RCCE 2021 SDGs
IN HIGHER EDUCATION INSTITUTIONS

PROCEEDINGS OF RCCE & SDGs 2021

Regional Conference in Civil Engineering & Sustainable Development Goals in Higher Education Institutions 2021

REGIONAL CONFERENCE IN CIVIL ENGINEERING

AND SUSTAINABLE DEVELOPMENT GOALS

(RCCE & SDGs 2021)

22-23 January 2022

Universiti Teknologi Malaysia (UTM)

Regional collaboration in civil engineering education to accelerate delivery of the SDGs

REGIONAL CONFERENCE IN CIVIL ENGINEERING & SUSTAINABLE DEVELOPMENT GOALS IN HIGHER EDUCATION INSTITUTIONS 2021 (RCCE & SDGs 2021)

First Edition 2022

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WELCOMING SPEECH

**Prof. Datuk Ts. Dr.
Ahmad Fauzi Ismail**
The Vice Chancellor
Universiti Teknologi Malaysia

First and foremost, I would like to congratulate and thank the ASEAN University Network/Southeast Asia Engineering Education Development Network (AUN/SEED-Net), organize by School of Civil Engineering, Faculty of Engineering for providing the seed fund for this conference. Besides, that I would like to extend the gratitude to both the International Scientific Committee and the Technical Committee of the RCCE&SDGs Conference for their initiatives, relentless effort and commitment in making this virtual conference a success.

I am privileged and honoured to be here, again as the 2nd achievement of this conference to officiate the opening of this conference in my capacity as the Vice Chancellor of Universiti Teknologi Malaysia (UTM). Being on the 2nd Regional Conference, I believed the success of online virtual platform has successfully serves as a strategic platform to combine the transformation of Sustainable Development Goals (SDG) implementation for Higher Education Institutions (HEIs) as been highlighted by United Nations in the year of 2030. This year the aspiration continues with the targeting on creating the quadruple helix besides emphasis on in-demand of Industrial 4.0 skills and knowledge in digital and digitization in current academic practices. Besides that, this conference is aiming to support the national agenda of 2050, providing privilege which highlights four (4) key points mainly creating the value added in SDG's on new technology, able to expand the knowledge transfer among regional issues besides catering the living lab among universities and stakeholders, expand the networking through the conjunction of MySUN Conference and strengthen the networking among Alumni of AUN/SEED-Net community. With the involvement of networking across the regional and ASEAN mainly from China, Thailand, Philippine, Vietnam, Malaysia, Gaza, Cambodia, Myanmar, Laos, Bangladesh, Japan, Korea, Indonesia, Singapore, I hope this conference able to connect and expand the networking besides looking in the key points of SDG's for higher education for current practices.

I believe that all of you will leave this conference with having learned something new, be it in your field or other fields. I would like to convey my sincere gratitude to the conference committee, the generous sponsors, the cooperative host management and most importantly to you, our beloved participants for contributing to the success of this Conference. I wish, ladies and gentlemen, all the participants here today can actively continue to participate in contributing ideas, comments, views and suggestions which will certainly be beneficial for the good of our shared nation. Our hope is that all these ideas can be transformed into reality in solving all problems associated with sustainability of our environment. I once again congratulate all the people involved in making this conference a success especially the organizing committee for their hard work and perseverance in running this conference.

WELCOMING SPEECH

**Prof. Dr.
Norhazilan Md Noor**
Chair
School of Civil Engineering
Faculty of Engineering
Universiti Teknologi Malaysia

Assalamualaikum and welcome to the Second Regional Conference in Civil Engineering and Sustainable Development Goals (RCCE & SDGs 2021) in the theme of "Regional Collaboration in Civil Engineering Education in Accelerating Delivery for SDG's". As we know this conference is aiming to support the national agenda of 2050, providing privilege which highlights four (4) key points mainly creating the value added in SDG's on new technology, able to expand the knowledge transfer among regional issues besides catering the living lab among universities and stakeholders, expand the networking through the conjunction of MySUN Conference and strengthen the networking among Alumni of AUN/SEED-Net community.

This conference able to drives social, economic and human development that underpins our knowledge prior to the societies and infrastructures. As an academia this virtual platform has successfully serves as a strategic platform to combine the transformation of Sustainable Development Goals (SDG) implementation for Higher Education Institutions (HEIs) has been highlighted by United Nations in the year of 2030. Besides being an engineer, this conference opens up an innovation platform and indeed the rise and fall of the civilizations especially in the move continues with the targeting on creating the quadruple helix besides emphasis on in-demand of Industrial 4.0 skills and knowledge in digital and digitization in current academic practices.

This year promises to be equally stimulating, by having the involvement of networking across the regional and ASEAN mainly from China, Thailand, Philippine, Vietnam, Malaysia, Gaza, Cambodia, Myanmar, Laos, Bangladesh, Japan, Korea, Indonesia, Singapore, I hope this conference able to connect and expand the networking besides looking in the key points of SDG's for higher education for current practices.

I hope during your time at the conference that you take the opportunity to engage with your peers to discuss your ideas for research and practice and that you ask questions of the presenters. There will be plenty of opportunities for collaboration. We will all benefit from our combined participation at this conference.

Thank you.

FOREWORD

**Prof. Ir. Ts. Dr.
Mohd Fadil Md Din
Conference Chair
UTM Campus Sustainability
Universiti Teknologi Malaysia**

First and foremost, welcome to all speakers, delegates and participants who are joining our 2nd RCCE in 2021. The 2nd AUNSEED.Net Regional Conference for SDGs is a previous platform for Alumni and regional members in ASEAN to share the most updated technology and research of common issues, including the recent development of state-of-the-art in the trans-discipline research area. This program is also providing opportunities for participants to discuss future collaborations and activities related to engineering, social science and humanities that will be relevant to the Sustainability Development Goals (SDGs). With the new incoming partner from EU, this conference will benefit beyond the horizon of opportunity. Each keynote and invited speakers will expand their knowledge to induce the implementation of SDGs element, as well as for the other participants. Moreover, it aims at maximizing the outreach of the existing AUN/SEED-Net Network for stronger impacts by involving external participants such as representatives from the government, industry, community and other professional organizations.

The Regional Conference is the strategy to combine the transformation of SDGs implementation in HEIs based on the requirement of United Nation for the year 2030 and supporting the specific agenda in "The World in 2050" (TWI 2050). Previous conference in 2021, the strategy in enhancing SDGs across the field reached to the various industrial and non-governmental sectors. This aspiration is the global research and fact-based knowledge in transforming the indicated SDGs in a better way. Therefore, all the keynotes/invited/guest speakers will be explaining their roles and contribution to the society, with SDGs related to R&D, innovation, technology, knowledge-transfer and industrial experiences. Most of the issue and challenges will be connecting to the environmental application as to strengthen the interaction work between HEIs, Industry, Government and Community. The Conference will also be having parallel session on academia, networking among Alumni and several members from ASEAN countries. Moreover, MySUN member from Malaysia and EU will join as the part of co-existence network among the established AUN/SEED-Net platform and enlarge the membership between HEIs and external stakeholders.

Do activate yourself and wishes the best in our networking platform.

PLENARY SPEAKER 1
Prof. Dr. Norhazilan Md Noor
Chairman
School of Civil Engineering, Faculty of Engineering
Universiti Teknologi Malaysia, Malaysia

He is currently serving as a Professor at the School of Civil Engineering, Universiti Teknologi Malaysia. He served as the Principal of student residential college and Academic manager of postgraduate (research) from 2011 to 2015. He currently serves as the Chair of School of Civil Engineering. His primary interest includes the development of soil-corrosion model for tropical region, probabilistic-based reliability assessment software for pipeline integrity management, risk assessment approach for deteriorating infrastructure, non-physical inhibitor for mitigating microbial-influenced corrosion and new material for pipeline repair. He is currently the Editor-in-Chief of Malaysian Journal of Civil Engineering and ASEAN Engineering Journal. Dr Norhazilan Md Noor has already published more than 200 articles, journals and conference proceedings with several best publications awards. He has considerable experience in global networking and world university ranking exercise. He has also been privileged to participate in the ASEAN University Network (AUN/SEED-net) networking as a member of working group and field management meeting since 2012 and several Erasmus+ project funded by European Union. He pro-actively involves in MOU initiatives between UTM and global research partner in ASEAN, Japan and Korea. He is the recipient of Special Award for Innovation in 2013 by the Malaysian Construction Industry Excellence Award Committee. He has gathered more than 30 major awards locally and internationally for his contribution in research, teaching and administration.

KEYNOTE SPEAKER 1
Associate Professor Dr. Daisuke Komori
Associate Professor, Tohoku University, Japan

Associate Professor Daisuke Komori is currently Associate Professor in Department of Civil Engineering and Graduate School of Environmental Studies, Tohoku University, Japan. Affiliated members of Science Council and Young Academy of Japan. Board members on "Promoting Observation and Monitoring of Climate Change Impacts" Ministry of the Environment; Countermeasures against Woody debris in Reservoirs" and "Urban Flooding Countermeasures in Light of Climate Change" Ministry of Land, Infrastructure, Transport and Tourism, and so on. I have been researching the phenomenon that human activities modify the water cycle and environment and affect human life as environmental problems and natural disasters, from regional by global scales. I have also conducted interdisciplinary research on the mechanisms of local environmental problems while clarifying the reality of local communities based on the field survey in mainly Japan and Asia.

KEYNOTE SPEAKER 2
Prof. Kazuei Ishii
Professor, Hokkaido University, Japan

Kazuei Ishii is professor in Laboratory of Sound Material Cycle Systems in Faculty of Engineering, Hokkaido University, since 2018. His research topics is focus on research on soil and groundwater contamination and remediation: (1) Numerical simulation of contaminants transport and fate in groundwater: (2) Development of biological treatment method (bioreactor or in-situ bioremediation): (3) Nitrate groundwater pollution by daily farms. He is also interested in research on final disposal system of municipal solid waste: (1) Method of promotion to stabilization of landfilled waste: (2) Numerical modeling for washing pollutants from waste layer. But and not least his research interest also focus on development of biomass utilization systems such as biogas and biosolid fuels.

CONFERENCE AGENDA
DAY 1 (22 JAN 2022, SATURDAY)
Cisco Webex Meeting for Opening Session

TIME (GMT+8)	AGENDA		
8.30 am - 9.00 am	Conference Registration (Day 1)		
9.00 am - 9.15 am	Opening Ceremony by UTM By Professor Datuk Ts. Dr. Ahmad Fauzi Ismail (Vice Chancellor of UTM)		
9.15 am - 9.25 am	AUN/SEED-Net promotional session By Ms. Tonghathai Likhitweerawong		
9.25 am - 9.30 am	Welcoming remarks from AUN/SEED-Net By Prof. Emeritus Dr. Ueda Tamon		
9.30 am - 10.00 am	Plenary Speaker 1 (Civil): Prof. Dr. Norhazilan (UTM, Malaysia)		
10.00 am - 10.45 am	Refreshment		
10.45 am - 11.15 am	Keynote Speaker 1 (Civil): Assoc. Prof. Dr. Daisuke KOMORI (Tohoku University, Japan)		
11.15 am - 11.35 am	Invited Speaker 1 Dr. Phanthoudeth Pongpanya (Laos) *Theme: Geotechnical Engineering*	Invited Speaker 2 Assoc Prof. Dr. Nur Sabahiah Abdul Sukor (USM, Malaysia) *Theme: Transportation Engineering & Geotechnical Engineering*	Invited Speaker3 Lt Col Ir. Dr. Vikneswaran A/L Munikanan (UPNM, Malaysia) *Theme: Green and Sustainable Construction*
11.35 am - 12.55 pm	Parallel Session 1 (Room 1)	Parallel Session 1 (Room 2)	Parallel Session 1 (Room 3)
12.55 pm - 1.30 pm	Session 1 Q&A (Room 1)	Session 1 Q&A (Room 2)	Session 1 Q&A (Room 3)
1.30 pm - 2.30 pm	Lunch Break		
2.30 pm - 3.30 pm	Poster Presentation 1		
3.30 pm - 3.50 pm	Invited Speaker 4 Mr. Hiroshi Kokubu (Daisyo Corporation, Japan) *Theme: Architecture and Built Environment & Construction Project Management and Safety*	Invited Speaker 5 Assoc. Prof. Ts. Dr. Aeslina Binti Abdul Kadir (UTHM, Malaysia) *Theme: Environmental Engineering*	Invited Speaker 6 Dr. Trinh Quoc Dung (HUST, Vietnam) *Theme: SDGs in Engineering and Science*
3.50 pm - 5.00 pm	Parallel Session 2 (Room 1)	Parallel Session 2 (Room 2)	Parallel Session 2 (Room 3)
5.00 pm - 5.30 pm	Session 2 Q&A (Room 1)	Session 2 Q&A (Room 2)	Session 2 Q&A (Room 3)
5.30 pm	Tea time and End		

DAY 1 (22 JAN 2022, SATURDAY)

TIME	ROOM 1		ROOM 2		ROOM 3	
SESSION 1 **11.35 am -** **12.55 pm**	*Theme 1:* *Geotechnical Engineering* Chairperson: Ts. Dr. Norhidayah Abdul Hassan		*Theme 2:* *Highway and* *Transportation Engineering* *& Geology* Chairperson: Assoc. Prof. Ir. Dr. Sitti Asmah Binti Hassan		*Theme 5:* *Green and Sustainable* *Construction* Chairperson: Prof. Ts. Ir. Dr. Mohd Fadhil Md Din	
	ID20 ID33 ID42 ID46 ID63 ID96 ID92	My - Chinh Do – Thi Joenel Galupino Thet Htet Ye Htun Kunpeng Yu Mary Ann Adajar Nur Syahirah Syuhadah Zakaria Muhamad Nurfirdaus Sapawie	ID07 ID62 ID91 ID87 ID06 ID45 ID32	Hasanain Radhi Radeef Mohammad Jawed Roshan Ismail Hasim Rafiuddin Hakim Roslan Jeyasri A/P Packirysamy Donzala David SOME Shannen Teo Sin-Chze	ID35 ID73 ID93 ID77 ID17 ID98 ID100	Emad Ameen A Alharbi Cheryl Lyne C. Roxas Muhammad Zulkhairin Anwar Zainudin Shamzani Affendy Mohd Din Arjun Kumar Segar Muizzuddin Marzuki Eeydzah Aminudin
SESSION 2 **3.50 pm -** **5.00 pm**	*Theme 4:* *Architecture and Built* *Environment* *& Construction Project* *Management and Safety* Chairperson: Assoc. Prof. Dr. Kriengsak Panuwatwanich		*Theme 3:* *Environmental Engineering* Chairperson: Dr. Mohd Armi Bin Abu Samah		*Theme 6:* *SDGs in Engineering and* *Science* Chairperson: Assoc. Prof. Dr. Umi Aisah Bt Asli	
	ID18 ID36 ID50 ID59 ID64 ID52 ID31	Arjun Kumar Segar Ahmed Ali Ahmed Mohamed Mariawati Ali Vuthea MIN Kamoli Adetunji Alghamdi, Khalid Ahmed M Muhammad Qusyairi Zahar	ID21 ID58 ID47 ID51 ID56 ID88 ID83	May Phoo Ngyon Phetyasone Xaypanya Amyrhul Abu Bakar Nur Aqeela Syuhadah Aji Mazni Mat Zin Mohd Aznor Lamat Michael Angelo Promentilla	ID02 ID23 ID30 ID48 ID89 ID101	Wai Yan Soe Zuhaili Idham Nurfarhain Mohamed Rusli Mohammed Baqer Zaki Yahya Al-Quraishi Faridahanim Ahmad Eeydzah Aminudin

*Presentation Session: *Please refer to specific tentative for details*

CONFERENCE AGENDA
DAY 2 (23 JAN 2022, SUNDAY)
Cisco Webex Meeting for Opening Session

TIME (GMT+8)	AGENDA		
8.30 am - 9.00 am	Conference Registration (Day 2)		
9.00 am - 9.30 am	Keynote Speaker 2 (SDGs): Prof. Dr. Kazuei Ishii (Hokkaido University, Japan)		
9.30 am - 10.30 am	Poster Presentation 2		
10.30 am -10.50 am	<u>Invited Speaker 7</u> **Assoc. Prof. Ts. Dr. Shahrul Ismail (UMT, Malaysia)** *Theme: Environmental Engineering & Water Resources*	<u>Invited Speaker 8</u> **Scl. Dpl. Glenn Banaguas (DLSU, Philippine)** *Theme: Climate Change*	<u>Invited Speaker 9</u> **Assoc. Prof. Dr. Norhisham Bin Bakhary (UTM, Malaysia)** *Theme: Structures and Construction Engineering*
10.50 am - 12.00 pm	**Parallel Session 3 (Room 1)**	**Parallel Session 3 (Room 2)**	**Parallel Session 3 (Room 3)**
12.15 pm - 12.30 pm	**Session 3 Q&A (Room 1)**	**Session 3 Q&A (Room 2)**	**Session 3 Q&A (Room 3)**
12.30 pm - 1.15 pm	Networking Session		
1.15 pm - 2.00 pm	Lunch Break		
2.00 pm - 2.20 pm	<u>Invited Speaker 10</u> **Ms. Khadijah Madihi (Asia Family First, Singapore)** *Theme: SDGs in Engineering and Science*	<u>Invited Speaker 11</u> **Ts. Dr. Mohd Zamri bin Ramli (UTM, Malaysia)** *Theme: Disaster and Risk Engineering*	<u>Invited Speaker 12</u> **Assoc. Prof. Dr. Abdul Rahman Mohd Sam (UTM, Malaysia)** *Theme: Materials for Civil Engineering & Innovation*
2.20 pm - 3.30 pm	**Parallel Session 4 (Room 1)**	**Parallel Session 4 (Room 2)**	**Parallel Session 4 (Room 3)**
3.30 pm - 3.45 pm	**Session 4 Q&A (Room 1)**	**Session 4 Q&A (Room 2)**	**Session 4 Q&A (Room 3)**
3.45 pm - 4.30 pm	Poster Presentation 3		
4.30 pm - 5.30 pm	Award & Closing Ceremony By Prof. Ts. Ir. Dr. Mohd Fadhil Md Din (Director of UTM Campus Sustainability, UTM)		
5.30 pm	Teatime and End		

DAY 2 (23 JAN 2022, SUNDAY)

TIME	ROOM 1	ROOM 2	ROOM 3
SESSION 1 11.35 am - 12.55 pm	*Theme 3:* *Environmetal Engineering &* *Water Resources* **Chairperson:** **Ts. Dr. Kogila Vani Annammala**	*Theme 11:* *Climate Change* **Chairperson:** **Ts. Dr.** **Eeydzah Aminuddin**	*Theme 10:* *Structures and* *Construction Engineering* **Chairperson:** **Asst. Prof. Dr. Watanachai** **Smittakorn**

	ID38 Yongjun Wang
	ID40 Zhang Hemeng
	ID09 Zulfaqar Sa'adi
	ID10 Abdul Mazli Hafiz Abdul Malik
	ID57 Mohd Khairul Idlan
	        Muhammad
	ID80 Sergi S. Garbanzos
	ID81 Jay Manzano Navaluna
		ID72 Siti Norhuda Abdullah
		ID71 Nurul Nazleatul Najiha
		        Mohd Nazif
		ID69 Taishi Yazawa
		ID74 Fadzlin Md Sairan
		ID84 Adamu Musa Eya
		ID86 Adamu Musa Eya
			ID03 Khun Aye Han Kyu
			ID11 Thanh-Canh Huynh
			ID13 Yan Win Aung
			ID22 Duc-Duy Ho
			ID55 Azhar Ahmad
			ID68 Ngoc Lan Pham

SESSION 2 3.50 pm - 5.00 pm	*Theme 8:* *SDGs in Management and* *Social Science* **Chairperson:** **Dr. Shazwin Mat Taib**	*Theme 9:* *Disaster and Risk* *Engineering* **Chairperson:** **Dr. Nor Eliza Alias**	*Theme 7:* *SDGs in Engineering and* *Science* **Chairperson:** **Assoc. Prof. Dr. Umi Aisah** **Bt Asli**
	ID67 Vo Thanh Hung ID44 Nazlee Siddiqui ID08 Wesam Al Madhoun ID29 Monika EA ID94 Suzila Mohd	ID70 Dustine Louise V. Pancho ID79 Joseph Burhan ID01 Yusrin Faiz Abd Wahab ID95 Rasnavi Paramasivam ID97 Fara Aiza Md Sanin ID66 Alvin Kurniawan Santoso ID65 Fatin Munirah Mohd@Mohammad	ID37 Adithep Bunphot ID41 Ugen Tashi Lhamo ID76 Fadzli Irwan Bahrudin ID16 Arjun Kumar Segar ID34 Falmata Audu Mustapha ID99 Idlan Maszeri

*Presentation Session: *Please refer to specific tentative for details*

Presentation
Plenary Speaker 1
Prof. Dr. Norhazilan Md Noor
Universiti Teknologi Malaysia

Satellite Internet Constellation Technology: How It Will Change Construction and Infrastructure Management Forever

Abstract: Interplanetary spaceflight designed with the ultimate goal to colonize Mars has sped up radically the revolution of internet technology. The invention of a much cheaper way to send rockets into space has brought a new idea of satellite internet constellation technology. A satellite internet constellation is a constellation of artificial satellites providing satellite internet service as opposed to grounded cable internet network. A constellation of satellites capable of beaming internet from the sky will improve drastically high-speed internet penetration with superb low-latency network especially in rural areas. The construction industry can take advantage of this technology to embed IoT more aggressively in the current technology related to construction and infrastructure management. Future infrastructure development should be greener, low carbon footprint, longer service life, autonomous in nature and require minimal resources for maintenance. Most of these criteria can only be achieved with a high-data rate at low latency of internet technology. Autonomous construction, remote monitoring, connected construction site, real-time transfer of data, wireless sensor and cloud technology are among future components that can make the construction industry more sustainable. Look to the skies because the future is there.

Keynote Speaker 1
Associate Professor Dr. Daisuke Komori
Tohoku University

Trade-offs Between Urban Flood Resilience and Urbanization in Asia

Abstract: Inland water flooding is one of the typical urban floods, and its risk is expected to increase in urban areas in the future (IPCC, 2014). There are similarities in urban environments in monsoon Asia, (1) Water disasters are always suffering by typhoons and heavy rains, (2) Urbanization and mega-cities are developed at lowland areas (mainly paddy fields) along the river, where has difficulties for discharging water inundation. Therefore, this study was elucidated the transition mechanisms of occurrence of inland water flooding attributable to urbanization at seven cities in Japan each having a different urban scale. The "frequent inland water flooding areas" were extracted using the past 20 years inland water flooding records during 1993 and 2012. The average population in the target duration in each city was used as an indicator of the urban scale. The number of years of inland water flooding in the target duration divided by the target duration, 20 years, was used as the inland water flooding risk index. The ratio of daily maximum hourly rainfall larger than 30 mm/h in the target duration was defined as an index of meteorological factors. An index of topographical factors was calculated using a two-dimensional unsteady flow model. An index of urban factors was calculated by an inverse analytical manner using the inland water flooding risk index and other factors. The results of this study were as follows: 1) The risk of inland water flooding increases as the urban scale increases and decreases with further increases of urban scale. 2) There is a negative correlation between the urban scale and topographical factors on the occurrence of inland water flooding. 3) Urban factors on the occurrence of inland water flooding were minor in small- and large-scale cities, and significant in medium-scale cities.

