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Universiti Tun Hussein Onn Malaysia

ISCEE 2026

6th International Symposium on Civil and Environmental Engineering

14 - 15 September 2026
Universiti Tun Hussein Onn Malaysia

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Sub-Conferences:

ICSIE 2026
International Conference on Sustainable Infrastructure Engineering

ISuCOS 2026
International Conference on Sustainable Construction and Structures

ICSEWR 2026
International Conference on Sustainable Environment and Water Research

ICoSHBE 2026
International Conference on Sustainable Heritage and Built Environment

https://intl-conference.com/iscee2026

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Universiti Tun Hussein Onn Malaysia

Co-organiser

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Welcoming Remarks

Vice-Chancellor Universiti Tun Hussein Onn Malaysia

Assalamu'alaikum warahmatullahi wabarakatuh,

Respected Delegates, Distinguished Guests, Ladies and Gentlemen!

It gives me great pleasure to welcome all academicians, researchers, industry practitioners, and participants to the 6th International Symposium on Civil and Environmental Engineering (ISCEE 2026), proudly organized by the Faculty of Civil Engineering and Built Environment, Universiti Tun Hussein Onn Malaysia (UTHM).

I would like to congratulate the organizers on their success in bringing together the academic and industry communities onto this prestigious international platform. This event stands as a testament to UTHM's ongoing commitment to strengthening our research ecosystem and expanding the global network of cooperation in the fields of engineering and sustainability.

Guided by the inspiring theme, 'Empowering Sustainable Living and Climate Resilience through Responsible Engineering and Innovative Solutions,' is highly appropriate given the current needs of a world facing complex challenges related to climate change, urbanization, food security, energy, and natural resource management.

As a technical university grounded in TVET, UTHM continuously strives to produce high-impact research capable of contributing to national development and global well-being. In this context, the role of engineers, scientists, and researchers is crucial in pioneering technologies, policies, and best practices that support the achievement of the Sustainable Development Goals (SDGs).

I deeply appreciate the participation of delegates from various institutions and organizations. The diversity of perspectives and

experiences brought to this symposium will undoubtedly enrich discussions and generate new, creative, and relevant ideas for addressing future challenges.

It is my sincere hope that this symposium will serve as a catalyst for more interdisciplinary research, high-quality publications, and continuous international collaboration. Through the sharing of knowledge and experience, we can build an engineering community that is more resilient, innovative, and responsible towards environmental sustainability.

Thank you, and I wish all of you a fruitful and inspiring conference!

Prof. Dr. Mas Fawzi Mohd Ali
Vice-Chancellor
Universiti Tun Hussein Onn Malaysia

Dean Faculty of Civil Engineering and Built Environment

Assalamu'alaikum warahmatullahi wabarakatuh and greetings to all participants and delegates.

Welcome to ISCEE 2026.

The Faculty of Civil Engineering and Built Environment, Universiti Tun Hussein Onn Malaysia, is honoured to host the 6th International Symposium on Civil and Environmental Engineering (ISCEE 2026), continuing a proud tradition of academic excellence.

On behalf of the faculty, it gives me great pleasure to welcome all participants to Universiti Tun Hussein Onn Malaysia in Batu Pahat, Johor, on September 14th and 15th, 2026.

I would like to express my heartfelt gratitude to the organizing committee and everyone behind the scenes who have worked tirelessly to bring this event to fruition. This year's symposium, organized in collaboration with the National Institute of Technology (KOSEN), Kure College, Japan, is held under the theme 'Empowering Sustainable Living and Climate Resilience through Responsible Engineering and Innovative Solutions.' This theme reflects our commitment to fostering innovations that integrate development with environmental responsibility. As we face global challenges such as climate change, resource depletion, and rapid urbanization, the role of civil and environmental engineering remains essential in guiding us towards a resilient and sustainable future.

The 6th ISCEE 2026 provides an ideal platform to share new ideas and findings on topics related to civil and environmental engineering through our sub-conferences: ICSIE, ISuCOS, ICSEWR, and ICoSHBE. UTHM aspires to be a global university, and we continue to make significant efforts toward this ambition. This conference brings together distinguished scientists, researchers, and industry leaders to exchange knowledge, broaden networks, and promote new technologies in pursuit of a sustainable future.

I cordially appreciate all outstanding representatives from government and non-governmental agencies, as well as higher education and research institutions, for your presence. I hope all delegates will participate actively in the symposium and share their thoughts and ideas within their areas of expertise in civil and environmental engineering. It is also my hope that delegates will take the opportunity to renew old friendships, build new connections, and explore the dynamic state of Johor. I believe this conference will serve as a valuable platform for participants to gain the latest insights into research and practice in the civil engineering field.

In closing, I wish you all a productive and inspiring symposium. May ISCEE 2026 spark new ideas, strengthen collaborations, and drive innovations that advance sustainability through engineering. Let us move forward with the resolution that the decisions we make today will not only shape our profession but also define a lasting legacy of sustainability for future generations.

I hope you have a great and enriching experience at UTHM.

Thank you!

Assoc. Prof. Ir. Dr. Mohd Shalahuddin bin Adnan
Dean
Faculty of Civil Engineering and Built Environment

Executive Chairman ISCEE 2026

Salam Sejahtera & Salam Malaysia Madani,

It is a great honour to express my profound gratitude for your remarkable participation in the 6th International Symposium on Civil and Environmental Engineering (ISCEE 2026). This year, we are proud to announce that the symposium has received numerous paper submissions in the Civil and Environmental Engineering fields, which serves as an inspiring testament to the flourishing research community.

The 6th ISCEE 2026 is filled with a sense of enthusiasm and excitement among all of us. The convergence of distinguished researchers, industry experts, and intellectuals from Malaysia and around the world demonstrates that our commitment to the sustainability agenda is not merely rhetoric, but a collective endeavour.

As of this year, the theme that has been selected for ISCEE 2026 is 'Empowering Sustainable Living and Climate Resilience through Responsible Engineering and Innovative Solutions.' It conveys that the combination of nature-based innovation and engineering expertise is the key to building a sustainable future. It stimulates the notion that progress should not be achieved at the expense of the environment, but rather in harmony with nature through responsible and innovative methods.

The fundamental principle of engineering is the pursuit of solutions. However, in order to develop sustainable solutions, it is imperative that we take the initiative to investigate new frontiers, foster dialogue, and work in conjunction with a variety of stakeholders. Hence, I hope that this symposium will serve as a source of inspiration and lead to the discovery of novel innovations. The primary impact should surge as ideas that can be implemented in our respective fields.

Overall, I would like to extend my heartfelt gratitude and congratulations to the entire ISCEE 2026 organising committee for their unwavering commitment and hard work. I am also grateful to the Faculty of Civil Engineering and Built Environment (FKAAB) and our collaborators at the National Institute of Technology (KOSEN), Kure College, Japan, for their close collaboration in ensuring the success of this symposium. Without their tireless efforts, this would not have happened.

Thank you, and let's work together to make ISCEE 2026 a significant milestone in the quest for sustainability.

Ir. Dr. Tong Yean Ghing
Executive Chairman of ISCEE 2026

Keynote Speakers

Mohd Nazir bin Mohd Nor
Managing Director &
Chief Executive Officer
Malaysia Marine and Heavy Engineering Holdings Berhad
(MHB)

Prof. Eur Ing. Ir. Ts. Dr. Shahiron bin Shahidan
Professor
Universiti Tun Hussein Onn Malaysia

Assoc. Prof. Dr. Daisuke Tanikawa
Associate Professor
National Institute of Technology (KOSEN), Kure College,
Japan

Plenary Session Panellist

Ir. Ts. Haji Sazali bin Osman
Director
Johor State Department of Irrigation and Drainage

Datuk Ts. Dr. Sivakumar Chinnasamy
Managing Director
CSK Murni Services Sdn. Bhd

Ar. Khairil Anwar Halim
Principal
KAC Architect

Programme/ Presentation Schedules

Monday, 14 September 2026				
Time	**Venue: Big Stage, Level 2, Tunku Tun Aminah Library**			
08:30 AM	Registration			
09:00 AM	Welcoming Remarks & Opening Ceremony			
09:30 AM	Keynote Address 1 by Mohd Nazir bin Mohd Nor			
10:00 AM	Keynote Address 2 by Prof. Eur Ing. Ir. Ts. Dr. Shahiron bin Shahidan			
10:30 AM	Keynote Address 3 by Assoc. Prof. Dr. Daisuke Tanikawa			
11:00 AM	Break			
11:30 AM	Plenary Session			
12:30 PM	Lunch & Networking Session (Dewan Jamuan, Level 5)			
Parallel Technical Sessions 1 (Venue: Level 1, FKAAB)				
Time	**Room 1**	**Room 2**	**Room 3**	**Room 4**
02:00 PM	6	2	5	3
	20	14	7	19
	44	21	9	22
	69	25	10	36
	88	32	13	38
		40	29	90
			78	
			86	

03:30 PM	Tea Break			
Parallel Technical Sessions 2 (Venue: Level 1, FKAAB)				
Time	**Room 1**	**Room 2**	**Room 3**	**Room 4**
03:45 PM	70	48	1	39
	71	49	52	41
	80	61	56	42
	81	64	72	51
	84	66	77	60
	89	68		65
	95	83		92
	96			
05:00 PM	End of Conference			

Monday, 14 September 2026			
Online Presentations (Session 1)			
Time	**Room A**	**Room B**	**Room C**
02:00 PM	4	24	8
	23	30	16
	34	31	17
	35	33	26
	43	57	27
	63	75	47
	67	87	53
03:30 PM	Break		
Online Presentations (Session 2)			
Time	**Room A**	**Room B**	**Room C**
03:45 PM	37	11	45
	58	15	97
	59	50	98
	74	73	99
	91	76	100
	93	79	
	94		
05:00 PM	End of Conference		

Route Map for ISCEE 2026

https://uthm.mygeospatials.com/campus-map/

Abstracts

Paper 1
E-SCOOTER USAGE PATTERNS AND INFRASTRUCTURE IMPACT: A STUDY IN JOHOR BHARU CITY

Siti Aisyah Anasya Rosli[1*], Nafiz Adli N Badlihisham[2] and M Hanifi Othman[2]
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[2] Faculty of Civil Engineering and Built Environment, Universiti Tun Hussein Onn Malaysia, 86400 Parit Raja, Johor, Malaysia
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Abstract
Urbanization has led to increased car dependency, traffic congestion, and pollution, creating a demand for sustainable urban mobility solutions. Shared e-scooters have emerged as cost-effective, eco-friendly, and convenient alternatives for short-distance travel. While e-scooters offer potential to reduce car reliance and ease traffic congestion, their impact on urban mobility remains underexplored. This study examines usage patterns and the influence of infrastructure on e-scooter adoption. A survey using a questionnaire was conducted in Johor Bahru, by collecting data from 117 respondents to understand their demographics, trip characteristics, and influence of infrastructural elements on its utilization. The findings reveal that young adults aged 18-34 dominate e-scooter usage, primarily for recreation with peak usage during evenings and weekends. Adequate infrastructure, such as dedicated lanes and well-placed parking facilities, significantly enhances user satisfaction and adoption rates. However, challenges such as insufficient infrastructure coverage and poorly located parking zones were identified as barriers to broader adoption. The study underscores the importance of targeted infrastructural improvements and inclusive strategies to promote e-scooter accessibility and support sustainable urban mobility. These insights provide valuable recommendations for policymakers, urban planners, and e-scooter operators to optimize e-scooter sharing systems.

Paper 2:
OPTIMISATION OF WASTE COOKING OIL (WCO) ADSORPTION USING MACROPHYTE-DERIVED CELLULOSE AEROGEL (MCA) VIA RESPONSE SURFACE METHODOLOGY (RSM)

Muhammad Hazim D.Rahman[1], Aida Baizura Baharim[1], Ahmad Muzaffar Mohd Rozlee[1], Radin Maya Saphira Radin Mohamed[1,2,*], Mohd Azwan Bin Busu[2]
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Abstract
This study develops a sustainable macrophyte cellulose aerogel (MCA) as a bio-based adsorbent for the removal of waste cooking oil (WCO). MCA was characterized using field emission scanning electron microscopy (FESEM), thermogravimetric analysis (TGA), and water E-mail angle (WCA). FESEM confirmed a porous, fibrous network favourable for adsorption, and TGA indicated thermal stability with a peak degradation of 183.4 °C. However, WCA analysis revealed highly hydrophilic characteristics (WCA < 90°). Due to competitive adsorption resulting in preferential water uptake in actual oily wastewater, the material's current practical applicability is substantially restricted when testing is conducted exclusively in a dry WCO bath, which fails to capture the actual effluent dynamics. Process optimisation via response surface methodology (RSM) with a central composite design (CCD) determined that under optimum conditions (0.35 g dosage, 15 mL oil concentration, 35 min E-mail time), MCA achieved a capacity of 0.103 g/g. This capacity is markedly lower than that of conventional synthetic aerogels. Hence, this study serves solely as a foundational baseline, emphasizing that rigorous structural and surface modifications are required to achieve viable oil-water separation.

Paper 3:
UTILISATION OF DE-OILED BLEACHING EARTH IN LIGHTWEIGHT FOAM CONCRETE: EFFECTS ON CHEMICAL COMPOSITION AND MECHANICAL PROPERTIES

Mohd Izzat Bin Ismail[1*], Muhd Fauzy Sulaiman[1], Habib Musa Bin Mohamad[1], Nelly Binti Majain[1], Mohammad Radzif Bin Taharin[1], Arif Luqman Bin Bacho[1], Hasmirul Bin Radzman[1], Nazaruddin Bin Abdul Taha[1], Eugene Soo Zhen Xiang[1]
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Abstract
Lightweight foam concrete is increasingly used in non-structural and semi-structural applications because of its low density and favourable thermal and acoustic insulation properties. However, its wider utilisation is often restricted by relatively low mechanical strength, which is mainly associated with high porosity and the discontinuous nature of its cementitious matrix. This study examines the feasibility of using de-oiled bleaching earth, a by-product of the palm oil refining industry, in the production of lightweight foam concrete bricks. The material was characterised using X-ray fluorescence and field emission scanning electron microscopy with energy-dispersive X-ray analysis to determine its chemical composition and particle morphology. Lightweight foam concrete bricks were then prepared and cured under closed-space, open-space, and steam-curing conditions over a standard curing period. The characterisation results indicate that de-oiled bleaching earth is rich in silica, with the presence of calcium, aluminium, and iron oxides, suggesting that it may contribute as a micro-filler and provide limited pozzolanic activity. Among the curing methods investigated, steam curing produced the highest compressive strength, followed by closed-space curing and open-space curing. These findings highlight the importance of curing control in promoting strength development in porous lightweight foam concrete systems and support the potential use of de-oiled bleaching earth as a sustainable alternative material in lightweight foam concrete brick production.

Paper 4:
COMPARATIVE ANALYSIS OF LSTM, CNN-LSTM AND TRANSFORMER ARCHITECTURES FOR DAILY RUNOFF MISSING VALUE IN THE HIGHLY URBANIZED KLANG RIVER BASIN

Yee Jeit Ng[1], Wing Son Loh[1*], Ren Jie Chin[2], Ming Jie Lee[3], Sheong Wei Phoon[1], Lloyd Ling[2]
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Abstract
Accurate and continuous streamflow observations are indispensable for flood risk mitigation and water resource management, particularly in rapidly developing urban areas. However, hydrological datasets in urban catchments are frequently compromised by missing values due to sensor malfunctions during extreme weather or technical failures. This study investigates the efficacy of three advanced deep learning architectures: Long Short-Term Memory (LSTM), Hybrid CNN-LSTM and the Transformer for the imputation of missing data in Klang River, Malaysia. These models were developed to capture the complex and non-linear temporal dependencies found in urban runoff. Each model was evaluated using the Kling-Gupta Efficiency (KGE), Mean Squared Error (MSE), Mean Absolute Error (MAE), and the Coefficient of Determination (R2). Transformer model has the lowest RMSE (min: 1.93; max: 3.25) and MAE (min: 1.41; max: 1.91) among all the models at every missingness level (5% - 50% missing data) and has the best overall performance in R2 (average 0.72) and KGE (average 0.79).

Paper 5:

SOIL LIQUEFACTION POTENTIAL DUE TO SEISMIC ACTIVITY IN KOTA KINABALU SABAH: A COMPARATIVE STUDY BETWEEN UU TRIAXIAL TEST RESULTS AND SITE INVESTIGATION DATA

Hasmirul Radzman[1], Habib Musa Mohamad[1*], Muhd Fauzy Sulaiman[1], Siti Nor Farhana Zakaria[1]
[1] Faculty of Engineering, Universiti Malaysia Sabah (UMS).
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Abstract
Soil liquefaction is a significant geotechnical risk in seismically active coastal regions, especially in areas with loose, saturated granular soils. This study assesses the initial liquefaction potential of soil adjacent to Terowong Sepanggar, Kota Kinabalu, Sabah, by juxtaposing saturated Unconsolidated Undrained (UU) triaxial test results from a collected soil sample with a pre-existing Site Investigation (SI) report from the same locality. The evaluation concentrates on deviator stress, undrained shear strength, Mohr circle parameters, and stress–strain behavior to discern variations in soil resistance under undrained loading. The comparison reveals a substantial disparity in strength between the two datasets. The sample that was tested had a peak corrected deviator stress of 233.695 kPa, while the SI report sample only had 15.82 kPa. The undrained shear strength went from 7.91 kPa in the SI report to 116.847 kPa in the tested sample. This means that the collected sample was about 14.8 times stronger. This difference could be because of differences in soil density, sampling depth, moisture level, particle arrangement, and possible densification from vehicles, machinery, or construction work nearby that cause repeated dynamic loading. The tested sample has higher resistance, but the SI report says that the strength is low and the condition is loose, which means that there may still be weaker layers in the study area. So, UU testing alone can't prove that the soil has liquefied, but it could still be susceptible to liquefaction when it is saturated and under seismic loading. For safer decisions about future local geotechnical design practices, it is suggested that more research be done using SPT, CPT, groundwater monitoring, and cyclic triaxial testing.

