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Case Study **Published Date:- 2024-10-18**

Flood Risk Management in South-west Nigeria: Lagos as a Case Study

Flooding is a significant natural hazard impacting societies worldwide, with increasing severity in urbanized regions. This paper presents a case study of Lagos, Nigeria, examining flood risk management efforts in the city. The purpose is to evaluate the effectiveness of current strategies and suggest improvements for reducing the impacts of flooding. Findings highlight the roles of government and private stakeholders, as well as policy challenges. Recommendations for sustainable flood management practices are provided, with implications for other high-risk areas.

Research Article **Published Date:- 2024-09-17**

Improving the Concrete Compressive and Flexural Strength with a Low Fraction Addition of Carboxylated Nitro-oxidized Cellulose Nanofibrils from Banana Rachis

Conventionally, concrete strength depends on the bonding interface, especially in hydrated products such as calcium silicate hydrate (CSH). As a result, concrete is sensitive under tensile load. With its unique properties, a low fraction of carboxylated nitro-oxidized cellulose nanofibrils (NOCNF) from the banana rachis is employed to improve the mechanical performance of the concrete nano structurally. Compressive and flexural strength using the NOCNF content at 0, 0.05, and 0.1 wt. % cured in 7 and 28 days were evaluated. Notably, the compressive strength increased by 16% and flexural strength by 13% at 0.1% NOCNF compared to plain concrete after the 28 curing days. A low NOCNF fraction achieved a good, albeit impossible, performance with the microscale fibers. The nanostructured effect was discussed twofold: an excellent interaction between the NOCNF and the hydrated products and the carboxylic groups on the NOCNF surface enhanced the cement hydration. These data are better than the literature based on the small-diameter cellulose nanofibrils without the carboxyl groups. As a sustainable nanocomponent, NOCNF could be a perfect candidate to improve concrete performance under mechanical load.

Research Article **Published Date:- 2024-09-13**

Development of a Web-based Tomato Plant Disease Detection and Diagnosis System using Transfer Learning Techniques

A significant obstacle to agricultural productivity that jeopardizes the availability of food is crop diseases and farmer livelihoods by reducing crop yields. Traditional visual assessment methods for disease diagnosis are effective but complex, often requiring expert observers. Recent advancements in deep learning indicate the potential for increasing accuracy and automating disease identification. Developing accessible diagnostic tools, such as web applications leveraging CNNs, can provide farmers with efficient and accurate disease identification, especially in regions with limited access to advanced diagnostic technologies. The main goal is to develop a productive system that can recognize tomato plant diseases. The model was trained on a collection of images of healthy and damaged tomato leaves from PlantVillage using transfer learning techniques. The images from the dataset were cleansed by resizing them from 256 × 256 to 224 × 224 to match the dimensions used in pre-trained models using min-max normalization. An evaluation of VGG16, VGG19, and DenseNet121 models based on performance accuracy and loss value for 7 categories of tomatoes guided the selection of the most effective model for practical application. VGG16 achieved 84.54% accuracy, VGG19 achieved 84.62%, and DenseNet121 achieved 98.28%, making DenseNet121 the chosen model due to its highest performance accuracy. The web application development based on the DenseNet121 architecture was integrated using the Django web framework, which is built on Python. This enables real-time disease diagnosis for uploaded images of tomato leaves. The proposed system allows early detection and diagnosis of tomato plant diseases, helping to mitigate crop losses. This supports sustainable farming practices and increases agricultural productivity.