Keywords: Inland water flooding; Urban scale; Rainfall intensity; Inundation model; Vulnerability; Socio-hydrology

Keynote Speaker 2
Prof. Kazuei Ishii
Hokkaido University

Waste and Biomass to Energy toward Biomass Community Planning

Abstract: Reduction of greenhouse gases (GHG) has been required toward zero carbon society (net zero) in the world. Renewable energy (RE) should be promoted to reduce use of fossil fuel, such as oils, coal, and natural gas. Waste and Biomass to Energy is one of promising activities for promoting RE as well as establishing sustainable material cycle in each region.

(1) Current situation on society and environment in Japan: We are facing population reduction and aging society and in particular significant decrease in rural area that have financial difficulty to continue proper waste management.

(2) Circular economy: Cyclic use of waste, such as manure, food waste, sewage sludge, and wood biomass, in each region should be promoted to increase resource productivity (= production / resource consumption), to reduce money to flow out of the region, and to increase eco-efficiency (= production / environmental impacts).

(3) Biogas plants (Anaerobic digestion): Biogas plants contributes to enhance circular economy described above. In Japan, the number of biogas plant treating cow manure increased because of feed-in-tariff (FIT). Although the utilization of food waste for anaerobic digestion is not popular because most of municipal solid waste, including food waste, is incinerated. I will present the cases of biogas plants for food waste in Japan: Fukagawa city, Takikawa city, Sunagawa city, and Kitahiroshima city in Japan. In addition, the manure to hydrogen project in Shikaoi town will be presented.

(4) Wood biomass power plants: I will show the latest case introducing a technology for wood biomass to energy: gasification in Shimokawa town.

Keywords: GHG reduction; Waste; Biomass; Anaerobic digestion

Invited Speaker 1
Dr. Phanthoudeth Pongpanya
Freelance (AUN/SEED-Net Alumni)

Stability Analysis and Support Design of Main Roadway in Underground Coal Mine

*Phanthoudeth Pongpanya[1], Takashi Sasaoka[2], and Hideki Shimada[2]

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Abstract: This paper focuses on the stability analysis and support design of the main roadway prior to longwall mining at the deeper depth at GDM underground coal mine in Indonesia. The stability of the main roadway at the GDM coal mine under various depths and stress ratios is studied by means of numerical simulations. According to the results of a series of numerical simulations, the stability of the main roadway decreases by increasing the depth and stress ratio. Ground control problems such as falling roof, sidewall collapse, and floor heave can be expected unless an appropriate support system is provided. Three support systems, i.e. friction rockbolt, steel arch (SS540), and shotcrete, are discussed as methods to stabilize the roof and sidewalls of the main roadway. The steel arch is considered to be the most effective support system comparing with other systems. The steel arch meets the qualifications of stability control. The steel arch with closer space and larger size of cross section provides a better stability condition to the roof and sidewalls of the main roadway. Although the stability of roof and sidewalls of the main roadway can be controlled by steel arch support, the occurrence of floor heave can be expected according to the increase of mining depth. Therefore, two techniques using cablebolt and invert-arch floor are selected and discussed in order to control the floor heave. Heaving of the floor is controlled effectively after the cablebolt and invert-arch floor are employed. However, controlling the floor heave by cablebolt support may be the most appropriate technique in GDM coal mine compared with other methods in terms of installation process, providing a flat and safe working condition of floor, and economy. In addition, the cablebolt with closer row space and longer length works more effectively to control the floor heave.

Keywords: Main roadway stability; Support design; FLAC3D; Weak rock

Invited Speaker 2
Assoc. Prof. Dr. Nur Sabahiah Abdul Sukor
Universiti Sains Malaysia (USM)

The Effect of Behavioural Intervention Techniques in Encouraging Low Carbon Mobility Among Adolescents

*Nur Sabahiah Abdul Sukor[1]

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Abstract: In order to achieve the status of a sustainable city, the municipalities need to encourage the residents to use sustainable transportation, especially public transport, cycling, and walking. These exposures and encouragement need to be focused on the young generation to become accustomed to a more sustainable way of travel. The objective of this study was to examine the determinants that influence the intention to change to more sustainable transport while traveling to school among the school students in Penang city. Data were gathered through the survey of 176 school students living in Penang Island before and after an intervention program. These data were analysed using the PLS-SEM by considering the expanded version of the theory of planned behaviour (TPB), which contains psychological variables such as attitude, subjective norm, perceived behaviour control, awareness towards the environment, and moral obligation. The results indicate that negative awareness, moral obligation, and subjective norm are significant predictors of the intention to change mode before the intervention. Meanwhile, positive awareness, moral obligation, perceived behaviour control, and subjective norm are significant predictors of the intention to change the mode after the intervention.

Keywords: Travel to School; Adolescents; Urban Transportation; Theory of Planned Behavior

Invited Speaker 3
Lt. Col. Ir. Dr. Vikneswaran Munikanan

**Department of Civil Engineering, Faculty of Engineering
Universiti Pertahanan Nasional Malaysia, Malaysia**

Sustainable Neighbourhood Profile of Malaysia

*Vikneswaran Munikanan[1], Rozana Zakaria[2], and Noraziah Wahi[3]

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Abstract: Sustainable Development Goals (SDGs) is being debated as an important measure due to degradation of global environment and the consent for our future generation. To enable the environment being protected, a preventive measure must be implemented as soon as possible. But less attention is being paid to the type of nature close to where people live and work, to small-scale green areas in neighbourhood and to their benefits to people. In Malaysia the land use pattern for neighbourhood development needs to be protected from being overused and devastated due to minimal option of sustainable neighbourhood planning and designs guidelines. Focus need to be given to this type of development especially on small-scale green areas in neighbourhoods. The main concern of this paper is to give more emphasis to the sustainable neighbourhood elements in Malaysia as it gives much impact to the living environment of a group of community. The issues pertaining sustainable neighbourhood planning and design in Malaysia were discussed. To assist planners and stakeholders involved in the planning process, Sustainable Neighbourhood Elements can be the main contributions based on the current need which urban designers can manipulate. This is to make the planning process more transparent and explicit, and potentially making planning and design process more efficient.

Keywords: Sustainable Development Goals; Sustainable neighbourhood; Sustainable neighbourhood elements

Invited Speaker 4
Mr. Hiroshi Kokubu
Daisyo Corporation Tokyo

Important and Noteworthy Technical Content of Slope Cut Work in Highway Construction Project

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Abstract: Technical content empirically obtained in construction management of highway construction project is introduced. Highway construction work consists of mainly earth works, paving works, and bridge works, but the important and noteworthy technical content of slope cut works are shown concretely. Although all the pavement works and bridge works were completed as planned in the process, the completion was significantly delayed due to the collapse of the cut slope beside highway. The geology of the target cut slope, the collapse structure, the characteristics of the collapse, etc. were summarized by conducting a continuous field survey every day. By grasping the changing of the slope and the progress of the collapse on a daily basis, it is possible to concretely formulate the characteristics of the collapse and the countermeasures. Through this work, it was understood that detailed and continuous investigations along construction process, and the evaluation method for slope stability are very important, based on the geological technics. In addition, it is desirable that engineers who are deeply familiar with geology and engineers who are familiar with sabo technics also participate in the design and construction stages of road construction project.

Keywords: Geological characteristics; Muddy limestone; Slope collapse structure

Invited Speaker 5
Assoc. Prof. Ts. Dr. Aeslina Abdul Kadir
Universiti Tun Hussein Onn (UTHM)

Solid Waste Management

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Abstract: Solid waste management is recognized as one of the most challenging issues confronted by both the developed and developing countries. The problems rise due to rapid urbanization and industrialization, population growth and lifestyles. Malaysia is generating an immense amount of municipal solid waste (MSW) where 33,130 tonnes were recorded per day, with an average of 1.17 kg/capita/day. The tonnes of solid waste generated mostly come from food waste with the highest waste generated of 44.5% of the total volume of waste generated every day. There are three most common method used for MSW management in Malaysia. The main method is landfilling, which represents approximately 81.5% of the usage followed by recycling (17.5%) and only 1% is composting. Currently, Malaysia's recycling rate in 2019 is 28.1% surpassing the national recycling rate of 22% in 2020 as set by the Ministry of Housing and Local Government. Although the total recycling rate in Malaysia has been increasing yearly, it is worth noting that the recycling rate in Malaysia is still in a critical state as compared to other developed countries with best practices in the Asia region, such as South Korea and Singapore, which recorded recycling rate of 53.7% and 52.0%, respectively. These issues arising from improper solid waste management, insufficient and inefficient waste collection, lack of recycling or treatment facilities, and uncontrolled open dumping of wastes. The annual MSW generation rate in Malaysian is projected to increase by 3.3%, leading to an increase in GHGs, especially methane gas, resulting from the degradation of organic waste within landfills. Besides GHG, leachates, especially from dumpsites, giving rise to major surface and groundwater contamination. According to Malaysia's Third Biennial Update Report, the second-largest contributor of waste sector emissions is methane gas from solid waste disposal sites, accounting for an average of 31.2% emissions throughout the time series period. On average, the increase in the emissions from solid waste disposal sites was 4.6%. Despite this alarming situation, Malaysia still relies on landfilling as the main method for waste disposal compared to other selected countries that have been adopting other practices such as recycling, composting and incinerating processes. Therefore, an extensive adoption of solid waste management and recycling initiatives to reduce the environmental impact from the increased waste generation and disposal should be implemented. Although several issues and challenges may hinder, by executing a holistic approach and sustaining a strategic action plan could eventually lead to sustainable solid waste management.

Invited Speaker 6
Dr. Trinh Quoc Dung
Hanoi University of Science and Technology (HUST)

The Role of Refrigeration Towards Sustainable Energy and Environment

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Abstract: The refrigeration sector - including air conditioning - consumes about 20% of the overall electricity used worldwide. Electricity consumption for refrigeration and air conditioning has been increasing for many years in both developed and developing countries. This 20% share highlights the importance of the refrigeration sector, which is expected to grow further in the coming years because of (i) increasing refrigeration demand in numerous sectors, and (ii) global warming. The energy issue is a major challenge for the future. Fossil fuels resources are limited, so their exploitation has to be monitored closely. Many countries still do not have access to a sufficient level of energy, allowing to improve their quality of life and development. The important role of refrigeration technologies to the environmental aspect of sustainable development must be addressed due to the high global GHG emissions (i.e. 4.14 Gt CO_2 eq.). Therefore, a more reasonable use of energy and the development of new technologies to produce energy are necessary. Consequently, some promising alternatives related to use renewable energy and improve energy efficiency have been shown in the presentation.

Keywords: Refrigeration; Air conditioning; Energy efficiency; Renewable energy

Invited Speaker 7
Ts. Dr. Shahrul Ismail
Faculty of Ocean Engineering Technology and Informatics
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Application of Anaerobic Ammonium Oxidation (ANAMMOX) Process Technology for Sustainable Aquaculture Wastewater Treatment

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Abstract: Treatment of wastewater, especially aquaculture wastewater containing high concentrations of ammonia and nitrate, would improve the sustainable development of aquaculture and reduce its impact on the environment. The anaerobic ammonium oxidation (anammox) process is a novel solution to address this aquaculture wastewater problem. This paper provides an overview of the anammox process in the treatment of aquaculture wastewater, its impact on the marine ecosystem, and the control of ammonia and nitrogen in aquaculture. It also highlights the important role of anammox bacteria in the development of aquaculture treatment systems. Although the anammox process has been shown to be feasible for the treatment of aquaculture wastewater, the efficiency of nitrogen removal could be further improved by proper management of anammox bacteria, operating conditions, and microbial diversity.

Keywords: Anammox; Aquaculture wastewater; Ammonia; Nitrogen removal; Microbial

Invited Speaker 8
Glenn Banaguas
EU-Asia Expert Panel for Climate Diplomacy and Environmental Security

The Implementation Challenges of Climate Diplomacy in Asia

Sci. Dpl. Glenn Banaguas

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Abstract: Climate diplomacy plays an imperative role in the implementation of climate smart and disaster resilience in Asia. It provides elucidations in reducing disaster risks and preventing potential damage and losses through scientific wide-ranging assessment, capacity development, project management, and multilateral cooperation among stakeholders. It is an avenue for all the actors to understand, plan, develop and implement not only the best science and evidence-based strategic solutions but also the most humane and gender-responsive schemes in the most diplomatic way. It is also a stratagem designed to bring out the best in every individual to solve the most pressing conundrum regardless of culture, gender, and nationality. And it is also a bridge that influences and impacts public policy, which deals with matters of fretfulness, peevishness, and sensitivity. However, despite the significance of climate diplomacy in the region, recurring issues and threats still occur in the areas of policy and governance, science communication, monitoring and evaluation systems, and resource mobilizations.

Keywords: Climate diplomacy; Disaster resilience; Asia

Invited Speaker 9
Assoc. Prof. Dr. Norhisham Bakhary
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Uncertainties Handling for Damage Detection Using Vibration Data

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Abstract: Damage detection using vibration data is proven by many studies to be efficient in detecting damage in structures. Time domain data, Frequency-based data and modal data are always used as the parameters to detect the existence of damage. However, the existence of unavoidable uncertainties such as modelling error and measurement error may lead to false results. Modelling error is from inaccurate baseline model (finite element model) and nonlinearity effect that makes the model unable to represent exactly the actual structure. On the other hand, the measured data is also affected by systematic error and environmental factors. Therefore, the true information that submerged within those errors limits the efficiency of vibration-based damage detection in practice. This presentation highlighted three types of methods to consider the existence of damage in vibration data. The methods are statistical method, non-statistical method, and artificial intelligence method. For purpose of demonstration, several types of structures are used and the relationship between the vibration data and damage information are established using Artificial Neural Network. Through these methods, it is proven that by considering the existence of uncertainties appropriately, the vibration-based damage detection method can be used as an efficient method for damage detection.

Keywords: Damage detection; Vibration data; Artificial Neural Network

Invited Speaker 10
Khadijah Madihi
Founder Asia Family First

Refugee Rights (R2) - A Reflective Approach Towards Inclusivity to Reduce Inequalities

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Abstract: Human rights serve our existential being in having the freedom of choice, access to basic needs and opportunity to aspire for a better life. There are universal rights inherent to us all, regardless of gender, race, religious beliefs, or economic status with a common understanding that "when every individual is self-sufficient, the entire world prospers". Yet, that very fundamental right has been denied to many, in particular refugee and internally displaced populations, one of the long-standing challenges to our collective ideal and global goal in reducing inequalities (SDG10). Latest figures indicate there are 20.4 million refugees under UNHCR's mandate (plus 5.6 million Palestinian refugees under UNRWA's mandate) and 45.7 million internally displaced persons with an addition of 79.5 million forcibly displaced persons. Not including 272 million migrants and more than 1 billion migrants living away from home/within their own country. An estimate of nearly 20% of the world population. It is a multi-dimensional and global problem which cannot be simply disregarded nor turn a deaf ear to where the calls to assist these vulnerable groups have been quite deafening within the world community. Requiring a comprehensive, multifaceted and multi sectoral perspective in recognizing the wide range of factors as causes for the denial of the basic i.e., refugee rights. Delving into the established mechanisms, international treaties, and legislations to address the matter seem inadequate if we still fail to acknowledge that these rights are inalienable. We need to begin first by re-examining our own lenses in viewing the very individuals who are "living in exile" not by choice, unpacking some of the existing myths or narratives and re-framing platforms for mutual co-existence to build a better future together.

Keywords: Refugee rights; SDG10; Reduce inequalities; Reflective approach

Invited Speaker 11
Ts. Dr. Mohd Zamri Ramli

School of Civil Engineering, Faculty of Engineering
Universiti Teknologi Malaysia (UTM)

Implications of Seismic Requirements on Structural Design in Malaysia

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Abstract: Eurocode (EN) 1998 introduce the capability to design structures under earthquake will replacing the traditional standard with no earthquake design called British Standard (BS). In order to successfully implement Eurocodes 1998 in Malaysia, great efforts have to be undertaken by all stakes holders and industry players including governments agencies, researchers, consulting engineers, contractors and laboratory testers. The adoption of the Malaysia national Annex to the Eurocode 1998 which was developed and endorsed by Standard Malaysia at the end of year 2017 soar the understanding of structural design for earthquakes in Malaysia. This paper sets out the basic parameters necessary in designing structures under seismic. It also discusses the impact on reinforced concrete design requirements and applications to precast concrete for example. The cost study of reinforced concrete design is also applied in the study of this paper. The reference ground acceleration (a_{gr}), building importance factor ($\square$), soil factor (s), regional response spectra and behaviour factor (q) are important parameters in structural design against seismic. Design under ductility will affects the layout of reinforcement for reinforced concrete structures. The use of precast concrete needs to be proof by laboratory analysis data to ensure that its capacity is sufficient to withstand the expected earthquake load in the project area. The development of a fragility curve helps facilitate understanding to stakeholders for this purpose. In this case study, the cost will be significant in the change of ductility requirements with the increase of reinforcement rather than the relative increments of loads.

Keywords: Eurocode 1998; Reference ground acceleration; Response spectra; Ductility; Fragility

Invited Speaker 12
Assoc. Prof. Dr. Abdul Rahman Mohd Sam

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Green and Sustainable Concrete – The Way Forward

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Abstract: Concrete, a mixture of cement, water and aggregates is one of the most used materials in construction. It is estimated approximately 10 billion tons of concrete produced each year which definitely will affect the availability of natural resources. Concrete also contributes to the release of about 8% carbon dioxide gas to the environment. Thus, it is timely that people involve with construction industry to consider the concept of green and sustainable concrete through the use of waste and recycle materials. In view of this concept, this paper discusses the effects on fresh and hardened properties of concrete manufactured using waste materials. Concrete grade 30 were made using artificial aggregates and bottom ash as natural aggregate replacement by 25%, 50%, and 100%, fly ash (20%) as partial cement replacement and effective microorganisms (10%) as water replacement. Experimental tests conducted include workability, compressive strength, and concrete hydration temperature. The findings showed that concrete with the combination of artificial aggregates and fly ash recorded higher workability by 20 to 30% and comparable compressive strength at aggregate replacement of 50%. On the other hand, concrete with bottom ash and fly ash recorded lower workability by about 30% due to higher water absorption of bottom ash but comparable compressive strength at also 50% replacement. In addition, concrete mix containing 10% effective microorganisms shows relatively similar workability and compressive strength properties compared with control concrete. However, interestingly concrete with effective microorganisms recorded lower hydration temperature by 1 to 2℃ compared with control concrete. This lower temperature will likely to reduce the use of electricity for room air-conditioner. Overall, the findings indicated that concrete made using manufactured artificial aggregates, bottom ash, fly ash and effective microorganisms produced comparable concrete properties. Therefore, it is believed that these materials can be used for green and sustainable concrete production.

Keywords: Concrete; Green; Sustainable; Compressive strength; Waste materials

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RCCE_ID97	Open Data Application to Evaluate Exposure of Wildfire to Water Resources: Johor Area Case Study	Fara Aiza Md Sanin	Universiti Teknologi Malaysia (UTM)
RCCE_ID98	Construction Site Layout Planning Problem: Past, Present and Future	Muizzuddin Marzuki	Universiti Teknologi Malaysia (UTM)
RCCE_ID99	Potential Use of Recycled Plastic and Rubber Aggregate in Cementitious Materials for Sustainable Construction	Idlan Maszeri	Universiti Teknologi Malaysia (UTM)
RCCE_ID100	Development of Weightage Factor Focussing on Social and Safety Criteria for Malaysia Green Rural Road	Eeydzah Aminudin	Universiti Teknologi Malaysia (UTM)
RCCE_ID101	Potential of Digitizing the Industrialize Building System for Malaysian Construction Industry	Eeydzah Aminudin	Universiti Teknologi Malaysia (UTM)

ABSTRACTS

RCCE_ID01

The Ranking of Critical Infrastructure for Flood Risk Assessment and Flood Vulnerability Index in Sungai Pinang, Pulau Pinang

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Abstract: Infrastructure refers to systems that physically tie together metropolitan areas, communities, and neighbourhoods, as well as facilitate the growth of local, regional, and national economies. Critical infrastructure is considered 'critical' because an outage of the infrastructure has a serious effect on many people over a long period. The objective of this study is to rank the critical infrastructure for flood risk assessment and vulnerability index in Sungai Pinang. Based on the literature review that was undertaken, there are seven (7) indicators that are related to critical infrastructure which are industrial area, infrastructure and utilities, institution and public facilities, commercial area, transportation, residential area, and open space and recreational area. The indicators were ranked during the focus group discussion by professionals from local authorities and government agencies in the state of Pulau Pinang which are concerned with and related to critical infrastructure. These indicators were ranked by the most important level of critical infrastructure which are 1) residential area, 2) institution and public facilities, 3) infrastructure and utilities, 4) transportation, 5) commercial area, 6) open space and recreational and 7) industrial area. The results show that residential area has the highest result of 165 marks and is placed as the first rank in terms of important critical infrastructure. The second ranked indicator is institution and public facilities which have total of 160 marks. The third ranked indicator is infrastructure and utilities which scored 102 marks followed by the fourth ranked indicator, transportation which has a score of 100 marks. Commercial areas come in as the fifth ranked indicator with a score of 65 marks. The indicator ranked sixth, with a score of 64 marks, is open space and recreational areas. The lowest ranked indicator is industrial area which recorded a score of 58 marks.

Keywords: Critical infrastructure; Flood; Vulnerability; Risk; Assessment

RCCE_ID02

Vulnerability Assessment of Ancient Masonry Arch Bridge in Myanmar

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Abstract: Masonry arch bridges have been used as part of Myanmar's transport infrastructure system in the past. Because of their position in the transport network, but also because of their cultural, architectural, and historical value to the country, the preservation of these bridges is significant. The recent experience of the earthquake events in Myanmar have pointed out the necessity of a deep knowledge of the behaviour of the damage mechanism and the intrinsic vulnerability of the masonry structure. Based on the Probabilistic Seismic Hazard Analysis (PHSA), Vulnerability Assessment of Ancient Masonry Arch Bridge is presented in this study. Vulnerability Assessment of Ancient Masonry Arch Bridge is to predict the probability of the masonry bridge damage and economic losses according to potential seismic hazard or scenario earthquakes. The purpose of this study is to investigate the seismic performance of a bridge with a masonry arch. For this reason, as a case study, the historical masonry arch bridge in Shwebo, Sagaing Region is selected. It was established near the 1900s. In this study, the measurement and visual investigation of case study masonry arch bridge is conducted using MEXE methods. The experimental material properties for the case study bridge is using ASTM standards. The seismicity of the region, soil information, and the determination of pre-code structures were used as pre-field survey data for this study. According to RVS data, extensive structural study is necessary for high seismicity performance, but not for moderate seismicity performance.

