SCHOLARLY PUBLICATIONS
School of Civil Engineering
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Journal Name: Journal of Environmental Chemical Engineering **IF: 7.4**

Title: Irrigation water quality prognostication: An innovative ensemble architecture leveraging deep learning and machine learning for enhanced SAR and ESP estimation in the east coast of India

Author: Pati A.K.; Tripathy A.R.; Nandi D.; Thakur R.R.; Pandey M.

Details: Volume 13, Issue 3, June 2025, 116433

Abstract: Groundwater quality is fundamental to sustainable agriculture in regions that rely on irrigation systems. Accurate assessment of water quality is critical, as it impacts soil health and crop productivity. The purpose is to address the challenges of groundwater quality assessment by developing an advanced predictive framework. Traditional methods often lack accuracy in determining critical parameters like Sodium Adsorption Ratio (SAR) and Exchangeable Sodium Percentage (ESP). To overcome these limitations, a hybrid machine learning model named BoostNet Fusion was developed, integrating the strengths of Deep Neural Networks (DNN) and XGBoost for enhanced prediction accuracy. The dataset comprised groundwater quality parameters such as pH, Electrical Conductivity (EC), HCO3, Cl, SO4, Total Hardness (TH), Ca, Mg, Na, K, and F. BoostNet Fusion leveraged these features to predict SAR and ESP. The model was evaluated using performance metrics, achieving a low Root Mean Squared Error (RMSE) of 0.0484 and a high R-squared (R2) value of 0.9975 for SAR prediction, while ESP predictions demonstrated RMSE of 0.0742 with an R2 value of 0.9943. These results demonstrate the significant improvement in predictive power compared to conventional models, ensuring precise groundwater quality assessment. The predictions support informed decision-making for irrigation practices, enabling farmers and water resource managers to optimize water allocation, mitigate risks of poor water quality, and maintain soil health.

URL: https://www.sciencedirect.com/science/article/pii/S2213343725011297?via%3Dihub

SCHOLARLY PUBLICATIONS
School of Civil Engineering
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Journal Name: Journal of Building Engineering **IF: 6.7**

Title: Progress in sustainable vegetation eco-concrete technology: A review on materials, applications and challenges

Author: Mohanty S.; Sahoo K.; Samal K.

Details: Volume 104, 15 June 2025, Article number 112354

Abstract: The increasing demand for sustainable building materials has driven research into innovative solutions, resulting in the development of vegetation eco-concrete technology. Incorporating plants into porous concrete offers a promising way to design environmentally friendly infrastructure. The review covers the different materials used in vegetation eco-concrete production, such as cement, aggregates, admixtures, plant species, defining their roles in improving mechanical properties and ecological benefits. Furthermore, the manuscript also explores various properties such as permeability, strength, workability, vegetation growth, etc. along with wide-ranging applications in erosion control, architectural greening, heat island mitigation. Despite its potential, challenges like technical constraints, durability issues, the absence of a standardization protocol, and regulatory barriers hinder its broad acceptance. Strategies for overcoming these challenges are discussed, emphasizing the need for multidisciplinary collaboration and policy interventions. This review serves as a valuable resource for practitioners, researchers, and policymakers to implement VEC (Vegetation Eco-Concrete) in sustainable construction process.

URL: https://www.sciencedirect.com/science/article/pii/S2352710225005911?via%3Dihub

SCHOLARLY PUBLICATIONS
School of Civil Engineering
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Journal Name: Results in Engineering **IF: 6.0**

Title: Geospatial monitoring of environmental sustainability: A remote sensing-based approach for assessing mining-induced impacts in Eastern India

Author: Pandey M.; Thakur R.R.; Nandi D.; Bera D.K.; Beuria R.; Kumari M.; kasawnea A.M.; Zhran M.