Paper 6:
CRITERIA OF GRAY THIRD SPACE FOR INFORMAL SOCIAL LEARNING: A REVIEW

Jia Haotian[1], Liu Yuxin[1], Guan Jing[1], Jin Deran[1], Sarah Abdulakreem Salih[1*]
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Abstract
In response to increasing demands for adaptable and student-centred learning environments, self-social learning has emerged as a critical mechanism through which university students develop competencies, collaboration skills, and professional readiness. Informal learning spaces, commonly conceptualised as "third places," play a vital role in facilitating such interactions by providing open, flexible, and socially inclusive environments. However, existing campus third places are often limited by uneven distribution, restricted accessibility, insufficient capacity, and functional rigidity, constraining their effectiveness in supporting spontaneous and high-frequency learning activities. At the same time, campuses contain a significant number of underutilised "gray spaces" that present untapped spatial potential. This study employs a qualitative literature review using systematic search of literature and content analysis approach to synthesise theories of third place, gray space, and self-social learning, and introduces the concept of the "gray third place" as an integrative spatial model. The study defines the key spatial criteria that support students' self-social learning and establishes a structured transformation model for converting underutilised campus gray spaces into functional "gray third places. The findings reveal that activating gray third places and their spatial design criteria, such as spatial environment, layout and distribution, social interaction, and supportive facilities, can significantly enhance spatial efficiency, expand access to informal learning environments, and strengthen students' self-social learning behaviours. By addressing critical gaps in existing research, particularly the absence of systematic spatial standards and transformation strategies, this study contributes both theoretically and practically to campus design, learning environment optimisation, and the promotion of socially sustainable educational ecosystems.

Paper 7:
DEVELOPMENT AND LABORATORY VALIDATION OF AN IOT-BASED SLOPE FAILURE MONITORING SYSTEM USING ESP32 AND MPU6050 SENSOR

Arif Luqman bin Baco[1], Nazaruddin bin Abdul Taha[1*], Awang Bono[2] Jerrisly Sulindap[1], Habib Musa bin Mohamad[1], Hasmirul bin Radzman[1], Muhd Fauzy bin Sulaiman[1], Mohd Izzat bin Ismail[1]
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Abstract
Rainfall-induced landslides remain a major geotechnical hazard in tropical regions, where intense precipitation can rapidly reduce soil strength and trigger shallow slope failure. Conventional slope monitoring techniques, such as inclinometers, extensometers, and manual inspections, are useful but often limited by high cost, site accessibility, and delayed data collection. This study presents the development and laboratory validation of a low-cost Internet of Things (IoT)-based slope failure monitoring prototype using an ESP32 microcontroller and MPU6050 accelerometer-gyroscope sensor. The system was designed to measure real-time angular movement along the X, Y, and Z axes, process sensor readings using MicroPython, and transmit data wirelessly to a web-based monitoring dashboard. A local OLED display was also integrated to provide direct on-site feedback. Laboratory testing was conducted using manual tilt calibration and rainfall-induced slope failure simulations in a transparent labscale slope tank. The sensor readings remained within approximately ±1.5° of expected tilt values, while sudden movement was displayed on the dashboard within about 1.2 seconds. During three rainfall-induced slope failure simulations, major angular changes associated with visible slope collapse were detected and re lected on the dashboard within the graph update window. The results show that the proposed system can detect slope movement in near real time and provide useful visual information for early warning purposes. Although the prototype was tested only under controlled laboratory conditions, it provides a practical foundation for future ield deployment with improvements such as automated alerts, LoRa communication, solar power, weatherproof casing, and additional hydrological sensors.

Paper 8:
ESTABLISHING QUANTITATIVE WEATHERING THRESHOLDS FOR TROPICAL SHALE VIA SLAKE DURABILITY TESTING

Melvern Goh Keat Heng[1], Aziman Madun[1,2*], Mohd Firdaus Md Dan @ Azlan[1], Faizal Pakir[1,2], Mohd Khaidir Abu Talib[1,2], Ahmad Khairul Abd Malik[3]
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[3] Advanced Rapid Geotech Services Pte. Ltd., 31 Mandai Estate #01-05 Innovation Place, Singapore 729933
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Abstract
Traditional qualitative classification of shale weathering relies heavily on field observations, introducing subjectivity that can compromise geomechanical characterizations and stability analyses for tropical infrastructure projects. To address this, this study proposes a rigorous quantitative framework for classifying tropical shale weathering based on the second-cycle slake durability index (Id(2)). Utilizing 60 samples (n=20 per grade) from the Triassic Gemas Formation in Johor, Malaysia, specimens were initially categorized into weathering Grades II, III, and IV using standard geological guidelines before undergoing ASTM D4644-08 testing. The analysis reveals a definitive inverse relationship between weathering intensity and mechanical durability. Grade II samples recorded a mean Id(2) of 98.59%, while Grade IV exhibited a significantly lower mean of 86.73% with high variance (s = 6.10%), reflecting a heterogeneous transition zone where decomposed matrices coexist with competent remnants. Non-parametric statistical analyses (Kruskal-Wallis and Games-Howell) confirmed significant differences across all grade pairs ($p < 0.001$), validating that visual weathering classes represent mechanically distinct populations. Based on these distributions, formation-specific quantitative thresholds were established: $98.2 < Id(2) \leq 99.2\%$ (Grade II), $93.0 < Id(2) \leq 98.2\%$ (Grade III), and $68.4 < Id(2) \leq 93.0\%$ (Grade IV). These results demonstrate that slake durability testing provides a reproducible, objective supplement to field logging, enhancing the reliability of engineering assessments in tropical shale formations.

Paper 9:
TERRESTRIAL LASER SCANNING-BASED DISCONTINUITY EXTRACTION AND KINEMATIC ANALYSIS OF A LIMESTONE ROCK SLOPE: A CASE STUDY OF GUNUNG LANG, MALAYSIA

Aidatul Izana Mohd Taha[1,2], Astina Tugi[1], Nazirah Mohamad Abdullah[3,4*], Mohd Firdaus Md Dan @ Azlan[5,6], Ferdaus Ahmad[7]
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Abstract
Rock slope instability in tropical limestone terrains presents significant geohazard risks due to complex discontinuity networks and progressive weathering processes. This study aims to extract and quantify rock slope structural information from high-resolution terrestrial laser scanning (TLS) point-cloud data and to evaluate slope stability using kinematic analysis. A TLS-based discontinuity assessment was conducted at the Gunung Lang limestone hill in Ipoh, Perak, Malaysia. A total of fifteen scan positions were acquired using a RIEGL VZ-400i terrestrial laser scanner, generating a high-density point cloud of the vertical cliff face. The dataset was registered, georeferenced, and filtered in RiSCAN PRO, while structural extraction was performed in Coltop3D to derive discontinuity orientation parameters, including dip, dip direction, and strike. These parameters were subsequently projected onto stereonets and analysed using DIPS software to assess the feasibility of planar, wedge, and toppling failure modes. The results indicate that planar sliding is spatially limited, whereas wedge and toppling failures exhibit higher kinematic susceptibility, reflecting a structurally controlled instability regime. The findings demonstrate the effectiveness of TLS-based discontinuity extraction for rapid and reliable rock mass characterisation and provide critical input parameters for subsequent kinematic and machine learning-based rockfall prediction models. This approach offers a robust and scalable framework for hazard assessment in tropical karst environments.

Paper 10

NUMERICAL INVESTIGATION OF GAP-RATIO EFFECTS ON FORCES AND FLOW BEHAVIOUR AROUND PIPELINES UNDER EXTREME HYDRODYNAMIC LOADING.

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Abstract

Tsunami and tsunami-like waves generate extreme hydrodynamic loads on infrastructures resulting in significant damage and system failures. Pipelines at coastal areas or those crossing rivers and floodplains are one of the most vulnerable systems which require special attention to ensure their stability and functionality under such events. The gap ratio (e/D) is one of the major parameters that significantly influences the hydrodynamic forces and flow behaviour around the pipelines. Therefore, this study was conducted to assess the effect of this parameter under same hydrodynamic loading through an advanced and validated numerical modelling approach using FLOW-3D software. Three scenarios were simulated including e/D = 0.0 (pipe resting on the bed), e/D = 0.5 (clearance equal to half the pipe diameter), and e/D = 1.0 (clearance equal to the pipe diameter). Results show that introducing a gap significantly reduces drag force, with reductions of up to 56% compared to the bed-resting case. Drag decreases with increasing gap ratio but gradually converges after the initial wave impact. Lift force is also reduced by 90% compared to the bed-resting case at the first wave impact; however, greater flow unsteadiness occurs due to complex flow interactions beneath the pipe. Negative pressure beneath the pipeline generates downward forces, while vortex formation induces bidirectional torque, potentially contributing to vibration and long-term instability. The outcomes of this study provide a clear understanding of the influence of gap size on force magnitudes, and valuable insights into the flow behaviour around pipelines subjected to tsunami-like wave impacts.

Paper 11:
IDENTIFICATION OF THE RELATIVE IMPORTANCE OF FACTORS AFFECTING QUALITY IN SARAWAK HOUSING FACTOR

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Abstract
The construction industry in Malaysia significantly contributes to economic growth through infrastructure development and job creation. However, maintaining consistent quality in housing projects remains challenging due to workforce limitations, supplier issues, and evolving regulations. This study investigated key factors affecting construction quality from contractors' perspectives in Sarawak, aiming to identify and evaluate their importance to offer practical recommendations. A quantitative research method was used, involving an online survey targeting professionals engaged in housing construction across Sarawak. The survey, validated through expert review and a pilot test, used a structured Likert scale for response measurement. Data reliability was verified using Cronbach's Alpha, while the Relative Importance Index (RII) ranked the significance of factors. Findings indicated that the top five factors influencing construction quality were codes and standards (RII = 0.9643), constructability of the design (RII = 0.9417), accuracy of estimating and tendering (RII = 0.9400), drawings and specifications (RII = 0.9400), and construction-specific factors (RII = 0.9217). Lower-ranked elements like training, technology use, and organizational culture highlight areas for improvement. The study offers insights into quality challenges and supports the formulation of effective strategies for quality enhancement, benefiting policymakers, industry leaders, and practitioners in sustaining Malaysia's construction sector.

Paper 13:
SHAPE FACTOR OF FLAT BASE RECHARGE WELLS USING A VARIATION OF POROUS WALL AND RADIUS

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Abstract
There are several variables that determine in the process of impregnation. The flow of water into the well, the coefficient permeability and shape factors. The shape factor is the coefficient of dimension planning which considers the perimeter and area of the recharge well, volume and water level. The value of shape factor is influenced by the condition of the well with the flat base of half ball bottom. Forcheimer (1930) developing of flat base and Aravin (1965) made wells circular basis. Experiments in the field are three recharges well models in a flat base impregnation on the porous wall (L) test and well radius (R). This research aim is to investigate the shape factor values of the three recharge well models whose upper walls are made of concrete Buis with diameters of 0.6 m, 0.8 m, and 1.0 m. The high porous wall with variations: 0.3 m, 0.7 m and 1.0 m. In this study, the result showed that shape factor simultaneously influenced the high of porous wall ($F = 23.71 > F$ table $= 5.32$; $P < 0.05$). However, the positive correlation between the changes of shape factor and high of porous wall in flat base on the recharge wells ($R2 = 0.88$).

Paper 14

HOST-SPECIFIC PLASMID-INDUCED SCREENING (HOSPIS): A NOVEL METHOD FOR SELECTIVE BACTERIAL ISOLATION FROM COMPLEX MICROBIAL COMMUNITIES

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Abstract

This report introduces the host-specific plasmid-induced screening (HoSPiS) method, a novel approach that exploits plasmid host specificity to selectively isolate target bacteria from complex microbial samples. The efficacy of HoSPiS was validated by demonstrating the selective isolation of Escherichia coli from a model microbiome, even when present at only a 1/5000 ratio. Notably, isolation was achieved using cells in stationary phase, which is typically less efficient for transformation. HoSPiS capitalizes on plasmid host ranges, which provides a strategic advantage for studying microbial communities and bacterial interactions. These findings suggest that HoSPiS could contribute to microbial ecology and biotechnology research by facilitating the exploration of microbial diversity. Although expanding HoSPiS to uncultivated bacteria presents significant challenges, the method's premise of adapting bacteria to research needs positions it as a potential "general solution." Future efforts will focus on refining HoSPiS to broaden its applicability across diverse microbial taxa.

Paper 15

OPTIMIZING PRINTABILITY AND STRENGTH OF SUSTAINABLE OF 3D PRINTABLE CONCRETE INCORPORATING HIGH-VOLUME GGBS AND QUARRY DUST USING VISCOSITY-MODIFYING AGENT (VMA)

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Abstract
In 3D concrete printing, viscosity-modifying agents (VMAs) contribute substantially to regulating fresh state rheology, optimizing the printing process and the stiffening required for structural stability. This study investigates the influence of varying VMA dosage on the fresh state behavior and mechanical performance of 3D-printable concrete incorporating sustainable materials. The concrete mix design featured a fixed replacement of 50% ground granulated blast furnace slag (GGBS) for cement and 60% quarry dust for fine aggregates, with the VMA dosage varied between 0-0.2% by weight of binder. The objectives of this study were to evaluate the workability, buildability and compressive strength of the developed 3D concrete mixtures. The fresh concrete properties were characterized through slump test and manual layer extrusion test using a caulking gun, while the compressive strength was assessed using cube specimens. The experimental results indicate that the incorporation of VMA enhances the cohesiveness and shape retention of the printed concrete, with the optimum performance at 0.15% VMA dosage, with a buildability index of 0.97 and 28 days compressive strength of 40.7MPa. This optimized mixture successfully improved layer stability, contributing to more sustainable and structurally reliable 3D-printed construction elements.

Paper 16
ADVANCING SUSTAINABLE PAVEMENT INFRASTRUCTURE THROUGH PLANT FIBER-REINFORCED ASPHALT MIXTURES

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Abstract
Increasing traffic loads and stricter performance requirements have made conventional asphalt pavements more prone to defects such as rutting, cracking, and surface wear. The use of plant fibers in asphalt pavements has attracted increasing attention as a sustainable approach to enhancing conventional pavement performance and durability. Plant-based fibers derived from renewable agricultural sources have been shown to improve key properties of asphalt mixtures, including tensile strength, resistance to cracking, and moisture susceptibility. With growing concerns about environmental impact and the limitations of synthetic additives, researchers have shifted their focus to natural fibers as eco-friendly modifiers. This manuscript describes the chemical characteristics of plant fibers and advanced methods of fiber modification. It highlights the reinforcing mechanisms of natural fibers and examines the advantages of locally abundant pineapple leaf fiber (PLF) over other plant fibers, emphasizing its ability to enhance tensile strength, crack resistance, moisture resistance, and overall pavement durability. Although various modifiers have been introduced to improve asphalt performance, natural fibers offer a promising alternative due to their biodegradability, availability, and mechanical properties. Substantial quantities of pineapple leaf waste produced in Malaysia remain underutilized despite their high cellulose content and tensile strength. Converting this biomass into fiber for asphalt reinforcement provides a sustainable solution that improves pavement performance, supports waste valorization, and advances circular bioeconomy practices.

Paper 17:
LAND ACQUISITION CHALLENGES IN PUBLIC ROAD PROJECTS: IMPLICATIONS FOR COST, TIME, QUALITY, AND OVERALL PERFORMANCE

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Abstract
Land acquisition delays remain one of the major challenges affecting the successful delivery of road infrastructure projects, particularly in developing countries where legal, administrative, and social issues often overlap. These delays not only prolong project duration but also contribute to increased construction costs, reduced project performance, and declining infrastructure quality. The major factors contributing to delays in land acquisition and their impacts on road development projects are discussed in the present article. The literature consistently highlights three principal dimensions of land acquisition challenges: governance-related issues, compensation disputes, and social factors associated with affected communities and relevant stakeholders. Prolonged land acquisition processes can lead to cost escalation due to inflation, additional compensation payments, and project extensions, while also causing schedule overruns and disruptions to project cash flow. Delays may further affect pavement performance and construction quality, particularly when unfinished roads are exposed to traffic loading prematurely or when contractors accelerate work to recover lost time. Despite the growing body of literature on this issue, most previous studies have examined these factors separately and have remained largely descriptive. Therefore, this article highlights the need for a more integrated, quantitative approach to better understand the relationships between delay factors and their impacts on project performance, particularly in the Malaysian context.