Keywords: Masonry arch bridge; Vulnerability assessment; Material properties MEXE; ASTM

RCCE_ID03

Comparison of Two-Way Slab Designs Based on Different Building Codes

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Abstract: In building construction, the use of two-way (or bi-directional) slabs is very common; the advantages they provide when it comes to structural partitioning, ease of construction and reduced cost make them highly in demand. In buildings, reinforced concrete slabs are the most common. It is a standard solution for multiple periods and load ranges that can be implemented. The comparison includes safety provisions, flexural design, shear design and column design. In terms of minimum thickness for two-way slabs, various design provisions, including ACI 318, British code and India Standard, are compared. From the differences between concrete two-way slab using different design codes suitable for Myanmar construction industry, the results of this study can be concluded: BS code is the most economical based on concrete volume compared to ACI and IS. BS code also requires less amount of reinforcement than ACI and IS.

Keywords: Two-way slab; Flexural design; Different design code

RCCE_ID04

Cooling Behavior and Reusability of Hot Mix Asphalt

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Abstract: Temperature is the most crucial element that can affect the performance of hot mix asphalt. Moreover, there is a large amount of dumping of loose asphalt mixture waste after construction due to cooling phenomenon when exposed to the surrounding. This study presents the investigation of the cooling rate of the AC14 mixture and the reusability of hot mix asphalt after reheating and compacted at various temperatures. In this study, the cooling behaviour of the loose asphalt mixture was monitored by measuring the surface, internal temperature of the mix and the surrounding conditions. The cooling curve, cooling rate and TAC were determined based on the results obtained. Other than that, for the reusability of hot mix asphalt, five different types of samples were prepared with different reheating processes and compaction temperatures. The compacted samples were then tested for volumetric properties and Marshall stability test. Based on the result, the internal and surface TAC was determined at 32 and 40 minutes, respectively. It was also found that reheating the cold mixture twice and compacting at a high temperature could achieve the required properties.

Keywords: Asphalt reusability; Cooling behaviour; Time available of compaction; Marshall stability; Asphalt compaction

RCCE_ID05

Characterization of Penetration Grade Bitumen Blended with Petroleum Products for Cutback Production

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Abstract: This study presents the characteristics of produced cutback bitumen according to different types. The 60/70 penetration-grade bitumen was mixed with three types of petroleum solvents (gasoline, kerosene and diesel) to produce blended cutback bitumen for potential usage in asphalt pavement. The viscosity and rate of evaporation (curing time of solvent) were investigated experimentally to select the appropriate percentage of solvent that provides lower mixing and compaction temperature range. The viscosity of each blended bitumen decreases as the percentage of diluent in the mix increases. The percentages of diluent were varied for 30%, 35%, 40% and 45% at a temperature ranging from 30°C to 70°C with an increment of 10°C. The selected solvent gasoline, kerosene, and diesel evaporation rates were measured at ambient temperature to evaluate whether the produced cutbacks were within their classes as rapid curing, medium curing, and slow curing cutback. These effects are more dominant with gasoline, followed by kerosene and diesel due to the volatility and chemical compositions of the solvents. From the data obtained, the most effective percentage of solvents for the cutback production is 40% by weight of the penetration-grade bitumen, which establishes the lowest potential mixing and compaction temperature range.

Keywords: Cutback; Viscosity; Evaporation rate; Petroleum solvent; Medium curing

RCCE_ID06

Green Rural Road Approach for The Sustainable Development of Malaysia

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Abstract: A Green Rural Road is an inspiration for the infrastructure to be environmentally responsible and sustainable in all features. It is expected to be not harmful to the environment and crucially will diminish the emission of carbon dioxide and other greenhouse gases. To fulfil green rural road standards, priority should now be compatible with road needs with local ecological protection thought. The need to nurture sustainability and green rural road construction is vital as an assessment system. The aim of this study is to identify green rating tools to measure and perform rural roads .Data was obtained through comprehensive literature reviews, expert interviews and distribution of questionnaires. Respondents included experts and stakeholders from the highway development field. The Average Index Value analysis was also utilised for the result of the questionnaire. Data was achieved through an extensive literature review, which has also been validated by expert point of view and has been distributed among 100 experts but only 73 responses including experts and stakeholders have been taken into consideration for further analysis. This signifies that most of the respondents profess that among the rating tools, only 3 tools involve road specific categories which are Greenroads, STARS & pHJKR (Federal Roads), while others are developed specifically for the highway. Unfortunately, none of the listed tools is developed to measure and manage rural roads within the operation and maintenance phase.

Keywords: Social element; Safety element; Green road; Sustainability; Rural road

RCCE_ID07

Asphalt Cracking Assessment Using Digital Image Correlation

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Abstract: The evaluation of crack mechanisms on ductile materials such as asphalt mixtures is complex due to their nonlinear behaviour. Accurate cracking assessment in asphalt requires data on the crack closure and opening behaviour. This process requires monitoring the displacement field of the crack tip and fracture zone for notched samples under fracture test. However, an existing method for capturing crack parameters usually requires manual approaches and are onerous, particularly for inhomogeneous materials like asphalt. Digital Image Correlation (DIC) have recently been routinely utilised to measure displacement and strain field in many areas of fracture mechanics. In this study, DIC was used for determining the crack tip opening displacement (CTOD) for notched semi-circular bending samples under mode I fracture. The displacement field retrieved by the DIC was shown to be very effective in determining the asphalt sample's critical crack tip opening displacement. The results of CTOD were quite sensitive to asphalt modifying and conditioning.

Keywords: Asphalt mixture; Crack tip; Digital Image Correlation (DIC); Strain field

RCCE_ID08

Current Challenges, Future Sustainability Opportunities and Peace

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Abstract: The Global Assessment on Biodiversity and Ecosystem Services 2019 reported that one-third of the world's top topsoil degraded, 32 percent of the world's forest have been destroyed and 83 percent of the freshwater population have been seeing a decline since 1970. COVID-19 pandemic resulted in hundreds of millions being infected and almost 5 million lost their lives in many parts of the world. While The state of things looks less than optimal as not only, the globe is facing health crises but it's also looking at a deep economic recession. If there were any bright side of COVID-19, it would be the positive impact it has on our planet. Due to the lockdown globally, several positive findings were reported on earth healing, reduction of emissions, and a drop of greenhouse gases which might slow climate change. All of us wherever we are, we should see this crisis as a motivator for new change in our lives in pursuit of sustainable living. The Sustainable Development Goals (SDGs) are described by the UN as the blueprint to achieving a better and more sustainable future for all, and address the global challenges related to poverty, inequality, climate change, environmental degradation, peace and justice. Among the tools at our disposal are the digital economy should be seen as a driver for innovation and competitiveness. Preserving the environment should not be seen as an economic burden, rather as an opportunity for business sustainability. The reduction of pollution is a collective responsibility, government, industries, communities and NGO's, because as we see now, all of us are paying the costly price of neglecting the environment. There is a need for a stable political environment, strong legal and enforcement system and generous government budgets for health, education and IT infrastructure.

Keywords: COVID-19; Peace; Sustainable development

RCCE_ID09

A Comparative Study of Multiple Imputation Methods for High Spatiotemporal Variability of Rainfall in Johor River Basin, Malaysia

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Abstract: Rainfall data is a significant input parameter in climate research and modeling. However, due to various issues, the datasets are prone to missing values, which have become one of the well-known challenges faced by researchers. As a result, the cascading effect of inaccurate information will be passed on to various hydro-climatological research and water resources management. Therefore, missing data must be properly treated to provide a high-quality dataset before any rainfall assessment can be made. Most of the rainfall datasets in tropical countries are generally characterized by high variability due to seasonal patterns. These characteristics have certainly influenced the performance of the imputation methods. In this study, 23 multiple imputation methods under the MICE package in R were compared for 21 daily rainfall stations with less than 20% missing data for the period of 1970-2015 across the Johor River basin (JRB). Without removing the original missing data, additional artificial missingness (Missing Completely At Random) up to 5%, 10%, and 20% were added for each station to assess the performance of each method. The results showed a comparatively good performance of 9 methods, namely, Level-1 logistic, Level-1 normal homoscedastic, Classification and regression trees, Unconditional mean imputation, Weighted predictive mean matching, Linear regression (predicted values), Imputation of quadratic terms, Random forest, and Random sample from observed values. A further statistical assessment showed that Linear regression (predicted values) give the best performance for 5%, 10% and 20% missingness in almost all cases based on MAE (0.01-0.37; 0.00-0.79; 0.06-1.61), MSE (0.26-15.52; 0.01-27.25; 1.22-51.17), RMSE (0.51-3.94; 0.09-5.22; 1.10-7.15), PBIAS% (-0.7-0.5; -0.8-1.4; -1.3-1.5), NSE (0.93-1.00; 0.87-1.00; 0.75-1.00), R2 (0.93-1.00; 0.88-1.00; 0.80-1.00), KGE (0.95-1.00; 0.92-1.00; 0.84-1.00), VE (0.94-1.00; 0.87-1.00; 0.74-0.99) and MD (0.98-1.00; 0.96-1.00; 0.91-1.00). This indicates that Linear regression (predicted values) is the best method for filling the missing rainfall data in JRB.

Keywords: Daily rainfall; Imputation method comparison; Johor River Basin; Missing data

Assessment of Stormflow and Baseflow Pattern Controlling River Status and Classification of Sungai Koyan Catchment, Sarawak.

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Abstract: There is still little attention in river quality status and classification, especially in upper catchment areas of Sarawak. The stormflow and baseflow pattern that may control the physicochemical characteristic is still below satisfaction. Addressing the river water quality at the Sungai Koyan is deemed crucial for the enhancement of the river. Thus, the study objective is to quantify the river water status and classification based on stormflow and baseflow pattern using Water Quality Index (WQI) and National Water Quality Standards for Malaysia (NWQS). Four sampling points were selected based on the surrounding land uses within the Sungai Koyan catchment in Belaga, Kapit Division, Sarawak. One-year physicochemical data consisting of pH, DO, TSS, BOD, COD and NH_3-N were collected through *in-situ* measurement and laboratory analysis according to the 21st Edition APHA Standard Methods, 2005. The results demonstrated that stormflow more likely to be generated a better water quality as compared to baseflow in term of pH, DO, BOD, COD and NH_3-N elements. TSS element however posed higher yield for stormflow event due to surface runoff proses that contributed more sedimentation into the river. The study suggested that rainwater plays an important role in controlling the water quality status and classification of Sungai Koyan. The finding also revealed that water quality varies from the upstream compared to downstream which suggested to be dependent on the land use pattern alongside the Sungai Koyan. Generally, Sungai Koyan status for upper catchment (S1 and S2) are categorized as clean and S3 and S4 which located downstream found to be slightly polluted. The outcomes of this study provide a vital knowledge sharing for exploration of strategies to protect human health, the ecosystem and environmental reference for river quality status of the Sungai Koyan.

Keywords: Water Quality Index; Physicochemical; Pre-event and Event Water; Sungai Koyan, Sarawak

RCCE_ID11

Development of a Novel Piezoelectric Transducer
(PZT)-based Transducer for Admittance-based Prestress Force Monitoring

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Abstract: This study presents a novel design of the Piezoelectric Transducer (PZT)-based transducer that can be used for monitoring the change in the prestress force of an anchorage system. The transducer is designed as an aluminium cantilever beam embedded with a PZT patch to overcome the drawbacks of the previously-designed fixed-fixed PZT-based transducer. The performance of the proposed transducer is verified for prestress force monitoring of a lab-scaled cable-anchorage system. A transducer prototype is fabricated and installed at the anchorage zone. Afterwards, the admittance of the transducer is acquired in the frequency range of 10-100 kHz under different prestressing values. The change in the admittance response caused by the change in the prestress force is consequently quantified using statistical damage metrics. The obtained results show that the novel transducer can produce strong admittance responses sensitive to the prestress force. The variation in the prestress force can be effectively monitored by observing the change in the damage metrics.

Keywords: Admittance; Prestress Force; Anchorage; PZT; Transducer; Structural Health Monitoring; Damage Detection

The Role of Education 5.0 in Accelerating the Implementation of Sustainable Development Goals and Challenges Encountered in Civil Engineering Education: A Review

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Abstract: Higher education can play a role in the implementation of sustainable development goals (SDGs). Universities can do more to deliver against the sustainable development goals, working with faculty, staff, and students, as well as their wider stakeholder community and alumni body. However, there are steps and structures which are necessary for this to be possible. This systematic review thus attempts to analyse recent literature to identify the extent to which civil engineering education addresses Sustainable Development Goals. The review identifies several gaps in education, research, and practice that potentially hinder civil engineering education from adequately advancing sustainable development, including a dearth of research on fragile states and demographic diversity and a general lack of focus on educational technology, progressive education approaches, and innovation in fragile countries compared to stable ones. The review also identifies challenges pertaining to civil engineering education resource constraints in fragile contexts. The paper concludes by offering insights on how educational technology could mitigate civil engineering education challenges in fragile environments to ultimately ease some barriers towards SDG advancement and provides recommendations for future education and research directions as part of its mandate to implement the newly introduced Education 5.0.

Keyword: SDGs, Education 5.0, Challenges, Civil Engineering, Higher education.

RCCE_ID13

Study on Benefits of Hybrid Simulation System and Innovation Design Method in Reinforced Concrete Building

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Abstract: Nowadays, hybrid simulation systems in reinforced concrete (RC) structure and steel structure are the most popular systems to resist lateral load due to earthquakes and wind. The use of hybrid simulation is one of the best lateral loads resisting systems which is widely used in the construction world but use of it will be the viable solution for enhancing earthquake resistance. The static analysis and design of twelve-story reinforced concrete residential structure in Yangon's seismic zone (2B) are presented in this paper. The construction is made up of a frame that resists intermediate moments. ETABS v 18.0.1 (Extended Three-dimensional Analysis of Building System) software was used for analysis and design. MNBC 2020 is used to study the structure under dead loads, live loads, wind loads, and seismic loads. The planned building's stability is checked using the results of the study, including P-checking, story drift checking, and overturning checking at various floor levels. The American Concrete Institute's (ACI) 318-14 code is used to design all structure members. Software is used to design the slabs and stairs. This study will undoubtedly be useful to people who construct reinforced concrete structures.

Keywords: Hybrid Simulation System, MNBC 2020, P Checking, Drift Checking.

RCCE_ID14

A Case Study of Front Lawn Parking Needs in Terraced Houses

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Abstract: Front lawn modification has become a trend in recent years in many types of buildings, particularly single-storey terraced houses. In Malaysia, the majority of single-storey terraced houses are built for single-unit households and are typically intended to accommodate one car. As a result, with several vehicles have encountered a parking problem, requiring them to park on a side street, which has become an issue that will impede or cause inconvenience to their neighbours. The objectives of this study are to identify the necessity of front lawn parking which causes house owners to modify existing houses, to determine the spatial changes of the front lawns in terraced houses, and to assess the modification outcome of the front lawn spatial changes against house owners' demand. This study will take place in Taman Indah, Pontian, and the data collection methods are through observation and questionnaire surveys. A total of 83 front lawn-modified single-storey terraced houses were chosen by a simple random sampling method. The data is analysed using a descriptive statistical approach in Microsoft Excel. The results are presented in table and graph form with the measure of central tendency. The questionnaire's results showed that it is necessary to modify the front lawn area as a result of limited parking space in the residence. The suitable spatial changes to the front lawn are inside the house boundary line, partially modified, and the main demand of house owners is parking space. At the end of this study, it can be concluded that the objectives have been achieved as 93.98% of the respondents replied that front lawn modification is necessary due to insufficient parking space in the house, the modification is able to solve side-street parking problems, and effective solutions have been offered to solve the parking issues.

Keywords: Front Lawn Modification, Single-Storey Terraced Houses, Side Street Parking, Simple Random Sampling Method, Measure of Central Tendency.

RCCE_ID15

Multi-GNSS Satellite Geometry Analysis and Positioning Performance Evaluation under the Urban Environment

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Abstract: The accuracy of the space-based positioning system is affected by several factors like ionospheric delay, tropospheric delay, multipath, and satellite geometry. This study attempts to determine the strength of satellite geometry which is measured by dilution of precision (DOP) in multi-constellation combinations under the urban environment. The satellite constellation of GPS+BDS, GPS+Galileo, GPS+QZSS, GPS+BDS+ Galileo+QZSS are proposed to evaluate the effects of satellite geometry strength on position precision. In surveying, not all the observation sites are under ideal sky views, especially in urban environments. Obstacles such as high-rise buildings often hinder the signal of the lower altitude satellite signal yet decrease the satellite visibility. Thus, a single satellite constellation may face a problem of poor geometry or an insufficient number of visible satellites to perform positioning. Four types of urban scenarios (half-blocked, partially blocked, quarter-blocked, high-elevation condition) will be simulated as the typical situation for GNSS positioning under the urban environment. A 24-hour observation from GPS/GNSS Continuously Operating Reference Stations (CORS) will be chosen as the data simulation for different sky views by applying various elevation masks. A few sites around UTM with buildings height of a minimum of three floors will be chosen to carry out data collection to verify the simulation of the environment by carrying out static observation of 2 hours. Software RTKLIB and MATLAB will be used to compute the DOPs and their positioning precision. Residual error of the horizontal and vertical components will be evaluated for position precision based on combinations of satellite constellations. The research aims to examine the potential of utilizing multi-constellation rather than a single constellation satellite positioning in positioning performance and precision under the urban environment.

Keywords: Multi-GNSS, Positioning Performance, Satellite Geometry.

The Causes of Concrete Wastage in the Precast Manufacturing Industry

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Abstract: The growing era of concrete waste has had severe environmental, social, and economic consequences. In comparison to the normal construction site, there are only a few studies of the construction waste generated from offsite construction, particularly at precast manufacturing plants. The majority of the research has focused on how to reuse concrete panels, with a few studies focusing more broadly on construction wastes such as timber, cement, steel, etc. Nonetheless, only a few studies were conducted focusing on the concrete waste in precast manufacturing. The objective of this study is to investigate the causes of concrete wastages in the selected precast manufacturing plant. The case study on a selected precast concrete manufacturing plant was performed to assess the causes of concrete wastages using questionnaire survey. The questionnaires were distributed to managers, engineers, supervisors, drafters, quantity surveyors, and general workers. The 160 survey results were analysed using frequency analysis and average index method. The results of the study show that the causes of concrete wastages were due to multiple factors which can be classified into four categories namely design, concrete handling, operation, and procurement. In terms of design, the majority of respondents believe that not paying attention to the standard sizes available on the market is one of the most important factors impacting concrete waste in the precast production industry. Improper capacity leading to damage or degradation was one of the most common reasons in terms of concrete handling. Meanwhile, improper planning was found as the most major operational factor to concrete waste creation in this study. Finally in terms of procurement, order errors (requesting significantly more or less) are the leading cause of concrete wastages in the selected precast manufacturing industry.

Keywords: Concrete Waste, Causes, Construction, Precast Industry.

RCCE_ID17

The Measurement of the amount of Concrete Wastage that Produced in the Precast Manufacturing Industry

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Abstract: When estimating the amount of concrete needed for a specific structural project, an allowable of 3-5 percent is denoted for waste. Further excess of concrete waste will raise the project costs and affect productivity. It is important to keep track of the concrete waste on the job site. Concrete waste can be avoided by carefully preparing the pour. The objective of this study is to measure the concrete wastages produced in the selected precast manufacturing plant. The case study on a selected precast concrete manufacturing plant was performed to measure the amount of concrete wastage based on documented company reports such as concrete tickets, panel volumes, drawings, and so on. Daily site visits were conducted for several months to measure the concrete waste produced at the chosen precast company, as well as documentation tracking. During the visits, the quantification of building waste on the sites was carried out using volume estimation and waste audit. The reference to records such as the concrete order form, the actual amount of volume that should be required, and the amount of concrete lost through this process was made. The results were analysed using content and frequency analysis. To aid in the measurement of the concrete waste, the three years of concrete data were checked thoroughly and differentiated by plan-ordered data with actual batching data. Further analysis shows that the concrete wastages that were produced in the respected precast plant based on three years (2016 – 2018) data are 6.19%, 5.04%, and 5.06% respectively which surpass a typical concrete wastage set by the precast plant as in the range of 1 to 5 percent. This shows that the average concrete waste for the three years had reached 5.43% and if nothing is being done the amount could escalate.

Keywords: Concrete Waste, Measurement, Construction, Reducing Wastes, The Precast Industry.

RCCE_ID18

Strategy to Reduce the amount of Concrete Wastage in the Precast Manufacturing Industry

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Abstract: The Malaysian government has a keen interest in promoting the Industrialized Building System (IBS), otherwise called offsite development in different nations, to supplant the conventional technique for development as one of the drives to address concrete wastage issues and negative environmental effects in the construction industry. It is widely acknowledged that there is a colossal amount of waste in the construction industry. Because construction has a significant and direct impact on numerous other industries. Reducing waste in the construction industry may result in significant cost savings for society. The objective of this study is to propose a strategy on how to reduce concrete wastages. The case study on a selected precast concrete manufacturing plant was performed to generate concrete wastages reduction strategies using a questionnaire survey. The questionnaires were distributed to managers, engineers, supervisors, drafters, quantity surveyors, and general workers. The 160 survey results were analysed using content and frequency analysis along with the average index method. The proposed strategy to reduce concrete waste can be divided into 4 aspects, such as design aspects, concrete handling aspects, operational aspects, and procurement aspects. The results of the study show that the reduction of concrete wastages in the precast manufacturing industry could be materialised by practising multiple approaches such as hiring skilled personnel, accurate quantification, minimise design changes, standardized design, careful handling of tools and equipment on-site, the right equipment, better worker's attitude, better planning and estimation, adoption of proper site management techniques, the vigilant supervisor as well as an effective communication system. To effectively minimize concrete waste in the precast industry, this study recommends that all stakeholders, not just contractors, and subcontractors, in the construction sector should address the wastage factors at every level of the construction process and develop an effective concrete waste management plan.

Keywords: Concrete Waste, Strategy, Concrete Reduction, Construction, Precast.

