

# **ABSTRACTS & PROGRAMME BOOK**

## **GEO ENGINEERING INTERNATIONAL CONFERENCE 2020 (GEIC 2020)**



**20 DECEMBER 2020**

**ZOOM PLATFORM**

**8:00 AM MYT**

## ORGANIZED BY



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Mr. P.K. Chanda

# WELCOMING REMARKS

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## CONVENOR

**Prof. Ts. Dr. Edy Tonnizam Mohamad**

Director

Centre of Tropical Geoengineering  
(GEOTROPIK)  
School of Civil Engineering  
Faculty of Engineering  
Universiti Teknologi Malaysia (UTM)



It is my great pleasure to welcome you to the Geo Engineering International Conference 2020. The aim of this conference is to share the current knowledge, new findings, challenges faced and idea within geoengineering scope from national and international participants. We would like to thank the keynote speakers, participants, committee members and all for your participation and contribution. This conference has attracted numerous papers and we are very glad to welcome you on this conference platform. Last but not least, I would also like to acknowledge the IC Research, Journal of Mining, Metal and Fuel (JMMF) and the co-organizers for their supporting efforts for this event. In closing, I encourage delegates to participate actively in the interesting discussions throughout the days and I wish everyone a successful and fruitful conference.

Thank you.

## WELCOMING REMARKS

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### CONVENOR

#### **Dr. Ramesh Bhatawdekar**

International Fellow, Head of Training and Courses at Geotropik. Director-Innovative Consultancy Research Pte Ltd., Singapore.

I welcome everyone for Geotechnical Engineering International Conference 2020 webinar!

Due to Global COVID 19 epidemic and related health issues this conference webinar being organized on 20 December 2020 on the virtual Zoom platform. This webinar is organized jointly by Geotropik, Universiti Teknologi Malaysia and Innovative Consultancy Research Pte. Ltd., Singapore. UTM Space, Journal Mines Metal and Fuel- (Scopus Journal) from India, Universiti Tun Hussein Onn Malaysia (UTHM) and Geotechnical Research Group are co-organizers and supporting this webinar event.

Wet tropical climate of Malaysia, geotechnical issues are crucial. Several researchers have contributed on their latest research findings on such as geology & rock mechanics, geotechnics, geophysics, geoenvironment and geoinfomation. I appreciate overwhelming response by researchers who have contributed 58 papers for this conference webinar. Under the able guidance of Prof. Dr. Edy Tonnizam and Team from Geotropik, this webinar is an excellent platform for researchers to present their papers. With the support of Journal Mines Metal and Fuel, all the papers presented during conference webinar will undergo systematic review process. After necessary corrections by researchers, GEIC 2020 webinar Scopus volume will be published by Journal Mines Metal and Fuel.

During 2021, there will be opportunities for the researchers for participation and publication through similar conferences!

Thank You.

## SPEAKERS

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### **PROF. PIJUSH SAMUAI**



Prof. Pijush Samui is working as an associate professor in the civil engineering department at NIT Patna, India. He holds a Ph.D. in Geotechnical Earthquake Engineering (2008) from Indian Institute of Science, Bangalore, India. He was a postdoctoral fellow at University of Pittsburgh (USA) (2008-2009) and Tampere University of Technology (Finland) (2009- 2010). At University of Pittsburgh, he worked on design of efficient tool for rock cutting and application of Support Vector Machine (SVM) in designing of geostructure. At Tampere University of Technology, he worked on design of railway embankment, slope reliability and site characterization. In 2010, Dr. Pijush joined in the Center for Disaster Mitigation and Management at VIT University as an Associate Professor. He was promoted to a Professor in 2012.

### **DR. MANOJ KHANDELWAL**



Dr Manoj Khandelwal is a Senior Lecturer of mining engineering at Federation University and is an Australian Endeavour Fellow. Dr Khandelwal has more than a decade of a research and academic teaching experience in Australia and India. Dr Khandelwal has been recognized as a leading expert in the area of 'Mining Geomechanics' and 'Rock Blasting'. So far, Dr Khandelwal has published more than 100 research papers in different reputed journals with high impact factors and reputable conference proceedings. His total citations are more than 2200 (Scopus) and current h index is 27. He is also author of a book. Dr Khandelwal has been awarded several prestigious awards, including Young Scientist Award, Young Engineer award and Young Mining Engineer award.

## TENTATIVE PROGRAMME

Malaysia Time	Programme Particulars
8.00-8.05 AM	All participants log in to Zoom platform to check connectivity
8.00-8.30 AM	<ul style="list-style-type: none"> <li>• Welcoming speech by MC</li> <li>• Keynote Speech by Prof. Ts. Dr. Edy Tonnizam Mohamad (Director of Centre of Tropical Geoengineering (GEOTROPIK), Universiti Teknologi Malaysia)</li> </ul>
8.30-10.30AM	<p style="text-align: center;"><b>SESSION I</b></p> <p style="text-align: center;">Chair : Dr. Mohd Firdaus Md Dan @ Azlan</p>
10.30-12.30AM	<p style="text-align: center;"><b>SESSION II</b></p> <p style="text-align: center;">Chair : Dr. N.K. Nanda Ex NMDC Managing Director, India</p>
12.30PM-1.30PM	<p style="text-align: center;"><b>Special Session</b></p> <p>Title : Winning the Game of Publishing Papers in High Impact Factor Journals. Speaker : Mr. Yateendra Joshi, Master Editor, an editor certified by the Board of Editors in the Life Sciences (BELS), USA</p>
1.30PM-3.30PM	<p style="text-align: center;"><b>SESSION III</b></p> <p style="text-align: center;">Chair : Prof. Srikant</p>
<b>Main Event GEO ENGINEERING INTERNATIONAL CONFERENCE 2020</b>	
3.30PM - 3.40PM	Opening Speech by Dr. Ramesh Bhatawdekar
3.40PM - 4.00PM	Keynote Address by Prof. Pijush Samuai, NIT Panta, India
4.00PM - 4.20PM	Keynote Address by Dr. Manoj Khandelwal, Federation University, Australia
4.20PM - 4.35PM	Speech by Mr. P.K. Chanda- Chief Editor JMMF
4.35PM - 4.50PM	Prize Distribution conducted by Dr. Firdaus <ul style="list-style-type: none"> <li>• Best Paper</li> <li>• Best Presentation</li> </ul>
4.50PM -5.00PM	Closing Speech by Dr. Ramesh Bhatawdekar