Paper 19:
INTEGRATED VISUAL, NON-DESTRUCTIVE, AND DESTRUCTIVE ASSESSMENT OF FIRE-DAMAGED REINFORCED CONCRETE BUILDING MATERIALS: A CASE STUDY IN INDONESIA

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Abstract. Fires in reinforced concrete structures can cause material degradation, which has an impact on the reduction in the capacity and durability of the structure, so a thorough evaluation is required to determine the extent of damage and reusability. This study aims to evaluate the residual condition of reinforced concrete post- fire through the integration of visual inspection, non-destructive testing, and destructive testing in a five-storey office building that experienced a fire for three hours in Pekanbaru, Indonesia. The research methods include Rebound Hammer testing, Ultrasonic Pulse Velocity (UPV), Core Drill, carbonation testing using phenolphthalein solution, as well as spalling percentage and concrete cover measurement using rebar scanners. The results showed that the discoloration of concrete due to exposure to high temperatures had a tendency to be associated with increased carbonation depth, where areas with discoloration indicating higher temperatures showed deeper carbonation. Core Drill test results show a more representative residual compressive strength reduction than the Rebound Hammer estimate, while the UPV is effective in identifying the internal quality of concrete. In addition, the results of the analysis showed a negative correlation between the thickness of the concrete blanket and the level of spalling, where a thinner concrete cover resulted in a higher rate of damage. This study concludes that an integrative approach through a combination of visual inspection, NDT, and DT is able to provide a more accurate evaluation of the residual condition of reinforced concrete structures post- fire.

Paper 20:
STUDY IN TANAH AINA BENTONG, PAHANG ON EROSIVITY: ESTIMATION OF SOIL LOSS AND SEDIMENT YIELD USING USLE AND MUSLE

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Abstract. Soil erosion poses a significant threat in tropical regions such as Bentong, Pahang, due to intense rainfall, steep terrain, and land development activities. This study aims to assess the severity of soil erosion using the Universal Soil Loss Equation (USLE) and its modified form (modified USLE, or MUSLE). Soil samples were collected at multiple depths and tested for particle size distribution, organic content, and specific gravity. The USLE and MUSLE were used to calculate annual soil loss and storm-based sediment yield, respectively. Point 2 recorded 2,200.38 tonnes/ha/year of soil loss and 812.03 tonnes/storm of sediment yield, indicating moderate risk, while Points 4 and 6 exhibited extremely high erosion levels of 5,292 tonnes/ha/year and up to 1,952.96 tonnes/storm. Results demonstrate the significant influence of slope, vegetation, and soil type. Best Management Practices (BMPs) such as temporary drainage and seeding are recommended. This research highlights the need for integrated erosion control strategies in rapidly developing regions.

Paper 21:
EFFECTIVE UTILIZATION OF OYSTER SHELL WASTES AS MICROBIAL CARRIER, SOURCES OF ALKALINITY AND NUTRIENTS FOR AQUAPONICS-BASED RECIRCULATING AQUACULTURE SYSTEM

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Abstract. Aquaponics is a sustainable and eco-friendly food production system that combines aquaculture and hydroponics. Due to the nitrogen-rich nutrient balance of the fish feed used, chemicals such as an alkaline agent and macro- and micro-nutrients are required to enhance nitrogen removal in the aquaponics system. In this study, oyster shell (OS), discharged from oyster farming, was used as a microbial carrier and a source of alkalinity, as well as macro- and micronutrients, for the aquaponics system. Trickling filters filled with polyurethane sponge and OS were used to enhance the system's biological nitrogen removal. To optimize the additional amount of OS, a new parameter, the nitrogen-OS loading rate (N-OSLR), was proposed. The results of the continuous experiment showed that a N-OSLR of less than 1.4 mgN/(gOS.d) can maintain a pH level of over 6.0 in the aquaculture tank. In contrast, the primary nutrients nitrate, phosphate and potassium remained in the system. The results of the microbial community analysis showed that nitrifying bacteria and heterotrophic nitrifying-aerobic denitrifying bacteria were predominantly present on the surface of the OS carrier. Therefore, OS can be used as a microbial carrier and alkalinity supplier to enhance the removal of excess nitrogen in aquaponic systems.

Paper 22:
DEVELOPING A SOCIAL TECHNICAL DIAGRAM FOR NEW CONSTRUCTION OF POLYTECHNICS MALAYSIA

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Abstract. The success of building construction projects, especially in the development of new polytechnic institutions in Malaysia, depends on effective stakeholder engagement, process clarity, and structured coordination among key agencies such as JPPKK, MOHE, JKR, MOF, and MOE. However, the lack of a well-defined workflow framework has led to inefficiencies, project delays, and weak site monitoring across the project lifecycle. This research aims to identify existing workflow practices and propose improvements through the development of a Socio-Technical Diagram (STD) to support integrated project management. The study outlines three objectives: to categorize the current workflow in new polytechnic construction projects, to assess socio-technical elements related to policies and operational systems, and to propose a practical STD model that enhances coordination and monitoring between agencies. A qualitative methodology was used, involving document reviews and interviews with stakeholders from relevant government agencies. The study focused on the three key phases of construction: pre-construction, during construction, and post-construction. Key findings include ambiguity in procedures after project funding approval by MOF, technical changes following submission of the Client Brief of Requirements (CBOR), lack of formal policy or reference documentation, and limited on-site monitoring due to reliance on infrequent site meetings. To address these issues, a new STD model was developed using Whimsical software, offering a visual and integrated framework that connects key functions such as budgeting (MOF), resource management (MOE), project oversight (JPPKK and MOHE), and execution (JKR). The model improves role clarity, supports better decision-making, and promotes effective communication among stakeholders. This study contributes to the theoretical understanding of socio-technical systems in public project management and offers a practical tool for improving workflow efficiency. It highlights the benefits of adopting structured and digital solutions to reduce delays, improve coordination, and lower operational costs. The proposed STD serves as a guide for inter-agency collaboration in future polytechnic projects. Further research is encouraged to explore the use of centralized digital platforms for enhancing project governance and communication across government bodies.

Paper 23: DIGITAL PLACEMAKING FOR HERITAGE SUSTAINABILITY STRATEGY: A COMPARATIVE CASE STUDY ANALYSIS OF SENSORY FRAMEWORKS IN DIGITAL INTERVENTIONS

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Abstract. Digital placemaking may support heritage sustainability. However, the analysis of sensory modalities in that framework is still limited. This study reveals the configurations of digital form, sensory modality, and placemaking framework, as well as their potential for a heritage sustainability strategy. Thirty case studies of well-documented digital placemaking and media architecture from peer-reviewed publications between 2001-2025 were coded in an analytical matrix to identify patterns. The findings reveal a higher sensory modality in heritage cases compared to non-heritage cases, concentrated in movement and thought sensory, in line with the complexity of intangible cultural heritage (ICH). The engagement type is mainly artistic expression to shape place meaning at the neighborhoods scale. The strategy recommends integrating multisensory modalities according to heritage type and ensuring inclusive digital access to engage all community members as the main contributors. Future research should focus on living heritage in the geographical gap of documented cases in Southeast Asia.

Paper 24:
TOWARDS SUSTAINABLE CULTURAL SPORTS FACILITIES: AN ARCHITECTURAL GREEN BUILDING APPROACH

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Abstract. Green wall facades have emerged as an innovative sustainable design strategy that integrates natural elements into the built environment while enhancing both architectural and environmental performance. As living architectural systems, green walls contribute to the aesthetic enhancement of buildings and provide multiple environmental and social benefits. Various design approaches, including modular panel systems and three-dimensional structures, are utilised to support plant growth and facilitate structural integration within building facades. The selection of suitable plant species is also an important consideration, particularly in relation to growth characteristics and adaptability to vertical planting systems. In addition, green wall facades offer significant advantages in improving air quality, regulating thermal conditions, enhancing acoustic performance, promoting biodiversity, and supporting occupants' psychological well-being. Their sustainable characteristics further contribute to reduced energy consumption and minimised environmental impact. Overall, the integration of green wall facades demonstrates a harmonious balance between architectural innovation and natural ecosystems, supporting the development of sustainable, environmentally responsive, and visually appealing built environments.

Paper 25:
COUNTERMEASURES FOR COLOR ISSUES IN EXISTING SLOW SAND FILTRATION AT WATER TREATMENT PLANT: EVALUATION OF A MULTI-STAGE TREATMENT PROCESS COMBINING GRANULAR ACTIVATED CARBON AND MICROFILTRATION

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Abstract. In Japan, an increasing number of waterworks facilities are struggling to meet water quality standards with conventional technologies, because of aging infrastructure, a shortage of skilled technicians, and fluctuating quality of resource water. In particular, while the slow sand filtration offers excellent maintainability, it suffers from biological activity deterioration at low temperatures and difficulties in removing dissolved solids and colloidal suspended solids. In this study, we verified a color increase event that occurred at water treatment plant A by identifying the causative substances and evaluating the effectiveness of a countermeasure process. Results from laboratory and field tests confirmed that color reduction through coagulation and sedimentation was feasible. But concerns were raised such as the risk of exceeding water quality standards due to increased residual aluminum, as well as adverse effects on the biofilm in the slow sand filter. To address this matter, we evaluated the effectiveness of a multi-stage treatment process using "granular activated carbon (GAC) + microfiltration (MF)" as a complementary technology to slow sand filtration. This system successfully reduced the color of raw water from 8.0 degrees to less than 0.5 degrees (1 degree equivalent to 1 TCU; True Color Units) through multi-stage treatment. It is suggested that the substances causing the color were dissolved and fine suspended solids, including iron and manganese. The treatment system of "existing slow sand filtration + GAC + MF" in this study was evaluated to be an effective sustainable water supply model that achieves excellent water quality while utilizing existing facilities.

Paper 26:
AN SLR-INFORMED STREET-LEVEL AUDIT FRAMEWORK FOR ASSESSING INFRASTRUCTURE READINESS FOR LAST-MILE LOGISTICS VEHICLES IN GUANGZHOU MIXED-TRAFFIC NONMOTORISED LANES

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Abstract. Last-mile logistics vehicles (LMLVs) are increasingly promoted as part of low-emission and automated urban freight systems, but their responsible deployment depends on whether public streets can support their operation without weakening safety, accessibility or movement reliability. This paper develops an SLR-informed street-level audit framework for LMLV integration in Guangzhou mixed-traffic non-motorised lanes. Rather than treating deployment as a vehicle-readiness problem, the study frames it as an infrastructure-readiness problem in which risk emerges at conflict-prone micro-locations. The framework translates dispersed evidence on pedestrian and cyclist interaction, accessibility obstruction, route reliability, street crossing and operative readiness into a conflict-attribute-requirement chain. It identifies four micro-location categories: crossings, curb transitions, narrow pinch points, and loading or handover areas. For each category, the framework specifies the conflict mechanism, measurable design attributes and requirement logic needed to support future field auditing and expert validation. The paper contributes a methodological bridge between automated last-mile delivery research and civil engineering street-design practice by making the street condition, rather than the vehicle alone, the actionable unit of assessment.

Paper 27:
PERFORMANCE OF A BAMBOO LAYER FOR SOIL STABILIZATION

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Abstract
Soil reinforcement is a geotechnical approach used to improve the shear strength of the soil and soil stability. For peat, which is soft, troublesome (low shear strength, high compressibility) soil, a significant amount of settlement takes place under foundations. In this study the purpose of the study is to evaluate the performance of bamboo as a reinforcement for peat. Exploring how the different number of reinforcement layers influence settlement under different stresses. Physical properties of peat from Parit Nipah, Johor were tested in laboratory and settlement under static loading. A test box measuring 100 cm x 50 cm x 50 cm was used, with bamboo grids placed under the foundation plate in layers (1, 2, 3, and 4 layers). The results show that the peat has a moisture content of 604%, specific gravity of 1.34, density of 10.4 kN/m³, organic content of 82.51%, and fiber content of 55.72% and it was classified as H5 (hemic). Under a 2 kPa loading, unreinforced peat settled 9.5 mm, while the addition of the first bamboo layer reduced settlement by 15.8%. The second, third, and fourth layers further reduced the settlement by 26.3%, 36.8%, and 47.4%, respectively. Under 3.5 kPa loading, unreinforced peat settled 11.0 mm, with bamboo layers reducing settlement by 18.2%, 27.3%, 36.4%, and 45.5% with each additional layer. The study demonstrates that bamboo reinforcement significantly reduces settlement and improves peat soil stability under loading, with more layers providing better results. The study demonstrates that increasing the number of bamboo layers significantly improved the settlement performance of peat soil under embankment loading.

Paper 29:
IMPROVEMENT OF PEAT SOIL PROPERTIES USING HYDRATED LIME AND EXPANDED PERLITE: PHYSICAL, MECHANICAL, ELEMENTAL AND MICROCHEMICAL EVALUATION

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Abstract
Peat soil is a challenging geotechnical subgrade due to its low bearing capacity, high compressibility, high organic content, and exceptional water-holding ability. This study evaluates a sustainable composite stabilization approach using hydrated lime (HL) as the main stabilizer for strength enhancement and crushed expanded perlite (EP) as secondary amorphous silica material for idling voids. The mix proportions were designed based on volumetric approach adapted from concrete mix design and expressed as dry mass ratios of HL:EP:peat (1:3:6, 1:2.5:5, 1:2:4, 1:1.2:3, and 1:1:2). Laboratory testing included physical properties, compaction, Unconfined Compressive Strength (UCS), and Energy-Dispersive X-ray Spectroscopy (EDX) analysis. The soil was classi ied as acidic hemic peat, with a pH of 3.22, organic content of 97.45%. The UCS of unstabilized peat was very weak (25 kPa). Among the stabilized peat, the 1:1:2 mixture showed the best performance, with UCS increasing by 472% at 0 days and up to 1108% after 56 days of curing. EDX analysis indicated a reduction in the Ca/Si ratio from 35.6 to 2.0, confirming pozzolanic C-S-H gel formation. The findings demonstrate that the HL-EP composite offers a sustainable and effective stabilization technique for improving weak peat subgrades.

Paper 30:
DIGITAL CONSTRUCTION TRANSFORMATION THROUGH LIDAR TECHNOLOGY

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Abstract
Digital transformation has become increasingly important within the construction industry to improve productivity, operational efficiency, and project coordination. Light Detection and Ranging (LiDAR) technology has emerged as an important digital tool that supports construction transformation by providing accurate spatial information, enabling automation, and integrating digital workflows. This study examines the challenges, strategies, and relationships associated with LiDAR implementation in supporting digital construction transformation within construction projects. A quantitative research approach was employed among Grade 7 (G7) contractors in Johor Bahru, Malaysia. Data were collected through questionnaire surveys and analysed using the Statistical Package for the Social Sciences (SPSS). The findings revealed that the lack of established standards, insufficient workforce training, and weak organisational planning remain major barriers affecting effective LiDAR implementation. The study also identified that aerial LiDAR implementation, automation capabilities, and integrated digital workflows have strong potential to improve construction productivity, operational coordination, and time efficiency. The relationship analysis further demonstrated significant associations among organisational readiness, workforce competency, software integration capability, and digital workflow management practices. The findings contribute towards strengthening digital readiness and sustainable digital construction transformation within the Malaysian construction industry.

Paper 31:
SPATIAL ECONOMIC INTERACTIONS FOR INNOVATIVE SUSTAINABLE HOUSING CONSTRUCTION PROJECTS

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Abstract
Sustainable housing development continues to face challenges, including housing overhang, rising housing prices, ineffective spatial planning, and an imbalance between housing supply and market demand. Therefore, this study investigates the critical spatial-economic issues influencing housing construction projects, identifies strategic solutions to improve sustainable housing development, and examines the relationships among these issues and solutions. A quantitative research approach involving questionnaire surveys was conducted among housing developers in Johor, Malaysia, and the collected data were analysed using descriptive and relationship analyses. The findings reveal that iterative market reactions and spatial interaction imbalance represent the most critical spatial-economic issues affecting housing sustainability and development performance. Spatial clustering analysis, GIS-based planning, and market studies emerged as the most effective strategic solutions to improve spatial planning efficiency and align housing markets. The relationship analysis further confirms that strategic spatial-economic planning plays an important role in strengthening sustainable housing development and reducing the risk of housing overhang. Overall, the study provides a practical framework for improving long-term housing planning and spatial-economic decision-making within housing construction projects.

Paper 32:

PROPOSAL FOR THE EFFECTIVE UTILIZATION OF WASTES AS SOURCES OF ALKALINITY AND CARBON FOR NITROGEN REMOVAL

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Abstract
In the natural rubber (NR) industry, wastewater treatment is costly, especially for nitrogen removal. This process requires alkalinity and carbon sources for nitrification and denitrification, respectively. This study investigated the effective utilization of wastes as sources of alkalinity and carbon for nitrogen removal. A downflow hanging sponge (DHS) reactor, a trickling filter-type aerobic reactor, was used to treat anaerobically treated NR wastewater. Oyster shells (OS) and an NR grove were installed in the middle and lower parts of the DHS reactor to serve as sources of alkalinity and carbon, respectively. The results of the continuous experiment showed that ammonia was completely oxidized into nitrate due to the effectively supply of alkalinity by the OS, which maintained the pH within the optimal range for nitrification. In contrast, the total inorganic nitrogen removal efficiency was approximately 30%, despite the confirmed biodegradation of the NR glove. Rubber-degrading bacteria, Mycobacteroides, Nocardia, and Mycolicibacterium were predominantly detected on the surface of the NR glove. These results suggest that OS can function as an alkalinity source in nitrification-dominated wastewater treatment. However, the use of NR glove as a carbon source for denitrification requires further optimization of installation and operational conditions.