Details: Volume 26, June 2025, Article number 104692

Abstract: Coal serves as the primary energy source in India, with over 75 % of coal excavated from open cast coal mines, leading to significant environmental repercussions, especially in eastern and central regions. This study delves into the challenges posed by open coal mining in Katghora, a coal-abundant tehsil town situated in Korba district, Chhattisgarh in central India. Spatial analysis of LANDSAT-TM and OLI satellite data from1990 to 2023 reveals 3.93 % reduction in forest area, an 18.04 % decrease in agriculture-fallow land, and 1 % decline in water bodies, primarily due to their conversion into degraded land. Conversely, mining, and built-up areas experienced a respective increase of 1.74 % and 4.30 % during the same period. Moreover, intense mining activities have adversely affected soil health, with significant decrease in pH (varying from 4.8 to 5.6), and bulk density (reduced by up to 25–28 %) in the mined sites and the degraded wastelands compared to the agricultural and forest areas. Organic carbon content was also significantly lower in these areas, varying across soil depths from 0.21 % to 0.60 % (0–20 cm), 0.16 % to 0.54 % (20–40 cm) and 0.13 % to 0.51 %, (40–60 cm). Furthermore, analysis of land surface temperature (LST) data from LANDSAT datasets for 2000, 2010, and 2023 revealed a consistent increase in temperature, around 4 °C rises in both summer and pre-monsoon periods and approximately 1 °C in winter. These findings emphasize the importance of prioritizing eco-restoration initiatives and adopting sustainable mining practices to address the environmental degradation resulting from coal mining activities.

URL: https://www.sciencedirect.com/science/article/pii/S2590123025007698?via%3Dihub

SCHOLARLY PUBLICATIONS
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Journal Name: Geotechnique **IF: 5.2**

Title: Effect of variable strain rate on stress-strain behaviour of saturated clay

Author: Nanda S.; Sivakumar V.; Nanda P.; Mackinnon P.

Details: 2025

Abstract: This paper presents the results of laboratory investigation on variable strain rate effects of soils deformed under undrained conditions. Consolidated undrained triaxial tests were conducted under two categories with: (a) a constant strain rate control and (b) a variable strain rate control. In the constant strain rate control tests, the strain rate remained constant throughout the shearing, whereas in the variable strain rate control tests, the strain rate varied from 50 mm/s to 0·0007 mm/s during the shearing. Tests were carried out at initial effective confining pressures of 100 kPa, 200 kPa and 400 kPa. It was observed that the peak deviator stress increased and pore water pressure decreased with an increase in strain rate. However, this trend became reversed at a higher strain rate such as 70 mm/s. The stress-strain behaviour under variable strain rate control tests showed the tendency of soils to switch to a different stress-strain path as the strain rate changed. Two new parameters, ku and kσ, were introduced to express the change in excess pore water pressure and effective normal stress with strain rates. An approximate procedure sensitive to strain rate has been developed to predict the stress-strain behaviour of soil under undrained conditions.

URL: https://www.scopus.com/pages/publications/105009863140

SCHOLARLY PUBLICATIONS
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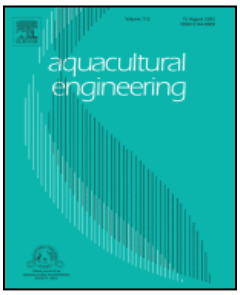
Journal Name: Aquacultural Engineering **IF: 4.3**

Title: Application of artificial intelligence in aquaculture â€“ Recent developments and prospects

Author: Roy S.M.; Beg M.M.; Bhagat S.K.; Charan D.; Pareek C.M.; Moulick S.; Kim T.

Details: Volume 111, 15 October 2025, Article number 102570

Abstract: Artificial intelligence (AI) offers innovative and efficient solutions to contemporary challenges in sustainable aquaculture. Machine learning (ML) and deep learning (DL) are integral components of smart aquaculture, driving significant advancements in the field. The integration of AI with ML, and DL technologies is transforming traditional aquaculture practices by enhancing operational efficiency, optimizing fish health management, improving environmental conditions, monitoring water quality and supporting advanced decision-making processes. This review highlights the latest applications of AI, including ML, and DL in aquaculture, emphasizing their roles in real-time water quality monitoring, disease detection, and automated estimation of fish biomass etc. Key techniques, including predictive modeling, image and video processing, and sensor data integration, are enabling these breakthroughs. Moreover, DL algorithms, such as convolutional neural networks (CNNs) and long short-term memory (LSTM) networks, have emerged as powerful tools for processing complex data and predicting critical events within aquaculture systems. Despite the notable progress, challenges such as the need for large, labeled datasets, high computational costs, and issues related to model interpretability continue to limit broader adoption. The current review aims to offer researchers and practitioners with a comprehensive overview of AI and its subfields such as ML and DL applications in smart aquaculture, discussing both the opportunities and challenges while suggesting future research directions to overcome existing limitations and expand AI-driven innovations in the industry.