## SCHEDULES

Time	Paper ID	Session I: Chaired by Dr Firdaus Md Dan (8.30 - 10.30 am)	Zoom ID
8.35 - 8.40 am	ID 040	INFLUENCE OF EL-NINO ADAPTED RAINFALL EVENT ON PARTIALLY SATURATED SLOPE BEHAVIOUR	01 Sesi 1
8.40 - 8.45 am	ID 034	DISCONTINUITIES ASSESSMENT AND HAZARD TO BLASTING WORK IN A GRANITE QUARRY, JOHOR	02 Sesi 1
8.45 - 8.50 am	ID 043	ROCK MASS CLASSIFICATION FOR TROPICALLY WEATHERED LIMESTONE IN SRI LANKA FOR BLASTABILITY	03 Sesi 1
8.50 - 8.55 am	ID 002	RADON MIGRATION THROUGH SOIL: A REVIEW	04 Sesi 1
8.55 - 9.00 am	ID 003	INFLUENCE BY DEPTH OF SENSOR TO VIBRATION AMPLITUDE FOR UNPAVED BRIDGE APPROACH FIELD MODEL ON SOFT SOIL	05 Sesi 1
9.00 - 9.05 am	ID 004	ASSESSMENT OF GEOTECHNICAL ENGINEERING PROPERTIES OF SOILS CONTAMINATED BY WASTED ENGINE OIL AS CONSTRUCTION MATERIAL	06 Sesi 1
9.05 - 9.10 am	ID 006	SUBSURFACE CHARACTERIZATION USING INNOVATIVE SOIL COHESION AND FRICTION ANGLE MODELS FROM GEOPHYSICAL AND GEOTECHNICAL METHODS	07 Sesi 1
9.10 - 9.15 am	ID 007	PHYSICO CHEMICAL PROPERTIES OF MUD ALONG INTERTIDAL ZONE AFTER THE CONSTRUCTION OF WAVEBREAKER BUNDS TANJUNG PIAI NATIONAL PARK JOHOR	08 Sesi 1
9.15 - 9.20 am	ID 009	BEARING CAPACITY ANALYSIS OF LIGHTWEIGHT EXPANDED CLAY AGGREGATE LECA COLUMN RAFT UNDER FOOTING LOAD	09 Sesi 1
9.20 - 9.25 am	ID 010	SETTLEMENT BEHAVIOUR OF TREATED HEMIC PEAT AT PARIT NIPAH, JOHOR	10 Sesi 1
9.25 - 9.30 am	ID 011	INITIAL EXPLORATORY INVESTIGATION OF PORE AIR PRESSURE RESPONSE DURING RAINFALL INFILTRATION USING 1D SOIL COLUMN MODELLING	11 Sesi 1
9.30 - 9.35 am	ID 013	COMPRESSIBILITY OF PEAT SOIL- A REVIEW	12 Sesi 1
9.35 - 9.40 am	ID 014	THE INTERPRETATION OF HIGHLY ORGANIC SOIL PROPERTIES IN GEOTECHNICAL ENGINEERING PERSPECTIVE	13 Sesi 1
9.40 - 9.45 am	ID 015	OBSERVATION METHOD OF THE SOIL MOVEMENT AND VIBRATION INDUCED ON THE STRUCTURE A REVIEW	14 Sesi 1
9.45 - 9.50 am	ID 027	HYDROPHOBIC EFFECT OF SOIL STABILIZATION FOR SUSTAINABLE SUBGRADE SOIL IMPROVEMENT	15 Sesi 1
9.50 - 9.55 am	ID 047	SUBSURFACE ASSESSMENT CORRELATION BETWEEN GEOPHYSICAL SURVEY AND BORING METHOD	16 Sesi 1

Time	Paper ID	Session I: Chaired by Dr Firdaus Md Dan (8.30 - 10.30 am)	Zoom ID
9.55 - 10.00 am	ID 036	ASSESSMENT ON TUNNEL CONSTRUCTION APPROACH EFFECTS TO THE GROUND CONDITION	17 Sesi 1
10.00 - 10.05 am	ID 008	SPILLWAY DAM ASSESSMENT USING DAM MASS RATING DMR FOR ESTIMATING MODULUS OF DEFORMATION AND SHEAR STRENGTH	18 Sesi 1
10.05 - 10.10 am	ID 054	CHARACTERIZATION AND CLASSIFICATION OF TROPICAL WEATHERED SHALE IN AYER HITAM, JOHOR FOR EXCAVATION PURPOSES	19 Sesi 1
10.10 - 10.15 am	ID 024	ROCK SLOPE FAILURE IN MALAYSIA COMPARATIVE CASE STUDIES AND LESSON LEARNT	20 Sesi 1
10.15 - 10.25 am	<b>Q &amp; A session</b>		
10.25 - 10.30 am	<b>Wrap Up by Chairperson</b>		

Time	Paper ID	Session II: Chaired by Dr. N.K. Nanda (10.30 - 12.30 pm)	Zoom ID
10.35 -10.40am	ID 029	DETERIORATION WEATHERED OF TUNNEL FACE EXCAVATION USING IMAGE ANALYSIS	21 Sesi 2
10.40 - 10.45am	ID 012	INTEGRATED GEOPHYSICAL SURVEY IN IDENTIFYING GROUND SUBSIDENCE-PRONE AREA	22 Sesi 2
10.45 -10.50am	ID 016	WATER FLOW MAPPING USING 2-D RESISTIVITY AND SELF-POTENTIAL METHOD FOR SUSTAINABLE APPROACH	23 Sesi 2
10.50 - 10.55 am	ID 018	INTEGRATION OF 2D RESISTIVITY AND REMOTE SENSING FOR POTENTIAL AQUIFER IN KEDUNGADEM, BOJONEGORO DISTRICT	24 Sesi 2
10.55 - 11.00 am	ID 022	ASSESSMENT OF OFFLINE ELECTRODES EFFECT ON COMMON ARRAYS USED IN 2-D RESISTIVITY SURVEY FOR SUBSURFACE PROBING	25 Sesi 2
11.00 - 11.05 am	ID 025	2D ELECTRICAL RESISTIVITY TOMOGRAPHY FOR FAULT MAPPING IN LAHAD DATU	26 Sesi 2
11.05 - 11.10 am	ID 026	THE IMPLICATION OF WATER TOWARDS SOIL EROSION IN PENANG, MALAYSIA	27 Sesi 2
11.10 - 11.15 am	ID 033	CROSS-GRADIENT JOINT INVERSION OF 2D RESISTIVITY AND SEISMIC REFRACTION METHOD FOR SUBSURFACE DELINEATION	28 Sesi 2
11.15 -11.20 am	ID 039	GROUND MAGNETIC INVESTIGATION ON ARCHAEOLOGICAL SITE AT BUKIT CHORAS, KEDAH, MALAYSIA	29 Sesi 2
11.20 - 11.25 am	ID 041	2-D RESISTIVITY AND TIME DOMAIN INDUCED POLARIZATION (TDIP) FOR SHALLOW SUBSURFACE	30 Sesi 2
11.25 - 11.30 am	ID 046	A CONTROLLED EXPERIMENT OF HYPERBOLA SIZE ON BURIED OBJECTS	31 Sesi 2