RCCE_ID19

Innovating the Tradition: Passive Cooling Design Elements Applied to the Traditional Barbadian Chattel House

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Abstract: The traditional Barbadian chattel house is an icon of Barbadian life and landscape. The Oxford Dictionary defines the French-rooted word "chattel" as "moveable possession", and this is exactly what the chattel house is – a house that can be moved. Mainly built to provide shelter for slaves after Emancipation in 1838, the development of chattel houses from basic moveable wood huts to beautiful, elaborate, and colourful houses is a clear indication of its definitive transformation from a symbol of social inequality into an icon of emancipation and independence. To survive as a traditional house typology that appeals to the modern way of living, the chattel house should evolve into a more sustainable and comfortable habitat for its owners. We believe that this step forward could be achieved by using passive cooling design principles. After a brief introduction of the traditional chattel house, we will analyse each of its elements (foundations, floors, walls, windows and doors, verandas, and roof), assess their importance and contemporaneity, and suggest how they can be improved to achieve a better living environment and indoor climate through the application of passive cooling principles and technologies. Passive cooling principles, such as thermal mass, cross ventilation, stack effect, and others, can easily apply to the traditional Barbadian chattel house. Overall, the application of passive cooling principles and technologies will improve the traditional Barbadian chattel house design, its sustainability, and indoor living quality; this will constitute a key factor in increasing its appeal to new home owners and, therefore, its survival as heritage typology.

Keywords: Passive Cooling, Barbadian Chattel House.

RCCE_ID20

Mechanical Behaviours of Soilcrete Specimens Made from Soft Clay Using Jet Grouting Technology to Treat Differential Settlement At Bridge Abutment in Ho Chi Minh city

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Abstract: Differential settlement at bridge abutment has often occurred in the South and particularly in Ho Chi Minh City, Viet Nam (HCMC). The current techniques treat differential settlements ineffectively. Jet Grouting is a technology improving mechanical characteristics of the in-situ soils using high-pressure beams to cut, erode, and mix in-situ soils with cement slurry. Jet Grouting has a high potential to mitigate differential settlements of bridge abutments. However, the Jet Grouting still has limited applications to treat bridge abutment differential settlement in HCMC. This paper investigated the mechanical behaviours of soilcrete specimens made from the soil samples taken at Tan Thanh Dong bridge simulating field Jet Grouting. About 50 soilcrete specimens were mixed with 50% slag cement and PCB40 cement. The cement contents of 400, 500, 600, 700, and 800 kg/m³ were utilized to mix the soft clay samples at a *w:c* ratio of 1.5:1. The results show that: (1) Unconfined compressive strength (UCS) of specimens made from the slag cement were higher 3.5 to 4 times than those made from the PCB40 cement; (2) UCS of soilcrete at a cement content of 500 kg/m³ cured at 3 days were higher 3 to 8 times than that of the soft clay; (3) Secant modulus of elasticity varying from 100 – 357 times to UCS; (4) Strain at failure varying from 0.5 to 1.2%; (5) A *w:c* ratio of 1.5 providing suitable soilcrete strength and the viscosity of cement slurry.

Keywords: Jet Grouting, Settlement at Bridge Abutment, Soilcrete.

RCCE_ID21

Assessment of Streamflow due to Land Use Changes in Bago Region

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Abstract: Assessment of streamflow is crucial in flood control and management systems. Increment of streamflow is influenced by climate changes, hydrological features, and land use/cover variations. Several flood events and land use/cover changes happened in the Bago Region. So, this study aims to assess the streamflow due to land-use changes in the Bago Region. An accessible and reliable portal, Myanmar National Land Cover Portal (MNLCP) was utilized for land use/cover information, and a hydrological model, Rainfall-Runoff-Inundation (RRI) model was applied to simulate streamflow in this study. Land use maps and rainfall data in Bago Region are required to accomplish the study. Three decades of 2000,2010 and 2017 were selected as study periods for land use/cover analysis in this study. Land use maps for 2000, 2010, and 2020 in Bago Region and Bago River Basin were obtained from MNLCP. Land use/cover percentage in Bago Region and Bago River Basin obtained from MNLCP were classified, compared, and analysed. When analysing land use/cover changes in Bago Region, woody areas, open forest, closed forest, and croplands had altered within 20 years. After calibration and validation of the RRI model, rainfall, and discharge data of 2015 and 2017 flood events were compared and analysed. The total rainfall of 2017 was higher than that of 2015 while the discharge was opposite to that. While analysing land use/cover impacts on streamflow, parameters in the RRI model were altered according to actual soil condition, topography, and land types of the Bago River Basin. The analysis of land use/cover changes on streamflow was based on five scenarios in this study. After all, scenarios had been analysed, it was found that land use/cover changes have a slight effect on the streamflow of the Bago River Basin.

Keywords: Streamflow, MNLCP, RRI, Bago Region.

RCCE_ID22

Vibration-based Damage Detection in Reinforced Concrete Beams Under Various Loading

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Abstract: Recent tragic collapses of bridges and buildings have awoken the public on the need of structural health monitoring (SHM) that plays an important role in the safety and service life of civil infrastructures. Since the early 1970s, many researchers have used vibration features of structural responses as an indication of structural damages. The basic concept of vibration-based damage detection is to examine changes in modal parameters (e.g., natural frequency, mode shape, modal flexibility, and modal strain energy) which represent changes in structural properties. In this study, a crack detection method for reinforced concrete (RC) beams using modal strain energy is proposed. The modal strain energy (MSE) is calculated from the modal analysis results of an RC beam using a finite element model with various crack levels. The RC beam is simulated by ANSYS software; and then it is loaded with different load levels to create the crack zones corresponding to each load level. The stiffness matrix of the cracked beam is transferred into the modal analysis program of ANSYS software to get the vibration characteristics (natural frequencies and mode shapes) for crack detection. Using the MSE method, a damage threshold is introduced to eliminate the noise zones. In order to evaluate the accuracy of the method, new damage detection indexes of cracked zones and non-cracked zones are also proposed. The results show that the proposed method accurately detects the occurrence and location of cracks in RC beams.

Keywords: Vibration, Damage Detection, Reinforced Concrete Beam, Crack, Structural Health Monitoring.

RCCE_ID23

Enhancing Phenolic Contents and Antioxidant Potentials of Roselle Calyces by Green Supercritical Carbon Dioxide Extraction Process

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Abstract: Supercritical carbon-dioxide (SC-CO2) is a clean and green technology for extracting polyphenols and antioxidants from roselle (*Hibiscus Sabdariffa*) as nutraceutical ingredients and high-value co-products development. To increase the SC-CO2 fluid affinity towards polar compounds, a general regard as safe (GRAS) solvent, ethanol-water was added in small amounts as a co-solvent. Dry roselle calyces were extracted using SC-CO2 and conventional solvents (ethanol, water) to determine whether the SC-CO2 technology may improve the extraction of phenolic content and antioxidant activity. The results showed that the SC-CO2 extract had a significantly higher yield, total phenolic, and flavonoid content than the ethanol and water extracts. It also had the highest antioxidant activity as measured by DPPH radical scavenging. Further investigation using ultra high-performance liquid chromatography with mass spectrometry detectors (UHPLC-MS) revealed the presence of chlorogenic acid as a major phenolic compound of roselle calyces, with the highest concentration detected in the SC-CO2 extract. These results suggest that SC-CO2 technology increases the quantity and quality of roselle calyces extract. The findings increased the reliability of using this technique to produce high-value products from this high-value plant. Roselle as a low-cost sustainable local crop source, as well as SC-CO2 as a clean energy process with low environmental impact, excellent solvent recyclability, and reduced chemical use, could increase the market value of antioxidant-rich extract.

Keywords: Supercritical Carbon Dioxide, Polyphenols, Natural Antioxidants, Roselle Calyces

RCCE_ID24

Impact of Land Use and Urbanization Activities on Freshwater Eutrophication: A Case Study of Megacity, Dhaka

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Abstract: Dhaka, the capital of Bangladesh, is a major beta-global city with over 18 million residents living in an area of 1528 km^2. Rapid urbanization coupled with increased industrialization has adversely impacted the management of Dhaka's many water resources, and the city struggles to provide adequate water for its residents. Numerous surface water bodies in and around Dhaka have been subjected to increased pollution due to indiscriminate disposal of untreated or partially treated waste by municipal, industrial and agricultural sources. In Dhaka, eutrophication is a leading cause of impairment of many inland water bodies. Harmful algal blooms, dead zones, and fish kills are the results of a process called eutrophication. As such, nutrient enrichment of these water bodies is a serious threat to the overall water quality. It is likely that future climate conditions will create more favourable conditions for the growth of algae and potentially toxic cyanobacteria. From a public health point of view, the fact that some of these organisms can release toxins into the aquatic environment or be toxic themselves is important. By 2030, targets within Sustainable Development Goal 6 aims to ensure availability and sustainable management of water and sanitation for all. With the 'water goal' in mind, this present study combines recent field surveys with a systematic review of available literature on the topic to identify the sources of nutrients and the influences of eutrophication on the city's freshwater system. Additionally, the study focuses on possible eutrophication control strategies to combat the problem. Moreover, the evidence regarding the combined effects of urbanization and changing climate on the eutrophication of urban water bodies of Dhaka is explored.

Keywords: Dhaka, Megacity, Eutrophication, Algal Bloom, Water Pollution.

RCCE_ID25

Assessment Study of Energy Demand in Multi-Story Steel Moment Frames

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Abstract: Most seismic design procedures use an elastic approach to produce the lateral design force from ground motions. Although this approach is permissible, the accurate inelastic response is not well understood and is still the subject of several investigations. The cumulative energy dissipation is an important aspect of the design process to ensure the target structural performance. Previous researchers have indicated that the energy demand of a single degree of freedom (SDOF) system may be calculated analytically, and the hysteretic energy can be expressed in terms of the system's input energy. However, the methods are not limited to multi-degree of freedom (MDOF) systems, and they remain unvalidated. For that reason, this study aims to predict the energy demand in multi-story steel moment frames (SMFs), and further provide a sensible modification of the energy factor (γ) in order to use in the energy-based design method. The study considered a SDOF system represented by a lateral cantilever column. Then, three-, six-, nine-story steel moment frames are used to evaluate the input and hysteretic energy demands. The system was performed under six ground motions selected from the Pacific Earthquake Engineering Research (PEER) database. All the ground motions were scaled to match the design basis earthquake (DBE) and maximum considered earthquake (MCE) hazard levels. Nonlinear time-history analysis was used to evaluate the energy demand corresponding to various structural periods and ductility. Finally, the results demonstrated that considering only the first mode of the MDOF structures was sufficient and applicable for the energy demand. The energy factor (γ) can be considered to vary as 0.6. However, the energy factor (γ) of the MDOF system should be further investigated, considering precise structural modeling parameters.

Keywords: Input Energy, Hysteretic Energy, Steel Moment Frames, Energy Demand, Perform 3D

Volarization of Banana Peels by Subcritical Water Extraction in Pectin Recovery

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Abstract: Volarization of banana peel in production of pectin known as banana peel pectin (BPP) using subcritical water extraction (SWE) is very efficient. SWE is selective to a variety of bioactive compounds including pectin, while minimizing the use of organic or inorganic solvents. In maximizing the pectin yield, the extraction condition was optimized using response surface methodology (RSM). The capability of BPP to scavenge free radicals was investigated by DPPH free radical assay. At a water to banana peels fixed ratio of 50 mL/g, a maximum pectin yield of 4.84 ± 0.03 % was obtained under the shortest extraction time at 5 min, 140°C and particle size of 1.18 mm. The proposed quadratic models by RSM could be adequately used in the prediction responses pH, total soluble solid (TSS) and pectin yield. BPP showed a lower inhibitory concentration range (IC50) of 0.177 to 1.385 mg/mL that has the advantage of scavenging free radicals. These findings demonstrated that SWE has produced pectin rich in antioxidant properties that are indispensable for various applications of pharmaceutical and nutraceutical products.

Keywords: Antioxidant Activity, Banana Peels, Pectin, Response Surface Methodology, Subcritical Water Extraction.

A Critical Review of Flood Resilient Housing Practices: Enhancing Disaster Resilience

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Abstract: To date, researchers have worked on various theories and methods to introduce the concept of resilience into the housing sector as this has become an urgent need to manage and mitigate excessive flood effects. One of the significant recent thoughts in reducing the flood disaster risks in the long term is by building resilient housing to a standard that is less vulnerable to future hazards. This study attempts to outline the strategies adopted around the global to improve preparedness before a flood disaster strike by aligning the needs and skill requirements with the capabilities of built environment experts. Hence, the study aims to identify the gap among the flood resilient housing practices and describe the features and possibilities of past, current and future practices in resilient settlements. The analysis adopts a semi-systematic review approach to define and classify the features and risks of flood resilient housing practices in resilient settlements. A review was carried out between January 2016 and November 2021 using the keywords "Flood Housing Design", "Vernacular Resilient Construction", "Indigenous Resilient Housing Design" and "Sustainable Resilience Housing" in two different databases, namely Scopus and Web of Science. The findings demonstrate the derivation of the characteristics and probabilities of the flood resilient housing under four key disaster resilience elements consisting of robustness, resourcefulness, recovery and redundancy qualities; and establishes a comparative review to support the development of flood resilient housing model in the current and future events.

Keywords: Flood Housing Design, Vernacular Resilient Construction, Indigenous Resilient Housing Design and Sustainable Resilience Housing

RCCE_ID28

Development of the National Fault Database of Malaysia

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Abstract: This study aims to digitize and produce a web-based GIS fault database to disclose all fault systems (active and inactive) based on Minerals and Geoscience Department Malaysia (JMG) 5th Edition 2009. Malaysia has not been classified as a seismically active country due to the absence of significant, destructive earthquakes throughout history. Although still at risk of seismic activity and is not immune to earthquake damage. Thus, it is required to digitize and produce a web-based GIS fault database and determine their contribution to the country's seismic dangers. This fault database consists of three types of fault: 1) normal fault; 2) reverse or thrust fault; 3) strike-slip fault. The term "normal fault" refers to a dip-slip fault in which the block above the fault has shifted downward concerning the block below, and this type of flaw comes as a result of the extension. A reverse or thrust fault is a dip-slip fault in which the higher block moves up and over the lower block. This form of faulting is prevalent in compression zones. The term "strike-slip fault" refers to a fault where two blocks move past one another. Within Peninsular Malaysia, seven main faults were identified, including Bok Bak fault, Lebir fault, Terengganu fault, Bukit Tinggi fault, Kuala Lumpur fault, Lepar fault, and Mersing fault. These locations mostly are normal and strike-slip faults. At the end of this study, a web-based GIS fault database will be produced. This web-based GIS fault database gives an overview of all fault systems in Malaysia, which are understandable and user-friendly to the community of geologists, seismologists and engineers. Due to the absence of available seismic, geological, and geodetic data, this web-based GIS fault database might be considered a preliminary map for JUPEM and JMG for facility improvement.

Keywords: GIS, Web-Based, Fault Database, Earthquake

RCCE_ID29

A Study on Quality of Work Life of Cambodian Female Civil Engineers

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Abstract: Quality of work-life (QWL) is a quality evaluation concept with having critical importance and proper balance in both work and personal life. Previous research in other disciplines has identified work-life quality in different ways and multi-dimensional concepts, i.e., workplace issues, work stress, job satisfaction, and career opportunity. This study aims to explore the Quality of work-life of female civil engineers in Cambodia. The online survey was conducted, and a stepwise Pearson analysis and multiple regression analysis were used to analyze the collected data. Pearson analysis was computed on selected pairs of variables to test for the direction and strength of the correlation between variables. Predictive mathematical equations for these factors were developed, tested, and validated. A primary relationship between the QWL factors was found, while the 14 sub-factors under the four main factors allow female civil engineers in Cambodia to distinguish the level of QWL with regard to the perspective of Cambodian female engineers in the construction industry. The present finding elucidated the QWL could be improved with the increase of job satisfaction and minimization of work stress and problems.

Keywords: Cambodia Work-Life Issues, Construction Industry, Female Civil Engineer, Quality of Work-Life.

RCCE_ID30

Assessing Water Scarcity in Muda River Basin: Water Energy Food Nexus in Malaysia for Rice Production

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Abstract: The demand for rice in the year 2030 is projected to be around 533 million tons of milled rice and is known to be a high-water consuming crop. Irrigated rice consumes as much as 150 billion m^3 of water in Asia alone. With water being the most important component for rice production, yielding more rice with less water is therefore a formidable challenge. This study aims to assess the water scarcity of paddy plantations at Muda Rice Granary, Kedah, using the Water Footprint approach. By using this approach, the amount of water consumption in planting and processing rice will be assessed. A water-energy-food nexus study was done for MUDA Area. The analysis identifies the relation of water, food and energy by understanding the challenges in sustaining these resources. The objective of the analysis is mainly to identify whether the area can sustain the natural resource with the increasing resource demand from rapid development. Data inventory were collected through direct meeting with stakeholder and literature. The boundaries have been set up based on resource input and output within the Sungai Muda basin. Portable water demand, non-paddy's water demand and livestock's water demand are increased throughout the year 2010 aligned with population growth. As for WEF solutions within the institutional level, they are integrating WEF in policy arrangements is chosen as the best solution. Within financial and economic instruments, incentives to upstream water users are agreed by the stakeholder; and for technological innovations and information management, the stakeholders agreed on sustainable monitoring and data-managements system. Implementing this water footprint research in the paddy field will be essential not only in the research area but also in agricultural development in Malaysia. Consequently, it will become the baseline for other agriculture in Malaysia in this research area.

Keywords: Water Footprint, Water Scarcity, Rice Production

RCCE_ID31

Effect Management of Plant and Machinery on Completion Time of Construction Projects

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Abstract: The plant and machinery have been one of the resources synonymous in the construction industry, where diverse organizations are involved in completing construction projects. However, without proper management practices of plant and machinery in construction sites, it will affect the required amount of completion time, thus, affecting the smoothness and productivity of the project. A co-relational research approach is used where this paper performs the interviews with the construction personnel themselves. The instrument and study design were based on a preliminary survey and literature search at the beginning. Effectively managing the plants and machinery on construction sites is very significant as it influences the completion time, thereby bringing down the percentage of unfinished projects. The survey's result shows that plants and machinery need to be managed to ensure they are performing well and ready to use. Besides, they need to ensure the safety of operating plants and machinery and reduce downtime and repair costs. The positive impact is primarily on contractors working on construction projects, who understand plant and machinery management and why it is essential. Thus, they could determine the critical criteria and adopt a competent management system for future projects. Finally, construction site plant and machinery management impact the completion time. Construction firms have long recognized the importance of effectively managing their plants and machinery. As a recommendation to ensure the plant's efficiency, contractors should evaluate well to see which firms meet their targets to make sure that lapses in equipment supply to the location are avoided, and proper monitoring of the operator's equipment on site can be conducted.

Keywords: Plant and Machinery; Management; Construction Projects; Completion Time

RCCE_ID32

The Impact of Distracted Driving on Traffic Safety

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Abstract: The previous researchers have been turning around with the matter of using mobile phone while driving. However, there are other distracted driving behaviours out there have less taken into consideration around the world. This means the issue will continue being the concern of the government as foreseen. The issue also remains unknown in many countries, including Malaysia because it is a subjective behaviour, which is not easy to be proved. Hence, this study aims to understand the cause-effect relationships of distracted driving behaviours and additional factors. An instrumented vehicle, google form and CCTV recording from authorities are used for data collection, also relevant relation modelling for data analysis. The collected data from this study helps the government to obtain, analyse and determine bigger and clearer view of the cause-effect relationship of this subjective behaviour. It aids the government in providing the appropriate solutions thus, the number of injury and fatalities due to accidents can be reduced, also can avoid in spending unnecessary costs on the consequences of accidents like repair road infrastructure, and roadside buildings. This is aligned with SDG 2030 Indicator 3 (Good Health and Well-Being) and Indicator 11 (Sustainable Cities and Communities), in terms of fatalities caused by road accidents and provide safe, affordable, accessible, and sustainable transportation, respectively. In recent decades, advanced vehicle like AV and advanced system like ADAS are introduced slowly and bring a lot of benefits to the society, solving traffic safety issue mostly on aggressive driver behaviours. Therefore, this distracted driving cause-effect research indirectly allows the nation to take part in AV and ADAS development, that can bring good reputation, knowledge and skills to the country

Keywords: Distracted Driving; Instrumented Vehicle; Relation Modelling; Cause-Effect Relationship.

RCCE_ID33

Regression Tree Model to Generate Standard Penetration Test (SPT) N-Values of Malabon City, Philippines

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Abstract: Borehole logs are often done occasionally because of funding and time restrictions. As a result, only the project site can solely obtain geological and geotechnical data. The information of subsurface information properties varies across an area. This has presented a challenge, since Geotechnical engineers need precise soil and rock information to plan and design geotechnical construction projects. In the dawn of soft-computing techniques such as Machine Learning, Machine Learning can provide models that can predict output data for a given example of input data. Thus, this study aims to apply Regression Tree Machine Learning Model to generate the Generate Standard Penetration Test (SPT) N-Values of Malabon City, Philippines. The independent parameters are latitude, longitude and elevation, while the dependent parameter is the SPT N-Value. To validate, the Root Mean Square Error (RMSE) and the Coefficient of Determination (R^2) were gathered.

Keywords: Geotechnology, Geospatial Intelligence, Machine Learning, Regression Tree Model, Philippines.

RCCE_ID34

Mechanical Properties of Concrete with Plastic Waste - An Overview

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Abstract: The growing environmental consciousness has greatly contributed to the concerns over the disposal of plastic waste. Waste utilization has emerged as a viable alternative to disposal. Plastic waste is a non-biodegradable material. It can be utilized as supplemental material in the production of concrete to reduce the environmental difficulties associated with the disposal of plastic waste. Several studies have been conducted to assess the characteristics of concrete that contains various forms of plastic waste as aggregate or filler. This study provides an overview of the efficiency of using waste plastic in concrete production. The effect of waste plastic on the fresh, mechanical properties, and durability of concrete is discussed. The use of waste in concrete not only makes it more cost-effective and ecologically friendly, but it also benefits the plastic recycling industries.