Paper 33:
DEFORMATION MECHANICS AND DUCTILITY BEHAVIOUR OF ULTRA-THIN REINFORCED PUMICE LIGHTWEIGHT CONCRETE PANELS UNDER FLEXURAL LOADING

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Abstract
The increasing demand for sustainable and lightweight construction materials has encouraged the development of lightweight concrete systems utilizing pumice aggregate as an environmentally friendly alternative material. This study investigates the .flexural behaviour of lightweight concrete panels through theoretical and experimental analyses under three-point bending loading, where the concentrated load was applied at the mid-span of the specimen. The tested panel measured 2000 × 400 × 50 mm with an elastic modulus of 22,707.66 MPa, while deformation and strain responses were monitored using a Linear Variable Differential Transformer (LVDT) and a strain gauge installed at the mid-span. The experimental results showed that the panel achieved a maximum.flexural load capacity of approximately 7 kN, with a maximum deflection of 13.5 mm and a peak compressive strain of approximately −650 με. The experimental deflection differed by only 9.5% from the theoretical prediction of 12.33 mm, whereas the measured strain was approximately 29.7% lower than the theoretical value of 925 με. During the initial loading stage, the panel exhibited stable linear-elastic behaviour, followed by a nonlinear response associated with microcrack initiation, stiffness degradation, and progressive crack propagation as the load approached the ultimate capacity. This study provides valuable insight into the deformation mechanics and.flexural reliability of pumice-based lightweight panels, while demonstrating the ability of reinforced pumice lightweight concrete panels to maintain residual load-carrying capacity and stable post-peak deformation behaviour despite their highly slender geometry. The findings contribute to the future development of sustainable lightweight precast structural systems with enhanced structural efficiency, serviceability, and .flexural performance.

Paper 34:
DRIVING SUSTAINABLE DESIGN: THE MEDIATING ROLE OF GREEN TRUST IN SUSTAINABLE PURCHASE INTENTION FOR BAMBOO ARCHITECTURAL DECORATION AND HOUSEHOLD PRODUCTS AMONG CHINESE CONSUMERS

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Abstract
Bamboo has become an increasingly important material in architectural decoration and household products due to its rapid renewability, biodegradability, and carbon sequestration capacity. Under China's "Bamboo as a Substitute for Plastic" initiative and the growing demand for green design, bamboo-based decoration materials (e.g., bamboo flooring, wall panels, furniture, kitchenware, and home ornaments) are positioned as sustainable alternatives to conventional wood, plastic, and synthetic composites. However, due to the lack of trust in the genuine green attributes of bamboo products, consumer acceptance of bamboo products is still low. This study explores the effects of green trust (ability trust and integrity trust) in the relationship between consumers' green consumption value (social, functional, emotional, epistemic, and price values) and environmental awareness (environmental knowledge, environmental affection, and environmental responsibility), on sustainable purchase intention for bamboo products among Chinese consumers. This study draws on the Theory of Planned Behavior (TPB), the Theory of Perceived Value of Consumption (CPV), and the Value-Belief-Norm Theory (VBN) to propose a comprehensive conceptual framework. A quantitative study design will be adopted to collect data on consumers in bamboo-producing areas in China through structured questionnaires. Partial least squares structural equation modeling (PLS-SEM) will be used to test the hypothetical relationship. In addition, this study is expected to demonstrate that green consumption values and environmental awareness positively influenced sustainable purchasing intentions, and green trust plays an important role in these relationships. This study contributes to the sustainable consumption literature by integrating multidimensional antecedents and two-dimensional trust mediators to provide practical insights for bamboo product marketing and policy promotion.

Paper 35:
EXPLORATORY STUDY OF THE CONSERVATION OF TIMBER HERITAGE BUILDINGS: PROCESS, TECHNOLOGY AND COST

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Abstract
Timber heritage building hold massive historical and cultural significance in Malaysia. Masajid, traditional Malay houses, and palaces reflecting the country's rich architectural heritage. A lot of timber heritage buildings threatened by destruction, extinction and ambiguity in modern times; and it is crucial to preserve such delicate and intricate Malay heritage for the next generation in form of a concise historiographical outline. Conservation projects frequently encounter challenges associated with conservation process, technologies advancement and cost management. Therefore, this exploratory study investigates the conservation process, technologies employed, and cost considerations associated with timber heritage building conservation in Malaysia. A qualitative research approach was adopted through semi-structured interviews with the experts in the conservation projects. The findings suggest that every conservation project should be guided with an established conservation guideline, efficient dilapidation surveys, and a clear scope of works. Technology advancement such as 3D laser scanning, drones and Historic Building Information Modelling (HBIM) provides opportunities for enhancing the accuracy of documentation and building conditions' assessment, and their use is currently fragmented and primarily client driven. Additionally, due to the unavailability of cost information such as Schedule of Rates (SOR) and the specialized nature of conservation works, this study reveals that cost management in conservation projects is the main challenge that will lead to financial risks and pricing based on assumptions. This study concludes that the current fragmented approach, which is impacted by the technology client-driven and costing based on conventional construction rates, poses a crucial risk viability of Malaysia's architectural and conservation inheritance.

Paper 36:
DURABILITY OF WASTE GLASS POWDER AND TIRE FIBER GEOPOLYMER CONCRETE UNDER CHEMICAL ATTACK

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Abstract
Cementless concrete can be a promising solution for the next generation concrete, as it reduces carbon emissions while providing high performance. The quick increase in waste generation poses a substantial sustainability challenge, remarkably in developing countries such as Malaysia. In addition, the production of ordinary Portland cement (OPC), which accounts for approximately 5–7% of global CO_2 emissions, has a significant environmental impact. The long-term performance of geopolymer concrete (GPC) under aggressive environmental conditions is critically influenced by its durability, microstructural integrity, and chemical stability. This study aims to investigates the effects of incorporating fly ash (FA), GGBS and waste glass powder (WGP) as binders with waste tire fiber aggregates (TFA) as partial fine aggregates on the mechanical properties of geopolymer concrete when subjected to chemical attacks. The findings indicated that an optimal WGP content of 9% of the total binder mass increased the slump and improved the 28-day compressive strength. The incorporation of TFA reduced the 28-days compressive. Lower TFA contents (5–10%) improved flexural strength, whereas higher replacement levels (20–30%) noticeably decreased workability and mechanical performance. The mixture blended with FA, GGBS, WGP, and TFA showed reductions in compressive, flexural strengths, and mass loss by 28%, 9.4% and up to 6.9% respectively, when exposed to 5% of H2SO4 for 30 days. Overall, the combined use of WGP and TFA in GPC significantly enhanced mechanical strength, durability, and structural performance. The findings demonstrate the potential of GPC as a sustainable concrete material for use in challenging environmental conditions.

Paper 37:

ASSESSMENT OF CRITICAL DELAY FACTORS IN BUILDING CONSTRUCTION PROJECTS: A CASE STUDY OF RIAU PROVINCE, INDONESIA

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Abstract
Delay remains a recurring problem in building construction projects because it affects time performance, cost control and coordination among project stakeholders. Although numerous studies have investigated construction delays, empirical evidence focusing on project-related delay factors in building construction projects in Riau Province, Indonesia remains limited. This paper presents an assessment and ranking of the most critical project-related delay factors in building construction projects in Riau Province, Indonesia. A structured questionnaire was distributed to construction stakeholders, and 101 responses were analysed. The study focused on 18 project-related factors associated with financial, managerial, procurement, human resource, subcontractor, design and scheduling issues; environmental factors were excluded to keep the analysis focused on controllable project management factors. The data were examined using Cronbach's alpha, Relative Importance Index (RII), Kendall's coefficient of concordance and the Kruskal-Wallis test. The reliability test produced a Cronbach's alpha of 0.887. The five highest-ranked factors were economic downturn, ignoring project schedule, incompetent subcontractors, delay in material procurement and payment delays. Kendall's W was 0.142 with $p < 0.001$, indicating statistically significant but weak agreement among respondents. The Kruskal-Wallis test identified significant differences among engineers, contractors and consultants for several delay factors. The findings indicate that delay mitigation should prioritise cash-flow resilience, schedule discipline, subcontractor evaluation, procurement planning and stakeholder coordination. The study contributes empirical evidence on project-related delay factors in context of building construction projects in Riau Province and provides practical insights for improving project delivery performance.

Paper 38:
SOYBEAN EXTRACT WASTE AS A BIO-BASED SELF-HEALING AGENT IN CONCRETE: A COMPRESSIVE STRENGTH STUDY

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Abstract
Concrete is a construction material known for its high compressive strength and durability; however, it remains susceptible to microcracking, which can reduce structural performance and service life. These cracks serve as entry points for water and aggressive substances, accelerating concrete degradation and increasing maintenance costs. One innovation developed to address this issue is self-healing concrete — a material capable of repairing cracks autonomously through chemical or biological mechanisms. This study aims to analyze the effect of soybean extract waste addition on concrete compressive strength and evaluate the effectiveness of the spray method in activating the self-healing process. A laboratory experimental method was employed, with soybean extract content variations of 0%, 2%, and 4% by cement weight. Cubic specimens measuring 150 × 150 × 150 mm were cured for 28 days, subjected to controlled cracking, and then spray-cured for an additional 28 days under controlled conditions. Compressive strength testing was conducted before and after treatment, and microstructural analysis using Scanning Electron Microscopy (SEM) was performed to observe the formation of calcium carbonate ($CaCO_3$) precipitation. The results indicated that the addition of soybean extract improved concrete compressive strength, with an optimum value of 434.44 kg/cm² at the 2% variation, representing a 3.79% increase over the control mix. The spray method yielded a more significant improvement, with the 4% variation achieving a maximum compressive strength of 454.84 kg/cm², corresponding to an 8.66% increase. SEM analysis confirmed the presence of $CaCO_3$ deposits within the concrete microstructure, suggesting successful self-healing activity. These findings indicate that the spray method is more effective in enhancing the self-healing capacity of concrete.

Paper 39:
DEVELOPMENT OF EXCAVATION TECHNIQUES FOR CONCRETE DEMOLITION USING MULTI-STAGE EXCAVATORS

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Abstract
The objective of this study is to develop excavation techniques aimed at improving efficiency and reducing environmental impact in the demolition of concrete structures that have reached the end of their useful life, as well as decommissioned nuclear reactors. Using a multi-stage excavator, we measured and considered parameters such as torque T, excavation speed V, and particle shape during edge excavation under four different patterns of set vertical force Fzset. As a result, we obtained data on the relationships between these values and the set vertical force Fzset, as well as the load at which particle shape is maximized. We believe these findings contribute to the development of application guidelines for structural demolition using edge excavation.

Paper 40:
STUDY IN STRUCTURAL EVOLUTION AND PEDOLOGICAL ATTRIBUTES OF UPLAND AND COASTAL LANDFORMS IN THE MALAY PENINSULA

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Abstract
Intermittent climate change episodes since the Late Pleistocene resulted in multi-scale shifts in global temperatures, causing dynamic sea-level fluctuations. These variations heavily sculpted the physiography and soil architecture of the Malay Peninsula. While the central spine is dominated by steep granitic highlands, the eastern and western corridors feature distinctive upland undulating terrains and low-lying alluvial plains. Major soils in the upland regions evolved from Paleozoic to Mesozoic parent rocks, weathering predominantly into highly leached, acidic Ultisols and Oxisols. In contrast, the coastal margins showcase intense depositional differentiation: the West Coast is dominated by clayey, pyritic marine sediments that pose severe acid-sulfate challenges upon drainage, whereas the East Coast exhibits extensive, highly weathered, low-fertility sandy beach ridges (BRIS soils). Recent field studies in the undisturbed, dense inland forests of Malaysia's Eastern Region (Kelantan, Terengganu, and Pahang) reveal that beneath intact multi-tiered canopy systems, pristine pedogenesis operates with high organic carbon conservation and stable aggregate structures that resist tropical monsoonal degradation compared to adjacent managed plantations. This study integrates late-Quaternary tectono-climatic evolution, river capture mechanisms, coastal progradation, and detailed pedological attributes to inform contemporary agro-technological optimization and conservation planning.

Paper 41:
NUMERICAL EVALUATION OF REINFORCED BUBBLE DECK CONCRETE SLABS USING CONCRETE DAMAGED PLASTICITY

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Abstract
Conventional solid reinforced concrete floor slabs consume excess material mass, driving up structural dead loads and carbon emissions. Reinforced Bubble Deck Concrete (RBDC) technology mitigates these issues by substituting non-structural core concrete with hollow High-Density Polyethylene (HDPE) void formers. This study presents a non-linear 3D Finite Element Analysis (FEA) of a 700 mm × 700 mm × 150 mm RBDC slab under three-point bending using Abaqus's Concrete Damaged Plasticity (CDP) framework. Numerical predictions were validated against experimental benchmark data, accurately reproducing load–displacement trajectories and flexural cracking patterns with a peak load deviation of -4.36%. Parametric comparisons revealed that increasing the void diameter from 90 mm to 120 mm (B/H = 0.80) yielded minimal deflection variance (<4.10%) while reducing total self-weight by 17.35% compared to solid control slabs. Overall, the 120 mm void configuration proved optimal, maximizing material savings without compromising flexural capacity.

Paper 42:
STRENGTH AND CARBONATION EFFECTS OF SAND CEMENT BRICK CONTAINING RICE HUSH ASH AS PARTIAL CEMENT REPLACEMENT UNDER CO2 CURING

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Abstract
The construction industry is faced with an increasing pressure to reduce the amount of emitted CO2 emissions from traditional brick-making methods. This paper presents a discussion on sustainable cement bricks made by incorporating Rice Husk Ash (RHA) partially cement replacement and Magnesium Oxide (MgO) as additive. The aim was to explore the effect of CO2 curing on the physical properties of such bricks. The experimental setup involved a mixture proportion of cement and sand at a ratio of 1:6. RHA substitution levels into the cement were at 0%, 10%, 20%, and 30%, with a constant addition of MgO at 2%. The samples underwent curing within a CO2 environment set at a chamber at a concentration of 60%. The results showed that all samples adhered to the density criteria set out by BS EN 772-1:2011 at 1800-2000 kg/m3. The highest strength was attained by the 20% RHA group at a strength of 14.8 MPa. The brick with 10% RHA, proved more resistant to carbonation with a depth of 0.09 cm. The results confirm that the combination of RHA and MgO additive cured with CO2 accelerates the intake of CO2.

Paper 43:
COMPARATIVE OF CRADLE-TO-GATE LIFE CYCLE ASSESSMENT OF IBS AND CONVENTIONAL HOUSING CONSTRUCTION IN MALAYSIA

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Abstract
The construction sector remains a major source of greenhouse gas emissions due to material-intensive production, transportation demands and site-based construction activities. In Malaysia, comparative evidence on the embodied carbon performance of Industrialised Building System (IBS) and conventional housing is still limited, especially at the structural-element level. This paper presents a comparative cradle-to-gate life cycle assessment (LCA) of three Malaysian housing case studies comprising an IBS framed house, an IBS load-bearing wall house and a conventionally constructed house. The assessment focused on the superstructure, namely columns, beams, slabs and walls, under system boundary stages A1-A5. SimaPro linked with the Ecoinvent database was used to quantify midpoint Global Warming Potential (GWP) and selected endpoint impacts, while all results were normalised to 1 m² of gross floor area (GFA). The results showed that IBS House 2 had the lowest GWP of 165 kg CO2-eq/m² GFA, followed by the conventional house at 209 kg CO2-eq/m² GFA, while IBS House 1 had the highest value at 267 kg CO2-eq/m² GFA. Concrete production was the major contributor in all cases, and steel reinforcement and transportation were the secondary drivers. Endpoint results also favoured IBS House 2, which recorded the lowest scores for human health, ecosystems and resource damage. The findings show that IBS does not automatically perform better than conventional construction in carbon terms; its performance depends on structural configuration, project scale, material intensity and logistics. The paper provides case-based evidence for low-carbon residential construction that is relevant to responsible engineering, sustainable housing delivery and climate resilience in Malaysia.

Paper 44:
FUTURE TOOLS AND TECHNOLOGIES IN INDIAN CEMENT INDUSTRY TO TACKLE CLIMATE CRISIS

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Abstract
Decarbonization of cement manufacturing industry is one of the biggest challenges in industrial climate action, as emissions emanate from both fossil-fuel combustion and clinker production process (calcination). It poses a critical challenge for India because India, being the world's second-largest cement producer nation, requires its infrastructure development to align with the national net-zero target by 2070. Thus, this study systematically reviews future technologies for reducing emissions from India's cement sector. A search in Scopus data base yielded 491 global articles in total, after which India-focused screening returned only 24 articles published during 2010–2026, of which 19 were retained for detailed analysis (PRISMA guided). VOSviewer keyword mapping and Excel-based thematic coding were used to analyse technological developments, feasibility, obstacles and potential policy introduction relevant to the issue at hand. The review shows that near-term mitigation is most feasible through clinker substitution, circular economy practices, low-carbon binders, alternative fuels, energy efficiency and waste heat recovery. In the medium term, LC3, calcined clay cement, and geopolymer binders could be promising technologies. Carbon capture, utilization and storage (CCUS), green hydrogen and kiln electrification are important in the long term, albeit expensive and difficult to implement due to technological maturity issues. Finally, this study presents a phased roadmap that connects technology readiness to implementation feasibility, offering a policy-relevant framework for India's low-carbon cement transition.