Time	Paper ID	Session II: Chaired by Dr. N.K. Nanda (10.30 - 12.30 pm)	Zoom ID
11.30 - 11.35 am	ID 005	MAPPING OF STANDARD PENETRATION (SPT) USING GIS (A CASE AT PULAU INDAH, KLANG, MALAYSIA)	32 Sesi 2
11.35 - 11.40 am	ID 019	DEVELOPING-A-PRELIMINARY-STUDY-OF-REMOTE-SENSING-AND-GIS-APPROACH-FOR-INTERTIDAL-SEAGRASS-MAPPING-USING-DRONE	33 Sesi 2
11.40 - 11.45 am	ID 023	DETERMINATION OF GROUNDWATER POTENTIAL ZONES OF PERLIS, MALAYSIA USING REMOTE SENSING AND GIS METHOD	34 Sesi 2
11.45 - 11.50 am	ID 031	THE ARCUATE GEOMETRY OF THE TRANS INDUS RANGE AN INTEGRATION OF GIS AND REMOTE SENSING TECHNIQUE	35 Sesi 2
11.50 - 11.55 am	ID 048	DEVELOPMENT OF GPS METEROLOGY INFRASTRUCTURE IN PENINSULAR MALAYSIA	36 Sesi 2
11.55 am - 12.00 pm	ID 050	RE-CONSTRUCTING STRAIN MAP IN MALAYSIA	37 Sesi 2
12.00 - 12.05 pm	ID 051	GLOBAL POSITIONING SYSTEM MEASUREMENT TECHNIQUE ASSESSMENT ON VIRTUAL REFERENCE STATION DATA	38 Sesi 2
12.05 - 12.10 pm	ID 052	THE PRACTICAL TECHNIQUES IN SELF-POTENTIAL DATA ACQUISITION	39 Sesi 2
12.10 - 12.15 pm	ID 053	NEW INSIGHTS FOR SUBSURFACE UTILITY MAPPINGS	40 Sesi 2
12.15 - 12.25pm	<b>Q &amp; A session</b>		
12.25 - 12.30pm	<b>Wrap up by Chairperson</b>		
12.30 - 1.30 pm	<b>Special Session by Mr. Yateendra Joshi</b>		

Time	Paper ID	Session III: Chaired by Prof Srikant (1.30 - 3.30 pm)	Zoom ID
1.40 - 1.45 pm	ID 028	EFFECT OF LIME ON SULPHATE-BEARING SOIL	41 Sesi 3
1.45 - 1.50 pm	ID 020	SEDIMENTOLOGY STUDY AT BUKIT TUNGKU LEMBU, PERLIS, MALAYSIA_NURUL SYAZWIN ZAMRI	42 Sesi 3
1.50 - 1.55 pm	ID 021	ROCKFALL TRAJECTORY AND BACK ANALYSIS APPROACH USING UAV PHOTOGRAMMETRY MAPPING AT GERIK-JELI HIGHWAY PERAK, MALAYSIA	43 Sesi 3
1.55 - 2.00 pm	ID 030	INFLUENCE OF CIELAB COLOUR SPACE VARIATION ON WEATHERED GRANITE	44 Sesi 3
2.00 - 2.05 pm	ID 032	PREDICTION OF BOULDER GENERATION IN OPENCAST BENCH BLASTING USING ARTIFICIAL NEURAL NETWORK AND THEIR LIMITATION	45 Sesi 3

Time	Paper ID	Session III: Chaired by Prof Srikant (1.30 - 3.30 pm)	Zoom ID
2.05 - 2.10 pm	ID 035	EFFECT OF MOISTURE CONTENT TO THE STRENGTH OF ROCK MATERIAL FOR VARIOUS ROCK TYPES AND WEATHERING STATE	46 Sesi 3
2.10 - 2.15 pm	ID 049	WEATHERING GRADE OF ROCK SLOPE AT EAST COAST EXPRESSWAY, MALAYSIA	47 Sesi 3
2.15 - 2.20 pm	ID 055	A REVIEW ON SHAFT RESISTANCE OF BORED PILES SOCKETED IN ROCK FORMATION	48 Sesi 3
2.20 - 2.25 pm	ID 056	MULTI-VARIABLE REGRESSION ANALYSIS TECHNIQUE FOR PREDICTION OF AIR OVER PRESSURE DUE TO BLASTING FOR GRANITE QUARRIES IN MALAYSIA	49 Sesi 3
2.25 - 2.30 pm	ID 058	INTEGRATION OF BUILDING INFORMATION MODELING (BIM) ON ENERGY EFFICIENCY IN GREEN BUILDING	50 Sesi 3
2.30 - 2.35 pm	ID 001	HARDNESS REMOVAL OF GROUNDWATER THROUGH SAND, ZEOLITE AND RICE HUSK ACTIVATED CARBON (RRHAC)	51 Sesi 3
2.35 - 2.40 pm	ID 037	INVESTIGATION OF BEDROCK AT HILLY AREA USING CAP-SASW METHOD	52 Sesi 3
2.40 - 2.45 pm	ID 038	THE EVOLUTION OF SPECTRAL ANALYSIS OF SURFACE WAVE METHOD: A REVIEW	53 Sesi 3
2.45 - 2.50 pm	ID 042	HARDENING SOIL MODEL PARAMETERS FOR SANDS AND CLAYS FROM LABORATORY TESTING	54 Sesi 3
2.50 - 2.55 pm	ID 044	ROCK MASS CLASSIFICATION OF TROPICALLY WEATHERED KARST LIMESTONE OF CAMBODIA FOR BLASTABILITY	55 Sesi 3
2.55 - 3.00 pm	ID 057	AN ASSESSMENT OF RELATIONSHIP BETWEEN REGIONAL FACTORS AND BOREHOLE PRODUCTIVITY IN SOUTHERN JOHOR BAHRU	56 Sesi 3
3.00 - 3.05 pm	ID 045	COMPARATIVE STUDY OF LANDSLIDE CASES IN MALAYSIA AND LESSON LEARNT	57 Sesi 3
3.05 - 3.10 pm	ID 017	DISTRIBUTED OPTICAL FIBRE SENSING TECHNIQUE IN SLOPE	58 Sesi 3
3.10 - 3.20 pm	<b>Q &amp; A session</b>		
3.20 - 3.30 pm	<b>Wrap up by Chairperson</b>		

## GEIC 2020: 001

### Hardness Removal of Groundwater Through Sand, Zeolite and Rice Husk Activated Carbon (RRHAC)

**Nor Izzah Abdul Aziz<sup>1</sup>, Norzila Othman<sup>1</sup>, Wahid Ali Hamood Al- Tawayti<sup>1</sup>, Zalilah Murni Yunus<sup>2</sup>, M.A. Malek<sup>3</sup>, Nurina Fitriani<sup>4</sup>, Muhammad Tahir<sup>5</sup>, Firhat Muhammad Fikri<sup>6</sup>**

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<sup>5</sup>(Faculty of Engineering, Universiti Teknologi Malaysia, [m.tahir@cheme.utm.my](mailto:m.tahir@cheme.utm.my))

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#### ABSTRACT

Recently the treatment for hard water was using a technique which will give an impact to environment and consumer. Sand, zeolite and rice husk activated carbon can be used as a media for water hardness treatment by adsorption process. Performance of sand, zeolite and rice husk activated carbon (RHAC) for removal of  $\text{Ca}^{2+}$  and  $\text{Mg}^{2+}$  in hard water was investigated by employing a batch experimental set-up. The study considered X-Ray Fluorescence (XRF) spectroscopy analysis for the evaluation of chemical composition of the media. Experimental adsorption data were modelled by Langmuir, Freundlich and BET. The adsorption process followed the Langmuir isotherm model with high coefficients of correlation  $R^2$  (0.9888) for  $\text{Ca}^{2+}$ ,  $R^2$  (0.9662) for  $\text{Mg}^{2+}$ . The  $R_L$  value in this study was less than one for both  $\text{Ca}^{2+}$  and  $\text{Mg}^{2+}$ , indicating the absorption of the metal ion onto all the media is favorable. The pseudo- second- order fitted well in correlation to the experiment results. Results indicate that sand, zeolite, and RHAC having chemisorption mechanism and can be alternative media for hard water treatment using the adsorption process. Furthermore, there will be an advantage in economic and environment friendly media.