Research Article **Published Date:- 2024-08-29**

Quantifying Levels of Selected Metals in Different Rice Brands

This research focused on assessing the levels of selected metal contamination in seven different rice brands (Jasmine, Basmati, Mapembe, Morogoro, Shinyanga, Mbeya, and Cheju). Cheju rice was obtained from local producers from the Cheju area in Zanzibar, while the remaining rice brands namely, Jasmine, Basmati, Mapembe, Morogoro, Shinyanga, and Mbeya were randomly taken from local markets at Darajani and Mwanakwerekwe in Zanzibar. Samples were prepared in accordance with applicable Safe Operating Procedures (SOPs) and laboratory SOPs using information provided by field sample preparation. The samples were ground to fineness and an aliquot of about 10.0 g was measured on the beam balance and mounted on the sample holders for laboratory analysis. An Energy Dispersive X-Ray Fluorescence (EDXRF) technique with a Rigaku NEX CG EDXRF model spectrometer was used for metal analysis. The study revealed that the percentage of metal contamination varied considerably from one rice brand to another, with Basmati and Jasmine rice each exhibiting a contamination level of 50%, while Shinyanga, Mbeya, Mapembe, and Cheju rice showed a level of 25% each. Notably, Morogoro rice had no observable heavy metal contamination. Additionally, a significant positive correlation was observed between several metal pairs: Au and Cr ($r^2 = 1.00$), Au and Ti ($r^2 = 0.613$), Cr and Ti ($r^2 = 0.613$), Ni and Pb ($r^2 = 0.748$), Ni and Hf ($r^2 = 0.660$), Pb and Hf ($r^2 = 0.656$), and Ti and Sn ($r^2 = 0.671$). The individual occurrence (percentage) for metals across all rice brands were as follows: 71.42% for Sn, and 28.57% for Hf, Ni, Pb, and Ti, while traces of Au, Cr, and Y each had an occurrence level of 14.28%. While Morogoro rice showed no metal discernible analyzed heavy metal contamination, the other rice brands were observed to have a considerable heavy metal contamination trend. The patterns of metal occurrence in each rice brand were observed as follows: Basmati: Sn > Ti > Au > Cr; Jasmine: Sn > Hf > Ni > Pb; Shinyanga: Sn > Pb; Mbeya: Sn > Hf; Mapembe: Sn > Ti; Cheju: Ni > Y. The patterns, then yield the ranking of metal contamination across all seven rice brands from lowest to highest is as follows: Morogoro < (Mapembe, Cheju, Mbeya, Shinyanga) < (Jasmine, Basmati). Furthermore, the data analysis indicated that the concentrations of Cr (1.08 mg/Kg), Ni (4.65 mg/Kg), and Pb (3.05 mg/Kg) detected in the samples surpassed the maximum permissible limits established by WHO/FAO which were 1.0 mg/Kg, 0.10 mg/Kg and 0.20 mg/Kg respectively. Consequently, the study concludes that Morogoro rice is the most superior and considered the safest choice for consumption, while Jasmine and Basmati rice are associated with higher levels of metal contamination. Thus, it is highly recommended that Tanzania intensify its rice cultivation efforts to reduce reliance on rice imports from other nations.

Research Article **Published Date:- 2024-08-24**

Characteristics of Stones Ageing for Climate Resilience Due to Carbon Lifeform Environment

The aging of stones in response to climate change and the carbon lifeform environment is a fascinating topic that highlights the resilience and adaptability of geological structures to the ever-changing conditions of our planet. Stones, as foundational components of the Earth's crust, undergo a complex process of weathering, erosion, and transformation in the face of environmental challenges such as climate change and the presence of carbon-based lifeforms. In this essay, we will explore the key characteristics of how stones age in response to these factors and the implications for climate resilience.

Research Article **Published Date:- 2024-08-02**

Air Quality Dynamics in Sichuan Province: Sentinel-5P Data Insights (2019-2023)

This study assesses air pollution in Sichuan Province, China, from January 2019 to December 2023 using Copernicus Sentinel-5P satellite data. The analysis reveals distinct seasonal variations in levels of Carbon Monoxide (CO), Nitrogen Dioxide (NO?), Sulfur Dioxide (SO?), and Ozone (O?), with urban areas experiencing higher concentrations due to industrial and vehicular emissions. CO and O? frequently exceeded WHO guidelines, particularly in winter and summer, indicating significant health risks. While most pollutant levels remained within safety limits, the findings highlight the importance of continuous monitoring and targeted mitigation strategies to improve air quality and safeguard public health, especially in urban environments.

Review Article **Published Date:- 2024-07-09**

[The Influence of Gravity on the Frequency of Processes in Various Geospheres of the Earth. Biogenic and Abiogenic Pathways of Formation of HC Accumulations]

Based on the results obtained in the study of the interaction of geological and biosphere processes, we found out that there is a close relationship between them. It was also found that the gravity of the bodies of the solar system on the Earth plays a significant role in the above relationship. The effect of gravity was demonstrated on the movement of lithosphere plates, on the processes in the atmosphere and hydrosphere, on related climatic cycles, and the biosphere processes, including "living" organisms' evolution and their mass extinctions. The periodicity of these processes due to gravity is shown. It is expressed in the alternation of short-term orogenic periods of the beginning of the processes with long-term geosynclinal periods of their development and completion. Both periods constitute the repetitive orogenic cycles. The relationship of the cycles with the evolution of photosynthesis, as well as with related Organic Matter (OM) accumulation in sediments after mass extinction of organisms, including OM transformation leading to the formation of Hydrocarbon (HC) accumulations, is shown. Biogenic processes accounting for the accumulation and transformation of organic matter in sediments constitute the biogenic pathway of the formation of hydrocarbon accumulations. It is shown that the influence of gravity extends to the processes in the inner geospheres, including the movement of magma in the asthenosphere under the lithosphere shell, to the movement of hydrogen gas coming from the Earth's core, combining with volatile compounds of elements present in magma, as well as to the rifting process. It is shown that rifting processes lead to the formation of gaseous HC accumulations and constitute a pathway called abiogenic. The obtained results shed light on the peculiarities of the formation of HC accumulations by biogenic and abiogenic pathways, allowing prediction of their chemical characteristics. This is essential when searching for oil and gas and planning exploration works.