Keywords: Plastic Waste, Concrete, Aggregate, Mechanical Properties, Durability

RCCE_ID35

Optimization of Mosque Geometry to Reduce the Total Cooling Load and Enhance the Sustainability of Future Mosque Design

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Abstract: Recently building sector accounts for 40% of all energy consumption of the world, which have led internationally to establish several legislations to reduce the energy consumption. Similarly, Saudi Arabia has expressed their concern and established a number of related policies, and the sustainability of building sector is first concern. Currently, the building sector consume about 80% of total energy use, and mosque buildings were discovered to consume huge quantity of energy above many other building types. Literature review indicated that there is a huge demand to establish new mosques all around the country. However, very little researches and efforts were found in regard with energy efficiency and energy efficiency design. This paper aims to highlight the issue and reduce the energy consumption, protect the environment by promoting sustainable mosque design. The process began by conducting three Delphi rounds with 33 experts which resulted with 13 out of 28 parameters were found to have significant impact on mosque energy consumption, which were then used in the optimization process. After that, Al Walidayn Mosque was selected as a case study which represented a medium sized- mosque as the most common type and the integration between Rhinoceros and Grasshopper 3D for parametric modeling, EnergyPlus software for energy analysis, and Genetic Algorithm (GA) were used to optimize the mosque geometry with the aim to reduce the total energy consumption. The total annual energy use of Al Walidayn mosque was 216544.898 kWh and after the optimization for whole geometry reached at 90868.788 kWh which represented about 58% of total energy reduction. In addition, the findings provided several optimum design solutions for mosque geometry including orientation, WWR, U-value of glazed window, ceiling height, number of windows, and shading devices. Furthermore, providing various design alternatives with the lowest demand for energy consumption for future mosques.

Keywords: Energy Consumption, Building Optimization, Genetic Algorithm, Energy Efficiency Design, Sustainable Mosque

RCCE_ID36

Communication Model Framework for Site Level of a Mega Construction Project

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Abstract: Poor communication between the site team and other departments at mega construction projects has a negative impact on project schedules and budgets. Proper communication channels to coordinate between stakeholders and their different interests can mitigate poor communication impact. Mega projects consumed 8% of the global gross domestic product. Therefore, any failure in the project has a negatively impact on the economy. Many studies have been conducted to highlight project cost and time overrun pandemic which reached to peak in 2017 by 18 articles and distributed between many countries where China had the largest contribution percentage by 9.9. Although poor communication factor has a significant impact on project progress many researchers excluded or did not prioritize it on project cost and time overrun factors. Between 1989 and 2019, many studies highlighted the poor communication impacts on project budget and schedule. To date, no real social network model for communication at the site level was provided. This research aims to provide a framework model that permits integration of project data on the platform to assist the site team. This paper presents results and discusses the importance of communication factor in project progress where literature review and rating questionnaire to real case studies from different countries were conducted, the factors affect the communication at the site were literature review and open ended questions were achieved and analysed by thematic analysis, and developing a communication model based on ant simulation to overcome the poor communication factors where the model is dealing with all departments, which have interface with site construction engineer. Rank order scale questionnaire was conducted to validate the model against the following criteria: comprehensiveness, objectivity, clarity practicality, and reliability. The results obtained in this study suggests that the proposed model can successfully enhance the communication at site level.

Keywords: Site, Construction, Communication

RCCE_ID37

Atmospheric Corrosion Resistance of Structural Steels After Exposure in Rural, Industrial, and Marine Atmosphere, Thailand

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Abstract: Structural steel specimens which are hot-rolled steel grade SS400 according to JIS G3101, SM490 according to JIS G3106 and galvanized steels according to ASTM A123 were exposed under rural, industrial, and marine atmosphere in Thailand to investigate their corrosion rates. The exposure time was up to 180 days from March to September 2021. The corrosion rates of specimens were determined by the weight loss method. Environmental parameters such as relative humidity, temperature, chloride deposition and sulfur dioxide deposition were also collected. The result showed that corrosion rates by atmosphere type from high to low according to order is marine > industrial > rural. The magnitude of the corrosion rate for SS400 and SM490 was 20 and 30 times as high as that for galvanized steel in industrial and marine atmosphere. The usage of galvanized steel is well recommended to minimize corrosion attacks compared to these structural steels in industrial and marine atmospheres.

Keywords: Structural Steel, SS400, SM490, Galvanized Steel, Atmospheric Corrosion

RCCE_ID38

Experimental Study on Dynamic Characteristics of Surface CO_2 Flux in Abandoned Spontaneous Combustion Goaf

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Abstract: In order to understand the impact of CO_2 on the surface environment in the goaf of the abandoned coal mine, based on the principle of CO_2 diffusion and the theory of residual coal spontaneous combustion in goaf, the surface CO_2 flux over the abandoned goaf was measured. The changes of surface CO_2 flux over goaf and normal area, winter and summer, spontaneous combustion and non-spontaneous combustion goaf are analyzed. The effects of rainfall and environmental temperature on CO_2 concentration in borehole and surface soil (CO_2 flux) are obtained. The results show that the surface CO_2 flux over the spontaneous combustion goaf is significantly greater than that in the goaf without spontaneous combustion; Environmental climate (especially temperature change)is an important factor affecting the change of CO_2 flux; Air leakage in the Open-pit mine slope promotes the emission of CO_2 from the overlying surface of goaf; The south part of the monitoring area is affected by surface collapse and landslide, which promotes the formation of high flux area; The scope of the fire area is gradually expanding with the time elapsed.

Keywords: Abandoned Coal Mine, CO_2 flux, Goaf, Coal Spontaneous Combustion

RCCE_ID39

Microgranulation Technology for Enhancement of Wastewater Treatment Process

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Abstract: It is hypothesized that the microgranule would be able to remove phosphorus and nitrogen while simultaneously improving the performance of the wastewater treatment process. This study aims to provide an assessment of microgranule as a curative measure for enhancement of wastewater treatment process to enhance plant efficiencies and performance. This study developed the microgranular by utilizing activated sludge sourced from local wastewater treatment plants. The sequencing batch reactor (SBR) was used to cultivate the microgranular. It was demonstrated that anaerobic ammonium oxidation (anammox), Candidatus *Kuenenia stuttgartiensis* cultivation using synthetic wastewater in the bioreactor could lead to good nitrogen removal efficiency. The development of the anammox bacteria was monitored weekly for parameters like pH, DO, ammonia, nitrite and nitrate. The readings of the samples for the parameters fluctuated due to tough competition between the microbes within the sludge with the chemical compounds in the enrichment medium. The changes in the environment of the sludge have resulted in an inconsistent reaction in the medium. The sequencing analysis using 16S rRNA anammox primers have proven that Candidatus genera is present. Meanwhile, the Illumina MiSeq platform is able to determine the anammox bacteria, namely Candidatus *Solibacter* and Candidatus *Methanofastidiosum* in the enrichment samples. The results obtained in this study indicated that maintaining low nitrate concentration is challenging and may result in inhibition of the anammox process. This is because the activated sludge that was used as the seed sludge contained anammox bacteria, however, unable to compete with NOB for nitrite. Therefore, the nitration process was more reactive compared to the anammox process.

Keywords: Anaerobic Ammonium Oxidation (Anammox), Candidatus *Kuenenia stuttgartiensis*, Candidatus *Solibacter,* Candidatus *Methanofastidiosum*

Study on the Prevention Effect of Pre-formed Gel from Inhibition Water Solution of Sodium Metasilicate Nonahydrate and Polyvinyl Alcohol on Coal Spontaneous Combustion

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Abstract: Spontaneous coal combustion threatens mining, transportation, and storage operations in the coal industry. A novel cross-linked gel (SMN-PVA gel) was presented from the inhibition water solution containing sodium metasilicate nonahydrate (SMN) and polyvinyl alcohol (PVA) to prevent coal spontaneous combustion. The wire-mesh basket test was applied to investigate the performance of the inhibition water solution with different SMN and PVA concentrations. The critical self-ignition temperature of cubic coal sample treated by inhibition water solution with higher SMN concentration possesses higher value than the lower one. The superior concentrations of SMN and PVA were measured to be 16wt% and 0.5wt%. the pre-formed SMN-PVA gel was normally formed in the coal micropores to prevent coal oxidation and thus exhibited better performance in stability and compatibility than traditional gels. Additionally, this paper analysed the effect of inhibition water solution with superior SMN and PVA concentrations (16wt% and 0.5wt%) on coal spontaneous combustion by applying thermogravimetry-derivative thermogravimetric analysis (TG-DTG) and Fourier transform infrared spectroscopy (FTIR) test methods.

Keywords: Coal Spontaneous Combustion, Sodium Metasilicate Nonahydrate, Polyvinyl Alcohol, Cross-Linked Gel, Wire-Mesh Basket Test

RCCE_ID41

Evaluation of Atmospheric Exposure Test on Structural Steel and Hot-dip Galvanized Steel in the East of Thailand

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Abstract: In today's civil engineering industry, steel is one of the basic materials used due to its versatility, high strength, and durability. However, it is highly susceptible to corrosion. Corrosion is unavoidable, but it can be minimized by galvanizing and painting. The rate of corrosion depends on the coating and environmental conditions. This research aims to study the corrosion rate of two types of structural steel SS400 and SM490 for bare steel and Hot-dip galvanized steel, which is exposed at three locations at Chachoengsao, Rayong, and Chonburi in the eastern part of Thailand. Following the ASTM G50, a test site is selected at each location and the specimens are exposed to the real environment for three months and six months, and so on. Weathering station at the test site collects and monitors environmental parameters. The exposed specimens are collected, cleaned and the data are gathered. The weight loss of the steel specimen's data is analyzed based on the ASTM standards. This analysis result shows the corrosion rate of both the bare steel and hot-dip galvanized steel, the deterioration of steel after three months and six months, and the importance of galvanizing. The result can be used for material selection and could contribute to the development of the steel corrosion manual of Thailand

Keywords: Steel Corrosion, Atmospheric Corrosion Test, Corrosion Rate, Bare Steel, And Hot-Dip Galvanized Steel

RCCE_ID42

Mechanism behind the Improvement in the CBR of Subbase Aggregates Blended with Non-pozzolanic Coal Bottom Ash

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Abstract: Due to its underwhelming performance as a pozzolan, only a small amount of coal bottom ash (CBA) is applied in concrete industry and most of it is disposed in landfills. The consumption of CBA in other fields are also low since there is not enough research to support its potential use. Pavement foundation layers are where high volume of CBA can be utilized while preserving natural aggregates. This study aims to investigate the feasibility of CBA as an aggregate replacement for subbase layer in road pavement. Lateritic soil, a conventional subbase aggregate, and CBA from Mae Moh power plant, the largest coal-fired power plant in Thailand were used. The dry soil was replaced with 0-50% CBA by weight and their geotechnical properties were studied. To examine the pozzolanic properties, the mixtures were cured and XRD tests were carried out at 0,28, and 90 days. During the span of 90 days, no significant change in the chemical composition was observed which concluded that the pozzolanic reaction inside the mixtures were negligible. To study the strength characteristics, CBR at optimum water content (OWC) and OWC+2% were tested. CBR value increased with increasing CBA content in the mixtures. A relationship between CBR and coefficient of permeability is found. Based on the standards specified by Department of Highways, mixtures with 30-50% CBA is qualified to be used in pavement subbase.

Keywords: Coal Bottom Ash, Pavement Subbase, CBR, Permeability, Grain Size Analysis.

RCCE_ID43

Renewable Biomass Nanofluid for Low Carbon Emission in Vehicle Exhausts

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Abstract: Biomass is an important renewable energy resource which primarily contributes to heating and cooling end use sectors. The conversion of biomass into biofuels is a promising approach for the production of renewable fuels to replace liquid fuels in modes of transportation. Biomass nanofluid is not only utilizing the most abundant waste in Malaysia, but also to ensure the environment sustainability towards low carbon emission in reducing less greenhouse gas (GHG). This study focuses to help to reduce the carbon emission to the environment and it will help Malaysia to reuse its abundant biomass waste into high value-added product besides mitigating air pollution and climate change. The bio-oil used in this study is produced from normal pyrolysis of bamboo crump as pure product. Due to pyrolysis oil size in nanometre, it is believed that nanofluidics is the one which helps the transport phenomena of nano molecules to reduce the fuel consumption by the vehicle and produce less carbon emission from the exhaust. Zeta potential is a key indicator of the nanoparticle stability of colloidal dispersions. High value of Zeta Potential result showed a positive improvement done by biomass nanofluid patch. Petrol RON 95 performs more stable with biomass nano fluid patch as higher number of stabilities 527.86 mV. The engine tests were carried out to analyse the emission performance and the results proved that biomass nanofluid provided significant advantages towards better engine performance and emission at maximum engine speed. The results revealed carbon dioxide reduction at 10%, carbon monoxide emissions were reduced by 35 % and the percentage of oxygen is 8% higher than standard condition due to complete combustion in the engine.

Keyword: Biomass Renewable Energy; Bio-Oil; Pyrolysis; Nano Fluid; Zeta Potential.

RCCE_ID44

An SDG Agenda: How to Motivate Engineering Teachers and Students for Research?

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Abstract: Engagement in research is necessary for students and teachers to pursue knowledge and lifelong learning in alignment to the sustainable developmental goals (SDGs). This study applied an online survey on enrolled undergraduate engineering students at the largest private university in Bangladesh. The survey covered a series of 1 to 5 Likert scale items on three variables. First, the student engagement variable of 28 items in five domains (i.e., academic, cognitive, affective, social engagement with peers and social engagement with teachers). Second, the teaching practice variable of 11 items, applied for teaching evaluation at the university. Third, a single item dependent variable that assessed if a student is "motivated to work on research project with a faculty member outside of course requirements". Regression by enter method was applied for data analysis. Out of the 354 respondents, 77% agreed or strongly agreed that they are motivated to work on research projects with faculty members outside of course requirements. The regression model was significant with $AR2 = .21$ and $F = 16.37$ ($P < 0.05$). The domains of cognitive (t-value = 5.10; $p<.001$), academic (t-value =3.61, $p<.001$) and social engagement with peers (t-value = 2.47, $p<.05$) had significant positive association with students' motivation to engage in research. Teaching practices were not associated with students' motivation to engage in research. Universities should facilitate teaching practices to connect with student's cognitive, academic and peer to peer engagement for enhancing student's motivation for research and alignment to SDGs.

Keywords: Student Engagement, Engineering Students, Research Motivation.

RCCE_ID45

Technique for Improving the Geotechnical Performance of Materials to Be Used as A Base Layer in Roads Construction: The Case of the Lithostab in Burkina Faso

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Abstract: The scarcity to find soils fulfilling the ideal geotechnical characteristics to enable the building of structures without any risk of settlement makes soil improvement increasingly important. Soil improvement can be done at the surface, such as shallow stabilization, or depth, such as the case of the deep mixing method. This article focuses on a technique for shallow mechanical improvement of soil which deals with the utilization of crushed granite mixed in a certain percentage with lateritic soils before road construction in Burkina Faso. Lithostab is the simplified name for litho-stabilization, a technique for improving lateritic soil by adding crushed granite that increases the CBR of that material for being used in the base layer for road construction. The class 0/25 of crushed granite added to the laterite in our case gives good performance in terms of CBR. Indeed, the CBR which was initially 48 at 98% of the optimum modified Proctor goes to 88. from 84 at 98% of the optimum modified Proctor, it goes to 128 for 30% of class 0/25 of crushed granite added. This means that class 0/25 of crushed granite provides better CBR to that material when it is incorporated at 30%. However, the CBR found with 25% of crushed granite added is sufficient for the base layer realization in road construction projects. Overall, Lithostab is an eco-friendly material for road construction and presents three advantages - the use of local materials; contributes to the protection of the environment in the sense that its production does not require a lot of energy and does not release large quantities of carbon dioxide into the atmosphere; and it is very easy to implement it.

Keywords: Technique, Improving, Performance, Base layer, Lithostab

Study on Caving Characteristics of Rock Mass and Mechanism of Rock Movement Controlled by Backfill

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Abstract: The movement and failure of the covering layer of the coal seam is a process of gradual development from bottom to top due to the complexity of rock mass and the particularity of mining rock mass. Overburden movement failure caused by mining is a complex nonlinear dynamic movement process. Caving zones backfill mining is aimed at the caving situation of the roof. The gangues in the caving zone are injected with cementing materials before compaction through directional drilling or roadway on the working surface. The broken gangue in the fall zone can be consolidated to a certain extent. Form a certain strength of the supporting body. Support the overlying strata. Reduce surface subsidence. This paper studies the formation of caving zone and overburden movement law, the supporting effect of injection on mined overburden rock mass and its influence on surface deformation and movement, and the mechanical properties of gangue slurry complex formed by caving zone injection. The roof management of goaf and the evolution law and mechanism of the complex fabric of bearing broken gangue and filling material are studied deeply. The findings can further improve the management ability of the subsidence area. Enrich green mining theory. It is of great theoretical and practical significance to promote the scientific and reasonable development of coal mining technology.

Keywords: Broken Gangue; Spatio-Temporal Evolution; Caving Characteristics; Rock Movement Control; Permeability.

RCCE_ID47

Modelling of Solute Transport for Water Quality Process in a Stream Reach

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Abstract: Eutrophication of the excessive algal growth that causes the degradation of freshwater quality worldwide is due to anthropogenic activity. Improper landuse practices in agricultural activity and urban development accelerate this process as multiple sources of nutrients are released into the aquatic system. This study investigates the possible cause of algal growth downstream of a stream reach in the UTM campus. Sources of nutrients that enter the stream are firstly identified through field observation. The sampling work for the water quality analysis is then conducted at six locations along the stream, for parameters of temperature, pH, phosphate and nitrate. A one-dimensional hydraulic model of the stream reach is further set up for the solution of solute transport and water quality process. Based on the laboratory experiment, water quality results indicate that sources of phosphate and nitrate that enter the stream are from upstream and the oxidation pond respectively. The modelling of solute transport based on the one-dimensional hydraulic solution is important to improve the understanding of the water quality process for the management of algal biomass in streams.

Keywords: River Hydraulic, One-Dimensional Model, Solute Transport, River Water Quality, Algal Growth

RCCE_ID48

Conceptual Design and Computer Fluid Dynamic Analysis of Floating Water Turbine

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Abstract: Researchers in Malaysia are attempting to advance and develop the renewable energy sector in response to increased emissions, fossil fuel exhaustion, and the need for electricity in remote areas. Water turbines are known to have a high potential for generating electricity. This paper is to propose a new concept of floating turbines and analyse it by using the CFD method. The process of finding the concept started with infaring the market needs in Malaysia and transforming them into design requirements by utilizing the requirement table and the objective tree tools. After that, the requirements were changed to a function box to understand the functionality of the turbine. A task specification table was implemented to assign the specifications, followed by creating four concepts. One of the four concepts was chosen by utilizing the evaluation chart to undergo CFD analysis. The selected concept was validated by the dynamic mesh technique by using Ansys Fluent. A grid independence study and boundary sensitivity study were conducted to ensure the accuracy of the solution. The performance of the turbine was calculated by the sliding mesh technique to find that the turbine showed higher performance than typical Savonius turbines, from 0.1 to 0.42 and 0.8 to 1.3 Cp and TSR respectively.

Keywords: Concept Design, Water Turbine, Floating turbine, Small-scale turbine, CFD.

RCCE_ID49

Estimation of Eroded Soil Volume using GPS and UAV: A Case Study in *Persiaran Satelit*, UTM

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Abstract: In modern times, GPS and UAV have been widely used in surveying. Both types of equipment can be used in volume determination. The calculation of land volume is one of the essential engineering works that rely on land surveying. It is commonly used in construction sites, quarries/mines and landfills and more. Topographic data is typically acquired with the use of GPS and UAVin soil volume estimation. This research aims to compare GPS and UAV's aerial photos to estimate the soil eroded volume. The study area of this project is in Persiaran Satelit, Universiti Teknologi Malaysia (UTM), where the data collection will perform with both GPS and UAV photogrammetry techniques. The GPS RTK technique will be utilized to conduct a topographic survey, while UAV photogrammetry, on the other hand, will perform an airborne aerial photo survey. The photogrammetry method requires several ground control points to determine the referenced coordinates for the designated area using GPS static technique. The processing software that will be used in this project includes FieldGenius (for GPS) and Pix4D (for UAV). Both methods expect to show different results in land volume, and analysis will be made on the efficiency of both methods in estimating land volume. In addition, this research will also generate the Digital Elevation Model (DEM) and analysis of soil erosion in that particular area of study. The outcome of this research is to observe the erosion of soil within a three-month period. Other than that, it is also expected to determine which method will come out to be more efficient.

Keywords: Soil Erosion, Volume Determination, UAV, GPS, Topography.

A Framework of Contractual Protocol for Building Information Modelling (BIM) Implementation in Water Treatment Plant Projects

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Abstract: Building Information Modelling (BIM) has become a comprehensive collaborative process in the construction industry. Since its introduction in 2009, the technology adoption rate has been slow compared to other countries of the world. Most of the construction companies in Malaysia have an insight into the BIM concept but are yet to implement it in the management of their construction projects. By the year 2020, the Malaysian government will make BIM mandatory thus, makes it important to study the possible applications of the technology. This research aims to establish a Framework of Contractual Protocol for BIM-Water Treatment Plant projects in Malaysia. This research focuses on four (4) objectives which are: (a) to explore the Contractual Issues on BIM Implementation, (b) to identify the Contractual provision on BIM Implementation, (c) to determine the Requirement Components of Contractual Protocol for BIM Implementation, and (d) to establish a Framework of Contractual Protocol for BIM Implementation for Water Treatment Plant projects. A qualitative method of inquiry was used for this study in Klang Valley using a semi-structured interview. The responses received were analysed using SPSS. The result of the analysis showed that the contractual issues posed by the adoption of BIM, the contractual provision, the required component of contractual protocol, and the establishment of the framework of contractual protocol for BIM Implementation for Water Treatment Plant projects. These findings imply that to prove the studies on the legal and contractual aspect of BIM implementation in water Treatment Plant Projects is increased to meet the demand of the implementations of BIM technology is regarded as the future of the construction industry, which makes it very important for the industry.

Keywords: Building Information Modelling (BIM); Framework of Contractual Protocol; Water Treatment Plant Projects.

RCCE_ID51

Food Waste Composting at Universiti Malaysia Sabah (UMS): An Economic Analysis

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Abstract: Composting can be an alternative that can convert organic waste into valuable products, which is compost. Higher Education Institution should have a leading role in the research and introduce to the communities about environmentally sustainable practice as it was well-equipped with knowledge and resources. The purpose of this study was to determine the feasibility of composting system in Universiti Malaysia Sabah (UMS) in terms of economic analysis. The economic data collected for this study included the initial investment, cost needed every year and total cash inflow per year. Based on the cost analysis, the composting system could possibly generate a profit of RM86,690 a year by selling the compost to the public. Thus, this suggest that the applicability of composting system in UMS is feasible and composting is an effective way to manage waste in university as it reduces waste from landfilling, reduce the dependency on chemical fertilizer and increase awareness among campus community about composting.

Keywords: Composting, Campus Sustainability, Economic Analysis.