URL: https://www.sciencedirect.com/science/article/pii/S0144860925000597?via%3Dihub

Journal Name: Materials Today Communications **IF: 3.7**

Title: Tribo-mechanical and microstructural evaluation of Cuâ€“MoS2 nanocomposites fabricated through powder metallurgy route

Author: Sahoo N.; Alam S.N.; Das B.; Ghosh A.; Sahoo K.; Kar U.; Sahu D.

Details: Volume 46, June 2025, 112772

Abstract: Copper-based composites are widely used in structural, electrical, and tribological applications due to their excellent thermal and electrical conductivity. However, their low mechanical strength and wear resistance limit performance in demanding environments. To address these limitations, the present study aims to enhance the mechanical and tribological properties of Cu through reinforcement with nanostructured molybdenum disulfide (MoS_2), a solid lubricant known for its layered structure, thermal stability, and self-lubricating behavior. Bulk MoS_2 was exfoliated by milling in a toluene medium for 30 h in a high-energy planetary ball mill to obtain few-layered nanoplatelets. Pure Cu powder was blended with exfoliated MoS_2 in different weight fractions (1, 2, 3, and 5 wt%) by ultrasonication in an acetone medium for 2 h, and the blended Cu-MoS_2 powders were later compacted under a load of 550 MPa for 5 min of holding time. The fabricated cylindrical green pellets had a diameter of 10 mm and a thickness of 3–4 mm. The resulting green pellets of Cu-MoS_2 were conventionally sintered at 850 ℃ for 2 h in an Ar atmosphere to develop the Cu-1, 2, 3, and 5 wt% MoS_2 nanocomposites. A sintered pure Cu sample was also developed under identical processing conditions to serve as a reference. The findings reveal that the incorporation of 3 wt% MoS_2 exhibited superior performance among all the developed Cu-MoS_2 nanocomposites, with a relative density of 88.74 %, hardness of 672.91 MPa, compressive strength of 350.01 MPa, and wear rate of 3.23 mm^3/m. Thermal analysis of Cu-3 wt% MoS_2 revealed a 1.8 % mass loss up to 284.86 ℃ due to the evaporation of adsorbed moisture or residual impurities, 14.1 % mass gain from 284.86–1000 °C due to oxidation of both Cu and MoS_2, and a 6.38 % mass loss above 1000 °C due to MoO_3 volatilization, with a melting endotherm at 1041.53 ℃. Notably, the deviations from the optimal reinforcing threshold deteriorated material integrity, reducing mechanical robustness and tribological efficiency.

URL: https://www.sciencedirect.com/science/article/pii/S235249282501284X?via%3Dihub

SCHOLARLY PUBLICATIONS
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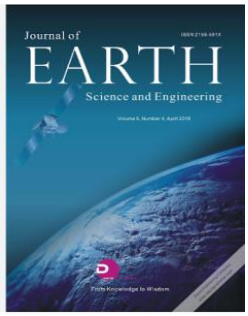
Journal Name: Earth **IF: 3.4**

Title: Urban Expansion and Land Use Transformations in Midnapore City (2003-2024): Implications for Sustainable Development

Author: Thakur, RR; Nandi, D; Shukla, AK; Das, S; Chand, S; Singha, P; Beuria, R; Sharma, C