Review Article **Published Date:- 2024-07-08**

[Review of AI in Civil Engineering]

This paper reviews the transformative impact of Artificial Intelligence (AI) on civil engineering. It explores AI's fundamental concepts and its applications across structural analysis, construction management, transportation, geotechnical engineering, and sustainability. The review highlights AI's role in automating tasks, predicting outcomes, and optimizing designs throughout project lifecycles. Recent advancements in AI-driven technologies for structural health monitoring, predictive maintenance, and risk assessment are discussed, along with challenges like data quality and model interpretability. Future trends such as autonomous construction and digital twins are examined, emphasizing the need for continued research and interdisciplinary collaboration. In conclusion, this paper offers insights for leveraging AI to address evolving challenges and opportunities in civil engineering, fostering innovation, sustainability, and resilience in infrastructure development.

Research Article **Published Date:- 2024-06-26**

[The Effect of Cellulose Fiber on the Bending Strength of Autoclaved Aerated Concrete]

Autoclaved aerated concrete is becoming an increasingly popular building material, and for good reason. It is ecological, energy efficient, strong, and durable. Studies show that the production of autoclaved aerated concrete saves 85% of energy compared to the production of heavy concrete. However, the use of steel reinforcement in large-sized aerated concrete products leads to deterioration of thermal insulation properties, corrosion, and destruction of the material. Replacing steel reinforcement with discrete fiber strands can solve this problem. The fiber does not affect the thermal insulation properties, is not prone to corrosion, and can be evenly distributed over the entire volume of the product.

Research Article **Published Date:- 2024-06-18**

[Evaluation of Performance Research Nuclear Reactors' Steady-state and Kinetic Model Analyses]

The mainstays of nuclear substance radiation and isotopic synthesis are nuclear-powered power plants, however effective safety evaluation is made tougher by the complicated construction topologies and physical connection effects. This work proposes a multiphysics-linked technique for evaluating both the kinetic and steady-state behaviors of the MPRR and LVR-15 laboratory reactors. To represent complicated member geometries, homogenized assembling sections are generated using two-dimensional whole-core computational simulations. It is discovered that the steady-state findings and the so-called Monte Carl solution comparisons correspond quite nicely. The greatest assemble power mistakes for LVR-15 and MPRR are 6.49%/10%, and the highest command rod value mistakes are 31 pcm/136 pcm, and the mistakes are 377 pcm/383 pcm, accordingly. Meanwhile, the study is done on transitory procedures, such as reactivity-initiated disasters and exposed loss-of-flow mishaps. Both units' modeling findings show plausible adverse feedback events. Furthermore, it is shown that the two reactors' accident-related behaviors are comparable though having different core architectures since they employ the exact same kinds of water as a fluid. The technique for studying nuclear power plant kinetics known as Multi-Physics Simulation (MPM) is explained. Drawing on many research and verification efforts conducted at Politecnico di Milan, Italy, MPM is shown to be a valuable instrument for managing reactors' security and oversight. It may be viewed as a holistic analytical tool that is implemented during the reactor architecture design phase. The capacity to concurrently answer the interrelated equations that control the many physical processes taking place in a nuclear plant inside the same simulated setting is a core characteristic of MPM.

Review Article **Published Date:- 2024-06-17**

Accidents at Waste Storage Facilities: Methods of Struggle with the Consequences of Accidents

The article deals with such issues as storage of industrial waste, causes, examples and prevention of accidents, NGO operation and reclamation, and methods of dealing with the consequences of accidents. When storing industrial waste in large volumes, various complications arise, including accidents in waste storage facilities. The article provides examples of accidents for specific objects and analyzes their causes and consequences. The methods of dealing with the consequences of accidents and their prevention are considered. The materials of the article can help specialists improve the design and operation of waste storage facilities.