**GEIC 2020: 002****Radon Gas Migration Through Soil - A Review**

**Nur Dalilah Othman<sup>1</sup>, Ahmad Safuan A Rashid<sup>2</sup>, Suhairul Hashim<sup>3</sup>, Mohamad Syazwan Mohd Sanusi<sup>4</sup>, Andy Anderson Bery<sup>5</sup>**

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**ABSTRACT**

Soil is generally a medium with pores and interstitial space thus allowing fluid to fill up, flow and trap within these spaces. Due to the radon state of matter, it has the ability to mobilize like any other fluids from subsurface to an atmosphere, but an only small percentage of radon manage to escape to the earth surface. This is because several other complex factors will interrupt and influence the migration of radon in the soil before it could reach the surface. Though diffusion of radon gas is limited to 3.82 days and restricted from moving in a longer distance, its emission has a probability to escape from soil to the atmosphere depends on meteorological and physical factors. The purpose of this review paper is to analyse the parameters that affect the migration and generation of radon in subsurface before it could reach the earth surface and exhale to the environment.

## GEIC 2020: 003

### I Influence by Depth Of Sensor to Vibration Amplitude for Unpaved Bridge Approach Field Model on Soft Soil

**Engku Shahrulerizal Engku Ab Rahman<sup>1</sup>, Adnan Zainorabidin<sup>2</sup>, Mohd Idrus Mohd Masirin<sup>3</sup>, Kasbi Basri<sup>4</sup>, Mohamad Niizar Abdurahman<sup>5</sup>**

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#### ABSTRACT

The information and the data of the bridge approach condition is important because it allows designers to know the response of the soil once loaded with vehicles and respectable suggestion for right engineering solutions to cater the matter. There are a few clarifications the reason of problem occurred at bridge approach was recently inspected by other researchers previously and one of the issues is a dissimilarity between the height of the bridge and road on the connection. The objective of this research is characterize and create techniques for field investigation to inspect the effect of vibration from vehicle loading at bridge approaches and this case might be referred to as a repetitive cyclic loading. The aim of this research is to investigate critical location of vibration at bridge approach model by the influence and effect from measurement tools by depth of sensor location. This research concentrated on constructed field model of the unpaved bridge approach model in Research Centre for Soft Soil Malaysia (RECESS), Universiti Tun Hussein Onn Malaysia (UTHM), Johor, Malaysia. A portable measurement equipment system with high sensitivity triaxial ICP accelerometer used to investigate and measure the effect of vibration loading at unpaved bridge approach field model. Piezoelectric (ICP) accelerometer is now preferable for researchers for the field surveillance or laboratory testing. From the analysis, it can be stated here that the vibration value increases as the speed and vibration level produced changes from L1 to L2. This is in line with previous studies where there was an increase in vibration value as vehicle speed increased. In the transverse direction, it is found that P1 values are larger than P2 to P6 values at both sites BAA and BAB. On the longitudinal direction, the farther away the plate compactor is from the bridge model connection, its value decreases and it is found that the D0.25 area has a higher vibration value compared to D0.5, D0.75 and D1. It may be then, concluded that in this research it based on the sensor depth, the value of the PPV decreases based on the sensor depth at both sites BAA and BAB.

## GEIC 2020: 004

### Assessment of Geotechnical Engineering Properties of Soils Contaminated by Wasted Engine Oil as Construction Material

**Nik Norsyahariati Nik Daud<sup>1,2\*</sup>, Johnson R. Oluremi<sup>3</sup>, Odreena D Jocksing<sup>1</sup>, Syazwani Idrus<sup>1</sup>**

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#### ABSTRACT

Oil contamination of soil due to hydrocarbon contents do not only affect the quality of the soil, but also alter the physical properties of oil-contaminated soil and can lead to groundwater contamination thereby causing damages to the environments in general. This paper therefore presents the effect of oil contamination on geotechnical properties of soil in Malaysia. Soil samples A and B obtained from two different area within Selangor, Malaysia, were artificially contaminated by mixing them with 2, 4 and 6% wasted engine oil (WEO) by the dry weight of natural soils. Laboratory testings were performed on both the natural and contaminated soils to study the physical properties (i.e. Atterberg limits, particle size distribution, specific gravity) and mechanical properties (i.e. settlement and permeability) of soils. The results showed that particle size of the soil mixture increased as the oil content increases which cause a reduction in fine grains portion of the sample. The Atterberg limits of soil samples also increased when more percentages of oil were added. Optimum Moisture Content (OMC) decreased while Maximum Dry Density (MDD) increased with the increment of WEO for both location. The settlement behaviour of the WEO contaminated soil showed a positive impact (less settlement) compared to natural soil and the permeability of soil mixtures which decreased with WEO contents, are within the range of  $3.8 \times 10^{-9}$  to  $0.47 \times 10^{-9}$  m/s for both soils. The results obtained especially for the settlement and permeability parameters showed that oil contamination had both positive and negative impacts on the geotechnical properties of the studied soils, however, there is high possibility of the WEO contaminated soil to be used as a liner media which will impact positively on the groundwater quality.



**GEIC 2020: 005**

## **Mapping of Standard Penetration (SPT) using GIS (A Case at Pulau Indah, Klang, Malaysia)**

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### **ABSTRACT**

Site investigation is essential in every construction work. Determining the type of soil and shear strength are the important things to design foundation system of infrastructure project. Site investigation is not only required high costs, but also takes time. Many developers tend to ignore site investigation works to reduce the construction cost. This study developed a site investigation database for Pulau Indah, Klang, Malaysia by using Geographical Information System (GIS). The study used the Thiessen polygon method to obtain some informations type of soil and shear strength for this area. The database and map as the analysis results produced is expected to help all developer or government in obtaining site investigation informations for future construction work related to the area.

GEIC 2020: 006

## **Subsurface Characterization using Innovative Soil Cohesion and Friction Angle Models from Geophysical and Geotechnical Methods**

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### **ABSTRACT**

Due to the complexity of shallow Earth's crust and heterogeneity nature, the imaging and characterization of subsurface have become necessary. For subsurface geomaterials characterization, accurate and reliable computation of geotechnical attributes of soils is required, to give a proper picture of the heterogeneous nature of the subsurface for engineering purposes. In this present study, empirical relationships (simple and multiple linear regression models) have been developed that connect multiple geophysical parameters (electrical resistivity and seismic refraction velocity) and soil properties determined from the laboratory geotechnical analysis (direct shear test). The results of the combined application of Electrical Resistivity Tomography (ERT) and Seismic Refraction Tomography (SRT) were first examined to determine the responses of the subsurface materials and properties as influenced by resistivity and seismic values during a five-month monitoring operation and data collection on the same location at Universiti Sains Malaysia (USM, Minden) Malaysia. The ERT analysis suggests that the subsurface is composed of two main zones: the unsaturated zone (characterized by loose sand & clay soils with boulders from the top - residual soil and weathered basement mostly granites at the bottom of the zone) covering the saturated (compacted sandy silt soil) zone. The SRT velocity values presented three subsurface layers: the first layer is characterized by loose soil associated with boulders, indicating substandard geomaterials. The second layer indicated the possibility of compacted and dry soil such as sandy silt and clays, gravels, and sand. This layer showed a higher standard of subsurface materials. The last layer is typified by the weathered bedrock materials. The joined interpretation serves as a cost-effective avenue to gain general subsurface detail for geotechnical characterization at local and regional scales. Eleven undisturbed soil samples are used to derive simple linear regression equations for cohesion and friction angle parameters from infield resistivity models. Then, these simple linear regressions are used to estimate 70 data of cohesion and friction angle in resistivity models. Finally, the MLR models are determined with cohesion and friction angle as dependent variables, while seismic and resistivity parameters as predictors. Therefore, in this study, both developed simple and multiple linear regression models are verified statistically by acceptable P-values, coefficient of multiple determination, and Variance Inflation Factor (VIF), making subsurface characterization more detailed without disruption of soil.