Paper 45:
SPECTRAL WAVE MODELLING AND NEARSHORE WAVE TRANSFORMATION ALONG THE EAST COAST OF JOHOR, MALAYSIA: IMPLICATIONS FOR SHORELINE MANAGEMENT

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Abstract
Wave climate analysis is one of the critical parameters for coastal hazard assessment and shoreline management especially in monsoon-dominated environments where seasonal variability in wave energy drives chronic erosion and episodic flooding along vulnerable coastlines. Herein, the wave climate along east coast of Johor, Malaysia was studied through spectral wave (SW) modelling under different monsoon conditions. DHI's MIKE 21 SW model was used to simulate wave transformation on an unstructured finite mesh, incorporating physical processes including wind-wave growth, refraction, shoaling, bottom friction, depth-induced breaking, and wave-current interaction. Simulations were conducted under Pure Tide, NE monsoon, and SW monsoon conditions where the offshore boundary conditions were derived from six years of United Kingdom Meteorological Office (UKMO) wave data (2012–2017). Extreme value analysis (EVA) was performed to determine wave parameters at a 30-year return period across three dominant directional windows (31–60°N, 151–180°N, and 181–210°N). Results indicated that waves propagating from the 60° direction produce the highest nearshore wave heights, ranging from 1.0 to 3.95 m depending on coastal orientation and the degree of sheltering by offshore islands. Waves arriving from 180° and 210° directions yielded significantly lower nearshore heights, generally below 1.5 m during NE monsoon and below 0.6 m during SW monsoon. The findings highlight the critical influence of coastline orientation, nearshore bathymetry, and island sheltering effects on wave energy distribution, providing essential baseline data for informed shoreline management and coastal protection planning along the east coast of Johor.

Paper 46:
MICROPLASTIC POLLUTION IN MANGROVE SEDIMENTS: AN ENVIRONMENTAL REVIEW OF SUCITAPPLAS, SURIGAO DEL NORTE, PHILIPPINES

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Abstract
Microplastic pollution is an increasing environmental concern, particularly in coastal and mangrove ecosystems that serve as sinks for land-based pollutants. This study assessed the occurence, shape, color, polymer type, and density of microplastics in mangrove sediments from Cobeton, Lamangon, Condona, and Bilabid Islands within SUCITAPPLAS in Surigao del Norte, Philippines. Sediment samples were collected in August 2025 from surface layers (0–5 cm) using stratified quadrats and transect sampling, followed by oven drying, density separation using a 30% NaCl solution, microscopic examination at 10×–40× magnification, and polymer identification through Fourier Transform Infrared Spectroscopy (FTIR). There was a total of five (5) microplastics that were detected in all sampling sites. In terms of shape, fiber line dominated (80%) followed by fragments (20%). In terms of color, blue (80%) is the most prevalant color, followed by green (20%). Polyethylene (33.33%), copolymers (33.33%), and phenoxy resins (33.33%) are the only polymer types that was found and the two other microplastics were not identified due to small size. Microplastic densities ranged from 2.22 to 4.45 particles/kg, with Condona (4.45 particles/kg) exhibiting the highest density followed by Cobeton (2.22particles/kg), Lamangon (2.22 particles/kg) and Bilabid (2.22particles/kg).The data in this study will serve as a baseline data for future research in the study sites to fully understand how microplastics integrate and accumulate into mangrove ecosystems and by that legislators can create policies in prevention for further microplastic contamination.

Paper 47:

A CRITICAL REVIEW ON ENHANCING THERMAL CONDUCTIVITY OF SANDY SOILS USING NANO ALUMINUM OXIDE (AL_2O_3) UNDER VARYING MOISTURE CONDITIONS

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Abstract

This review paper synthesizes recent research on enhancing the thermal conductivity of natural sandy soils, a key parameter for improving the performance of Ground Source Heat Pump (GSHP) systems and other geotechnical applications. The review is divided into four key research areas which capture the interdisciplinary nature in which this research fits. These research areas include the addition of mineral and non-mineral additives to sandy soils to improve their thermal connectivity and density through particle E-mail during loading processes; the role of moisture in improving thermal connectivity particle E-mail and therefore, thermal transfer is also explored when all air voids are filled; the investigation of the application of nanomaterials with a focus on nano-Al_2O_3 in the mechanical performance of sandy soils including; shear strength and cohesion, resulted in the improvement of these mechanical properties of sandy soils, which indirectly contributed to an enhancement of thermal pathways; the last area looked at the use of Al_2O_3 as a heat transfer medium in nanofluids and as a component in phase change materials (PCMs), both of which have been shown to provide continual improvements of thermal conductance and superior thermal performance management. Although all lines of inquiry have explored many aspects of these areas, significant gaps exist in our understanding of the interaction of nano-Al_2O_3 and moisture variation with respect to the thermal conductivity or transfer properties of sandy soils, particularly under tropical climatic regions/circumstances. The gap described above in the study examines the implications and potential future experimental studies to address these gaps.

Paper 48:
DEVELOPMENT OF AN EFFICIENT OBSERVATION METHOD FOR EXPANDED POLYSTYRENE PIECES

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Abstract
Plastic pollution has evolved into a global environmental crisis. In particular, Hiroshima Bay, Japan, has been identified as an area of severely high contamination dominated by expanded polystyrene pieces (EPSP). While consistent monitoring is essential, conventional methods are often labor-intensive and inefficient due to the high volume of natural wood debris mixed with plastic fragments. This study aims to develop an efficient, reproducible monitoring workflow. Sediment samples were collected from two sites, Saka Coast and Nagahama Beach, at both surface (0–1 cm) and subsurface (1–5 cm) layers. To address the challenge of wood debris interference, a "boiling method" was introduced. The results demonstrated that the boiling method achieves a wood removal efficiency of approximately 80% and an average EPSP recovery rate of nearly 100%. Spatial analysis revealed significant variability in EPSP density and size composition between sites and depths, emphasizing the necessity of multiple sampling points and subsurface analysis for accurate assessment. Ultimately, the proposed systematic workflow significantly reduces sorting labor and provides a practical approach for long-term environmental monitoring, thereby helping to overcome technical barriers and labor shortages in local community-led conservation efforts.

Paper 49:
MEASUREMENT AND ANALYSIS OF RIVERBED CHANGE AT THE MOUTH OF THE KUROSE RIVER CAUSED BY FLOOD EVENTS AND TIDES

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Abstract
This study investigates the effects of flood discharge and tidal fluctuations on riverbed deformation in the lower reach of the Kurose River, western Japan, through field measurements and numerical simulations. The Kurose River discharges into the Seto Inland Sea and is subject to one of the largest tidal ranges in Japan, approximately 4 m, which creates a highly dynamic estuarine environment. Field surveys were conducted on three occasions in 2025 to measure cross-sectional bed elevations before and after two flood events in which peak discharge exceeded 150 m³/s. The results indicated that flood discharge induced bed elevation changes of approximately 10 cm overall at both observation sites, with deposition exceeding 15 cm near the river mouth. In contrast, tidal fluctuations of 3.5 m produced only minor bed changes of a few centimeters, suggesting that tidal forcing alone does not drive significant riverbed deformation. Numerical simulations employing the GBVC3 morphodynamic model reproduced flood-induced bed changes at the upstream site with reasonable accuracy. However, the model tended to underestimate bed variation at the downstream site, which is likely attributable to limitations in spatial resolution. These findings demonstrate that flood discharge is the dominant driver of riverbed change in this mesotidal estuarine system, while tidal fluctuations play a comparatively minor role. The results contribute to improved flood risk assessment for tidal rivers.

Paper 50:
GEOTECHNICAL CHARACTERIZATION AND STABILIZATION OF JOHOR FIBRIC PEAT USING ORDINARY PORTLAND CEMENT

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Abstract
Fibric peat soils pose significant construction challenges due to their high water and organic content, which result in inherently low shear strength. This study investigates the geotechnical characterization and stabilization of fibric peat sourced from Medan Sari, Pontian, Johor, utilizing Ordinary Portland Cement (OPC) as a chemical binder. Untreated peat samples were mixed with OPC dosages of 200 kg/m³ to 400 kg/m³, then subjected to moist curing under a surcharge load for periods of 7 and 28 days. Performance was evaluated using the Unconfined Compressive Strength (UCS) test, alongside Scanning Electron Microscopy (SEM) and Energy Dispersive X-Ray (EDX) spectroscopy to analyze microstructural and chemical changes. The findings reveal a substantial increase in the unconfined compressive strength of the treated peat compared to untreated specimens. SEM imaging demonstrated a more compacted soil structure with significantly reduced total porosity in the treated samples. Furthermore, EDX analysis showed a decrease in carbon and an increase in calcium content upon adding OPC. These microstructural and chemical alterations directly contribute to the enhanced compressive strength, proving OPC to be an effective stabilization agent for problematic fibric peat soils.

Paper 51:
SUSTAINABLE CONCRETE PAVER BLOCK BY INCORPORATION RECYCLED MUSSEL SHELL (PERNA VIRIDIS) POWDER AS PARTIAL REPLACEMENT OF FINE AGGREGATES

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Abstract
Overutilisation of fine aggregates in paver blocks manufactured has led to depletion of natural resources and ecological deterioration. Hence, the aim of this study is to reduce reliance on conventional resources and utilise mussel shell powder (MSP) as an alternative material to replace fine aggregates (FA) for paving production. The performances of seashell concrete paver block were evaluated based on physical and mechanical properties (density, compressive strength, and water absorption). Three mixes of mussel paver block (MPB10, MPB20 and MPB30) including conventional paver block (CPB) were investigated under ambient curing condition for 7 and 28 days. The results showed that mixture with 20% replacement (MPB20) demonstrated the best performance. This approached achieved a compressive strength of 65 MPa, density of 2156 kg/m³, and lowest water absorption (2.09%), hence surpassing the control blocks and achieve by the BS EN 1338 standards. Subsequently, correlation analysis was conducted between each variable in this study to observe each relationship and dependency. The results indicate that compressive strength and density revealed a strong negative correlation with water absorption nearest to 1 (r = -0.87 and r = -0.82). Overall, seashell paver blocks (MSP) demonstrate a significant positive establishment on its physical and mechanical performances, hence potentially provides a foundation for eco-friendly construction practices by integrating industrial waste into pavement materials.

Paper 52:
A SPATIAL ANALYSIS OF PEOPLE-FLOW DYNAMICS ASSOCIATED WITH FUNCTIONAL DIVERSIFICATION AT CITY CENTRAL STATIONS

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Abstract
Recently, functions of central railway stations and terminal have diversified. They provide as multifunctional urban spaces that integrate commercial and social activities, rather than merely as transportation hubs. These changes are revitalizing urban mobility structures and influencing how people interact with and navigate cities and their city centers. However, previous studies have relied primarily on aggregated indicators, such as passenger numbers, and therefore fail to capture the spatial and dynamic characteristics of these behavioral shifts. This paper analyzed the impact of people staying and flow under the project of Hiroshima Station redevelopment, which involved the introduction of a big commercial facility and the realignment of the streetcar terminal. This research analyses the spatial changes in the distribution of people staying in and around the area before and after the development. using mobile location database. It is confirmed that an increase in the number of people staying around the station area, while these of the existing downtown area are not significantly decreased. This research concludes that the station and downtown areas are not direct competitors; upgrading the central station generates new urban demand.

Paper 53:

FIELD EVALUATION OF PAVEMENT PERFORMANCE FOR FULL DEPTH RECLAMATION (FDR) WITH BITUMEN EMULSION AND POLYMER MODIFIED CEMENTITIOUS BINDER

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Abstract

Full Depth Reclamation (FDR) is a sustainable pavement rehabilitation technique that recycles existing pavement materials to construct a new stabilized road base while reducing the need for virgin aggregates and disposal of deteriorated pavement. This study evaluates the long-term performance of two FDR stabilization approaches implemented in a Proof of Concept (POC) project at Ramp C, Bandar Gamuda Cove Interchange (KM 26.70), North-South Expressway Central Link (NSECL), Malaysia. The first approach, Full Depth Reclamation using Emulsion (FDR-E), incorporated recycled pavement materials and engineered bitumen emulsion to produce a bituminous stabilized base. The second approach, Full Depth Reclamation using RHAzyme® (FDR-RH), utilized a polymer-modified cementitious binder to produce a cementitious stabilized base. Three trial sections were constructed comprising FDR-RH with 50% reclaimed asphalt pavement (RAP) and 50% crusher run (CR), FDR-E with 25% RAP and 75% CR, and FDR-RH with 25% RAP and 75% CR. Pavement performance monitoring was conducted over a 12-month period through field inspections and laboratory testing at Months 6, 9, and 12. This paper presents the findings of the Month-12 post-construction laboratory evaluation using core samples extracted from the trial sections, together with a summary of the previous monitoring phases. The study provides valuable insights into the structural performance and durability of emulsion- and cementitious-stabilized FDR mixtures, contributing to the development of sustainable pavement rehabilitation strategies for highway applications.

Paper 54:
INFLUENCE OF BAMBOO FIBER ON THE FRESH AND HARDENED PROPERTIES OF CONCRETE

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Abstract
Although concrete is the most widely used construction material, its long-term durability is often compromised by water ingress, cracking, and reinforcement corrosion. These challenges have encouraged researchers to explore sustainable reinforcement materials capable of enhancing concrete performance while reducing environmental impacts. This study evaluates the influence of chemically treated Semantan bamboo fiber on the workability, durability, internal quality, and compressive strength of concrete to identify an optimum fiber dosage for sustainable construction applications. Concrete cube specimens measuring 100 mm × 100 mm × 100 mm were prepared and cured for 7 and 28 days with bamboo fiber contents of 0%, 1%, 2%, 3%, 4%, and 5%. A total of 72 specimens were cast using Semantan bamboo fibers with lengths of 25 mm, which were pre-treated with a boric and borax acid solution to enhance durability and compatibility with cement. The workability, durability, internal quality, and mechanical performance of the concrete were evaluated using slump, water absorption, ultrasonic pulse velocity (UPV), and compressive strength tests. The results showed that concrete workability decreased as bamboo fiber content increased due to the fibrous nature and water absorption of the fibers. Lower fiber contents improved durability, with 1% bamboo fiber showing the lowest water absorption. Meanwhile, UPV results confirmed that all mixes achieved good concrete quality, with the best internal uniformity observed at around 2% bamboo fiber. Compressive strength was generally maintained, although excessive fiber content caused a reduction in strength. The findings demonstrate that treated bamboo fiber has considerable potential as a sustainable reinforcing material capable of improving concrete durability while maintaining satisfactory mechanical performance for future structural applications.

Paper 56:
A PRELIMINARY STUDY ON EVALUATING THE DEVELOPMENT PROCESS OF MOBILITY COMMUNITIES

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Abstract
In Japan, many regions have recently found it increasingly difficult to maintain reliable local transport services. At the same time, technologies such as automated driving have continued to improve. These advanced technologies have not always matched the actual needs of local communities, thus only a limited number of projects have moved into long-term operation. This study focuses how Mobility Communities grow over time, and proposes classification that process into five stages. Also this paper proposes eight indicators which examine maturity from several viewpoints, including participating members, shared goals, management systems, business progress, and resource capacity. A questionnaire survey was conducted in some regions involved in the Mobility Community Development Conference (MCDC). In general, the responses showed similar tendencies across the indicators. However, some differences appeared depending on respondents' occupations and positions, which suggests that views on community maturity are not always the same among stakeholders.

Paper 57:
ASSESSING THE IMPACT OF AUTOCAD SKILLS ON THE EMPLOYABILITY OF TVET GRADUATES IN THE MALAYSIAN CIVIL ENGINEERING INDUSTRY: A PILOT STUDY

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Abstract
The construction industry in Malaysia driven by the Industrial revolution 4.0 is demanding Technical and Vocational Education and Training (TVET) graduates to have technical competencies. As a result, among these competencies, computer-aided design (AutoCAD) is a basic literacy of a civil engineer. This is well used software. But there has been no study which is able to quantify the relationship between AutoCAD and employability of the graduates. It is not clear if the up to the mark institutional training already in place meet recruitment needs of the industry. The quantitative survey instrument (N = 41) used in this pilot study showed excellent reliability (Cronbach's Alpha = 0.953). The results of the descriptive analysis demonstrated that graduates skilled in AutoCAD had the highest mean with value of 3.83 with standard deviation of .95 while assessing the industry demand. There was a strong, significant, and positive relationship between proficiency in AutoCAD and employability according to the result of Pearson correlation analysis ($r = 0.786$, $p < 0.001$). Greater technical confidence is a critical predictor of employability. AutoCAD is a necessary skill for employing TVET graduates in the civil engineering industry, as the study concludes.

Paper 58:
FINITE ELEMENT MODELLING OF PUNCHING SHEAR BEHAVIOUR OF BFRP-REINFORCED CONCRETE FLAT SLABS FOR SUSTAINABLE STRUCTURAL APPLICATIONS

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Abstract
Punching shear failure of flat slabs is a brittle limit state that can occur with limited warning, and the use of basalt fibre-reinforced polymer (BFRP) reinforcement introduces additional uncertainty because the bars remain linear elastic until rupture and have a lower elastic modulus than steel. This paper presents a three-dimensional nonlinear finite element modelling framework for BFRP-reinforced concrete slab-column connections and validates it against experimental results. The model was developed in Abaqus using solid concrete elements, embedded truss reinforcement, and the Concrete Damage Plasticity model to represent compressive crushing, tensile cracking, stiffness degradation, and damage localisation. Validation was performed for eight interior slab-column specimens covering concrete compressive strengths of 30, 60 and 90 MPa and BFRP flexural reinforcement ratios between 1.8% and 3.0%. The model reproduced the load-deflection response, punching-governed peak resistance, post-peak strength drop, and diagonal tensile-damage patterns observed experimentally. The absolute difference between experimental and predicted punching capacities ranged from 0.26% to 6.27%, with an average of approximately 3.0%. The validated framework therefore provides a reliable basis for subsequent parametric investigation of BFRP-reinforced flat slabs and supports the assessment of corrosion-resistant reinforcement systems for sustainable structural applications.