Research Article **Published Date:- 2024-04-25**

Evaluation of Soil Water Characteristic Curves of Boron added Sand-bentonite Mixtures using the Evaporation Technique

Compacted bentonite or sand-bentonite mixtures are considered buffer/backfill materials in the engineering barriers of deep geological repositories for high-level nuclear waste (HLW) disposal in many countries. The design and long-term functionality of nuclear repositories have critical importance for environmental safety and public health. The initially unsaturated buffer material could become re-saturated long after following the sealing of the repository. Although the saturation degree of the buffer might decrease due to high temperatures and evaporation, it tends to increase with groundwater intrusion. Therefore, the soil water characteristic curves (SWCCs) for these unsaturated soils are a key factor in geotechnical engineering. Yet, the determination of SWCCs can be time-consuming and prone to inaccuracies. The HYPROP (Hydraulic Property Analyzer) evaporation technique is a preferred method for accurately determining water retention curves of soils. This reliable method was applied to estimate the water retention curves for sand-bentonite mixtures in the presence of boron minerals. Known for their minimal thermal expansion and commonly used in various industries, boron minerals may improve the thermal stability of sand-bentonite mixtures. The findings revealed that the boron addition increased the water retention capacity of the 10% bentonite mixtures but had a negligible impact on the 20% bentonite mixtures.

Research Article **Published Date:- 2024-04-02**

Drinking-water Quality Assessment in Selective Schools from the Mount Lebanon

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The present study aims to assess and compare the quality of drinking water according to WHO Standards and then illustrate the resulting diseases. Eight samples have been taken from selective different schools in the Mount Lebanon Region. The laboratory tests of the collected samples were performed to determine various physical (e.g., temperature, pH, electrical conductivity, etc.), chemical (Ca+2, Cl-, Fe, Mg2+, NO3, Na+, SO2-4), and microbial such as E. coli, coliform, and non-coliform. Several techniques were used for the analysis including Atomic Absorption Spectrometry, Flame Photometer, and Total Organic Carbon (TOC). The resulting water quality was compared with the standard limits. Each school has different defects according to specific contamination that existed. To save local residents and according to the results of this study, regular monitoring for water quality was proposed; besides more water filtration plants should be installed to provide safe drinking for children's health.

Research Article **Published Date:- 2024-02-09**

Isolation and Influence of Carbon Source on the Production of Extracellular Polymeric Substance by Bacteria for the Bioremediation of Heavy Metals in Santo Amaro City

The city of Santo Amaro (Bahia, Brazil) gained visibility among the scientific community due to the contamination of the Subaé River by lead and cadmium from the PLUMBUM Mineração e Metalurgia Ltda industry, on the banks of the river in 1956, which produced lead ingots The present work aimed to investigate the adsorption capacity of heavy metals (Pb and Cd) of EPS produced by bacterial species from the Subaé River, for possible future application of these biopolymers in bioremediation processes in areas impacted by the aforementioned heavy metals. Subaé river water was collected for physical-chemical analysis and bacterial isolation. It was verified that all isolated bacteria produced an expressive amount of Exopolysaccharide (EPS). Thus, the optimization of this production in different sugars (sucrose, glucose, and mannitol) and in three different pHs: 5.5; 6.5, and 7.5. All bacteria produced EPS in large quantities and the best sugar was sucrose at pH 7.5. In order to use the EPS for the bioremediation area, the adsorption test of lead and cadmium was carried out by the isolated EPS. 0.5 g of the EPS was dissolved in 50 ml of deionized water, then the solutions of metals, lead acetate, and cadmium sulfate (procedure performed separately) were incubated at 28 °C for 16 h after that period, and were centrifuged. Samples were filtered to separate the insoluble EPS and the filtrates obtained were used in the quantification of the metals by atomic absorption (FAAS- Flame Atomic Absorption Spectrometry). Bacillus spp., Bacillus cereus, Staphylococcus spp., and Serratiamarcescens, all showed tolerance to the tested metals, due to the efficiency in the adsorption capacity of the EPS, and it was possible to distinguish seven genera, Klebsiella pneumonia, Pseudomonas aeruginosa, Lysinibacillus spp. to be used in the bioremediation of environments contaminated with heavy metals.

Review Article **Published Date:- 2024-01-23**

Management and use of Ash in Britain from the Prehistoric to the Present: Some implications for its Preservation

The properties that make the wood of fast-grown Ash pliable, strong, and resilient have been exploited by man for thousands of years, and are illustrated by reference to the probable use of Ash timber for tools, arms, and transport by the Roman Army of Occupation in Britain two thousand years ago. Militarily organized and disciplined, the Roman Army was responsible for changing the face of Britain with huge infrastructure projects that required significant numbers of tools, equipment, and fuel, in addition to the arms it used to maintain control over the fractious tribes of the north. The extent to which it maintained supplies of this valuable resource by managing its woods, possibly by coppicing, is discussed and raises the question as to the degree of genetic selection involved in coppicing.
Ash: Fraxinus excelsior: extinction: prehistoric and historic uses: Roman army military use of Ash.