GEIC 2020: 007

## **Physico-Chemical Properties of Mud Along Intertidal Zone After The Construction Of Wavebreaker Bunds, Tanjung Piai National Park, Johor**

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### **ABSTRACT**

The coastal mangrove at Tanjung Piai had been protecting the coastal line from erosion. An increasing heavy maritime traffic near the Tanjung Piai causes erosion along the coastal line. Due to that reason, a wave breaker bund was constructed along intertidal zone. This bund will promote sedimentation process, and thus the young mangrove plantlets able to growth in the coastal mud of Tanjung Piai. The aim of this study is to provide the baseline data to monitor future physical and chemical changes of the mud along the coastal after construction a breakwater breaker system. It was found that soil in the study area is sandy silt, mixture of minerals grain from rock and organic matters. The study also found scum from wood-based material in the mud amounting to less than 1.36 % in weight. Chemical properties indicated the mud contained major elements commonly found in soil which are oxygen, silica, aluminum, carbon, chlorine, natrium and magnesium. In addition, there was non-presence of heavy metal. All these physical and chemical properties should enable promotion of mangrove growth at Tanjung Piai. The presence of bunds had attenuated the waves that move shoreward across the breakwater to the mangrove. The waves transported the sediments towards the shallow mudflats, fine sediments were deposited, thus allowing for establishment of mangrove plantlets.

GEIC 2020: 008

## Spillway Dam Assessment using Dam Mass Rating (DMR) for Estimating Modulus of Deformation and Shear Strength

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### ABSTRACT

Rock mass assessment have been conducted at a spillway structure located at Sultan Mahmud power station, Tasik Kenyir, Kuala Berang, Terengganu, Malaysia. The assessment aims to evaluate the rock mass strength and rock deformation modulus, for investigating the stability of the spillway structure. The area of the spillway was divided into eight zones for assessment purposes which denoted as spillway zone 1 to 8. In situ rock tests were conducted included point load test, rock quality designation (RQD) and discontinuity mapping condition as well as dam mass rating (DMR) for rating purposes. Result reveals the average of rock mass deformation modulus is 8.19 MPa and varies between 4.22 MPa and 16.79 MPa across the spillway area. From DMR value, the cohesion of rock mass is ranges from 0.13 MPa to 0.24 MPa and internal friction angle from 20° to 27°. The assessment at spillway also revealed that the block size is small with average of 0.013m<sup>3</sup> and joint spacing of 0.13m. This indicates that the structure of the rock mass is highly vulnerable to break when water is flowing in high volume. On top of that, the discontinuity dip angle is dipping toward the water flow direction with uneven rock surface, which might decrease the stability of the rock mass structure in the spillway. Dam mass rating (DMR) was successful estimate empirically the in-situ rock mass deformation modulus and shear strength of rock with quick preparation for point load testing. This approach allows the engineers to make quick decisions regarding rock mass parameters if there is a sudden change in the geology structures.

## **Bearing Capacity Analysis of Lightweight Expanded Clay Aggregate (LECA) Columns-Raft Under Footing Load**

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### **ABSTRACT**

The major part of this paper is to present the LECA columns-raft load carrying capacity under footing load through three-dimensional finite element (FE) analysis. Instead of conventional aggregate for stone columns, lightweight expanded clay aggregate (LECA) has the potential to be used as replacement material. Using PLAXIS 3D, LECA raft and LECA column were modelled as Mohr-Coulomb material and the nonlinear behavior of soft soil is modelled with Soil Hardening constitutive model. Drained analysis was adopted to allow for a greater number of sensitivity and parametric analysis. The LECA columns are assumed to be 'wish in place', where possible smear effects caused by disturbance on the surrounding soil due to column installation effect is ignored. The column diameter and soft soil depth used in the study were 700mm and 10 meters, respectively. The laboratory tests were carried out to identify the engineering properties of kaolin clay (represent the soft clay layer) and LECA material. From the finite element analysis, it was noticed that ability of soft soil replacement by LECA aggregates to improve the bearing capacity of footing on soil. The ultimate load carried by the LECA columns-raft increases by decreasing LECA column spacing, increasing the raft thickness and length of LECA columns. The load carrying capacity of the LECA columns-raft increases with increasing L/D (column length to diameter ratio) up to a certain ratio. The FE analysis revealed that for L/D greater than 6, the increment in the ultimate load for all raft thickness are negligible. Thus, it is not necessary to construct end bearing LECA columns with the LECA raft due to the small difference between bearing capacity and the other lengths of LECA columns. It is also proved that LECA columns with higher replacement ratio do not necessarily require a thick raft replacement. Several physical modelling were conducted in order to validate the results from numerical modelling. Ultimate bearing capacity was evaluated using 2D chamber. From the physical modelling, it was found that the error percentage of ultimate bearing capacity in which the difference was contributed by the over prediction of numerical analysis. Nevertheless, based on the comparison of the results, the maximum difference is 11.5%, which is less than 12% and is in good agreement.

## Settlement Behaviour of Treated Hemic Peat at Parit Nipah, Johor

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### ABSTRACT

Peat is classified as soft material which consists of decaying wood and plant remains. Peat has been considered as a challenging material for engineers due to its high natural moisture content, large void ratio, and high compressibility. Its rapid initial settlement followed by large long-term settlement always caused problems for any form of construction on peat. Numerous ground stabilization method for peat have been developed in recent years. Polyurethane grouting is one of the ground stabilization method that is gaining recognition as a fast and effective way to stabilize ground. Polyurethane is a lightweight material with high compressive strength. This study investigated the settlement of polyurethane treated peat under static embankment through full scale testing at Research on Peat Station (REPEATS), Parit Nipah, Johor. The peat in Parit Nipah is categorized as hemic peat with thickness of 4.0 m. Four static embankments were constructed representing different depth of peat stabilization by polyurethane grouting. The settlement of the embankments was monitored on daily basis. Results indicated that the injection of polyurethane grout into the peat able to reduce the settlement of peat under static embankment loading. This study also shows the potential of polyurethane grouting to mitigate long term settlement of peat.

## **Initial Exploratory Investigation of Pore Air Pressure Response during Rainfall Infiltration using 1D Soil Column Modelling**

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### **ABSTRACT**

In unsaturated soil mechanics, matric suction is often regarded as negative pore water pressure because the pore air pressure is regularly assumed to be atmospheric. Therefore, the component of pore air pressure is often being neglected although the actual response of pore air during infiltration is yet to be clearly understood. This study aimed to investigate the response of pore air pressure during rainfall infiltration to substantiate the mechanism of rainfall infiltration in affecting slope stability. Laboratory physical modelling using one dimensional (1D) soil column was utilized to initiate an exploratory study on pore air pressure response. Parametric study was performed by varying the rainfall intensities and initial water content on glass beads which is classified as uniformly graded sand. The outcomes of the physical modelling showed that soil subjected to higher rainfall intensity and initial water content will result in higher pore air pressure development compared to lower rainfall intensity and initial water content. Subsequently, this increase in pore air pressure may resist seepage flow thus affecting the overall mechanism of rainfall infiltration. Therefore, the effect of pore air pressure needs to be further explored before the hypothesis can be applied to real geotechnical applications particularly in slope stability.