Wayfinding Evaluation in an Open Environment: Al-Mashaer Al-Mogadasha Metro Station

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Abstract: Wayfinding system has been studied in various environments to help the users to reach their destinations Despite its importance, the assessment of a navigation system in the context of the Hajj is rarely investigated. According to prior research, most pilgrims follow group guides to their destinations. As a result, the goal of this study is to identify employees' perspectives to evaluate existing wayfinding systems and enhance wayfinding designs at the AL-Mashaer Al-Mogadasha Metro Station. To increase the efficiency of the navigation system, this study used a questionnaire. It is made up of questions that look at the demographics of the participants as well as indicators for evaluating the signage information. The data collected was thoughtfully, deliberately, specifically, and through Web-Based Questionnaires from 193 workers from various authorities. The acquired data were analysed using the SPSS programme.

Keywords: Wayfinding, Hajj, Metro, Signage, Pilgrims.

RCCE_ID53

Quality Assessment for High Precision GNSS Positioning with Android-Based Smartphone

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Abstract: Global Navigation Satellite System (GNSS) was created and being popularized over time. Nowadays, majorities of smartphones are manufactured with a GNSS chipset and built-in antenna. Huawei Nova 5T with Kirin 980 chipset that can support dual-frequency (L1 + L5) carrier phase observation was selected for this research. Majority of smartphones available on the market support code-based measurement only. Thus, it could not achieve mm-cm level precise positioning. This research is to evaluate the positioning performance of the Android-based smartphone on GNSS positioning. This study aims to achieve mm-cm positioning precision with the Android-based smartphone. GNSS observation file will be recorded by using the Android application Geo++ RINEX Logger. This research will also cover the effects of smartphone setup configuration, with or without the presence of ground plane, during the data collection stage on the quality of GNSS positioning. This research will use Huawei Nova 5T and one geodetic grade GNSS receiver for static observation. GPS, GALILEO, QZSS, and BDS will be selected for static observation for at least one hour per session. One GPS/GNSS Continuously Operating Reference Station (CORS), namely ISK1, will be used as the reference station for relative positioning. RTKLIB will be used for processing observation files by relative positioning (RTK). Positioning performance between smartphone and geodetic GNSS receiver will be evaluated, data from geodetic GNSS receiver will be used as the benchmark. The research aims to test out the best device setup during the data collection stage for a better quality of GNSS positioning data.

Keywords: Multi-GNSS, Android-Based Smartphone, Smartphone Positioning.

RCCE_ID54

Building Information Modelling in Indonesia's Medium Consultant Construction

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Abstract: Technological advances in construction have a direct or indirect impact on planning consultants in Indonesia. The exchange of conventional design models to 3D digital models based on BIM has begun to be carried out by consultants, although there are still few. With government regulation Number 16 of 2021, the design process with the concept of building information modelling is increasingly being discussed. This paper describes research on the use of building information modelling in Indonesian construction consulting firms. This paper finds that the construction consultants who started using BIM were consulting firms with a medium classification. In Indonesia, 793 consulting companies are members of INKINDO which have a medium classification but not all of them apply the concept of Building Information Modelling in their planning work due to various inhibiting factors.

Keywords: Consultant, Medium, INKINDO, Indonesia

RCCE_ID55

Pile Load Analysis of a Four Pile Group Arrangement Due to Pile Eccentricities

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Abstract: This paper presents the pile load analysis due to the pile eccentricity of a four pile group arrangement. This study aims to evaluate the maximum permissible pile eccentricity such that the redistributed pile loads due to pile eccentricity do not exceed the pile working load. Furthermore, the effect of column load N over pile working load capacity n, designated as N/n ratio is also investigated. In this study, three levels of N/n ratios were selected to indicate low, medium, and high load intensities, namely N/n 3.25, 3.50, and 3.75 respectively. Results from the study show that the maximum permissible pile eccentricity can be translated into a Pile Eccentricity Limit Chart. With this chart each pile eccentricity can be identified as either being in a "safe zone" or beyond, thus resulting in a "Pass/Fail" condition. Results also indicate that the N/n ratio has a direct impact on the maximum permissible pile eccentricity. This is evident when the result of permissible eccentricity at a high N/n ratio is plotted against lower N/n ratios, the corresponding "safe zone" becomes narrower, indicating that the higher the intensity of column load N the smaller is the permissible pile eccentricity. A novel addition to this study is the development of a chart that could be used to locate the optimum position of the additional pile when pile eccentricity exceeds maximum permissible values, leading to a "Fail" condition. Thus, this study has contributed by developing not only a Pile Eccentricity Limit Chart but also an Optimum Pile Location Chart for a four-pile group arrangement usually adopted in practice. These charts with the corresponding N/n ratio can be used to verify a "Pass/Fail" condition using actual pile eccentricities recorded on-site as well as to locate optimum additional pile position for the "Fail" condition.

Keywords: Piles; Eccentricities; Pile Group; Chart.

RCCE_ID56

The Influence of Aquaculture System and Microplastics to Green Mussels

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Abstract: This study presents analysis of microplastics (MPs) in green mussels, *Perna veridis* in relation to aquaculture area. Knowledge concerning MPs pollution in aquaculture systems is limited. Aquaculture systems are designed specifically to rear aquatic animals for human consumption worldwide. Therefore, current research needs to pay more attention to ecological and food safety issues caused by MPs pollution. The objectives of this study are to determine the sources and characteristics of MPs in aquaculture systems and explore the interrelation between MPs abundance in green mussels to access the risk level of microplastics pollution in each aquaculture operation. Three main parameters to be considered in the study are green mussels, sediment and substrate from aquaculture system. The methods of the study focus on field monitoring and laboratory experiment. In this paper, we look at microplastic contamination in 63 green mussel samples and sediment samples from the Temon River, Teluk Jawa, Kampung Pasir Putih, and Tanjung Buai. The laboratory works consist of sample digestion to eliminate organic matters, density separation, observation stereomicroscope and verification of microplastics by Attenuated Total Reflection Fourier Transferred Infra Red (ATR-FTIR) spectroscopy. The findings revealed that microplastic ingestion by green mussels was closely related to microplastic contamination in the aquaculture environment.

Keywords: Aquaculture, Microplastics, Green Mussels, Sediment.

RCCE_ID57

Trends in Evapotranspiration in peninsular Malaysia and its causes

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Abstract: Evapotranspiration (ET) is an important factor for defining hydroclimate, irrigation, water resources and atmospheric characteristics. ET depends on several radiation, and aerodynamic factors, and therefore, the changes in ET are not straightforward like other climatic variables, e.g., rainfall and temperature. Despite of increasing temperature, ET has been found to decrease or not change significantly in many regions of the world. This motivated the present study to assess the trends in ET in peninsular Malaysia. The trends in daily average ET and five driving factors ET, namely, daily maximum temperature, minimum temperature, net solar radiation, wind speed, and relative humidity have been evaluated in this study. Considering the influence of short- and long-term autocorrelations in trend significance of hydrometeorological time series, a modified version of Mann-Kendall (MK) test is used. Besides, non-parametric Sen's slope method is used to estimate the magnitude of change. The relative trends in ET and its driving factors are analysed to identify the causes of the changes in ET is different locations of the study area. The results revealed increase in ET in peninsular Malaysia, unlike the decreasing trends noticed in some studies in the nearby countries. A large increase in minimum temperature might be the cause of increase in ET. The study also revealed a decrease in wind speed and solar radiation in some locations of peninsular Malaysia. However, the decrease was not as prominent as the increase in minimum temperature to affect ET trend. The finding of the study can help in understanding the effect of global warming inducted climate change on different meteorological variables and hydrology in peninsular Malaysia.

Keywords: Evapotranspiration, Trend Analysis, Non-Parametric Statistics, Tropical Region.

Assessment of Landfill Leachate and Sediment Qualities Case Study Of Major Landfills in Thailand, Cambodia, and Laos

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Abstract: Leachate and sediment samples were collected at the major landfills from three countries, namely Nonthaburi province landfill, Thailand, Dangkor landfill, Phnom Penh, Cambodia, and KM32 landfill, Vientiane, Laos. Field investigations have also been conducted to discuss the effect of site specifics of each landfill on the leachate and sediment qualities. In-Situ and laboratory measurements are the main activities for this study. Compared to the national effluent standard, the results show a high concentration of most assessed basic parameters, especially the one related to organic materials, such as TDS, BOD5, COD, which Nonthaburi landfill is the highest, followed by Dangkor and KM-32 landfill, respectively. The fresh leachate showed higher concentration than LDP and WL for Nonthaburi and KM-32 landfill. Closed dumping area generated higher concentration than active dumping in a very deep pit Dangkor landfill. The observed heavy metal concentrations are relatively higher, exceeding over the groundwater standard limit as for the dissolved liquid part concentration and over the industrial effluent standard as for the total concentration of leachate. The major part of the HMs of leachate is partitioned in the suspended solid of leachate.

Key Words: Solid Waste, Landfill Leachate, Suspended Solids, Sediment, Heavy Metals.

RCCE_ID59

Construction Waste Management in Thailand Through Digitalization

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Abstract: This paper is written based on literature reviews and preliminary survey. Recent years have witnessed a significant amount of construction waste as a result of urbanization development and construction activities in Thailand. The country is moving towards better construction waste management; however, there is still insufficient collection and improper disposal of construction waste. Ineffective planning and scheduling, and material storage were among the highest impact factors on construction waste generation in Thailand. At the moment there is no specific approach for the planning in construction waste management (CWM) in Thailand. There's not much research in construction waste management, especially in the context of Thailand. Moreover, there is no evidence of integration of digital technology to improve construction waste management in Thailand. However, as compared to many research areas, very few studies have been carried out to help guide the integration of digital technology in construction waste management. There is a need to integrate digital technology in CWM. The objective of this research is to understand the current situation of construction waste management in Thailand among the construction stakeholders and to identify digital approaches to improve construction waste management in construction project, and then to develop a conceptual framework linking all digital technology in construction waste management. Based on the literature review, the digital technology that could be used for CWM are BIM, GIS, GPS, RFID, big data, digital image, VR, AR, DFMA, 3D printing, CCTV, HAV (drone), block chain technology. And based on the preliminary survey, there is very limited of digital technology have been used for construction waste management in Bangkok, Thailand. Conceptual framework for construction waste management has been developed in order to apply the digital technology to minimize the construction waste in Bangkok, Thailand.

Keywords: Construction Waste Management, Digitalization, Building Information Modelling (BIM), Thailand.

RCCE_ID60

Evaluating the Slope Stability on Shallow Landslide using Geographic Information System (GIS)

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Abstract: Landslide is a dangerous natural hazard that caused hundreds of billions of dollars of destruction and adversely affects a country's economy. Most roads in Malaysia were constructed across the mountain area. These landslides occurred on cut slopes or embankments (man-made) along the roadside, causing severe traffic disruption, property damage, and loss of life. Numerous studies have attempted that have applied various approaches to evaluating landslide losses. However, limited research was done on the effect of groundwater development on slope stability. Thus, this study is intended to focus on the evaluating the slope stability to generate FOS map on shallow landslide along roadside at Cameron Highlands by using geographic information system (ArcGIS software). The most of FOS value diverse in dynamic state fully saturated and dry condition. FOS values were obtained from 1.58-8.98, 1.86-13.89, and 1.72-10.65 for fully saturated, dry, and partially saturated conditions, respectively. In terms of appearance, the FOS values indicated that the area of intensity study was stable condition. Unfortunately, there was still a significant decrease in FOS values when the slope was introduced from completely dry to fully saturated. The constructed of FOS maps can be used to prepare regional land use and mitigate the risks of landslides.

Keywords: Factor of Safety (FOS), Geographic Information System (GIS), Landslide

RCCE_ID61

Indonesia Engineering Consultant Competitiveness Model

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Abstract: The low competitiveness of Indonesian Engineering consulting firms makes the company not grow and even die and new companies with lower competitiveness grow. The lack of personal and low knowledge of the company's leadership on the company's managerial make the company not develop. Building a competitive model that can be guided by small and medium classification consulting firms that are classified as low in competitiveness, so that they can grow and become sustainable is the goal of this paper. The study was conducted on 5443 Inkindo member companies spread across 34 provinces. 354 research samples were taken by means of a combination of proportional and random sent with the help of google form. The Competitiveness Model is obtained from the results of data processing with the SPSS program giving weight to each indicator that has been determined in a Focus Group Discussion with senior members of Inkindo West Sumatra.

Keywords: Model, Competitiveness, Engineering Consulting.

Measures for Reducing Rail Wear in Railway Track: A Review

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Abstract: Railway transportation is of great importance among other modes of transportation, particularly among land transportation systems. The reasons for this issue are the advantages of the railway over other types of transportation. However, on the other hand, the high initial and maintenance cost is considered the disadvantages of the railway. The rail wear in railway track causes a considerable amount of maintenance cost. Therefore, it is needed to consider some countermeasures against this phenomenon. Given this issue, this paper critically reviews the possible ways to reduce rail wear, according to previous studies. The results of this paper indicate that different methods can be utilized to reduce this problem. Reducing rail wear can be achieved using proper geometric alignment, using the lubrication techniques of rail, reducing rail joints, using rigid steel rail, tilting train, and applying a good maintenance plan. However, the selection of methods is related to some factors. For instance, in post-war and developing countries, titling train is not economically possible. Thus, among other methods, the planning of a good alignment in the design stage and using an effective maintenance plan during operation are suggested as efficient and sustainable methods to reduce the rail wear.

Keywords: Railway, Rail Wear, Maintenance, Geometric Alignment, Tilting Train.

RCCE_ID63

Shear Strength Behaviour of Expansive Soil Stabilized with Agricultural Wastes

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Abstract: Agricultural wastes like rice husk ash (RHA), sugarcane bagasse ash (SCBA), and rice straw ash (RSA) have been found as effective in stabilizing expansive clayey soils. The use of agricultural wastes as stabilizing agent offers a cheaper way of controlling the shrink-swell behaviour of expansive soils, at the same time, alleviates the waste disposal problem in the agricultural industry. There is a need to evaluate the shear strength behaviour of the stabilized expansive soil under different environmental conditions to assess its suitability as embankment material or structural fill. This study conducted direct shear test on expansive soil stabilized with 20% RHA mixed with 5% SCBA or RSA as binders under different curing methods such as drying, saturated, sealed, and with sulfate attack to simulate the various environmental conditions. Results showed that both the SCBA and RSA binders with RHA are effective in reducing the expansive behaviour of the clayey soil. The use of SCBA as binder resulted to an increase in shear strength at all curing methods. The dry curing method exhibited the greatest shear strength as manifested by higher friction angle and cohesion values. Though the modified soil showed a reduced frictional resistance in comparison to pure soil, it was compensated by a huge increase in cohesive strength. Samples in dry and sealed curing methods showed strain softening with dilative volume change while samples under saturated and sulfate attack curing methods showed strain hardening with compressive volumetric strain. Samples subjected to sulfate attack curing method exhibited the lowest shear strength as indicated by the very low values of angle of friction and cohesion. This indicates that clayey soil, though modified with binder, is not suitable to be used when exposed to acidic environment.

Keywords: Expansive Soil, Shear Strength, Curing Methods, Agricultural Wastes.

RCCE_ID64

Training for Improving Occupational Health and Safety Performance in the Construction Industry

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Abstract: The potential to attract, maintain and develop brilliant workers is a key attribute of a successful organization. However, training is the most efficient method an organization can use to sustain, update and increase the intellectual wealth of the organization's workforce and to guarantee that its actions add positively to the well-being of humanity as a whole. Literature has revealed that lack of training exposed employees to high-risk levels because they are not informed about hazards in the workplace. The study was conducted on how training can ensure occupational health and safety performance and the prevention of accidents in the construction industry. The study adopted structured questionnaires distributed to construction professionals in the Federal Capital Territory of Abuja, Nigeria, to solicit information on how training can improve occupational health and safety performance. 399 questionnaires were returned out of 443 distributed. The data were analyzed with SPSS and SEM Amos software. The result of the model fit indexes obtained were: ratio= 1.273, CFI=0.998, IFI=0.998, TLI=0.995, RMSEA=0.026. These results met the minimum threshold of a good model and confirmed training is indispensable in improving health and safety performance in the construction industry. Adequate training ensures the competencies of employees and increases their awareness concerning hazards in the workplace. All these contribute to health and safety performance in the construction industry. The study suggests adequate allocation of funds for training at all levels in construction organizations. The study concludes that improvement in the training programs will enable employees to recognize hazards, reduce accidents, and improve health and safety performance in the workplace.

Keywords: Accident, Construction, Health, Safety, Training.

RCCE_ID65

Reputation Loss Model Subject to Pipeline Explosion from Public Perception

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Abstract: Pipeline accident may cause reputation loss, which is often neglected during consequence assessment because of its qualitative nature, thus, causing inaccurate consequence and risk assessment of pipeline accidents. From previous study, a quantitative model was already developed to quantify the qualitative reputation loss. However, since reputation is time-dependent, the model needs to be revised using up-to-date reputation loss factors especially from the public's perspectives. There are three objectives of this study. In Objective 1, literature review and case studies on recent pipeline accident events that occur within the 10 years' time frame (2011 – 2021) are conducted to identify the reputation loss factors. Afterward, questionnaires are designed and distributed to sample target which is the public. In Objective 2, the factors are prioritized by using analytic hierarchy process (AHP) and fuzzy analytic hierarchy process (FAHP). In Objective 3, a revised reputation loss model equation from the public's perspective is formulated and then compared to the model in previous study. Results shows that the most influential factors are D3 "Accident severity" and D3a "Accident that involves many fatalities and injuries", while D2 "Loss of public trust" is ranked the least. Comparison between the current and previous model shows that there is no difference in the factors ranking. Difference is only observed for the reputation loss model equation in which majority of the current factors indicates lower priority weight vector, which is in line with the result from previous study. To conclude, a new revised model with appraisable accuracy in addition to a new reputation loss factor was able to be developed.

Keywords: Pipeline Accident, Reputation Loss, Public, AHP, FAHP

RCCE_ID66

Seismic Performance Investigation of Simply Supported PSC Box Girder Bridge Using Lead Rubber Bearing (LRB) As Seismic Isolator

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Abstract: The seismic performance of a simply supported prestressed concrete (PSC) box girder using lead rubber bearing (LRB) as a seismic isolator is investigated in this study using numerical analysis. The isolator is widely employed to dampen the earthquake force acting on isolated bridge structures, minimizing the pier damage. Due to the damping properties of LRB, it is feasible to disperse a significant amount of seismic energy. Thus, it is possible to shift the period provided by the isolated bridge's flexibility to reduce spectral acceleration, seismic forces, and pier reinforcements. Most bridges in Indonesia were designed using single-mode and multimode spectral approaches, which cannot accurately depict genuine seismic motions, although natural earthquakes exhibit varying responses each period. As a result, the seismic performance investigation employing NLTHA is crucial for defining the structure's dynamic responses. Thus, this research aims to investigate the seismic performance of an isolated bridge using nonlinear time history analysis (NLTHA). In this paper, a 5-spans simply supported PSC box girder bridge in Makassar was analyzed using NLTHA at Opensees. Five ground motions with the maximum direction spectral were selected and scaled roughly similar to the designed spectral of the located bridge. The results indicated that while the LRB dissipated significant seismic energy, the maximum longitudinal and transverse pier responses remained within full operational and operational limits. This indicates that the bridge is still capable of being used commonly. Thus, LRB is a good preference for improving structural performance and mitigating the damage caused by seismic excitation.

Keywords: Box Girder Bridge, Pier, LRB, Seismic Performance, NLTHA

RCCE_ID67

Machine Learning Techniques for Smart Predicting Trapping Index In Geological Carbon Dioxide Storage Sites

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Abstract: Geological carbon dioxide (CO_2) storage (GCS) is recognized as the promising technology for global CO_2 emission reduction, and the crucial problem in GCS is how to determine the trapping efficiency in storage sites. Thus, the main goal of this paper is to explore the aptitudes of three robust machine learning models, including multilayer perceptron (MLP) optimized with Levenberg-Marquardt (MLP-LMA) and Bayesian Regularization (MLP-BR) and General regression neural network (GRNN) in predicting residual trapping index (RTI) and Solubility Trapping index (STI) for geological storage sites. A sufficiently widespread databank was generated from literature, including more than 1910 simulation samples from numerous field models of CO_2. The prediction results demonstrate that the suggested machine learning paradigms achieve the high accurate evaluation of CO_2 trapping in storage sites. Also, error analyses and comparison of statistical indicators indicated that the GRNN model was superior the other machine learning models and the previous study. The GRNN model showed that the overall coefficient of determination (R^2) of 0.9995 and an AAPRE of 0.0197 for RTI and a R^2 of 0.9442 and an AAPRE of 0.0113 for STI. Ultimately, the curve analysis finalized the stability of the GRNN model in foretelling the RTI and STI in storage sites, and its produces matching perfectly the simulated values with changes in all input parameters.

Keywords: Machine Learning; MLP-LMA; MLP-BR; GRNN; CCUS; CO_2 Storage.

Numerical Feasibility of Spherical Smart Aggregate for Detecting Structural Damages in Prestressed Concrete Anchorage

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Abstract: Spherical smart aggregate (SSA) has proven its effectiveness for structural health monitoring (SHM) of reinforced concrete (RC) structures. This study is motivated to investigate the feasibility of SSA for detecting inner damages and prestress-loss occurrence in a post-tensioned anchorage system. Firstly, the fundamental of the impedance based SHM technique and the operating principal of SSA are briefly described. Next, a finite element model of a post-tensioned RC anchorage in literature is established using ANSYS. Stress analysis is then conducted to identify the potential cracks inside the RC anchorage and to determine the optimal placement of SSA. Afterwards, the impedance response of SSA is numerically analysed under different levels of the prestress force and the crack severity, respectively. The change in the impedance response is consequently quantified to diagnose the occurrence of the prestress-loss and the inner damages in concrete. The numerical results show that the impedance response of SSA sensitively varies with those structural damages and the SSA technique could be a promising tool for damage assessment in prestressed RC systems.

Keywords: Impedance Response; SSA; RC Anchorage; Crack Monitoring; Prestress Monitoring

RCCE_ID69

Impacts of Climate Change on Design Flood Estimation in the Johor River Basin, Malaysia

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Abstract: A flood is one of the most serious disasters in Malaysia under two major monsoon seasons, the Southwest (SW), which runs from May to September, and the Northeast (NE), which runs from November to March. The Johor River Basin has been one of the most severely damaged areas in Malaysia by floods during the NE monsoon season. The damage might become more severe because of changing climate; therefore, the current design flood system must be revised with the consideration of the impacts of climate change. This research aims to make the intensity-duration-frequency (IDF) relationships of the historical (1979-2003) and future (2075-2099) scenarios and evaluate the changes in the estimated design flood values and those return periods in the Johor River Basin. The Hydrologic Simulation Program-FORTRAN was used for runoff simulations in this research. Then, the hydrological frequency analysis using the historical and future GCM outputs was conducted to estimate the changes in design flood values (peak flows). The changes in return periods of the estimated flood values were checked by the cumulative distribution function (CDF) mapping method. As an example of the results under the future scenario, a design flood value with 5-day rainfall duration will become 992.1 m^3/s (i.e., an increase of 58.1% compared to the historical scenario) based on the future IDF relationship. The return period of this value corresponds to 282.8 years based on the historical IDF relationship. This means that the current planning scale, e.g., the 100-year return period that has been commonly used in Malaysia, might not be adequate and should be extended to prevent and/or mitigate the damage of devastating floods under climate change.

