suitability, DOAB

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Chemical Surface Modification Of Seaweed Species For Cationic Dyes Removal From Simulated Water

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Efficient adsorbents were prepared from two seaweed species (green and brown algae) by simple surface modification using chemical agents. The raw materials were impregnated and agitated in hydrochloric acid (0.1 N) and calcium chloride (0.2 N). The resulting AC-1, AC-2, AC-3 and AC-4 samples were used for basic green and basic red dyes removal from simulated water. Pollutants adsorption parameters, such as solution pH, contact time, carbon dosage and temperature were measured in batch experiments. Enhancement of the adsorptive capacities of upto 500 mg/g and 188.68 mg/g for basic red and basic green dyes, respectively were obtained. Samples were characterized by performing FTIR, SEM, iodine number, methylene blue index and pHzpc. Langmuir, Freundlich and Temkin isotherms were used to analyze the adsorption equilibrium data and adsorption mechanism obeys pseudo second order kinetic model. Thermodynamic analysis of the adsorption processes of both dyes confirms their spontaneity and endothermicity. Cationic dyes can be efficiently removed from liquid effluents by local algal species chemically modified as an alternative to the commercially available adsorbents.

KEYWORDS

Surface modification, Seaweed, Removal, Dyes, Isotherms

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Isolation And Characterization Of Bifenthrin and Cypermethrin Tolerant Bacteria From Pesticide Contaminated Soil From Punjab

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Pesticides contaminated soil is the most appropriate ecological niche which gives rise to such autochthonous microbial populations having the capacity to resist or degrade the particular class of pesticides. Isolation of indigenous bacterial strains having the potential of degrading pyrethroids insecticides has acknowledged significant consideration throughout the world due to their environment friendly in situ bioremediation capability. For isolation of bifenthrin and cypermethrin resistant bacterial strains from pesticides contaminated soils, enrichment culture technique was used. The isolated bacteria were further screened based on their morphological characteristics, biochemical parameters and pesticides tolerant capacity. Furthermore, the effect of different growth factors, like temperature, pH were also studied. In the present study, three bacterial strains were isolated having the ability to tolerate cypermethrin upto the concentration of 150 *µ*g/mL. Molecular and phylogenetic analysis of 16S rRNA gene of bacteria identified them to be *Pseudomonas aeruginosa*, *Pseudomonas monteilii* and *Alcaligenes faecalis*. *Pseudomonas monteilii* was found to be the most tolerant strain against pesticide cypermethrin upto the concentration of 200 *µ*g/mL. *Pseudomonas monteilii* and *Bacillus licheniformis* were found to be most resistant towards pesticides bifenthrin upto the concentration of 150 *µ*g/mL and 200 *µ*g/mL, respectively. These indigenous bacterial strains can be used in bioremediation of pesticide contaminated soil in situ.

KEYWORDS

Pesticides, Cypermethrin, Bifenthrin, Bacteria

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Extractive Spectrophotometric Assessment Of Diuron Herbicide Leaching Risk In Five Soils

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This paper investigates the adsorption and leachability of diuron herbicide as these processes control its migration from soil to water bodies and consequently influence the surface and groundwater contamination. Adsorption of diuron, using the batch equilibrium technique, has been studied on five soils of different characteristics for which a spectrophotometric methodology has been developed based on the reaction of dimethyl amine (formed from hydrolysis of diuron with potassium tert.-butoxide) with carbon disulphide and nickel (II) acetate to form methyl isobutyl ketone (MIBK) extractable yellow nickel (II) dimethyl dithiocarbamate [$Ni(DTC)_2$] complex showing λ_{max} at 428 nm. The method has also been applied to the determination of diuron in a commercial formulation and in residues on agricultural produce and water for the purpose of getting reliable adsorption data and predicting health hazards. The leaching risk of diuron in terms of groundwater ubiquity score (GUS) index was evaluated and shows values in the range 1.97-2.12, which classifies it as a transition leacher and has a potential to contaminate ground and surface water resources. The present study reveals the serious contamination status of surface and groundwater by this herbicide.