Details: June 2025

Abstract: Amidst global shifts in land use patterns due to urbanization, this study focuses on the rapid land use and land cover (LULC) changes in Midnapore City during the periods 2003–2014 and 2014–2024. The study employs Landsat 5 and 8 imagery with 30 m spatial resolution which were processed through Maximum Likelihood Classifier (MLC) algorithms. The results were attained through ArcGIS 10.2.2 and ERDAS IMAGINE 2014 software, with ground-truth validation using data from 117, 111, and 116 points for 2024, 2014, and 2003, respectively. For the validation, the kappa coefficient was calculated and achieved 87.3%, 88.1%, and 81.7% for 2024, 2014, and 2003, indicating substantial accuracy. Using statistical measures such as change matrix union, binary logistic regression, and correlation matrix analysis applied to classified LULC outputs and spatial drivers, the research highlights significant transformations in the region. The study reveals significant transformations, notably the conversion of 77% of forest areas and 5% of fallow land to built-up land. The increased rate of agricultural land conversion to built-up areas is evident after 2014, indicating rapid urban growth. These factors led to the reduction of LULC classes possessing substantial ecological value like forests and scrub lands which are becoming more accessible due to the increasing population. The results point out the drastic alteration of these developments and recommend a planning approach responsive to environmental needs for safeguarded ecological impacts. The research highlights the importance of reforestation, preservation of water bodies, and socio-economic surveillance in fostering urban management and sustainable development in Midnapore City.



URL: https://www.mdpi.com/2673-4834/6/2/50

SCHOLARLY PUBLICATIONS
School of Civil Engineering
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Journal Name: Sustainability **IF: 3.3**

Title: Predicting Potential Habitats and the Conservation of the Tasar Silkworm (Antheraea mylitta) in the Similipal Biosphere Reserve, Odisha, India

Author: Thakur R.R.; Nandi D.; Bera D.K.; Singh S.; Beuria R.; Mishra P.; Hasher F.F.B.; Kumari M.; Zhran M.

Details: June 2025

Abstract: The tasar silk production of India's sericulture industry supports tribal livelihoods and economic sustainability. However, *Antheraea mylitta* Drury, 1773, the primary species for tasar silk, faces habitat threats due to deforestation, climate change, and anthropogenic pressures. This study evaluates the distribution and habitat suitability of wild tasar silkworm using multi-criteria approach, Geographic Information System (GIS), Remote Sensing (RS), and ecological niche modeling using the MaxEnt algorithm. Field surveys were conducted to collect cocoon samples, and the analysis of environmental parameters and assessment of soil micronutrient influences were also carried out. The MaxEnt model predictions indicate that the Central, Western, and Southern zones of Mayurbhanj, encompassing the Similipal Biosphere Reserve, provide the most suitable habitats. The jackknife test confirmed that these climatic variables collectively contributed 68.7% to the habitat suitability model. This study highlights the impact of habitat fragmentation and deforestation on tasar silkworm populations, emphasizing the need for conservation strategies, sustainable forest management, and afforestation programs. The findings highlight the following key conservation strategies: restoring habitats in Similipal, enforcing anti-deforestation laws, promoting community-led planting of host trees, and adopting climate-resilient silk farming to protect biodiversity and support tribal livelihoods.

URL: https://www.mdpi.com/2071-1050/17/13/5824

SCHOLARLY PUBLICATIONS
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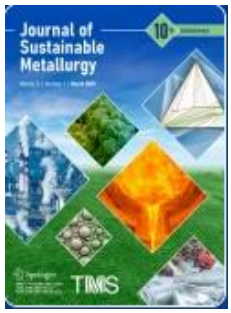
Journal Name: Journal of Sustainable Metallurgy **IF: 3.2**

Title: Effect of Hybrid Layer and Potential Supplementation of Blast Furnace Slag Powder on Sustainability, Mechanical Ability, and Durability of Functionally Layered Concrete

Author: Pal A.; Acharya P.K.