Paper 59:
FROM SPATIAL MAPPING TO PRIORITIZATION: A SEGMENT-BASED ANALYSIS OF ROAD ACCIDENT HOTSPOTS

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Abstract
Identification of accident hotspots is a starting point for setting evidence-based road safety priorities. This study employs a segment-based Geographic Information System (GIS) approach to investigate accident concentration along Federal Route FT050 Batu Pahat–Mersing, Johor, Malaysia. The analysis is carried out based on data of accidents at the level of kilometres for the years 2010-2018, which include segment location, latitude, longitude and total accident frequency. The spatial distribution of accidents from KM0 to KM10 was mapped using QGIS along with descriptive statistical analysis such as percentage contribution and accident frequency ranking. Z-score screening was used to classify and prioritize accident-prone segments. The spatial output shows that accidents were not evenly distributed along FT050 but were concentrated at selected km segments. The KM0–KM10 dataset contains a total of 4,244 accidents. The KM1 had the highest frequency of accidents, followed by KM8 and KM0. According to the Z-score analysis, KM1 was identified as a very high hotspot. In general, the results suggest that segment-based GIS screening is a viable preliminary tool for identifying priority accident locations.

Paper 60:
VALIDATION OF A FINITE ELEMENT FRAMEWORK FOR PREDICTING RESIDUAL MECHANICAL PROPERTIES OF STAINLESS-STEEL REINFORCEMENT AFTER THERMAL EXPOSURE

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Abstract
Stainless steel has demonstrated its durability and cost-effectiveness across diverse applications and austenitic stainless steels are crucial for promoting sustainability in the future, due to their adaptability to varying temperature conditions, good ductility and high strength. However, the residual performance of cold-worked stainless-steel reinforcement following exposure to elevated temperatures remains a critical consideration in structural safety assessment. This study focuses on a comprehensive finite element (FE) analysis aimed at predicting the residual mechanical behavior of cold-worked AISI 316L reinforcing bars. The numerical framework employs user-defined material parameters within an isotropic elastic model combined with a multilinear isotropic hardening model. The accuracy of the proposed modelling approach was assessed through comparison with experimental results obtained under three distinct cooling conditions: water quenching (Q), air cooling (A), and slow furnace cooling (S). The study found a close alignment between the experimental results and numerical simulations for both virgin and thermally exposed materials. The FE models demonstrated a high level of predictive accuracy, with discrepancies in ultimate tensile strength (fu) and 0.2% proof strength (f0.2p) generally remaining below 5%. The main exception was observed for the ultimate tensile strength of the virgin material, for which the discrepancy reached 9%. In addition, higher deviations in 0.2% proof strength were recorded for samples subjected to rapid water cooling from 700°C, intermediate air cooling from 500°C, slow furnace cooling from 500°C, and slow furnace cooling from 700°C, with corresponding differences of 12%, 8%, 6%, and 6%, respectively. The findings indicate that the proposed modelling approach reliably characterizes the complex stress-strain response and associated total strain components across varying thermal histories. Accordingly, this study establates a validated numerical framework that can support the structural fire engineering community in assessing the post-fire capacity of stainless-steel reinforced structures with a high degree of confidence.

Paper 61:
VEGETATION EFFECTS ON STORMWATER RUNOFF REDUCTION IN RAIN GARDEN PROTOTYPES UNDER CONTROLLED RAINFALL SIMULATION

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Abstract
Rain gardens are a nature-based approach for stormwater management, designed to mitigate runoff through enhanced infiltration and temporary storage. This study quantified the effect of vegetation complexity on runoff reduction using three laboratory scale rain garden prototypes replicating conditions in Parit Raja, Johor, Malaysia. The prototypes shared identical geometry (0.14 m² plan area, 6% slope) and engineered media layers (2 cm mulch, 10 cm local clayey soil, 6 cm lightweight expanded clay aggregate) but varied in vegetation: Prototype 1 had no vegetation, Prototype 2 contained grass and a fern, and Prototype 3 featured a more diverse assemblage of grass, fern, and three herbaceous perennials. A calibrated rainfall simulator applied a controlled, high-intensity event (1 L/min for 8 minutes, totalling 8 L) over three consecutive trials. Outflow was measured at 2-minute intervals to calculate total discharge and retention. Results demonstrated a clear positive relationship between vegetation complexity and hydrological performance. Mean total discharge decreased significantly from 7.88 ± 0.03 L for P1 to 7.46 ± 0.05 L for P2 and 7.08 ± 0.12 L for P3. Correspondingly, mean event retention increased from 0.12 L (1.5%) for the bare prototype to 0.54 L (6.75%) for the simple vegetation, and 0.92 L (11.5%) for the diverse vegetation system. These findings confirm that increased plant diversity substantially enhances retention capacity, with the most complex system retaining nearly eight times more water than the non-vegetated control. The study concludes that incorporating diverse vegetation is a critical and effective design strategy for improving the performance of rain gardens in tropical urban environments

Paper 62:
GROUND MOVEMENT CAUSED BY COUPLED HIGH HYDROSTATIC AND DYNAMIC PRESSURES FROM AQUIFER LAYER

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Abstract
An increase in pore-water pressure causes slope failure in residual soils. The main characteristic of residual soils is their heterogeneity, with a wide variety of grain-size distributions and an unlimited number of particles. Expansive residual soils with a few clayshale and expansive clay soil fractions that are easily weathered, in particular, have the potential for shrinkage and swelling due to changes in water content. In road or highway infrastructure, large-volume changes in swelling residual soils can lead to construction failures. The research aims to evaluate ground movement caused by coupled high hydrostatic and dynamic pressures in the aquifer layer. This study adopts an integrated hydrogeological and geotechnical approach to investigate ground movement induced by dynamic hydrostatic pressure within the aquifer system. Research results showed that a gradual increase in pore water pressure would exceed total stress, drastically reducing effective stress and creating an initial ground movement at the toe of the slope around the infrastructure area. A high dynamic of hydrostatic pressure from the aquifer due to an increase in water volume in the aquifer layer can push down soil layers with a safety factor (SF) < 1.0. Increased groundwater pressure from an aquifer layer is a primary trigger of landslides. At the same time, ground movement would generate cracks > 10 cm in width on the concrete road surface layer within two and/or three weeks, which would subsequently cause fatal damage, to the extent that the entire pavement system had to be removed, as well as the prediction analysis.

Paper 63:
HYDROLOGICAL ASSESSMENT AND DRAINAGE CHARACTERIZATION OF THE LOWLANDS CATCHMENT IN PARIT RAJA, JOHOR

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Abstract
Flooding is a persistent issue in Batu Pahat, Johor, particularly during the monsoon season in lowland areas like Parit Raja. This study aims to characterize the existing drainage system within a 14 km² catchment basin in Parit Raja. The research maps and analyzes the drainage network, focusing on critical areas prone to water stagnation caused by overflow and backwater effects, while assessing the system's overall effectiveness during heavy rainfall. The methodology integrates topographic data from the United States Geological Survey (USGS), infrastructure characteristics from the National Water Research Institute of Malaysia (NAHRIM) and the Department of Irrigation and Drainage (DID), and precipitation data from MET Malaysia. Additionally, field observations were conducted to gather primary hydraulic data, including river cross-sections, flow velocities, and invert levels. The findings detail the flow distribution within the area's earthen drainage systems, highlighting their susceptibility to structural changes from environmental and anthropogenic activities. Ultimately, by identifying the mechanisms behind water stagnation in low-lying zones, this study provides a foundation for recommending structural redesigns to enhance overall drainage efficiency.

Paper 64:
A SYSTEMATIC REVIEW OF CHALLENGES IN IMPLEMENTING EXTENDED PRODUCER RESPONSIBILITY (EPR) IN MALAYSIA

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Abstract
Extended Producer Responsibility (EPR) has emerged as an essential environmental policy instrument for transitioning from a linear waste management model to a circular economy. Despite global momentum, developing economies face distinct systemic hurdles in domesticating EPR frameworks. This study systematically identifies, categorizes, and synthesizes the structural, operational, financial, behavioural, and technological challenges impeding the effective implementation of mandatory EPR in Malaysia. In accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA 2020) guidelines, a systematic literature review was conducted using the Scopus and Web of Science (WoS) databases. Core publications from 2015 to 2026 were screened and analysed using thematic qualitative synthesis. A total of 28 core studies met the inclusion criteria. Five primary thematic barriers were identified: (1) Legal and Governance Challenges, driven by jurisdictional fragmentation under Act 672 and enforcement deficits; (2) Organizational and PRO Infrastructure Gaps, characterized by the absence of a centralized national Producer Responsibility Organization (PRO) and reliance on informal waste pickers; (3) Financial and Economic Barriers, notably high eco-design transition costs and disproportionate burdens on Small and Medium-sized Enterprises (SMEs); (4) Behavioural and Stakeholder Readiness, marked by low household waste segregation compliance; and (5) Technical and Data Granularity Limitations, including the lack of centralized post-consumer material inventories. Transitioning to a mandatory EPR scheme in Malaysia requires overcoming a "double burden" by simultaneously establishing physical reverse-logistics infrastructure while harmonizing state-federal regulatory policies. Key interventions must include establishing an independent national PRO, implementing eco-modulation fee structures, and deploying digital tracking systems.

Paper 65:
ADVANCING CONCRETE QUALITY CONTROL: THE ROLE OF MATURITY METHODS AND SENSOR TECHNOLOGIES

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Abstract
This study presents the establishment of the maturity-strength relationship for C25 grade concrete conducted by monitoring the concrete temperature using thermocouples and the MONSEC device, an IoT-based system. The Maturity Index (MI) is calculated from the recorded temperature using the Nurse-Saul function with various datum temperatures of -10°C, -5°C, and 0°C. The maturity-strength relationship is represented by a correlation curve that was then validated through experimental work. Traditionally, concrete strength was determined by standard compression tests. Several concrete cylinders were prepared and tested to validate the relationship. Findings indicate that real-time concrete strength measurement devices help in predicting the concrete strength and that the maturity-strength relationship developed from the maturity method closely predicts concrete strength with less than 10% difference. This further indicates that the maturity method offers significant predictions of real-time strength measurements demonstrating its high accuracy.

Paper 66:
A SOCIO-TECHNICAL ASSESSMENT OF URBAN FLOOD RESILIENCE IN JOHOR BAHRU

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Abstract
Urban flooding remains a persistent challenge in rapidly urbanising cities despite continuous investment in flood mitigation infrastructure. This study adopts a socio-technical approach to assess urban flood resilience in Johor Bahru by integrating residents' perceptions with engineering field assessments. A descriptive-correlational design was employed using a bilingual questionnaire completed by 372 residents, complemented by structured assessments at four flood-prone locations along the Sungai Skudai and Sungai Tebrau catchments. Data were analyzed using descriptive statistics, Spearman's rank correlation, Mann–Whitney U, and Kruskal–Wallis H tests in IBM SPSS Statistics Version 29. The results show that residents had high awareness of flood causes, particularly climate change and human activities, but only moderate household preparedness, especially in emergency planning and the use of flood warning systems. Drainage maintenance, public warning systems, and community participation scored relatively lower ratings, even though respondents generally viewed positively on flood mitigation infrastructure and government response. Correlation analysis showed positive relationships among preparedness, infrastructure perception, and government support, whereas flood risk perception exhibited comparatively weaker relationships with the other constructs. Field assessments supported the survey findings by identifying blocked drains, uncontrolled riverbank development, and limited warning facilities at most sites. The findings highlight that strengthening urban flood resilience requires engineering improvements to be supported by effective governance and active community participation.

Paper 67:
ENVIRONMENTAL SUSTAINABILITY DESIGN ON COMFORT LEVEL IN MALAYSIAN PUBLIC KINDERGARTENS

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Abstract
The comfort of kindergarten buildings is essential for fostering children's attachment to the learning environment. The public type of kindergarten building has a gap in the identification of comfort factors and faces issues such as poor ventilation, inefficient design, limited space, and lack of exposure to the outdoor environment. This study aimed to identify the current state of comfort-related issues in Malaysian public kindergartens. This study was conducted as a case study in a selected Community Development Department (KEMAS) kindergarten in Batu Pahat, Johor, Malaysia. The results were adopted using visual and tabulation analyses. Observations and measurements were conducted to identify issues across the four comfort factors: air and thermal, visual, space, and acoustic comfort. The results indicate that issues such as space utilization, aesthetics, and visual comfort are becoming major problems for most kindergartens. These aspects can negatively affect children's learning processes and their emotional and overall well-being. An environmentally sustainable design solution may serve as a model for enhancing the comfort of public kindergartens in Malaysia.

Paper 68:
ASSESSMENT OF WATER QUALITY AND POTENTIAL POLLUTION SOURCES IN AN ARTIFICIAL LAKE

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Abstract
With the surge in urbanisation and anthropogenic activities which influence surface water quality, water pollution has become a growing concern of the environment. Runoff from the roads, buildings, drainage, and landscaped areas surrounding Tasik Kemajuan, an artificial lake in Universiti Tun Hussein Onn Malaysia (UTHM), may enter the lake and drainage system and cause pollution. The purpose of this study was to evaluate the water quality and determine the potential point and non-point pollution sources in Tasik Kemajuan. Water samples were taken weekly for five weeks from 10 sampling sites in two monitoring zones. The six parameters measured were: pH, dissolved oxygen (DO), biochemical oxygen demand (BOD_5), chemical oxygen demand (COD), total suspended solids (TSS) and ammoniacal nitrogen (NH_3 – N), with standard in-situ and lab methods used. The measured values ranged from 5.2–6.7 for pH, 1.8–7.6 mg/L for DO, 2.5–55.4 mg/L for BOD_5, 5–116 mg/L for COD, 5–34 mg/L for TSS, and 0.3–3.5 mg/L for NH_3–N. Point sources identified in the field included drainage inlets and culvert discharges while NPS sources included runoff from roads, parking areas, and landscaped areas. The results suggest that stormwater is the predominant runoff source to contribute pollutants to Tasik Kemajuan and it is used as the baseline data for environmental monitoring, pollution control and sustainable use of water resources in the UTHM campus.

Paper 69:
URBAN MILITARY MORPHOLOGY BASED ON SPATIAL DEVELOPMENT OF MAGELANG CITY, INDONESIA

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Abstract
This study aims to understand the morphology of Magelang City by measuring changes in the area and the ratio of civilian and military built-up areas, and by identifying patterns of development and the persistence of military areas in the morphological transformation of Magelang City across periods. The study uses a quantitative-descriptive approach through spatial-temporal analysis of six observation periods, namely 1885, 1915, 1930, 1945, 2003, and 2025. Historical and contemporary maps were digitized using ArcMap based on Geographic Information System (GIS), then the built-up areas were classified into civilian and military areas to calculate the area, proportion, and ratio of both. A comparison of maps across periods was then used to understand the changes and persistence of spatial structures through historical and figure-ground morphological perspectives. The results show that the built-up area of Magelang City increased from 6.78 ha in 1885 to 668.70 ha in 2025. During the 1915–1945 period, civilian and military areas developed with a relatively stable composition, with the military area covering approximately 32–34% of the total built-up area with a ratio of approximately 1:2 to the civilian area. Entering the contemporary period, the civilian area expanded rapidly, while the area of the military area increased to 42.75 ha and then remained relatively stable, so that the proportion decreased to approximately 6-7% of the total built-up area. Nevertheless, the military area, which was the initial embryo of development in the central part of the city, remained and was strengthened by the presence of military areas in the north and south. This finding indicates the phenomenon of declining proportional dominance and spatial persistence, namely a condition where the proportion of the military area decreased due to the expansion of the civilian area, but its spatial structure and institutional function remained in the morphology of Magelang City. This study shows that the transformation of urban morphology is not only influenced by changes in the area of the built-up area, but also by the persistence of historical structures that shape the character of the city. These findings can inform understanding and managing sustainable urban development that still takes into account historically formed spatial structures.

Paper 70:
THERMAL SUITABILITY OF LANDFILL-MINED WASTE AND SCREENING-LEVEL PREDICTION OF INCINERATION EMISSIONS AT JATIBARANG LANDFILL

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Abstract
Legacy waste accumulated in the passive zones of Jatibarang Landfill creates a need for landfill-space recovery and potential energy recovery. This study evaluated the thermal characteristics of the separated combustible fraction and estimated screening-level emissions from its incineration. Excavated waste was dried, sieved, sorted into combustible, non-combustible, and soil-like fractions, and characterized for moisture, ash, elemental composition, and gross calorific value. A stoichiometric mass-balance model, supplemented by stated conversion assumptions and literature-derived emission factors, was used to estimate uncontrolled emissions at standard conditions and 11% O_2. The recovered sorted material comprised 75.63% combustible material, 14.90% non-combustible material, and 9.47% soil-like material. The combustible fraction contained 11.17% moisture and 9.54% ash, and its gross calorific value was 30.66 MJ kg^{-1}. Predicted concentrations of CO, SO_2, NO_x expressed as NO_2 equivalent, and total particulate matter were 999.16, 800.71, 2,795.32, and 1,193.55 mg Nm^{-3}, respectively, exceeding the Indonesian emission limits. The separated combustible fraction therefore showed preliminary thermal potential; however, representative sampling, replicated laboratory analysis, pilot combustion, and appropriate air-pollution-control systems are required before full-scale application or any claim of regulatory compliance.