GEIC 2020: 012

## Integrated Geophysical Survey in Identifying Ground Subsidence-Prone Area

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### ABSTRACT

In this study two geophysical methods such as microgravity and 2D resistivity method have been utilized to identify the ground subsidence of the prone area within Universiti Sains Malaysia (USM). Penang island. The area of study suffers from a partial collapse in some parts due to the subsidence. The pole- dipole array was conducted with electrode spacing of 2 m. The bouguer anomaly map was created after applied the minimum curvature gridding method within Oasis Montaj software, while the RES2DINV and surfer software were used for gridding and contouring the 2D resistivity dataset. The results show the ground subsidence was identified by low gravity values between -41.2 to -41.0 mGal and resistivity value of  $<160 \Omega\text{m}$  in the southeast part of the study area.



## Compressibility of Peat Soil- A Review

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### ABSTRACT

Peat is exposed to problems of instability and provide the development of excessive settlement. Peat is permeable soil with high compressibility, low shear strength, and high-water holding capacity. This can be seen through the value of the initial void ratio which extremely higher from the other soils. A deep study on this ground is crucial especially on the settlement parameter in other to understand the behavior of compressibility. The aim of this study is to review, analyst and discuss the results of the peat compressibility characteristic from past researchers. Collecting data had been done by selecting the reliable and trusted sources. The data was extracted by year, place, type of peat and vital compressibility parameter such as void ratio ( $e_0$ ), compression index ( $C_c$ ), coefficient of consolidation ( $C_v$ ), coefficient of secondary compression ( $C_s$ ), compression of ratio ( $C_c/1+ e_0$ ), law of compressibility ( $C_c/C_v$ ) and coefficient of volume compressibility ( $m_v$ ) in order to demonstrate clear features of compressibility peat characteristic. Based on the result of this review study, it shows that the fibric peat show most compressible characteristic compared to hemic and sapric peat. This could be proved by the higher value of  $e_0$ ,  $C_c$ , and  $C_s$ . For instance,  $e_0$  for fibric peat lies between 9 to 11 while for hemic and sapric peat are recorded in range of 5 to 8 and 2 to 4 respectively. It was observed that  $C_c$  and  $C_s$  of tropical peat displays smaller value compared to temperate peat. This finding revealed that temperate peat is generally high compressible than tropical peat. It also can be understood that  $C_c$  and  $m_v$  would be higher when  $e_0$ ,  $C_c$  and  $C_s$  increase. As the result, peat is subjected to problems of instability and as indicator the development of failure and massive long-term settlement. Some studies had shown the decent potential of cement as a binder and utilization of pozzolan in peat compressibility improvement. This approach seems able to stretch an idea in developing environment friendly binder by utilizes the agriculture waste as a pozzolan in the future for peat stabilization.

GEIC 2020: 014

## The Interpretation of Highly Organic Soil Properties in Geotechnical Engineering Perspective

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### ABSTRACT

Highly organic soil was determined as the organic content is more than 75% and it is generally known as peat. Peat technically was formed from the decayed process of organic matters such as tree component and animal shell. An identification of peat properties was a crucial element to be investigated before proceeding with future work. The progress was proposed to being conducted due to the peat physical is very complex. It was challenging to developing infrastructure on it, as its low strength since it in a loose condition state. The aim of this research is to examine the index, chemical and engineering properties of peat as its criteria need to observe at the early investigation to decide a possible design and suitable method in overcoming the geotechnical problem on the peat in the future. Generally, the dried oven method was mostly applied in determining the index properties test. Meanwhile, chemical material and x-ray was used to investigate the chemical properties. At the same time, the engineering properties commonly identified through compressive strength. The results present the peat was highly organic and classified as fibric type (H<sub>i</sub>). The strength of natural peat is very weak due to the low of clay mineral (SiO<sub>2</sub>+ Al<sub>2</sub>O<sub>3</sub>+ Fe<sub>2</sub>O<sub>3</sub>). The loose condition of peat tends to hold a high water content. Due peat was highly acidic, it is caused the soil stabilization to become highly challenging. Overall, the entire analysis was established shows the visible as challenging soil due to its properties. Thus, researchers need to provide with a suitable method such as mass stabilization to overcome the problem of this soil without any adverse effect on the structure and environment.

## **Observation Method of The Soil Movement and Vibration Induced on The Structure: A Review**

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### **ABSTRACT**

A structural integrity test is important to prevent deformation, breaking and catastrophic failure of a structure due to external load and material failure. This paper reviews and discusses the method used to determine the soil movement and vibration which contribute to the structural crack or failure. The observation methods are discussed into three parts: settlement, vibration monitoring and slope stability monitoring and analysis. A brief discussion about these three factors are reviewed in this paper and a discussion about case studies are presented as well in this paper.

GEIC 2020: 016

## Water Flow Mapping using 2-D Resistivity and Self-Potential Method for Sustainable Approach

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### ABSTRACT

The application of 2-D resistivity survey is considered as one of the most common methods in groundwater exploration. However, this method does not provide water flow data within the subsurface. The integration of this non-destructive geophysical method of 2-D resistivity and self-potential (SP) is suggest in this study for sustainable approach. The objectives are to detect saturated zone of potential groundwater, identify water flow movement and propose tube well location. Pole-dipole array is deployed in order to get deeper depth of penetration, with electrode spacing constant at 5m. Four survey lines LR-01, LR-02, LR-03 and LR-04 are proposed in crosshatched pattern. The apparent resistivity is measured during the survey and forwarded in inverted model. SP method is executed between line LR-01 and LR-02 in 40 x 30 m<sup>2</sup> area. A non-polarised electrode is utilised and fixed base configuration is adopted with total of 60 grid points is measured. Resistivity inversion model revealed low resistivity values (1 - 400 Ωm) which indicate as zone of saturation; intermediate resistivity values (> 500 - 5000 m) indicate fractured granite formation; and high resistivity values (> 5000 m ) indicate mass bedrock granite. The interpretation of the inversion model is then supported and correlated with borehole record (BH01). Result from SP method revealed negative and positive anomalies value range from -35 mV to 105 mV and the value is illustrated in isopotential and magnitude map. From the map shows the low anomaly value serve as recharge zone while high anomaly value indicate discharge area. The integration between 2-D resistivity and SP method managed to identify water flow movement that directed from Northeast part towards Southwest direction. The potential area for groundwater is discovered for tube well development at latitude 4.709831° - 4.710408° and longitude 101.56790° - 101.56860°.