KEYWORDS

Diuron, Spectrophotometry, Adsorption, Leachability, Groundwater ubiquity score

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Effect Of Diesel And Ethanol Content In Plastic Oil On The Performance And Emission Of Diesel Engine

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In the present study, experiments are conducted to analyse the performance, combustion and emission characteristics of a diesel engine fueled with plastic oil and its blends of diesel and ethanol. Experiments were carried out for various test fuels at different loads keeping compression ratio of 18 to find the performance, emissions and combustion parameters, like brake thermal efficiency (BTE), brake specific fuel consumption (BSFC), exhaust gas temperatures (EGT), carbon monoxide (CO), unburnt hydrocarbons (HC), nitric oxides (NOx), smoke, cylinder pressures, mass fraction of fuel burned, rate of pressure rise and net heat release rates. It is noticed that P90D10 is having highest brake thermal efficiency of 28.63% which is 12.58% higher when compared with diesel and 5.97% higher when compared with pure plastic oil at 80% of full load and compression ratio 18. The brake specific fuel consumption decreases by 16.66% when compared with diesel for P90D10 and 7.79% with pure plastic oil. For the blend P90D10 the emissions, like CO, HC and smoke emissions decreases by 10.2%, 25.71% and 48.2%, respectively when compared with diesel and it is also found that the emissions are decreased by 3.92%, 25.7% and 26.96% with pure plastic oil. NOx has contrary results compared to other emissions and has increased by 12.4% when compared with diesel and 9.8% with pure plastic oil.

KEYWORDS

Engine, Waste plastic oil, Emissions, Ethanol

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Trend Study And Forecasting Of SO_2 And NO_2 In Jaipur

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Over the past few years, an increase in the interest of the public in the day-to-day air quality conditions to which they are exposed to has been evolved. Driven by the increasing awareness of air pollution exposure, especially by most sensitive sub-populations, such as children and elderly, short-term air pollution forecasts are being provided more by local authorities. The main objective of the present study is to provide an overview and analysis of air quality factors: sulphur dioxides (SO_2) and nitrogen dioxides (NO_2) and to forecast monthly air quality levels in Jaipur city, Rajasthan. The analysis was carried out on the data for the period of 13 years from 2005-2017 for criteria pollutants. This paper also reviews progress towards meeting the requirements of national ambient air quality directives. An attempt for trend analysis and forecasting for the polluting factor SO_2 using exponential smoothing method and for NO_2 using seasonal auto regressive integrated moving average (SARIMA) model of time series analysis have been made. Analysis has been done for the data covering the year 2005-2015 and forecasting is performed for the period 2016-2018 monthly observations as well as cross-validated with the actual recorded values.

KEYWORDS

National Ambient Air Quality Standards, Jaipur, Exponential smoothing, SO_2, NO_2, SARIMA, Forecasting, Air pollution

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Chromium And Copper Removal From Aqueous Solution By Using Natural Adsorbent

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Coal ash wastewater is the discharge from the thermal power plant, laden with heavy metals, need remediation to discharge into water bodies. This work aims to promote the use of natural, deposited silt, as an untreated sorbent for the eviction of substantial metal particles from wastewater. Adsorption studies were conducted with the synthetic sample in a batch system as a component of pH of the solution, adsorbent dose, initial metal concentration and stirring time. A contact time of 120 min secure attainment of equilibrium for chromium (Cr) and copper (Cu). The sorption proficiency after balance was higher for Cr (88% adsorption), followed by Cu (77-88%). The pilot adsorption data were fitted by both Langmuir and Freundlich sorption models, with Langmuir isotherm providing the best fit ($R^2 > 0.99$). The adsorption of metal ions increased with the increase in adsorbent dose for Cr and Cu and the results showed that the highest adsorption capacity occurred at pH 6 for both Cr and Cu. A comparison of the maximum sorption capacity of several untreated geographical based material showed that deposited silt is a suitable contender for use as an adsorbent in the removal of heavy metals from aqueous solutions.