Paper 71:
WATER INVENTORY DISCLOSURE IN INDONESIAN CORPORATE SUSTAINABILITY REPORTS: A COMPARATIVE ASSESSMENT OF SBTI-COMMITTED, GOLD PROPER, AND GREEN PROPER COMPANIES

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Abstract
Water disclosure in corporate sustainability reports has become increasingly important as freshwater scarcity intensifies globally, yet the quality and consistency of water inventory reporting remain highly variable across companies and governance frameworks. This study assesses and compares water withdrawal, discharge, and consumption disclosures across 12 Indonesian companies, four each from SBTi-committed, Gold PROPER, and Green PROPER categories, using the GRI 303 (Water and Effluents 2018) framework and a structured 14-point water disclosure scoring matrix for the 2021 and 2022 reporting periods. Results show that Gold PROPER companies achieved the highest mean water disclosure score (12.75 out of 14), followed by SBTi companies (11.75) and Green PROPER candidates (9.25). A Kruskal-Wallis test confirmed statistically significant differences across categories ($H(2) = 6.63$, $p = 0.036$), with Gold PROPER companies scoring significantly higher than Green PROPER companies ($p = 0.036$, $r = -0.938$). The study further identifies four reporting anomalies, including a case where discharge volumes exceeded withdrawal by up to 36 times and cases where water consumption exceeded total reported withdrawal. These anomalies suggest incomplete water source accounting and highlight the gap between environmental award recognition and GRI 303 reporting completeness in the Indonesian corporate context.

Paper 72:
EVALUATION OF MARSHALL PROPERTIES TO ENHANCE THE RESILIENT MODULUS OF ASPHALT MIXTURES CONTAINING ALTERNATIVE FILLERS

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Abstract
Insufficient high-quality mineral filler content severely reduces the stiffness of asphalt mixtures, leaving pavements vulnerable to premature deformation under heavy traffic and elevated temperatures. Consequently, this study investigates the effect of different mineral fillers on asphalt mixture stiffness performance. Marshall-compacted specimens were prepared using conventional bitumen 60/70 penetration grade combined with 2% by total mixture weight of four distinct fillers namely as quarry dust, ordinary Portland cement, conventional hydrated lime, and a newly developed pavement modifier. Following ASTM D4123 standards, the resilient modulus of each specimen was evaluated at 25°C and 40°C using a Universal Testing Machine. Results demonstrated that the novel pavement modifier significantly outperformed the traditional fillers. Specimens containing a new pavement modifier achieved a Marshall stability of 24,000 N, a bulk specific gravity of 2.30 g/cm³, and superior resilient modulus values of 6,129 MPa at 25°C and 1,380 MPa at 40°C, respectively compared to other filler types. Statistical analysis verified that the pavement modifier had a significant effect on mixture stiffness with $p < 0.05$, and revealed a statistically significant interaction between the filler type and testing temperature. Ultimately, the findings indicate that this newly developed pavement modifier strengthens the aggregate-bitumen interfacial bond, substantially enhancing the pavement's resistance to permanent deformation.

Paper 73:
INTEGRATED OF UAVS FOR ROAD PAVEMENT SURFACE ASSESSMENT

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Abstract
The degradation of road pavements influences both road safety and performance of road maintenance activities, whereas traditional methods of road inspection are time consuming, labour-intensive and endanger the life of road inspectors. This paper focuses on the application of Unmanned Aerial Vehicles (UAVs) for assessing pavement surface conditions using high-resolution imagery integrated with the Pavement Condition Index (PCI) methodology. This test was carried out on a 250 m stretch of the Jalan Parit Sempadan, Batu Pahat, Johor split into five sections of pavement. A total of 178 RGB images collected by UAVs were analyzed to generate orthomosaic images and Digital Surface Models (DSM), which were then used to identify, measure, and classify pavement distresses based on ASTM D6433 using Global Mapper. The values of PCI were also determined according to the type, severity, and extent of distress. The pavement condition assessment shows that all five sections are in very poor to failed condition, with PCI values ranging from 9 to 39. Sections 1 (PCI = 22) and 5 (PCI = 18) are classified as LOS F, indicating serious deterioration that requires reconstruction, while Section 2 (PCI = 9) is in a failed condition and requires immediate reconstruction due to severe cracking, potholes, rutting, and edge failures. Sections 3 (PCI = 28) and 4 (PCI = 39) fall under LOS E, representing very poor conditions where major rehabilitation is needed to prevent further deterioration. Overall, the results confirm significant pavement distress across all sections, and the UAV-based inspection effectively provided reliable data to support maintenance and rehabilitation decision-making.

Paper 74:
RESIDUAL PERFORMANCE OF RC BEAMS SUBJECTED TO COMBINED FATIGUE LOADING AND LOCALIZED CORROSION: AN EXPERIMENTAL INVESTIGATION WITH 10% METAKAOLIN

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Abstract
The combined effects of reinforcement corrosion and fatigue loading accelerate the deterioration of reinforced concrete (RC) beams, reducing their residual structural capacity and service life. This study experimentally investigated the residual flexural behavior of RC beams subjected to combined fatigue loading and localized reinforcement corrosion, considering conventional concrete and concrete incorporating 10% metakaolin (MK). Two reference specimens from a previous static study were used to establish the fatigue loading limits, while four additional beams were tested under four-point bending fatigue loading with a target of 2,000,000 cycles. Structural performance was evaluated in terms of fatigue life, stiffness degradation, mid-span deflection, residual load-carrying capacity, and failure mechanisms. Localized corrosion significantly accelerated fatigue deterioration, resulting in earlier fatigue failure, greater stiffness degradation, larger deflections, and lower residual load-carrying capacity. The combined effects of corrosion and fatigue reduced the residual load capacity by 50.99% in Group I and 54.31% in Group II. Although the MK-modified beams exhibited stable post-fatigue structural behavior, the independent effect of MK on fatigue performance could not be conclusively established because different fatigue loading regimes were adopted. These findings provide valuable experimental data for assessing the residual performance of corroded RC structures under cyclic loading.

Paper 75:
A CONCEPTUAL FRAMEWORK FOR EVALUATING BUILDING ENVELOPE STRATEGIES FOR ENERGY EFFICIENCY IN MOSQUE BUILDINGS IN HOT-HUMID CLIMATES: THE CASE OF KELANTAN, MALAYSIA

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Abstract
The building envelope of Malaysian mosques (walls, roof, fenestration, and shading) accounts for an estimated 90% of cooling load in these skin-load-dominated buildings, yet no structured framework exists to guide its evaluation in hot-humid climates. This paper proposes the Tropical Mosque Envelope Assessment Framework, a three-layer conceptual model anchored to Kelantan, Malaysia, that integrates envelope typology classification, locally benchmarked thermal performance parameters (MS1525:2019, ASHRAE 90.1/55), and a five-step simulation-based evaluation protocol. The framework consolidates fragmented evidence on mosque envelope performance into a coherent gap argument, proposes the first typology-grounded evaluation model for mosque envelopes in hot-humid climates, and defines a falsifiable simulation protocol for empirical validation. It is the conceptual foundation of an ongoing doctoral research programme; immediate next steps are a Kelantan field survey, EnergyPlus baseline model construction, and parametric simulation.

Paper 76:
EXPERIMENTAL INVESTIGATION OF THE FLEXURAL PERFORMANCE OF DUAL-LAYER REINFORCED CONCRETE BEAMS WITH DIFFERENT INTERFACE TREATMENTS

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Abstract
Reinforced concrete (RC) beams are typically designed for monolithic casting; however, construction constraints or unforeseen delays often necessitate staged concreting. This staged casting introduces a horizontal construction joint that may compromise the beam's structural performance. This study investigates the influence of different interface bonding treatments at horizontal construction joints on the flexural behavior of dual-layer RC beams. Three-beam specimens were fabricated and subjected to three-point bending tests until failure: a monolithic control beam, a dual-layer beam with a cement slurry interface, and a dual-layer beam with a mechanically roughened interface. The experimental results demonstrated that all dual-layer beams achieved ultimate load capacities comparable to those of the monolithic control beam, failing predominantly in flexure, without interface debonding or horizontal splitting along the joint. However, the beam with the roughened interface exhibited lower ductility, indicating that while mechanical roughening provides sufficient shear transfer to reach peak capacity, it restricts post-yield deformation and energy dissipation capacity compared to a slurry-bonded or monolithic joint. Consequently, utilizing a cement slurry interface treatment is recommended for staged-cast RC beams to maintain both load-bearing capacity and structural ductility. Additionally, an analytical study demonstrated results that were in very close agreement with the experimental test results.

Paper 77:
PREDICTING ENERGY INFRASTRUCTURE PROJECT OUTCOMES USING MACHINE LEARNING: A SECTORAL STUDY

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Abstract
Energy infrastructure projects have significant failure and cost-overrun risks, extremely long lifecycles, and are extremely capital-intensive. While the majority of machine learning (ML) studies in infrastructure outcomes have analysed outcomes across sectors, they have not identified energy-specific factors. The objective of this study is to predict the success or failure of energy infrastructure projects. Seven supervised ML classifiers (k-Nearest Neighbour, Support Vector Machine, Bagged Trees, Random Forest, Extreme Learning Machine, Deep Neural Network, and Extreme Gradient Boosting (XGBoost)) are developed and evaluated with an Energy-sector subsample of the World Bank's Private Participation in Infrastructure (PPI) dataset for the period 1900-2023. In the full historical sample, XGBoost obtains the lowest classification loss for Energy (0.01553), and in the case of the contemporary sample (2000 to 2023) the best performer is Random Forest (0.09317). The results of the feature importance analysis suggest that, besides technology choice, investment timing, contract period and macro-institutional conditions also play an important role in the project outcome. These findings offer engineers, financiers, and policymakers a data-driven, sector-specific decision-support tool for de-risking energy infrastructure investment in support of climate-resilient, sustainable development.

Paper 81:
PREDICTION OF FLOOD PEAK DISCHARGES IN THE TRIMOMUKTI WATERSHED, SOUTH LAMPUNG, INDONESIA

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Abstract
Flood peak prediction is essential in lowland agricultural catchments because uncontrolled inundation can disrupt drainage, prolong submergence of paddy fields and increase the probability of crop damage or harvest failure. This study estimates the potential flood peak discharges for the Trimomukti Watershed, South Lampung, Indonesia, using a 2015–2024 daily rainfall dataset from four rainfall station. Spatial rainfall was calculated using Thiessen polygon weighting. Three probability distribution models including Log-Normal, Log-Pearson Type III, and Gumbel Type I were evaluated. The Gumbel model was retained as the preferred parsimonious distribution among the three models, while all models showed small Kolmogorov Smirnov distances. Gumbel design rainfall for return periods of 5, 10, 25, 50, and 100 years is 105.26 mm, 119.74 mm, 138.03 mm, 151.60 mm and 165.08 mm, respectively. Short-duration intensities were derived using the Mononobe equation and distributed temporally using the Alternating Block Method. Flood hydrographs were then generated with the Nakayasu Synthetic Unit Hydrograph. The predicted peak discharges are 556.05 m³/s, 632.54 m³/s, 729.19 m³/s, 800.88 m³/s and 872.05 m³/s for the 5-, 10-, 25-, 50-, and 100-year events, respectively, with the simulated peaks occurring at approximately 4 h. These estimates provide a hydrological basis for evaluating drainage and flood control capacity in the paddy-dominated Trimomukti area.

Paper 83:
ARTIFICIAL NEURAL NETWORK FOR WATER QUALITY INDEX PREDICTION IN AN ARTIFICIAL URBAN LAKE

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Abstract
Water quality deterioration in lakes is increasingly driven by eutrophication, nutrient loading, wastewater discharge, and other anthropogenic activities that alter the physical, chemical, and biological characteristics of water. This study aimed to develop an Artificial Neural Network (ANN) model for predicting the Water Quality Index (WQI) of Tasik Kemajuan, an artificial lake at Universiti Tun Hussein Onn Malaysia (UTHM). The model was developed using 52 weekly secondary water quality observations collected over a one-year monitoring period. Twelve water quality parameters were used as input variables for ANN modelling. The mean WQI was 71.30, classifying the lake as slightly polluted. The developed ANN model demonstrated strong predictive performance with a correlation coefficient (R) of 0.923 and a coefficient of determination (R^2) of 0.852. Model validation produced MSE and RMSE values of 0.145 and 0.381 for the training dataset, and 0.048 and 0.219 for the testing dataset, indicating high prediction accuracy and good model generalisation. Variable importance analysis identified ammoniacal nitrogen (AN) as the most influential predictor of WQI. The findings demonstrate that the developed ANN model provides a reliable approach for WQI prediction and offers practical support for sustainable water quality monitoring and management of artificial lakes.

Paper 84:
DESIGN OF A RAINWATER HARVESTING SYSTEM (RWH) AS A BUILDING COOLING ELEMENT

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Abstract
Malaysia has a hot and humid equatorial climate with an average annual rainfall of 2,000-4,000 mm, which can be utilized as an alternative water source in sustainable water management. This study aims to propose a design for a Rainwater Harvesting (RWH) system as a building cooling element for the Rumah Masak of Universiti Tun Hussein Onn Malaysia (UTHM) Mosque, which faces high indoor temperatures up to 35.7°C and dependence on the treated water supply. The objective of the study is to propose an effective Rainwater Harvesting (RWH) design as a building cooling element for the Rumah Masak of Universiti Tun Hussein Onn Malaysia (UTHM) Mosque. A qualitative approach was employed, using interviews with two engineers from the UTHM Development and Maintenance Office, supplemented by field studies measuring roof area and slope. The system design was developed in SketchUp based on user requirements, and official rainfall distribution data from the Malaysian Meteorological Department were used to support the design. The findings show that the proposed RWH design is practical, cost-effective, and suitable to serve as a building cooling element for the Rumah Masak of the UTHM Mosque. Overall, this study demonstrates that the proposed RWH system has the potential to enhance building thermal comfort and support sustainable water management.

Paper 86:
EFFECT OF SAND ADDITION ON SOIL COMPACTION AND P-WAVE VELOCITY OF KAOLIN–SAND MIXTURES

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Abstract
Assessment of geotechnical compaction during layered filling is essential for quality control in earthwork construction. The seismic reflection method, through the measurement of P-wave velocity, offers a promising non-destructive approach for evaluating soil compaction. This study investigated the influence of sand content on the seismic response of kaolin–sand mixtures. The objectives were to determine the physical properties of the mixtures and to evaluate the relationship between soil compaction and P-wave velocity. Dewesoft-X software, together with a SIRIUS mini portable four-channel vibration meter, was used to acquire P-wave data, while IEPE accelerometer sensors were positioned at 50 mm intervals from the source to ensure accurate wave propagation measurements. Two kaolin–sand mixtures, K100S0 and K60S40, were prepared and tested using the Standard Proctor test and seismic reflection method. The results showed that the maximum dry density increased from 1315 kg/m³ for K100S0 to 1437 kg/m³ for K60S40, while the optimum moisture content decreased from 20% to 15% with the addition of sand, indicating improved particle packing and reduced water retention. A clear relationship was observed between dry density and P-wave velocity. P-wave velocity increased with increasing moisture content up to the optimum condition, followed by a decrease beyond the optimum moisture content. The measured P-wave velocities ranged from 515 m/s, to 700 m/s, reflecting variations in soil density and moisture condition. These findings demonstrate the sensitivity of P-wave velocity to changes in soil compaction and moisture content and highlight its potential as a non-destructive indicator for compaction assessment under controlled laboratory conditions.

Paper 88:
ASSESSMENT OF RAINWATER HARVESTING SYSTEM (RWHS) PERFORMANCE FROM A SMALL CATCHMENT ROOF

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Abstract
Rainwater harvesting system (RWHS) has emerged as a sustainable solution for reducing dependence on treated water supplies while improving stormwater management in urban environments. RWHS have shown to potentially benefit the environment and societies; through the water storage system for potable and non-potable uses. RWHS could also benefits the urban drainage by providing sustainable reduction by slowing down the urban surface runoff rates. This study explores the understanding on characteristics of flow, volume and storage of a RWHS that was built from a small roof of the Faculty of Civil Engineering & Built Environment (FKAAB), UTHM; then to analyze the quantity and quality of the water collection and the system's contribution on the water saving issues within the faculty. MSMA 2nd Edition and NAHRIM Technical Guides are the referred guidelines used for this basic RWHS design and operation. Daily rainfall data was manually collected i) on-site from basic manual rain-gauge; and ii) from the monitored real-time reading of the official website of Public Infobanjir. The cumulative daily runoff data from the RWHS tank was also collected. Results showed that a 181 mm of total 30 days rainfall had generated an estimated of runoff volume at 245 L. The system achieved a Water Saving Efficiency (WSE) of 80.3% with utility cost saving at estimated of RM5.16 during the monitoring period, indicating a substantial reduction in reliance on municipal water supply. Overall, the findings demonstrate that the RWHS may effectively contributes to water conservation and stormwater management, with supporting sustainable campus development and green infrastructure implementation within UTHM.