Details: 05 June 2025, Article

Abstract: Cement production is a major contributor to CO_2 emissions, significantly impacting global warming and climate change. To mitigate this, research is focused on reducing cement consumption and enhancing the efficiency of concrete through the use of supplementary binding materials (SBM) and technological developments. One technological development is functionally layered concrete (FLC), wherein concrete is laid in layers that have different characteristics that offer customized properties for specific building needs. This study investigates the performance of FLC made from two concrete grades (M30 and M20) using pozzolana cement (PC) and slag cement (SC), respectively, in a 50:50 layer arrangement. Further, the replacement of PC 40–70% from M30 with blast furnace slag powder (BFSP) and limestone powder (LSP) was checked. Mechanical properties such as compressive, tensile, and flexural strengths were tested at 7, 28, 91, and 182 days. Durability was assessed through sulfate resistance and water absorption tests. Environmental performance was evaluated by analyzing embodied carbon and energy, while cost-effectiveness was assessed through the cost–benefit analysis and economy index. The FLC demonstrated significantly enhanced performance compared to 30P concrete, with compressive strength increased by 33–39%, tensile strength by 9–13%, flexural strength by 4–16%, sulfate resistance by 23–32%, and water resistance by up to 39% over the curing period of 7 to 182 days. Furthermore, replacing 40–60% of cement in FLC with a combination of 33–53% BFSP and 7% LSP led to additional improvements in compressive strength by 37–46%, tensile strength by 10–16%, flexural strength by 7–14%, sulfate resistance by 23–39%, and water resistance up to 63%.



URL: https://link.springer.com/article/10.1007/s40831-025-01132-0

SCHOLARLY PUBLICATIONS
School of Civil Engineering
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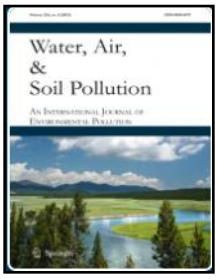
Journal Name: Water, Air, and Soil Pollution **IF: 3.0**

Title: Micro-Electrolysis Assisted Floating Vegetated System (ME-FVS): A Novel Hybrid System for Wastewater Treatment Focusing on Experiment and Modeling

Author: Das B.; Sahoo S.R.; Mohanty M.; Sahoo K.; Samal K.; Dash R.R.

Details: Vol. 236, July 2025

Abstract: Micro-electrolysis Assisted Floating Vegetated System (ME-FVS) integrates the redox potential of Fe:C Micro-electrolysis with the natural purification capacity of floating vegetation, enhancing the removal of nutrients and organic pollutants. This system is more energy-efficient than conventional methods, generates less sludge, and fosters microbial synergy at the root-electrode interface, making it ideal for decentralized, low-maintenance wastewater treatment. In ME-FVS, iron (Fe) functions as a sacrificial anode releasing $Fe2^{+}$ ions for coagulation, while carbon (C) acts as a cathode facilitating electron transfer. This Fe:C pairing creates localized electric fields that drive redox reactions and pollutant degradation without external power. Eichhornia crassipes was selected for its floating ability and aerenchyma-rich tissues. The system was developed using a Box-Behnken Design (BBD) to evaluate the effects of initial COD concentration, vegetation coverage ratio, and Fe:C ratio, along with their interactions. Among 15 experimental runs, Run 13 characterized by an initial COD of 800 mg $L^{-}1$, Fe:C ratio of 1, and vegetation coverage of 0.5 achieved the highest removal efficiencies: 75.6% TN, 89% NO_3^{-}-N, 81.2% TP, and 95.6% COD under optimized conditions (COD: 667.4 mg $L^{-}1$, vegetation coverage: 0.48, Fe:C ratio: 0.862). Higher initial COD levels provided more substrate for microbial degradation, while increased vegetation coverage enhanced nutrient uptake and microbial activity. The Fe:C ratio influenced redox reactions and electron transfer. The optimized balance of these parameters ensured maximum pollutant removal and system stability, as computed by the BBD model. The highest Relative Growth Rate (RGR) of Eichhornia crassipes was 0.0992 g $g^{-}1$ $day^{-}1$ at 0.25 coverage ratio. Kinetic analysis showed pollutant degradation followed both zero- and first-order models, with R2 values of 0.9817 and 0.9337, respectively. Overall, ME-FVS demonstrated high efficiency and sustainability in treating polluted water bodies.



URL: https://link.springer.com/article/10.1007/s11270-025-08308-0