KEYWORDS

Heavy metals, Chromium, Copper, Adsorption

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Activated Carbon Production From Biowaste Materials - Properties and Applications: A Review

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Activated carbon (AC) is utilized in various conditions of uses after its disclosure as a solid and dependable adsorbent. Various techniques used to create activated carbon include pyrolysis actuation, physical enactment, synthetic initiation and steam pyrolysis. The significant components influencing the activated carbon creation, the potential uses of activated carbon and their future prospects are likewise discussed in the present work. Air conditioning is connected in water, wastewater and leachate medications in numerous nations, particularly to clean the shading, evacuate the scent and some substantial metals. It is shoddy and accessible and can be created from horticultural waste materials, for example, rice husk, tea husk, cir pith, palm oil shell, waste egg shells and coconut shell. The AC's fine and permeable structure and an amazingly huge molecule surface territory (>800 m^2/g) bring about making it had incredible adsorptive properties. Along these lines, the adsorption procedure utilizing activated carbon is observed to be a conceivably suitable technique for expelling contaminations from different fluid arrangements.

KEYWORDS

Activated carbon, Properties, Applications, Porosity

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Role Of Bioadsorbants In Reducing Heavy Metal Stress In Spinach Seedlings

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Leafy vegetables are more prone to heavy metal contamination, causing threats to humans by depositing it into its edible parts. Reduction in the heavy metal absorption by the use of bioadsorbants, like fruit wastes, tea wastes, egg shell powder, etc. To achieve this, spinach seedlings were grown in the heavy metal treated soil as well as in soil containing both heavy metal and bioadsorbants. Biochemical analysis, as well as gene expression study, was done in control, treatment 1 (T1) (containing heavy metal only) and treatment 2 (T2) (containing heavy metal and bioadsorbant). It was found that the protein, proline, carotenoid, chlorophyll and the chloroplast content of spinach seedlings was increased in treatment 1 (T1) and the level reached back to its normal concentration in treatment 2 (T2). Whereas the level of carbohydrate was reduced in T1 and in T2, the level increased to its normal value. A more intense band of atpA gene was found in T1 compared to control and T2. This gene can be considered as a marker for heavy metals. Hence, spinach seedlings act as metal accumulators at 70 ppm of heavy metal concentration. To better understand the role of bioadsorbants to reduce the heavy metal toxicity in vegetables, additional experiments need to be carried out on a large scale.

KEYWORDS

Heavy metal, Spinach seedlings, Bioadsorbants, atpA

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Acid Red 88 Dye Degradation By Green Synthesized CeO_2/RGO Nanohybrid Photocatalyst Under Solar Light

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A sustainable method of preparation and its utilization in harvesting renewable energy is a prime concern in environmental protection. We report here the preparation of a hybrid inorganic semiconductor with organic carbon base as a solar active photocatalyst. The prepared catalyst is used for the environmental remediation of degrading dye molecules in an aqueous medium. Reported CeO_2/RGO nanohybrid catalyst (NHC) synthesis includes green synthesis of rGO using *Carica papaya* leaf extract followed by nanoceria coating over the reduced graphene oxide (RGO). The prepared catalyst was characterized by SEM, XRD, EDX, FTIR, BET surface area and UV-DRS. Photocatalytic degradation study of the acid red 88 (AR 88) dye by NHC was carried out under both UV and direct solar lights. Reaction kinetics for the photocatalytic degradation was studied.

KEYWORDS

Carica papaya, CeO_2/RGO NHC, Photocatalyst, Fractional order, Acid red 88

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Confiscation Of Chemical Oxygen Demand From Groundwater Samples Collected From Near Tanneries Using Activated Carbon Of *Ricinus communis* Blended With Coconut Shell

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The confiscation of chemical oxygen demand (COD) of groundwater samples collected from near tannery regions carried out using low cost adsorbent, like *Ricinus communis* blended coconut shell carbon. The COD adsorption efficiency of *Ricinus communis* leaves (LAC), stems (SAC) and roots (RAC) blended with coconut shell were examined. The plant *Ricinus communis* mixed with coconut shell was carbonized as at 300 ± 50°C then was activated in an electric hot-air oven at a very high temperature around 400°C with steam in absence of air. The significant COD removal efficiency rates of stem activated carbon (11%), leaves activated carbon (6%) and root activated carbon (12%) was achieved by using little quantity of adsorbent (5 g/100 mL). The effectiveness of the activated carbon produced from *Ricinus communis* and coconut shells for the removal of organic contaminant has been established. This study also showed that a natural low cost adsorbent, such as activated carbon of *Ricinus communis* is an alternate option for COD removal from water and wastewater.