GEIC 2020: 017

## Distributed Optical Fibre Sensing Technique in Slope Deformation Monitoring

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### ABSTRACT

Over the past decades, slope deformation monitoring has applied the use of traditional monitoring instruments, which among them is the widely used inclinometer. Such instrument possesses many disadvantages where it is prone to electromagnetic interference, requires numerous cable installations and limited sensing range. With the advancement of optical fibre sensing technology, researchers have started to look into its capability in monitoring slope deformation. The fully distributed optical fibre sensing (BOTDA) was employed in monitoring the horizontal deformation of a smart pipe installed in the medium-scaled laboratory slope model. The smart pipe is made up of a PVC pipe integrated with optical fibre cable and buried into the soil. The result obtained showed that the performance of the smart pipe was able to record the deformation when the slope was subjected to incremental surcharge loading. This study concluded that the smart pipe is able to replace the existing traditional inclinometer in improving geotechnical monitoring efficiency.

**GEIC 2020: 018**

## **Integration of 2D Resistivity and Remote Sensing for Potential Aquifer in Kedungadem, Bojonegoro District**

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### **ABSTRACT**

Water is important for mankind. The groundwater exploration is conducted to determine the potential shallow fresh water. The purpose is to provide the water supply especially for local people of Kedungadem city in Bojonegoro district of East Java, Indonesia. The local people of Bojonegoro had faced the insufficient water supply to support daily living, hence Kedungadem city is selected to investigate the potential groundwater. The common geophysical methods used to study the groundwater potential is 2D resistivity and remote sensing. The study area is focused on Kedungadem city of Bojonegoro, where the selected resistivity sites are Buntan, Tondumulo and Lele. The configuration setting for 2D resistivity method is pole-dipole array, while for remote sensing, the satellite imagery used is Landsat 8. The potential groundwater zone is defined by performing the weighted overlay analysis. The integration of both methods indicates the high potential of groundwater occurrence in Tondumulo and Lele, and as for Buntan the potential of groundwater is low.

GEIC 2020: 019

## **Developing A Preliminary Study of Remote Sensing and GIS Approach for Intertidal Seagrass Mapping using Drone**

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### **ABSTRACT**

Fine scale seagrass such as *Halophila ovalis* usually grows in patches along the intertidal zone in the tropical waters. This species is commonly covered by epiphytes and other vegetative plants that limits satellite imagery to obtain a clear image of the seagrass due to high spatial resolution needed. Hence, to overcome this problem, (DJI Spark Drone) was used to cater high resolution image of the seagrass. This study aims to monitor seagrass distribution and to distinguish the potential application of remote sensing (RS) and GIS analysis using drone imagery as a direct source image for mapping fine scale seagrass. The survey was carried out at peak low tide (0.5m) during neap tide season. Eight sampling stations consists of 3 replicate quadrants whereby represents upper, middle and lower littoral zones were placed along a 50m transect line perpendicularly to the shore with the size of 0.5m × 0.5m. Ground truth assessment includes identifying seagrass species, observations of environmental conditions and visual interpretation of seagrass percent cover. Meanwhile, for RS survey, the drone captures image of each quadrants at 1.5 m above ground and stored in JPEG file. GIS analysis such as image processing involves Region of Interest (ROI) as a reference data while image classification was done using Supervised Maximum Likelihood method. From the results, seagrass distribution was higher in the upper and middle littoral zone compared to the lower littoral zone which relates to turbid waters nearshore although *Halophila ovalis* commonly grows mostly in the lower littoral zone. Next, based on the RS and GIS analysis, each class represents the percentage cover within the quadrat. Seagrass percentage ranges from 0.00% to 82.28% while substrate percentage ranges from 0.00% to 95.56% based on each quadrant features. Results obtained revealed that seagrass distribution are considered rather good in all stations. In conclusion, RS and GIS approach using drone are effective to produce high resolution and reliable imagery for mapping fine scale seagrass as high accuracy of 86.05% were able to be achieved.

**GEIC 2020: 020**

**Sedimentology Study at Bukit Tungku Lembu, Perlis, Malaysia**

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**ABSTRACT**

The ancient sedimentary rock from the field outcrop gives information on sedimentary features and enhancing the understanding of the depositional environment history. Several sedimentology studies had been conducted in North-Western Peninsular Malaysia, but only limited in the Bukit Tungku Lembu area. Therefore, this study overview was carried out to analyse the sedimentary facies and reconstruction of the paleoenvironment history model for this rock profile via sedimentology logging, facies analysis study, and Fischer plotting analysis. Sedimentological and sequence stratigraphic evidence indicates that this outcrop represents a deposit of coastal, wave, and storm-influenced shoreface shelf system that reflects a shallow marine near to fluvial paleo-depositional environment. Five sedimentary facies have been recognized in which; (F1) coal facies, (F2) silty shale facies, (F3) shale facies, (F4) sandstone facies, and (F5) interbedded of sandstone with silty shale facies. The complete sedimentology sequence is made up of several facies cycles in which the cycle shows a thinning upward pattern indicating the sediments were deposited during the rising of sea level which is also known as transgression event, in the Palaeozoic time scale.



GEIC 2020: 021

## **Rockfall Trajectory and Back Analysis Approach using UAV Photogrammetry Mapping at Gerik-Jeli Highway Perak, Malaysia**

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### **ABSTRACT**

Landslide is one major disaster in Malaysia, resulting in economic loss and results in loss of life. On 4th October 2017, the landslide occurred, which triggered several rockfalls from a steep slope along the roadside of Gerik-Jeli Highway at Km 140. Second occurrence of a landslide occurred at a similar location on 28th April 2018. These landslides occurred mainly due to the continuous rainfall event as the triggering factor and the loose, steep weathered sedimentary rocks slope as the controlling factor. In this study, an unmanned aerial vehicle (UAV) was used to capture both series of landslide events to obtain the digital surface model and extract the slope's profile after failures. The slopes' profile serves as essential inputs to determine the field's rockfall trajectories using Rocscience RocFall software. The simulation was made based on real site conditions and to evaluate the effectiveness of the temporary barrier. The 'New Jersey' barrier is used to limit the movement of rocks that falls onto the road. Comparisons were made before and after the second rockfall events to determine the efficiency of the road barrier as a temporary structure after the first incident. The results demonstrate the benefits of integrating UAV data acquisition as an essential input for the simulation of rockfall trajectory, which represents the actual slope geometry. At the same time, change detection analysis between two series of events can be made.

GEIC 2020: 022

## Assessment of Offline Electrodes Effect on Common Arrays Used In 2-D Resistivity Survey for Subsurface Probing

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### ABSTRACT

Two-dimensional electrical resistivity imaging (2-DERI) survey remain the most commonly used geophysical method in obtaining subsurface information for engineering, archaeological and environmental applications. Most of the standard arrays employed for 2-DERI are designed with the theoretical assumption of straight survey profile layout in which all multi-electrodes are collinear at each point of measurement. However, due to surface constraint for which most of the survey areas are characterized with, some of the electrodes might be shifted off the profile line, thereby contravene the theoretical assumption upon which the arrays are built. Hence the result is prone to false anomalies. In view of this, the two most used arrays (Wenner and Wenner-Schlumberger) were considered with the aim to compare the effect of offline electrodes on them and make recommendations. The result revealed that the Wenner array is less susceptible to offline electrodes effect as the inverse resistivity tomograms fairly resolve all the geometries (low and high resistivity zones) of the true model, particularly for one and two electrodes offline. However, slight to distinct variation of anomalies is observed for three electrodes offline at all offline distances. More so, high (>80%) Pearson's correlation coefficient (R) and low mean absolute percentage error (MAPE) was observed for the Wenner array whereas the Wenner-Schlumberger array has low (<80%) R and high (>20%) MAPE. This translate to the variation of anomalies present in the tomograms, which could lead to misinterpretation. Therefore, the study has shown that 2-DERI survey using Wenner-Schlumberger array is more susceptible to offline electrodes effect.