Keywords: Climate Change; Hydrological Frequency Analysis; IDF Relationship; CDF Mapping; Johor River Basin

RCCE_ID70

Cost-Effective and Sustainable Foldable Structure as Post-Flood Transitional Shelter in the Philippines

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Abstract: Millions of Filipinos are displaced yearly due to typhoons, which creates a demand for transitional shelters for internally displaced persons (IDPs). This paper presents a viable cost-effective and sustainable shelter for the victims of floods and other disasters. To address sustainability of shelter, measures were taken into consideration of the United Nations Sustainable Developmental Goals (UNSDG) 11 and 13, which are focused on sustainable cities and communities and climate change, respectively. A total of 8 shelters were considered, namely shelters A to H, the design remained constant while the materials for structural elements and wall panels and floorings were varied. Structural elements were made of either structural steel or bamboo elements, while the wall panels and floorings were made of bamboo plywood or aluminum honeycomb panels. The shelters utilizing bamboo panels yielded maximum force and stress results due to their higher weight density. All shelters were analysed to ensure the capability to withstand the loads applied. The shelter made of bamboo structural elements and aluminium honeycomb panels resulted as the most cost-effective shelter with 50.2% difference compared to its structural steel shelter counterpart. The most sustainable shelter was the shelter made of bamboo structural elements and aluminium honeycomb as wall panels and bamboo plywood as flooring. Overall analysis evidenced that shelter made of bamboo structural elements and aluminum honeycomb panels was determined as the champion. The impact of the champion shelter on the UNSDG 11 was forecasted 17% decrease in the number of IDPs from the year 2016 to 2030. Focusing on UNSDG 13, the shelter made of bamboo structural elements and aluminum honeycomb as wall panels and bamboo plywood as flooring was the best solution as it yielded 2.44% and 2.12% higher contribution to climate change compared to shelters A & E, respectively.

Keywords: Typhoon, Transitional Shelter, Sustainable Cities and Communities, Climate Change

RCCE_ID71

Significance in Managing the Midstream and Downstream Stages of Fluorocarbon Gas Lifecycle to Reduce Climate Change Impacts

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Abstract: The environmental impact of fluorocarbon (FC) gas, such as chlorofluorocarbons (CFCs), hydro-chlorofluorocarbons (HCFCs), and hydrofluorocarbons (HFCs), has been widely studied because of climate change and the emission of greenhouse gas (GHG). The emission of FC-gas occurs over the whole life cycle, starting from production until end-of-life. Each stage of the FC-gas lifecycle must be addressed to reduce emissions. Many studies have been made at the upstream level such as on refrigeration and air conditioning (RAC) system performance, low or zero global warming potential (GWP) refrigerants and designing the RAC system. However, at midstream and downstream of FC gas lifecycle, more attention is needed. This is because the famous hotspot of the direct (leakage of FC gas) and indirect (increase in electricity consumption) emission has occurred at midstream. Whereas the insufficient amount of FC gas in the RAC system will increase the electricity consumption. This issue is relatable to the service and maintenance practice of consumers and RAC technicians. Besides, some study shows the emission of CFC is still exist even though it has banned in 2010. The direct emission of the CFC is occurred due to the improper disposal of FC-gas from the old RAC equipment. Thus, without proper management at midstream and downstream of FC gas lifecycle can increase the direct and indirect emission to the atmosphere through leakage incident, "bank" of FC gas and increase in electricity consumption. Direct emission together with indirect emission will double up the contribution to global warming.

Keywords: Fluorocarbon Gas, Lifecycle Management, Climate Change.

RCCE_ID72

Optimization of Thermal Efficiency on Bio-nanocomposites Coating for Passive Cooling in Green Building Using Taguchi Method

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Abstract: Energy efficiency is very important in a green building scheme. As Malaysia is a tropically hot and humid country, smart cooling technology will reduce the dependence on the air condition which is high in electricity consumption and GHGs emission due to heatwaves and solar radiation. Passive cooling technology creates barriers with insulation through the coating to keep indoors cool and remains warm at night. Bio-nanocomposite is biomass waste in nanosized and is used as an additive in coating material to improve the properties of coating material. Therefore, this study aimed to identify thermal performance with or without coating material and to optimize the efficiency of bio-nano composite coatings in a passive cooling system for green building construction. A series of thermal studies is used includes surface temperature and the level of efficiency of different coating mixtures on plastered solid-block prototypes' surfaces. The data is collected based on Taguchi design and analysed using Minitab software. By having bio-nano composite as an additive in paint structure, there will be a significant thermal performance with temperature reduction during daytime and maintaining warm condition during night-time in which increase the efficiency in cooling from the mixture of bio-nano composite additives in coating to improve passive cooling system better than thermal insulation paint which is widely sold in the market.

Keywords: Green Building, Energy Efficiency, Passive Cooling, Coating, Thermal Insulation Paint, Additive, Biomass Waste.

RCCE_ID73

Response Optimization of Cementitious Materials and Seawater on the Compressive Strength of Mortar

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Abstract: Several industries, including construction, are greatly affected by the low water supply, especially during the dry season. Thus, the construction industry needs to explore alternative ways of outsourcing water for construction needs, particularly in the mixing and curing of concrete. An abundant resource like seawater and products like fly ash and silica fume are promising alternatives for manufacturability, sustainability, and cost-effectiveness. In this study, the effects of supplementary cementitious materials on mortar mixed and cured in seawater of varying salinities were investigated. Freshwater and seawater at 15ppt and 35ppt were used as mixing and curing water. Fly ash was used at 15% and 30% replacement to cement, while silica fume replaced a portion of the sand at 5% and 10%. The specimens were cured for 3, 7, 28, and 84 days using the standard curing cabinet. Results showed no significant correlation between the type of mixing water used – freshwater or seawater – and compressive strength. Seawater showed an increase in compressive strength after 28 days of curing with either 15ppt or 35ppt. Fly ash increased the compressive strength after 7, 28, and 84 days of curing as it reacted with calcium oxide to form C-S-H. Silica fume was found to decrease the early compressive strength after 3 days of curing and increase after 84 days of curing. No relationship was found on the other curing periods. Through response optimization, a mixture with 35ppt seawater for mixing, 24.75ppt seawater for curing, 21.20% fly ash replacement, and 0.90% silica fume replacement would result in high compressive strength of up to 51.20 MPa after 28 days of curing. Further research is recommended to ascertain the effects of these supplementary cementitious materials, especially for extended curing periods.

Keywords: Seawater, Fly Ash, Silica Fume, Compressive Strength, Mortar.

RCCE_ID74

Estimation of Greenhouse Gas Emission from On-Site Septic Wastewater Treatment

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Abstract: Imhoff Tank, an on-site domestic wastewater treatment system, is one of the potential sources that could emit greenhouse gases (GHG) mainly methane and nitrous oxide to the environment. Moreover, if Imhoff Tank is not desludged based on the schedule (approximately every two years), it may increase the methane production and release to the atmosphere due to the active microbial breakdown of organics in human waste. Imhoff Tanks are normally used to serve small communities up to 1,000 PE. However, in this study, few Imhoff tanks served for almost 2,000 PE. Referring to the 2006 Intergovernmental Panel on Climate Change (IPCC) approach and based on the primary wastewater data, the estimation of GHG emission from selected Imhoff Tanks in Malaysia was done. The inventory of GHG emissions from the Imhoff tanks for six years shows that under the different Population Equivalent (PE), wastewater with higher Biological Oxygen Demand (BOD) concentrations is generally produces more methane than wastewater with lower BOD concentrations. Furthermore, the direct liquid treatment processes made the highest GHGs production, compared with the indirect emissions from electricity consumption and wastewater treatment effluent that is discharged into the river. The anaerobic treatment process that occurs in Imhoff Tank is releasing methane, which has greater Global Warming Potential (GWP) than carbon dioxide.

Keywords: Imhoff Tank, Greenhouse Gas Emission, Global Warming Potential.

RCCE_ID75

Assessment of Peat Fire Susceptibility for Carbon Emission Reduction

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Abstract: Peatlands play a critical role in carbon accumulation. Consequently, their deterioration releases a considerable amount of carbon that it wields an impact on the global climate. Moreover, fire has the ability to agitate the carbon stored in peats which account for almost the total amount of carbon in the atmosphere. Despite peat being naturally fire-resistant in the tropics due to their immense moisture retention, it has been expressed that extensive anthropogenic activities as well as warmer climates resulting from global warming will drastically increase the deterioration rate of intact tropical peatland, eventually resulting in the increase of feasibility for peat ignition. Therefore, this paper aims to achieve two (2) main objectives; (1) to identify the peat classification in relation to peat depth and (2) to identify carbon dioxide (CO_2) content stored and CO_2 emission of peat within the study area. These are vital data in producing a holistic peat fire management approach. Identifying peat classification is done by conducting site work mainly consisting of peat auger, resistivity survey, and borehole exploration. Samples are collected to undergo laboratory tests to determine bulk density and organic content necessary to calculate CO_2 content stored and emission. Based on the site work, majority of the peat within the area is classified as Sapric which has low fibre content, with a maximum peat thickness of 1.2m. The carbon content was calculated to be at 52.82 carbon tonne per hectare. On the other hand, the samples tested indicates that the organic content is at an average of 45.24% with a bulk density of 1.03 Mg/m^3. From these values, the CO_2 emission was determined to be at 381,925.18 tCO_2/year. It can then be concluded that continued development without considering appropriate mitigation measures will potentially increase feasibility of peat ignition, thus, increasing overall carbon emission significantly.

Keywords: Tropical Peatlands, Climate Change, Fire Susceptibility, Organic Content, Carbon Emission.

RCCE_ID76

Development of Bacterial-Cellulose-Fiber-Reinforced Composite: Material Strength and Product Application

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Abstract: The radical transformations induced by the notion of sustainability, circular economy, and the democratisation of biotechnology knowledge have led to new opportunities for product designers and engineers to explore the development of environmentally benign materials. Notably, living organisms offer an appealing advantage for product design, as they can become the co-maker of the output materials or products. One of the promising lab-grown materials developed and utilised in product design is the bacterial cellulose composite. Nevertheless, existing research primarily focuses on the cultivation process and the feasibility of the materials at molecular levels. Therefore, much research is needed to fill the void of knowledge in developing biomaterials for product design. This project presents the strength test of bacterial cellulose composite reinforced with plant fibres and its conceptual product applications using the Material Design-Driven framework (MDD). It has been found that the tensile strength of the reinforced composite is higher than other naturally grown materials. As a result, the designed material can be embedded in many novel product applications, although it is incomparable to the technical properties of animal leather. The findings of this study reflect a positive development of locally developed sustainable material from living organisms and, importantly, prove the viability of the material to be commercialised.

Keywords: Sustainability, Sustainable Materials, Bacterial Cellulose Composite, Biomaterial, Product Design.

RCCE_ID77

Carbon Footprint Assessment of The Construction Materials and Energy usage of Kict Building in IIUM

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Abstract: The increasing carbon emissions in the atmosphere due to climate change and global warming has become an environmental issue. The construction industry is one of the biggest carbon dioxide emitters in the world. The statistic shows that in Malaysia, buildings account for about 20% of GHG production, which comes in third place after transport 27% and industries 21%. In 2017, Malaysia ranks 25th in the world in terms of carbon emissions, with 255 $MtCO_2$ of the 36153 $MtCO_2$ world total emissions. To minimize the carbon emissions from the construction activities, several studies have used carbon assessment tool such as the Inventory of Carbon & Energy (ICE) developed in the UK. However, the tool is less likely being implemented in Malaysia. This study presents an analysis of carbon footprint from an office building (KICT building) to identify and quantify the main sources of carbon emissions and energy consumption of the project and propose environmentally friendly materials to replace the conventional building materials to achieve the implementation of sustainability in Malaysia. The study has shown that the values obtained for electricity consumption are 38,191.4 tons CO_2 for only twelve (12) months of operation, whereas construction materials are 8,262.4 tons CO_2, with the difference of 29,929 tons CO_2. In percentage, it is account overall of 82.2% and 17.8%, respectively for electricity consumption and construction materials. In comparison to electricity consumption and construction materials, it is found that during operation at KICT building generated four times more carbon dioxide than embodied carbon from construction materials. One key factor to success is to work in cross-function teams where different knowledge and experience cooperate and make the emission reduction even more efficient.

Keywords: Global Warming, Construction Industry, Carbon Footprint, Electricity Consumption, Construction Materials.

RCCE_ID78

Exploring Elements Contributed to the Popularity of Malaysian Local Car

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Abstract: Based on marketing reports, Perodua Myvi is the most popular Malaysian car for the last decade and predicted to be a best-seller for the coming decade as it is as a "true Malaysian icon". Since 2015, Myvi has become the Perodua's best-selling model. This study aims to explore elements that contributed to the popularity of Perodua Myvi. Therefore, the objective of this study is to identify the user preferences on elements that contributed to the popularity of Perodua Myvi. A questionnaire survey was conducted in Kuala Lumpur area, and hundred (100) respondents were selected among Perodua Myvi users. A convenience sampling was adopted for this study. Questions were answered by using the Likert Scale 1-5, ranging from 1 indicating strongly disagree to 5 indicating strongly agree. The survey included multiple-choice as well as single-choice questions. The results show that users prioritize [cost], [size], [performance] and [long-life] as the elements that contributed to the high popularity of Myvi car among the users. Myvi was rated as a car with relevant price, quality and size that satisfied users preference in design and driving needs. Myvi car received a special place in many Malaysian hearts due its features mainly by the attractive and affordable price. Based on these findings, it is hope that it will improve decision-making processes by the local car companies in developing a car that really meets the user needs and demands.

Keywords: Elements, Perodua Myvi, Malaysian Local Car, Popularity.

RCCE_ID79

Preliminary Investigation using QGIS to Assess the Recession and Advancement of the Coastline of San Juan, La Union, Philippines

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Abstract: Coastal erosion has been affected by environmental factors and human development. The investigation of the coastal erosion in San Juan, La Union covers the analysis and quantitative data that can be applied to protect the coastal community, to minimize economic losses, and to plan for the improvement of coastal process response. The main objective of this study was to investigate the extent of the coastal erosion problem of the 5.36 km - coastline of San Juan La Union and predict the long-term erosion pattern. The characteristics of the triggering factors of coastal erosion such as tide, wind and wave were evaluated during normal and extreme weather conditions. The areas along the coastline were characterized whether it experienced dominant deposition or erosion. Changes in shoreline position were assessed in order to predict future shoreline change scenarios. The study analyzed the characteristics of the study area in terms of nautical data and bathymetric chart, tide, wind, and wave data. Sediment transport analysis was conducted by using the Kamphuis Formula and the CERC Formula. For the Kamphuis formula, it was found that the beach slope had a significant effect on the amount of sediment transport rate. For the CERC formula, it was found that all were having the same value per month. Satellite images were georeferenced in order to conduct shoreline positioning and shoreline prediction. The shoreline positioning analysis showed that the southern region of the study area was dominated by erosion and the central to northern regions were dominated by deposition. The 1985 to 2020 shoreline change indicated an average movement of shoreline at 57.036 cm/yr and at 51.903 cm/yr characterized by recession and advancement, respectively. Furthermore, the shoreline prediction analysis reveals that the rate of displacement from 2020-2050 is 131.56 cm/yr and 173.04 cm/yr showing deposition and erosion patterns, respectively.

Keywords: Coastal Erosion, QGIS, Recession, Advancement.

RCCE_ID80

Simulating the Hydrologic Capability of Low Impact Development Structures in a Residential Subdivision using Stormwater Management Model (SWMM)

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Abstract: The growing concerns toward the massive population surge in the past few decades have prompted the mass construction of residential housing in the Philippines, increasing impervious cover and inducing multiple stormwater-related risks in the form of increased runoff, a loss of infiltration, and the conveyance of land pollutants to receiving water bodies. Low impact development (LID) structures, a recent approach towards sustainable stormwater management, have been used by many countries to minimize the potential stormwater impacts in heavily urbanized areas and mimic the predevelopment hydrological processes. There is a research gap on its application in the Philippines, however, as traditional drainage such as concrete pipes and culverts are still the preference of local authorities. The objective of this study is to propose LID controls in a residential park area and assess their respective water quantity reduction capabilities using Stormwater Management Model (SWMM). Daily rainfall data was first collected from a nearby rain gauge and was disaggregated hourly in a 24-hour span for input in the model. Different LID scenarios were then set and then simulated in SWMM to compare the runoff, volume, peak flow, and flow results with the no LID scenario. Results of the assessment have shown that all LID scenarios have also generated lesser runoff, volume, peak flow, and flow compared to the no LID scenario. It was also observed that scenarios with multiple LIDs generated the greatest reductions. These results show that there is a huge potential for LID use in the Philippines, and the widespread use of LIDs in areas with excessive impervious cover such as residential subdivisions can aid in the flooding issues experienced in the country.

Keywords: Low Impact Development; Rainfall Analysis; Residential Area; Stormwater Management Model.

RCCE_ID81

Pollution Event Mean Concentration (EMC) Prediction on Low Impact Development (LID) using Machine Learning

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Abstract: Prediction of the pollutants could help to discover optimum design and operational approaches, as well as maintenance requirements. The data sets acquired were monitored and collected from 2009 to 2018 at Low Impact Development (LID) Facility, Kongju National University, Cheonan City, South Korea. EBF, GEF-1, GEF-2, SCW1 and SCW2 are the five (5) constructed bioretention methods considered in the study. The objective of the study was to determine the predicted pollutant particularly on its event mean concentration using artificial neural networks considering the rainfall data, total volume runoff and the effluent concentration of pollutants on the bioretention. The training algorithm in the study uses Bayesian Regularization Backpropagation. The results reveal that bioretention EBF is ineffective at capturing pollutants, particularly heavy metals. It also notices the actual EMC have high values compare to the predicted EMC. The highest EMC can could capture by a bioretention was TSS with 68.02%. Also, the predicted EMC indicates that it was not able to capture pollutants by a bioretention was BOD. This explains why increased rainfall recurrence intervals will limit bioretention facility treatment capacity.

Keywords: Bioretention System, Low Impact Development, Event Mean Concentration, and Artificial Neural Network.

RCCE_ID82

Experimental study of delayed-release admixture encapsulation pellets for concrete

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Abstract: Chemical admixtures play an essential role in concrete engineering with increasing demand for quantity and quality. The interaction process, the reaction of admixtures from mixing to curing, and the strength development of concrete significantly influence their effects. In recent years, with the introduction of "controlled-release" or "delayed-release" technology, the effectiveness of the admixtures has improved and at the same time reducing the adverse effects of early reaction, which is more beneficial for controlling the quality of concrete, as well as open the way to use admixture pre-mixed dry mortar. This study focuses on experimentally manufacturing encapsulation Sulfonate Naphthalene Formaldehyde (SNF) admixture pellets with a fly ash shell. The layers of fly ash gradually dissolve and react with the hydrated cement matrix, creating conditions for the inner core of additives to be released and take effect gradually over time. The content evaluation and the level of admixture release from the pellets were evaluated through FTIR analysis combined with UV-vis. In addition, the effects of using delayed-release admixtures in mortar samples compared with the use of the conventional method were also experimentally evaluated through flow-testing and developing compressive and flexural strengths.

Keywords: Control Release, Encapsulation, Admixture Concrete, Sulfonate Naphthalene Formaldehyde.

RCCE_ID83

Fertilizing Value of Recovered Phosphate from Wastewater

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Abstract: Household septage disposal is a recurring problem in developing countries like the Philippines, where septic tanks are poorly maintained and few are connected to a sewerage system. Wastewater effluent coming from households when disposed without proper treatment can cause eutrophication of water bodies. This has caused negative impact on biodiversity, human health, and the environment. This problem can be addressed by recovering nutrients especially phosphorus from wastewater and converting it to fertilizer. Wastewater is first hydrolyzed thru addition of acid to release the phosphates. Then the supernatant is transferred back into the reactor. Then Precipitation happens upon application of sodium hydroxide and salts to precipitate the phosphates. The utilization of septic wastewater to convert into a new valuable product will help the community from this environmental and health problems. A total of 3,182 liters of septage was processed and 9,297 grams of recovered phosphate was collected after drying. Yield performance of tomato, eggplant, pechay, and mustard applied with three (3) fertilizer treatment namely No fertilizer (Treatment 1), Inorganic/Commercial Fertilizer (Treatment 2) and Recovered phosphate (Treatment 3). The results show that tomato, eggplant, pechay and mustard fertilized with inorganic/commercial fertilizers obtained the highest yield of 47.77 t/ha, 29.23 t/ha, 15.32 t/ha and 25.85 t/ha, respectively. Tomato, eggplant, pechay and mustard fertilized with recovered phosphate (Treatment 2) recorded yields of 30.77 t/ha, 20.32 t/ha, 8.88 t/ha and 14.34 t/ha. Lowest yields were obtained in plots with no fertilizer application These results show that crops fertilized with commercial fertilizers obtained the highest yields. The experiment also presents that crops responded to the applied recovered phosphate (Treatment 3) because higher yields were obtained compared to crops grown in plots with no fertilizer application (Treatment 1). The study shows that resource can be recovered from wastewater and help man develop a circular bioeconomy in the Philippines.

Keywords: Recovered Phosphate, Resource Recovery, Circular Bioeconomy.

RCCE_ID84

Assessment of Residential Housing and Density: Actualisation of Building Collapse in Nigeria

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Abstract: Urbanisation has resulted in people's lifestyle of living in substandard units, chanty, slums environment, un-habitable units, squatter units, and deteriorating housing situations. The relevant planning Authority concerned with responsivity to enforce development order in relation to building regulations in developed countries prove very active where in Africa and Nigeria in particular, the reverse is a case of mismatched game given rise to backyard principle where both professionals and non-professional are both in to site supervision and managing construction sites leading to poor construction work. This paper aims at examine the root causes of building collapse other than material cause in Nigeria. The study focuses on residential housing as the main target where long time human activities are carried out. Residential housing density are the major indicators which mostly account for building collapse I most our towns and cities. The study also takes cognisance of all the components of residential housing and accommodation density, space standards. The study established an online questionnaire administration for stronghold and reliable data. The researchers used both primary and secondary data to determine the relationship between housing and density. The study employed Chi square goodness of fit to provide evidence of relationship between housing and density; building collapse and enforcement tools. The study revealed a strong relationship between residential housing and density as well as structural collapse. This study will significantly contribute to knowledge for builders, professional allied and decision-making organs in the provision of housing policy and development standards in Nigeria.