KEYWORDS

Groundwater, Activated carbon, *Ricinus communis*, Coconut shell, COD, Low cost adsorbent

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An Initiative Batch Experimental Studies On Fibrous Materials As Fixed Beds For Wastewater Treatment

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This study examined the performance of two-reactors, fixed film systems in which the biofilm is attached to submerged beds, such as sisal and oil palm empty fruit bunch fibres (OPEFB) with similar density packings under diffused aeration, known as the aerated submerged fixed film (ASFF) process. These fibrous materials also have the ability to withstand sudden shock loads during their routine treatment cycles, which is a vital requirement for any wastewater treatment. Trial run experiments were conducted using two ASFF units operated at predefined experimental conditions (under varying detention times) for wastewater treatment. Two rectangular packed bed reactors filled with sisal fibre (RS-1) and OPEFB fibres (RP-2) were studied for their applicability in wastewater treatment under batch mode with a packing density of 50 kg/m^3. Experiments were conducted at 12 hr interval with grab sampling and the reactors were analyzed for the removal efficiency of parameters, such as BOD_5, COD, NH_3-N and PO_4^{3-}. It is concluded from the investigation that both sisal and OPEFB fibrous organic materials showed significant removal of organics and nutrients at shorter and longer retention times. The trial run experiments with a longer residence time of 72 hr provided acceptable removal results (greater than 70%), which infer that these agricultural fibrous materials, such as sisal and OPEFB are good enough to treat domestic wastewater.

KEYWORDS

OPEFB fibres, Sisal fibres, Detention time, Biofilm, Fixed film systems

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Impact Of Organic And Inorganic Materials On Total Mercury Distribution In Saline Soil Profile

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Mercury (Hg) is a major environmental pollutant when they present in high concentration in soil and have toxic effects on plants growth, environmental quality and human health. This experiment was performed as a completely randomized design (factorial) with three replications. For this purpose, columns containing 6 kg of saline soil was treated with humic acid (HA) and zeolite (Zol) both at concentrations of 0 and 0.5 mg/kg soil. Treated soil columns were irrigated with three mercury levels of 0, 75 and 150 mg/L using mercuric chloride salt. Irrigation with mercuric chloride was done every five days with equal amounts of prepared solution to each column. After 20 days, the total mercury was determined in 5 sections of soil with 10 cm thickness (D_1...D_5). The results indicated that increasing Hg levels enhanced Hg concentration in all soil sections, highest was noted in D_1 compared to other sections. Both humic acid and zeolite treatments played an important role in controlling Hg in saline soil. Further, total Hg retention in saline soil was increased by humic acid and zeolite treatments. Accordingly, humic acid (HA) treatment in D_1–D_4 sections proved to be superior to zeolite (Zol) treatment in more retention of total Hg in saline soil. All in all, the positive impact of humic acid treatment was greater than that of zeolite treatment.

KEYWORDS

Mercury toxicity, Humic acid, Zeolite, Salinity

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Effect Of Three Commonly Used Insecticides On Earthworm Mortality Under Laboratory Conditions

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Pesticide toxicity in agro-ecosystems undergoes transformational changes and enters into soil ecosystem through pest control programmes and remains in the soil for few days to months, depending on the chemical property of the pesticides used. The indiscriminate and excessive use of pesticides is leading to environmental pollution. Pesticides are generally disastrous for earthworm communities. Earthworms contribute significantly the macro fauna of soil ecosystems, therefore, used to monitor the soil pollution and contamination. The agricultural practices break the sustainability by means of pesticides use which is only selective to target species but it adversely affects various non-target individuals including useful macro and micro fauna. Toxicity of pesticides on earthworms is assessed by performing acute mortality test and it was concluded that insecticide imidacloprid and monocrotophos are toxic to earthworms in the soil based on agriculture recommended dose and rate of application whereas chlorpyrifos observed less toxic to earthworms during the present investigations.

