SCHOLARLY PUBLICATIONS
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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

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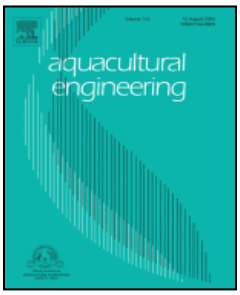
Journal Name: Aquacultural Engineering **IF: 4.3**

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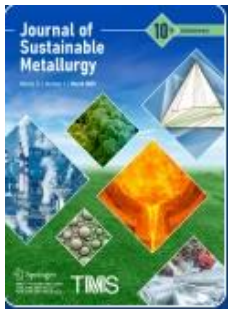
Journal Name: Journal of Sustainable Metallurgy **IF: 3.2**

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
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Journal Name: Water **IF: 3.0**

Title: Hydrogeochemical and Geospatial Insights into Groundwater Contamination: Fluoride and Nitrate Risks in Western Odisha, India

Author: Barad S.; Thakur R.R.; Nandi D.; Bera D.K.; Sahu P.C.; Mishra P.; Samal K.P.; Ã□urin B.

Details: Volume 17, Issue 10, May 2025, Article number 1514

Abstract: Fresh groundwater is essential for sustaining life and socio-economic development, particularly in regions with limited safe drinking water alternatives. However, contamination from natural and anthropogenic sources poses severe health and environmental risks. This research examines the health risks linked to groundwater quality in the agroeconomic region of Boudh district, Odisha, India, where residents depend on untreated groundwater due to limited access to alternative sources. A total of 82 groundwater samples were analyzed during pre- and post-monsoon of the year 2023 using multivariate statistical methods (PCA, correlation analysis) to determine pollutant sources and regulatory factors, while XRD was employed to characterize fluoride-bearing minerals in associated rock samples. Fluoride concentrations range from 0.14 to 4.6 mg/L, with 49% of samples exceeding the WHO limit of 1.5 mg/L, which raises significant health concerns. Nitrate levels fluctuate between 1.57 and 203.51 mg/L, primarily due to agricultural fertilizers. A health risk assessment (hazard quotient and hazard index) indicates that 63% of samples fall into the low-risk category, 21% into moderate-risk, and 16% into high-risk. Children (HI = 29.23) and infants (HI = 19.51) are at the greatest health risk, surpassing that of adult males (HI = 12.2) and females (HI = 11.2). Findings provide scientific evidence for policymakers to implement groundwater protection and remediation strategies. Immediate interventions, including water quality monitoring, defluoridation measures, and community awareness programs, are essential for ensuring long-term water security and public health.

URL: https://www.mdpi.com/2073-4441/17/10/1514