Keywords: Residential Housing; Density, Building Collapse; Development Control.

Attempt to Improve the Kaolin Clay using Bittern, Calcium Oxide, Acetic Acid and Surfactant

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Abstract: Prior to the widespread use of cement for soil improvement, bittern was used in Japan. Bittern, called 'Nigari' in Japanese, is salt solution containing magnesium, calcium, and potassium ions as well as chloride, sulfate, iodide, and other ions. It is made from sea water. It is also well known as a coagulant in the production of Tofu. Nowadays, a method of clay hardening using bittern known as 'Tataki' is still used in traditional Japanese architecture. The soil improved using this method has a slight acidity. As a result, pollution due to alkaline water from lime or cement can be avoided. However, the mechanical strength of the improved soil produced by this method is less than that produced as a result of using lime or cement. Furthermore, substantial compaction work is required. In order to address these concerns, this study examines acetic acid and surfactant for 'Tataki'. The surfactant is expected to remove the water membrane on the surface of a soil particle, and acetic acid is expected to generate condensation of clay particles. Both effects are expected to increase soil density and mechanical strength. Mechanical strength is estimated using tensile strength because there is a relationship between tensile strength and uniaxial compressive strength in hardened clay. Tensile strength can easily be obtained using a small uniaxial compressive testing machine in the Brazilian test. A total curing period of 28 days are selected, with four types of wet curing period of 0, 1, 3 and 7 days included in the total curing period of this study. According to the results of this study the effect of acetic acid and surfactant can be seen in the mechanical strength of the specimen for all curing conditions from 450 to 550 Ncm/cm^3 of amount of compaction work.

Keywords: Traditional Soil Improvement in Japan, Clay, Tensile Strength, Acetic Acid, Surfactant

Authentication of Physical Planning Authority and Building Collapse: Contemporary Challenges in Nigeria

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Abstract: The control of physical developments, proper coordination of present and future requirements as well as creating an enabling environment for living and working is the major priority attaché to planning organisations. Planning is beyond paperwork and approval, it is the responsibility of planning authority to control development activities for the purpose of supporting, enclosing and protecting building structure as well as inspecting buildings on site after approval from foundation level to finishing level. The aim of this study is to examine the physical planning activities, planning laws in safeguarding buildings from collapsing. This study focuses on two action areas Abuja, Federal Capital Territory and Lagos State using proportional sampling methods. The study used a quantitative research method. A total of 50 questionnaires were administered online; 25 respondents represented the Federal Capital Development Authority (FCDA) Abuja also 25 represented staff of Lagos states Urban Development Board (LSUDB). On the building side, 20 construction workers were interviewed orally at the construction site with the aid of ad-hoc staff. The study employed Chi square goodness of fit and simple linear regression analysis to determine the relationship and coefficient of correlation between planning coordination and building collapse. The study revealed strong evidence of poor planning coordination especially building plans interpretation, building plans approvals, enforcement orders while, on construction workers poor building materials, low standard mixed ratio were the factor for building collapse. This study will enable decision makers, stakeholders, site developers adhere to planning law and building standards in order to ameliorate inorganic building collapses in Nigeria.

Keywords: Authentication, Physical Planning, Building Collapse, Contemporary Challenges, Planning Law, Safeguarding.

RCCE_ID87

Effect of Joint Roughness Coefficient with regards to the Seismic Effect on Planar Block Movement

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Abstract: This paper presents a study on measuring the effect of joint roughness coefficient (JRC) on a rock block by considering the tension crack of the rock slope located in Malaysia. By referring to the seismic hazard map produced by MOSTI, Malaysia is a country that has a low seismicity level. Peak ground acceleration (PGA) value was around 0.02 to 0.10 g in peninsular Malaysia and 0.06 to 0.12 g for East Malaysia (Sabah and Sarawak) for 500 years return periods. These PGA values were selected and performed in this study using the Limit Equilibrium Method (LEM). This method utilizes RocPlane software by Rocscience, which was used for assessing the stability of planar sliding blocks or wedges in rock slopes. This study covers deterministic analysis concerning secondary data from Bandar Seri Alam, Johor, Malaysia. The output data was validated first with the actual site condition before sensitivity analysis on JRC was performed. For the first case of the parametric study, the effect of JRC and the seismic coefficient on the rock slope stability was investigated and highlighted based on the graph produced. Results show that the effect of the roughness on the rock surfaces will give resistance against sliding hence increasing the shear strength of the rock, which indicates that the slope becomes more stable. In the presence of seismic force, it will induce inertial force of the controlling joint surface which will lead to the instability of the rock slope and reduce the FS values. For second and third case of the parametric study, water percent filled were varied along the potential sliding surface of the rock plane and in tension crack with regards to seismic coefficient values. The results show that the presence of tension crack was tended to be more severe in terms of slope instability.

Keywords: Joint roughness coefficient; Peak ground acceleration; Limit equilibrium method; Factor of safety; RocPlane software

RCCE_ID88

Waste Tracking Analysis at the Selected Higher Education Institution (HEI) in Malaysia

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Abstract: The generation of solid waste from various streams is inevitable for a university campus, based on its large population and variety of activities that being carried out around the campus. As such, it is a challenge to implement effective solid waste management. Henceforth, the purpose of this study is to analyze the waste-stream management of solid waste in five (5) research universities covering from waste generation until disposal. The method to carry out the study is by interviewing the relevant officers related to the solid waste management operations in the campus. The study will evaluate a component of waste data from operator, facility, transport, and disposal and suggestions as well as improvements that can help minimize the waste disposal to landfills will be elaborated. The results provide the framework of the waste management system and the status-quo waste handling by all selected universities as the baseline. A series of three (3) years data were considered to determine the baseline of waste operation, including procurement and routine works. The period waste management that been selected will be based on the validity and readiness of data. Overall, the computed results demonstrated that all operations are critical and must be carried out correctly to keep waste at the end disposal as low as possible or to achieve zero waste management on campus.

Keywords: Waste-Stream Management, Waste Tracking Analysis, Research University, Higher Education Institution (HEI)

Application of Industrialized Building Systems in Malaysian Construction Industries

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Abstract: In Malaysia, the term Industrialised Building System (IBS) refers to a construction approach in which components are manufactured in a controlled environment, either on-site or off-site, and then installed and integrated into construction works. The Critical Success Factor (CSF) of the industry's implementation of the IBS for the Malaysian construction have been identified and need to be elaborated intensively. The direction of this study is to investigate the current CFS of the IBS in Malaysian Construction Industries. Every significant detail that happens from the very beginning of the manufacturing process until maintenance period is monitored and observed. The methodology that being use is the IBS components was manufactured off-site by the local supplier or even from foreign country, later transported to the project and ready to be installed as the building structure. The benefit from this is we can ensure what part that cause the CSF to occur and how to implant the things in our country. The negative social impression of using IBS in construction was the highest among the CSFs in the concerns and perceptions component. Also, identified CSF that, IBS buildings are often associated with unpleasant aesthetics and complicated designing. Concisely, the critical success factor of IBS in Malaysian construction industry can be identified by understanding the IBS research, implementation of technology applied and construction strategies.

Keywords: Controlled environment; Industrialised Building System; Construction technology.

RCCE_ID90

A Comparison of Single and Multi-stream Waste Recycling in Higher Education Institutions in Malaysia

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Abstract: There is a current debate on the effectiveness and efficiency of a single-stream recycling system compared to a multi-stream recycling system. The single-stream recycling system is gaining attention among waste management, including higher education institutions. Implementing the single-stream recycling system is easier because all the recyclables are set out in one container without sorting them further than the conventional system in which the assortment is needed. However, to what extent is single-stream recycling more effective in improving recycling performance than multi-stream recycling is uncertain. This study examines differences in performance on the single-stream and multi-stream waste recycling systems applied in higher education institutions. Three higher education institutions, including Universiti Teknologi Malaysia (UTM), Universiti Kebangsaan Malaysia (UKM) and Universiti Malaya (UM), were involved as case studies to examine the progress of waste recycling systems practised. The volume of recyclable materials collected, recycling rate, and recyclable generation rate were explored to compare the recycling performance between single and multi-stream recycling systems in selected higher education institutions. The results indicated that the effectiveness of a recycling system does not only lie in the type of system used; other factors such as the type of recyclables taken into account, the total population, and recycling management play an important role in the success of the recycling system. This present study offers general recommendations on single and multi-stream recycling approaches that can be applied by waste management to adopt an appropriate recycling system in higher education institutions to increase the efficiency of waste recycling activities that can have a positive impact on the recycling performance in higher education institutions.

Keywords: Recycling Performance, Single-Stream Recycling, Multi-Stream Recycling, Higher Education Institutions, Recycling Management.

RCCE_ID91

Relationship between the Rock Mass Strength to the Rock Support

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Abstract: Geomechanical classifications, such as the Rock Mass Rating and Q-system are common ways of defining rock mass behaviour, especially in the early stages of tunnel projects. Japan Highway Public Corporation (JH) rock mass classification also known as JH-System (JHS) was used in a tunnel project, known as Pahang Selangor Raw Water Transfer Tunnel to determine the rock mass class using geological assessment of the tunnel face and the side walls of the excavated tunnels. It is important to assess overstressing in deep hard rocks to minimize the risks of excavation such as tunnel excavation activities. The aim of this study is to study the rock mass strength at tunnel NATM-2, investigate the tunnel rock support used and find the relationship between the JHS grade point to the tunnel rock support. This research activity includes development of tables from the secondary data which are the tunnel face mapping, converting the data into tabulation of line graphs, and finally studying the geological condition and the support pattern. The results obtained from the secondary data will be tabulated and analysed. The description of the rock mass rating and the results of the rock strength will be discussed. High JHS grade points need minimum tunnel rock support. Little support is needed in areas with high quality rock mass as it is already stable when tunnelling activities are carried out.

Keywords: Tunnel, Q system, NATM, Pahang Selangor Raw Water Transfer Tunnel, Rock Mass Rating, JH-System.

RCCE_ID92

Computerised Tomography Application: Coal Integration Between Sorption to Carbon Dioxide

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Abstract: Dual-energy CT scanning is not a novel method for evaluating reservoir rock. It has been used for many years. Each time the rock is scanned with a different X-ray energy, the same region is scanned twice. Dual energy scanning is successfully used in investigations of fluid flow visualisation. Along with the lack of appropriate software and procedures for generating mass density and nuclei count pictures from high and low energy CT data, the added problem is the absence of processes for characterising the cores using density and atomic numbers. The density and atomic number images can now be generated from the dual-energy data using commercially available software. Several strategies are described in this work to better characterize reservoir rocks using density and atomic number data. Small plug samples with known petrophysical parameters were first used to validate the process. A 60-foot-long core section was scanned with two different X-ray energies CT scans every five centimetres (2 inches) from an Upper Jurassic carbonate reservoir in Saudi Arabia. Qualitatively, the results were interesting and could help us better understand carbonates. To calculate porosity values using approximate mineral compositions, this document provides step-by-step directions in the form of diagrams.

Keywords: Coal, Carbon Dioxide.

RCCE_ID93

Advantages of Industrialised Building System in Malaysia

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Abstract: Industrialised Building System is one of the techniques where all the components freshly made by the factory were transported, placed, and assembled at the site with minimal additional structures. The Industrialised Building System has been used in Malaysia since the early 1960s, when the Malaysian Ministry of Housing and Local Government toured many European countries to review and get the ideas from their housing development plans. The problem is what are the benefits of using this method in construction compared to the conventional method? The method that has been used for this study is that we do a survey and give questionnaire to local construction firms to know their taught on Industrialised Building System. It is significant to increase the uses of Industrialised Building System in a construction of building but only for a suitable area or environment. As a result, this method of construction is the modern-systematic construction, which applies better consequences such as decrease the construction time, reduce labour and installation costs on building materials. It also needs a very high skilled workers to conduct the installation process which can boost the quality and efficiency in working. In overall, Industrialised Building System method is more beneficial than conventional method. The result of this study will encourage the construction firms to use this method in their construction works.

Keywords: Industrialised Building System, Benefits, Construction Method.

RCCE_ID94

Development of Humanitarian Aid Distribution Process for Flood Disaster Management in Malaysia

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Abstract: Natural and human-made disasters have caused significant physical damage, loss of life or drastic changes to the environment. During disaster, disaster relief teams consist of government agencies, non-government organizations (NGOs), individual volunteers and private sector provide humanitarian aid to disaster victims such as search and rescue, foods and basic needs as well as medical and health. However, lack of coordination among them in managing humanitarian aid distribution has contributed to several issues such as of redundancy of goods and volunteers at the same affected area. Meanwhile, there are few disaster affected areas do not received any relief. Responding to those issues, this study attempts to propose a process flow which could improve collaboration and coordination among disaster relief teams in managing humanitarian aid distribution effectively during disaster. The development of this study adopted general design cycle (GDC) framework which consists of five (5) phases, which are phase 1: awareness of the problem, phase 2: suggestions, phase 3: development, phase 4: evaluation and phase 5: conclusion. The findings were analysed and used to develop the formulation of process flow of humanitarian aid distribution. It is believed that the proposed process flow could improve the collaboration and coordination among disaster relief teams in managing humanitarian aid distribution during disaster occurrence effectively.

Keywords: Disaster Management, Disaster Relief Team, Flood Disaster Humanitarian Aid, Process Flow

RCCE_ID95

Probable Maximum Precipitation Estimation Considering Homogeneous Regions Using Hershfield Statistical Method

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Abstract: The probable maximum precipitation (PMP) is used to design major hydraulic structures, such as dams and spillways, flood protection works, and nuclear power plants. PMP estimation using Hershfield statistical method requires long observation data. In Malaysia, the PMP estimated using state boundary as usually being done has PMP values near to historical maximum. Since homogeneous regions are region containing stations with similar rainfall characteristics, the boundary for identifying stations for PMP calculations may be adopted using the homogeneous region boundaries. In this paper, yearly maximum 1-day rainfall data of more than 25 years for 161 stations in the Peninsular Malaysia, were analysed to estimate PMP for 1-day duration based on an appropriate frequency factor by considering the homogeneous regions. Based on the actual rainfall data of the stations, the highest value of this frequency factor was used to estimate 1-day PMP values for the 161 stations. Using these PMP estimates, a generalised graph was prepared showing the spatial distribution of 1-day PMP. It was found that 1-day PMP over Peninsular Malaysia by considering state boundary, varied from 146 to 552 mm and by considering the homogeneous regions, varied from 247 to 625 mm. The PMP considering homogeneous regions is considered as important to determine reliable and consistent PMP estimate for any location in Peninsular Malaysia.

Keywords: Probable Maximum Precipitation, Homogeneous Region, Peninsular Malaysia.

RCCE_ID96

Assessment of Soil Deformation and Groundwater Table During Deep Soil Mixing using Finite Element Method in Homogenous Soil

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Abstract: Deep soil mixing has become one of the ground improvement techniques in recent years. This paper presents the study about the installation of Deep Soil Mixing (DSM) as a retaining wall that acts as excavation support in the Finite Element Method to prevent soil deformation. The construction of Gerup Gerak Khas Combat Diving Pool project was modelled and analyzed in a case study. The project is located at Camp 21 GGK in Mersing, Johor. 20 numerical models have been made in PLAXIS 3D to achieve the goals of this research. Some information needs to be gathered to simulate in PLAXIS 3D models such as soil dimension, soil type, and soil parameters. In software PLAXIS 3D, 3 different types of design were modelled which are soil bed without DSM method, soil bed with a lattice pattern of DSM, and soil bed with a grid pattern of DSM with various types of homogonous soil: silt (N=3), silt (N=6) and kaolin clay. Two important findings that can be concluded: lower the SPT-N number of the soil will cause higher soil deformation after excavation process while lower the depth of the groundwater table below the ground surface, the higher the soil deformation occur.

Keywords: Deep Soil Mixing, Excavation Support, PLAXIS 3D, Groundwater Table, Hardening Soil.

RCCE_ID97

Open Data Application to Evaluate Exposure of Wildfire to Water Resources: Johor Area Case Study

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Abstract: Climate change impacted wildfire events as well as water availability. Exposure of water resources to a wildfire can reduce water quality supplied to humans and resulting health problems. On the other hand, water resources such as rivers and ponds are essential in wildfire fire fighting. This paper intended to discuss the exposure of wildfire to water resources by using spatial analysis. Johor state is selected as a study area due to high numbers of wildfire and water demand. Fire data retrieved from MODIS fire product for 2000-2020, from FIRMS website, has been used to create a hotspot map. Water resources and waterbody data originated from Department of Surveying and Mapping Malaysia was used to create distance analysis. 5 class exposure level has been set to show the degree of closeness of water resources to wildfire hotspot area. The wildfire water exposure map shows that 7% of the Johor water area is medium-level exposure. Only 1% Johor water area was exposed to a high level of wildfire. Most of the streams are at very low-level exposure. Lebam dam at Bandar Penawar Kota Tinggi, Machap dam at Simpang Renggam Keluang and Labong dam at Endau Mersing are three dam that exposed at level 3. In the other direction, the overlay map of hotspot with water stream and body helps prepare wildfire response. This study only provides a preliminary result; an in-depth study needs to be conducted for precise outcomes and assessments.

Keywords: Water Resources, Wildfire, Exposure.

RCCE_ID98

Construction Site Layout Planning Problem: Past, Present and Future

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Abstract: Construction site layout plans are created as part of contractor mobilisation activities before starting work at the construction site. Most of the relevant peer-reviewed literature focused on static site layout models, in which facilities are assigned just once during the building phase. The construction site layout determination should be done systematically using the proper approaches to ensure a reliable and cost-effective movement of goods and people around a facility that is acceptable to employees and neighbours. This article provides a detailed assessment of the previous research on the construction site planning problem using both static and dynamic techniques. It includes the exact and heuristic methods of layout planning approaches for both techniques. The scientific literature on construction site layout planning problems was reviewed in a systematic manner and compiled in electronic databases. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines were followed to a large extent in the conduct of this study. This paper provides a thorough review of the published literature on static and dynamic mathematical modelling of construction site layout planning, including both exact and heuristic methods. As a result, from the research there are some methods that can be a guide for future research such as inclusion of various design parameters, formulation of the model, integration with a decision-making approach representation of the pathway representation of facility shape. In conclusion, construction site layout planning is one of the most challenging problems in operations management where it links three scientific areas: construction project management, facilities planning and optimization.

Keywords: Construction Site Layout Planning; Optimization; Static Layout Model; Dynamic Layout Models.

RCCE_ID99

Potential Use of Recycled Plastic and Rubber Aggregate in Cementitious Materials for Sustainable Construction

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Abstract: In recent times, non-degradability wastes such as plastic and rubber have turned out to have a significant impact on the environment on a global scale. Aware of this complication, researchers have been suggesting by taking plastic and rubber as substitutes of aggregate in concrete. The objective is to find and prove whether recycled plastic and rubber can be use in replacing natural aggregate for more sustainable construction. To conduct this study, two main approaches have been taken, which is scientometric analysis of the bibliometric data and manual review of plastic and rubber waste utilization. The method that were used are scientometric analysis of statistical data and manual evidence. Primary databases were used and later were plotted into maps and linkages to ease the process. Then, VOSviewer were used to analyse bibliometric data. As a result, high concentration of plastic and rubber aggregates in cement mix decrease workability unless added superplasticizers. The mechanical strength such as compressive strength, split tensile strength and flexural strength has shown decreasing trend unless pozzolanic materials such as fly ash are added but can only compensate for the loss. However, positive results were shown in functional properties as plastic and rubber aggregates are better in reducing thermal conductivity, electrical resistivity and increasing sound-absorption. In conclusion, plastics and rubber waste can be recycled and used back as aggregates for cementitious materials to build road pavements and manufacture concrete bricks and blocks. However, only a specific type of cement that can be used such as lightweight, sound-proofing, or thermal conductivity cement due to its porous characteristics. Further studies needed to be done due to its poor mechanical strength especially in compressive, split-tensile, and flexural strength.

Keywords: Plastic, Rubber, Aggregates, Cement.

RCCE_ID100

Development of Weightage Factor Focussing on Social and Safety Criteria for Malaysia Green Rural Road

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Abstract: A green rural road is an inventiveness for the infrastructure to be environmentally responsible and sustainable in all features. The need for promoting sustainability and green rural road construction requires an assessment system. The Green Rural Road Assessment provides a management and technical approach for rural road life cycle from construction to its maintenance processes. The aim of this study is to analyse which social and safety elements are to be comprehended in green rural road criteria and therefore outlined in Malaysia Green Rural Road Index and its assessment. Hence it allows the basic approach requirements of individuals and societies to be met safely and in a manner persistent with human and ecosystem health focussing on the rural road. Data was achieved through extensive literature reviews, expert interviews and distribution of questionnaires. Respondents included experts and stakeholders from road development field. 100 survey questionnaires were distributed and 73 responses have been taken into consideration for further analysis. The data had been analysed using SPSS with factor analysis method. The result shows 5 main criteria and 10 sub-criteria are identified in the study. This includes services and facilities, economy, pollution reduction, public acceptance and environment. Analysis of the major factor weights shows that ecosystem protection is weighted the highest, accounting for 0.51 of the overall framework weight of 1.0. This indicates that ecosystem protection during the construction stage is the most important consideration in green rural road construction, followed by pre-construction surveys, and then by monitoring after project completion. As conclusion by developing the whole indicator of social and safety for Rural Road, the sustainability of rural road development will be holistically accomplished.

Keywords: Green rural road assessment, maintenance process, social and safety

RCCE_ID101

Potential of Digitizing the Industrialize Building System for Malaysian Construction Industry

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Abstract: Construction 4.0 is a process of implementing modern technology into digitisation transformation for construction industry throughout its supply chain. However, many organisations are unaware on the transformation especially the potential as way forward for digitizing the current construction method especially on Industrialized Building System (IBS). A discussion on helping the organisations in determining the issues and providing the solution towards Construction 4.0 transformation is essential to shed some light. While this construction industry transformation focuses on the element of technology, from automated production to a greater level of digitalisation, the overall elements need to be investigated and established. Hence, this study focuses on the identification and the possibility on the way forward for IBS implementation, which looks beyond the Malaysian construction industry's technology aspect and considers organisations from the various value chain, such as contractors, developers, academics, and government leaders. The focus was among experts with high knowledge and experience in the construction industry and the fourth industrial revolution for more than ten years. Information obtained from the discussion was used to identify and categorise the assessment readiness based on company readiness. Besides that, the identification of on the gaps between current and future goals were revealed. In conclusion, this identification on issues and way forward able to serves as a basis for enriching and expanding the needs of construction businesses and helping to proactively leverage existing Construction 4.0 opportunities.

Keywords: Industrialized Building System, Construction 4.0, fourth industrial revolution

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