Paper 89:
CHARACTERIZATION OF MICROPLASTICS IN COMMERCIAL BOTTLED DRINKING WATER: PHYSICOCHEMICAL PROPERTIES AND OCCURRENCE IN MALAYSIA

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Abstract
Microplastic contamination in bottled drinking water has become an emerging environmental and public health concern due to its widespread occurrence and potential risks. However, information regarding the physicochemical characteristics of microplastics in commercial bottled drinking water in Malaysia remains limited. This study aimed to determine the occurrence and characterize the physicochemical properties of microplastics through morphological, elemental, and polymer analyses. Ten bottled drinking water samples were collected from retail stores in Malaysia. Microplastic particles were extracted using vacuum filtration and identified using light microscopy. Further characterization was conducted using Scanning Electron Microscopy coupled with Energy-Dispersive X-ray Spectroscopy (SEM-EDX) for surface morphology and elemental composition, while Fourier Transform Infrared Spectroscopy (FTIR) was used for polymer identification. Water quality parameters, including pH, turbidity, total suspended solids (TSS), and colour, were also analysed. The results confirmed the presence of microcontaminants in all samples, with fibres and fragments identified as the dominant particle types. FTIR analysis detected polyethylene terephthalate (PET), suggesting bottle packaging as a potential contamination source. This study provides baseline information on microplastic occurrence and physicochemical characteristics in commercial bottled drinking water in Malaysia, supporting future monitoring and risk assessment efforts.

Paper 90:
RESPONSE-DEPENDENT EFFECTS OF RICE HUSK ASH, EGGSHELL POWDER AND USED COFFEE GROUNDS IN BACILLUS TEQUILENSIS BIO-CONCRETE MORTAR: COMPRESSIVE STRENGTH AND ABRASION LOSS

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Abstract
This study aims to compare the response-dependent effects of three waste-derived additives — rice husk ash (RHA), eggshell powder (ESP) and used coffee grounds (UCG) — combined with Bacillus tequilensis, on two performance criteria of bio-concrete mortar, namely 28-day compressive strength and Los Angeles abrasion loss, which have previously been evaluated separately but rarely compared as two responses of the same additive system. The scope of the study was limited to two independently conducted 13-run Response Surface Methodology (RSM) programmes developed in Minitab-18 with non-identical factor levels, in which RHA, ESP and UCG replacement levels and B. tequilensis concentration were varied and analysed using RSM-based ANOVA at α = 0.05 to identify statistically significant main and interaction effects, supported by SEM/EDX microstructural observations. UCG was the only main effect statistically significant in both models, associated with lower compressive strength ($p = 0.001$) and greater abrasion loss ($p = 0.016$). ESP was non-significant for compressive strength ($p = 0.943$) but significant for abrasion loss ($p = 0.016$), while the RHA×B. tequilensis interaction was significant for abrasion loss ($p = 0.029$) but not compressive strength ($p = 0.726$). The highest observed compressive strength was 35.6 MPa, 31.4% above the control mean, although the compressive-strength model showed limited predictive capability (predicted $R^2 = 37.10\%$). Overall, these findings indicate that the statistical importance of waste-derived additives in bio-concrete mortar is response-dependent rather than uniformly transferable between structural and abrasion-related performance, and that UCG dosage represents the most consistent formulation constraint identified across the two measured responses.

Paper 91:
GOVERNANCE FRAMEWORKS FOR SUSTAINABLE OPERATIONAL INITIATIVES IN INFRASTRUCTURE-BASED ORGANIZATIONS

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Abstract
Infrastructure-based organizations, particularly in emerging economies, face increasing pressure to integrate Sustainable Operational Initiatives (SOIs) into routine operations due to their environmental impacts and long asset lifecycles. However, the governance mechanisms that translate strategic sustainability commitments into operational readiness and successful implementation remain fragmented and insufficiently adapted to asset-intensive organizations. This study employs a systematic literature review guided by the PRISMA framework, synthesizing 47 peer-reviewed articles published between 2010 and 2024. The synthesis identifies four interrelated governance mechanisms: leadership commitment, strategic oversight, accountability mechanisms, and stakeholder engagement and positions operational readiness as a critical mechanism linking governance intentions to SOI implementation. Operational readiness is conceptualized across three domains: energy management, waste and materials management, and sustainable procurement. Drawing on Institutional Theory, Stakeholder Theory, the Resource-Based View (RBV), the Natural-Resource-Based View (NRBV), the Triple Bottom Line (TBL), and Circular Economy (CE), the paper proposes an integrated conceptual framework in which governance mechanisms are hypothesized to influence SOI implementation success through domain-specific operational readiness. These relationships are further conditioned by regulatory and policy pressures, resource availability, and digital maturity, while a Plan–Do–Check–Act (PDCA) feedback loop supports continuous governance review and organizational learning. A sequential explanatory mixed-methods design is also outlined for future empirical validation. The proposed framework provides a context-sensitive foundation for translating sustainability governance into systematic, scalable, and measurable operational practices within infrastructure-based organizations.

Paper 92:
BARRIERS TO EFFECTIVE ISO 9001 IMPLEMENTATION AMONG MALAYSIAN CONSTRUCTION CONTRACTORS

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Abstract
ISO 9001:2015 provides a structured framework for establishing and maintaining a quality management system (QMS). However, certification does not necessarily ensure that its requirements are effectively implemented in construction practices. This study uses certified contractors in Johor to investigate the barriers to the effective implementation of ISO 9001:2015 by construction contractors in Malaysia. This study adopts the questionnaire survey method. A total of 127 responses from ISO 9001:2015 implementation-related construction professionals from 12 certified contractors in Johor were collected in the quantitative survey. The study used the five-point Likert scale to assess 19 barriers and analyzed them using the average index (AI) and the relative importance index (RII). The results show that barriers are common, with an overall average index of 3.70. The biggest barrier is the cost of maintaining ISO 9001 certification (AI = 4.01; RII = 0.802), followed by the limited allocation of funds for quality management activities (AI = 3.92; RII = 0.784), project workload and departmental coordination (AI = 3.87; RII = 0.773), the difficulty of applying ISO 9001 requirements to on-site operations (AI = 3.84; RII = 0.769) and time-consuming document preparation requirements (AI = 3.80; RII = 0.761). The research shows so many interrelated factors such as money, operations, people, paperwork and stakeholders make it difficult to successfully implement ISO 9001. The research highlights that these challenges need to be addressed in routine construction operations, instead of treating ISO 9001 as a certification requirement in itself.

Paper 93:
CORRELATION BETWEEN COMPRESSIVE AND SPLITTING TENSILE STRENGTH OF CONCRETE CONTAINING BAMBOO CULM ASH AS PARTIAL CEMENT REPLACEMENT

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Abstract
The growing use of Ordinary Portland Cement (OPC) in concrete production has raised concerns about carbon dioxide emissions, the consumption of natural resources, and the environmental impacts associated with cement manufacturing. One possible approach to addressing these concerns is the use of agricultural and industrial waste as supplementary cementitious materials to partially replace cement. In this study, the relationship between compressive strength and splitting tensile strength was investigated for concrete containing bamboo culm ash (BCAsh) as a partial replacement for OPC. The BCAsh was produced from Bambusa vulgaris culm waste through controlled combustion at 700 °C for 6 hours, followed by drying and grinding to obtain the required fineness. Five concrete mixtures were prepared with 0%, 5%, 10%, 15%, and 20% BCAsh replacement, designated as C100, C95BCA5, C90BCA10, C85BCA15, and C80BCA20, respectively. Compressive strength was evaluated using 100 mm × 100 mm × 100 mm cube specimens, while splitting tensile strength was determined using 100 mm × 200 mm cylindrical specimens after 28 days of curing. The experimental results were analysed using linear regression to examine the relationship between the two mechanical properties. The results showed a gradual reduction in both compressive and splitting tensile strength with increasing BCAsh content. The control mixture recorded the highest compressive strength of 29.49 MPa and splitting tensile strength of 3.421 MPa, while the 5% BCAsh mixture achieved 29.00 MPa and 3.206 MPa, respectively. A strong positive linear relationship was obtained between compressive strength and splitting tensile strength, with a coefficient of determination R^2 of 0.9653. This indicates that the two mechanical properties followed a similar trend as the BCAsh replacement level increased. Among the mixtures investigated, the 5% BCAsh replacement provided strength performance closest to that of the control concrete, indicating its potential for use as a partial cement replacement in more sustainable concrete production.

Paper 94:
FROM INFORMATION MANAGEMENT TO RESOURCE EFFICIENCY: BIM-ENABLED PROJECT DELIVERY FOR SUSTAINABLE CONSTRUCTION

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Abstract
Building information modelling (BIM) is increasingly associated with sustainable construction, but its contribution is often examined through environmental performance indicators such as energy consumption, carbon emissions, and material impacts. Less attention has been given to the role of BIM-enabled information management in supporting process sustainability and resource-efficient project delivery, particularly in infrastructure projects in developing countries. This study examines the proposed implementation of BIM in a provincial road upgrading project in Vietnam to identify the mechanisms through which BIM-enabled project delivery can contribute to sustainable construction. A single-case study approach was adopted using project documentation, BIM implementation arrangements, and a survey of 20 project participants. The survey indicated a generally favourable but uneven level of BIM readiness: 70% of respondents had received BIM training, 60% had previous BIM project experience, and 90% considered the available BIM tools and software to be adequate or provisionally adequate. The findings identify five interconnected mechanisms: structured information governance and responsibility allocation, common data environment (CDE)-enabled coordination and traceability, model-based prevention of avoidable errors, BIM-supported quantity, schedule and cost control, and information continuity across project stages. These mechanisms establish organisational and information-management conditions through which rework, information loss, duplicated effort and inefficient resource use may be reduced, rather than demonstrating direct environmental improvements. The resulting framework positions information and coordination quality and process-waste avoidance as intermediate mechanisms linking BIM-enabled information management with resource-efficient project delivery.

Paper 95:
PRELIMINARY MECHANICAL EVALUATION OF CONSTRUCTION WASTE MODIFIED PAVING BLOCKS IN LAMPUNG PROVINCE

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Abstract
Construction waste can provide a secondary mineral fraction for precast concrete products, but its use requires careful interpretation when complete mix-design records are unavailable. This study presents a preliminary mechanical evaluation of T-shaped paving blocks produced in Lampung Province, Indonesia using processed construction waste. Residual concrete, brick/masonry and mortar were manually crushed and screened, and construction waste was used as a partial aggregate replacement at approximately 15–20% by mass. The blocks were compacted manually, subjected to periodic water curing for 7 days, and tested in compression at 28 days following ASTM C140/C140M procedure. Ten modified specimens were loaded over a plan area of 30,000 mm². Compressive strength ranged from 3.9 to 11.4 MPa, with a mean of 6.02 MPa, a standard deviation of 2.52 MPa and a coefficient of variation of 41.9%. The mean remains below the 10 MPa average compressive strength level associated with the lowest SNI 03-0691-1996 paving block class. Because the complete batch proportions, water-cement ratio, full recycled aggregate gradation, density and water absorption were not retained, the findings are limited to preliminary characterization rather than mix optimization or conformity assessment. Controlled mixture design and durability testing are required in subsequent work.

Paper 96:
PRELIMINARY FIELD INVESTIGATION OF IRRIGATION CHANNEL CONDITIONS IN TRIMOMUKTI VILLAGE, SOUTH LAMPUNG, INDONESIA

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Abstract
Irrigation and drainage channels are important for maintaining water levels in lowland paddy areas. In Trimomukti Village, South Lampung, the network is required to remove excess water during the rainy season while also supporting water distribution during the dry season. This study investigated the physical and functional condition of the irrigation and drainage network using field walkthroughs, direct visual observation, photographic documentation, and discussions with local farmer groups and agricultural officers. The assessment followed the condition index framework specified in Indonesian irrigation operation and maintenance guidelines, covering the wet channel section, berm, embankment, and hydraulic structures. Two critical locations were examined. At Location 1, sedimentation was observed in tertiary channels and the Bumi Asri secondary drainage channel, together with upstream inflow from Way Panji, and approximately 100 ha of agricultural land were reported to be inundated for a minimum of one week. Sediment accumulation of approximately 20–30 cm was observed at inspected tertiary channel points. Location 2 was more critical, with approximately 200 ha reported to be inundated for a minimum of one week near the junction of the Bumi Asri secondary drainage channel and Way Buha primary drainage channel. The main observed problems were sedimentation, embankment subsidence, water hyacinth, damaged hydraulic structures, and absence of water control gates. These conditions indicate reduced channel functionality and inadequate water regulation under the adopted condition assessment framework. The findings support prioritizing connected desilting, vegetation removal, embankment rehabilitation, repair of hydraulic structures, and installation of control gates. The study is limited to field-based condition assessment and does not quantify hydraulic capacity because systematic cross sectional, discharge, and elevation measurements were not undertaken.

Paper 97:
PERFORMANCE EVALUATION OF SUBMERSIBLE PUMPS FOR AERATION AND DISSOLVED OXYGEN TRANSFER IN SHALLOW STAGNANT WATER BODIES

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Abstract
Stagnant water bodies in tropical regions are highly susceptible to DO depletion due to limited circulation, thermal stratification, and high biological oxygen demand. This study experimentally evaluates the performance of three miniature submersible fountain pumps, Sobo WP-3100 [3.0 W], WP-3200 [5.0 W] and WP-3300 [12.0 W]), in improving DO concentration and managing related water quality parameters in stagnant water. A controlled laboratory investigation was conducted over eight weeks using four tanks (one control and three treatments) with weekly monitoring of DO, temperature, pH, and turbidity. The findings reveal that the primary benefit of small-scale submersible pumps in shallow water is not the localized enhancement of dissolved oxygen, as passive atmospheric diffusion was sufficient to maintain near-saturation levels, but rather the significant control of water turbidity and prevention of particulate accumulation. The 5.0 W model (WP-3200) emerged as the most optimal configuration, offering a practical balance between visual water clarity improvement and moderate energy consumption.

Paper 98:
COMPARATIVE ANALYSIS OF DISSOLVED OXYGEN ENHANCEMENT IN WATER: A BIOLOGICAL AND MECHANICAL APPROACH

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Abstract
DO plays a pivotal role in maintaining water quality and ensuring the sustainability of aquatic ecosystems. Low DO levels, particularly in stagnant or poorly circulated water bodies, can precipitate severe ecological degradation and hypoxia-induced stress on aquatic life. Consequently, establishing effective, sustainable, and scalable methods to replenish dissolved oxygen is critical for environmental engineering and water resource management. This paper presents a comprehensive comparative analysis evaluating the efficacy of natural biological processes versus artificial mechanical methods in enhancing dissolved oxygen concentrations. Three distinct experimental conditions were systematically investigated, i.e. a control sample (without plant or pump); a biologically active sample containing submerged aquatic macrophytes of Vallisneria asiatica, Cabomba furcata, and Egeria densa; and a mechanically aerated sample utilizing an electrical aeration system. DO concentration, temperature, pH and turbidity were continuously monitored over 9 weeks using DO meter and multiparameter probe under controlled laboratory conditions. Biological treatment has shown DO enhancement of up to 75.4% while mechanical system with 44.1% increased. This study contributes robust empirical data applicable to aquaculture, sustainable water treatment, and broader environmental quality management initiatives

Paper 99:
A MOBILE-BASED NEAR-MISS INCIDENT REPORTING APPLICATION FOR PROACTIVE SAFETY MANAGEMENT: A DESIGN SCIENCE AND SCENARIO-BASED EVALUATION

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Abstract
Near-miss incident are commonly acknowledged as significant precursors to catastrophic occupational accidents, particularly in construction-related settings. However, near-miss occurrences are commonly underreported due to procedural complexities, delayed reporting mechanisms, and restricted accessibility in standard reporting systems. This paper describes the design and analysis of a mobile-based Near-Miss Incident Reporting Application aimed at promoting proactive safety management. The project adopts a Design Science Research (DSR) methodology, with an emphasis on the production of a digital reporting artifact and its assessment using a scenario-based simulation framework. Instead of using post-deployment operational data, the evaluation is based on experimentally reported ranges from established construction safety and near-miss reporting literature. Reporting frequency, response timeliness, and system usability are the key performance factors examined in this study. Analytical findings show that mobile-based reporting systems can potentially minimize reporting obstacles, increase reporting frequency, and improve response efficiency by utilizing real-time communication and simplified user interactions. Methodologically, this work demonstrates the feasibility of scenario-based simulation as a rigorous and ethical evaluation technique for digital safety artifacts in the absence of real-world deployment data. This study yields a practical digital artifact and an analytical assessment methodology to optimize technology- enabled proactive safety management in construction-related contexts.

Paper 100:
EVALUATION OF REBAR CORROSION MORPHOLOGY IN REINFORCED CONCRETE USING TRANSPARENT SHEET MAPPING TECHNIQUES IN CONTROLLED ENVIRONMENT

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Abstract
Corrosion in reinforced concrete structures poses a significant challenge to their long-term durability and safety, necessitating reliable methods to quantifydeterioration patterns under varying environmental conditions. To address this, the present study aims to assess the effectiveness and reliability of manual assessment techniques in evaluating rebar corrosion influenced by chloride content and distinct exposure conditions. An experimental laboratory study was conducted on four reinforced concrete prisms—two mixed with sodium chloride (NaCl) and two chloride-free—cast under controlled temperatures. To evaluate the extent of deterioration, specimens were crushed to expose the reinforcement bars for detailed visual inspection, and the corroded areas were mapped by tracing them onto transparent sheets before being analysed using ImageJ software to calculate the exact percentage of corrosion. Results indicated that chloride concentration is the primary catalyst for corrosion initiation; the highest level of corrosion occurred in the chloride-added sample exposed to dry conditions, which promoted aggressive localized corrosion. In contrast, wet/dry exposure cycles led to a more uniform but slower corrosion progression, while the chloride-free specimen kept in dry conditions exhibited zero corrosion. Ultimately, the transparent sheet mapping technique combined with ImageJ software proved effective for identifying and quantifying corroded areas, providing valuable insights into environmental deterioration patterns and advancing structural assessment practices to ensure the long-term resilience of reinforced concrete infrastructure.