KEYWORDS

Insecticides, Earthworms, Mortality, Agro-ecosystem

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Urbanization In India And Impact On Environmental Degradation : A Cross State Analysis

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Urbanization - the rural flight of people due to many economic and social factors - is quite evident since the second half of the last century. This concentration of people in urban centres affects both the economy as well as the environment. Today environment – the survival kit of human being is under threat from the negative impact of urbanization. India is no exception in this regard. Unplanned urbanization in India is greatly responsible for excessive air pollution, water quality degradation, changes in land use pattern, loss in vegetation cover, the problem of waste management and noise pollution in metro cities. Uncontrolled urbanization is mainly responsible for growth of slums in the country which also greatly contributes towards worsening the quality of environment. India has been ranked 177 out of 180 countries in the Environmental Performance Index (EPI) 2018. In this context, this paper attempts to examine the impact of urbanization on the degradation of the environment and level of urban-induced environmental degradation across the States and Union Territories of India. Impact of urbanization on different components of the environment has been measured with the help of simple linear regression analysis. Categorization of states has been done on the basis of a composite environmental degradation index constructed for each state with the help of principal component analysis. The estimated results of the analysis clearly establish the negative impact of urbanization on different components of the environment as well as huge cross-state variation in case of the level of environmental degradation.

KEYWORDS

Urbanization, Rural-flight, Urban slum, Air pollution index, Environmental degradation index

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Study On The Effect Of Acidic Polluted Water On The Strength Of Concrete

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As there is a scarcity of potable water in many places, impure water is being used sometimes for mixing as well as curing of concrete in the civil engineering constructions. An experimental investigation was carried out to find the most effecting acid in curing. Batch experiments were conducted to study the influence of 1% H_2SO_4, 1% HNO_3 and 1% HCl in acid curing. It was found that compressive strength loss of concrete was maximum for H_2SO_4 curing and minimum for HCl curing. The sand was replaced by 20%, 40% and 60% copper slag in batch experiments to study the influence of copper slag on the strength of concrete in an acidic environment. It is observed that the percentage loss of compressive strength of copper slag concrete mixes is considerably lower than that of conventional concrete mixes at all ages of acid exposure. The results confirmed that concrete made with copper slag is relatively resistant to acid curing in terms of low mass loss and compressive strength loss.

KEYWORDS

Copper slag, H_2SO_4, HCl, HNO_3, Concrete, Compressive strength

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Poverty Eradication Through Green Economy: A Case Study Of Two Villages Of Lakhimpur District Under Narayanpur Region

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Based on the economic development concept, it is the sustainable development that meets the needs of the present without compromising the ability of future generations to meet their own needs. The economic growth of a nation, directly and indirectly, depends on environmental degradation. Initially, it is said that a developed nation may be used in developing nations as a dumping ground of pollution. Heavily carbon emitted or pollution based industry are being shifted to developing nations. Developing nations need such type of economic growth as well as development which can achieve growth and development, create employment opportunities, gender equality, caste equality, improved standard of living, environmentally friendly methods of production, easily available credit support system. Such an economy is called a green economy. Poverty is the main problem which creates difficulty to implement green economy because of the societal issue- social scar which decreases the livelihood security and further environment degradation leads to worsening poverty. This paper attempts to discuss how green economy can improve human well being and social equity through the development of soft and economic infrastructure with special emphasis on sewage, roads and communication, education and health sector. The present study is conducted in two villages of Lakhimpur district in the state of Assam. The study will be based upon both primary and secondary data. The present study concludes that moving towards a green economy should aim at increasing state help and joint partnership/ joint projects among the different states of India.

KEYWORDS

Green economy, Sustainable development, Economic infrastructure, Lakhimpur district, Human well being

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