GEIC 2020: 023

## **Determination of Groundwater Potential Zones of Perlis, Malaysia using Remote Sensing and GIS Method**

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### **ABSTRACT**

Demand for groundwater resources is growing from time to time due to the insufficient clean surface water supply. The increasing demand for water resources is caused by many factors such as population increase, urbanization and farming activities. Therefore, by using remote sensing and Geographic Information System (GIS) technology will make the survey more efficient in term of cost, energy, and time before proceeding to geophysical survey to double confirm the potential aquifer. This research is to delineate groundwater potential zone combining Geographic Information System and Remote Sensing. The study area was elaborated in the state of Perlis, Malaysia covering 819 km<sup>2</sup> area. One of the main economic activities in Perlis is agriculture, with a progressive agricultural activity and consequently increased exploitation of groundwater resources. Geographic Information System (GIS) and Remote Sensing (RS) were used to generate a groundwater potential map, consisting of four classes, showing groundwater potentiality, ranging from low to very high. The extraction of this map is based on the integration of thematic maps of six groundwater parameters; annual rainfall, geology, lineament density, land use, slope, and drainage density. Weights were assigned to all the parameters according to their relevance to groundwater favourability and a groundwater potential map is generated using weighted overlay analysis in ArcGIS 10.3 software. Based on the results analysed, northern area of Perlis such as Kaki Bukit area hold a high groundwater potential. Remote Sensing and GIS tools are proven remotely advance in groundwater potential zonation. The results provide a base data to select suitable sites for further groundwater development, exploration and contribute for future studies and purposes in Perlis.

**GEIC 2020: 024**

## **Rock Slope Failure in Malaysia: Comparative Case Studies and Lesson Learnt**

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### **ABSTRACT**

Rock slope failure is common natural incident in Malaysia. Hence, the this paper presents a comparative studies and lesson learnt from 3 cases of rock slope failure in Malaysia. Three rock slopes failure cases have been chosen with each one identified respectively nearby highway, railway line and school compound. The comparison among cases is carried out in order to identify the similarities and differences among cases that lead to the indetification of the main causal factors that caused slope failure and the common solution been taken to stabilize the problem. From the comparative studies, it is found that the main factors that contributed to slope failure for these 3 cases are poor management of drainage system and also ineffective slope protection. Up to now, many methods of rock slope stabilization can be used, however, most popular and reliable to be adopted in Malaysia is guniting with BRC. This study is significant to identify the necessities work to be done to overcome the rock slope failure and to ensure the stability of rock slope for long periods: lesson learnt.

GEIC 2020: 025

## 2D Electrical Resistivity Tomography for Fault Mapping in Lahad Datu

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### ABSTRACT

Earthquakes poses a threat to human in many aspects. A study was carried out in Lahad Datu, Sabah to provide information on seismic hazard. 2D electrical resistivity tomography (ERT) data were collected in sedimentary formation with crystalline basement to resolve for possible fault that could be a source for earthquake occurrences. Two survey lines were executed in WE and NS orientations. The results obtained from resistivity inversion revealed a low resistivity anomaly of less than 50  $\Omega\text{m}$ , which is sandwiched between highly resistive bodies in both L1 and L2 profiles. The structural and physical properties of the area show clear indications of a fault zone. To obtain more information of the fault in the area, a 3D plot has been constructed that indicates a fault plane orienting in NE-SW direction that dips towards NW direction. As this study is a pioneer subsurface study for faults in Lahad Datu, the results will help seismic hazard planning in the area.

GEIC 2020: 026

## The implication of water towards soil erosion in Penang, Malaysia

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### ABSTRACT

Water plays a crucial role in any engineering and environmental problem, which will affect the structure of soil. In soil erosion, high amount of water can move and transport the soil especially sand. Sand consists of large particles, which allow the water to flow easily and thus make it more susceptible to erosion. Soil erosion causes climate change, reduce the soil fertility and production, flooding and landslide. The implication of water towards soil erosion is a serious problem in a tropical region. In this study, 2-D resistivity and self-potential methods were used to provide the subsurface information. There are five survey lines were measured at the study area to study the implication of water to soil erosion. Subsequently, the information from the soil samples has been used to validate the 2-D resistivity result. Interpretation of 2-D resistivity results showed a low resistivity value (1 – 150  $\Omega\text{m}$ ), which indicates a saturated soil. Meanwhile, the SP result shows that the direction of subsurface water from east to west. The west part will act as a recharge area which will be an influencing factor to increase the water level. Therefore, this area has a high risk of soil erosion.

GEIC 2020: 027

## Hydrophobic Effect of Soil Stabilization for Sustainable Subgrade Soil Improvement

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### ABSTRACT

The engineering properties of soil samples can be improved via chemical stabilization processes; these processes involve the use of chemical additives to improve soil properties. The presence of water in structures remain the major cause of structural deterioration, premature pavements distress, and the weakening of other supporting geo-technical structures. Many researches have been recently focused on the effects of non-conventional additives on the geotechnical properties of soils. In this paper, the chemical improvement of laterite soils using hydrophobic caltite and cement was studied. The investigations conducted in this study covered evaluation of the compressive strength of the soil in soaked and unsoaked cases, flexural strength, as well as microstructural analysis. In terms of the strength, the addition of hydrophobic caltite and cement to the soil improved the strength characteristics. Additionally, the best soil-additive reaction occurred at the early stage of curing (the 7th day). However, there was a decrease in the rate of strength development (20% and 10%) on the 28th day of curing upon soaking the soil-cement and soil caltite samples, respectively for 24 h in water. Regarding the microstructural analysis, both hydrophobic caltite and cement reduced the porosity, voids and crack of the soil sample. The stabilization process was also found to modify the porous nature of the sample. Finally, there was formation of new reaction products on the soil surface which reduce water absorption.

## Effect of Lime on Sulphate-Bearing Soil

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### ABSTRACT

Sulphate-bearing soil is one type of expansion soil that is widely distributed around the world; it is predominant in the UK, USA, Africa, and Australia. When sulphate-bearing soil is treated with calcium-based stabilizers (such as lime and cement), it normally results in the formation of a crystalline mineral called ettringite. This crystalline mineral grows between soil particles and causes the destruction of soil structure; it also contributes to the increase in the swelling behaviour of the soil. In this study, kaolinite clay (K) was chosen as the soil sample while lime (L) was selected as the calcium-based stabilizer. The stabilizer was added to the kaolinite clay at 5 and 10% by dry soil weight while gypsum (G) was added at the rate of 10% by dry soil weight. Linear expansion test and unconfined compressive strength (UCS) test were conducted to determine the mechanical properties of the sulphate-bearing soil with and without soaking in water. From the results, it was observed that increases in lime ratio increased the swelling behaviour of the sulphate-bearing soil; K-10L-10G exhibited the highest swelling (25.226%) while K-5L-10G showed swelling of 21.284%. However, the swelling of K-L was only in the range of 0.093-0.479% compared to the swelling of K-L-G and K-G. The maximum strength, according to the USC test, was exhibited by K-10L-10G (802.33 Kpa) without soaking but after soaking, all the samples showed decreased strengths except the K-L-stabilized soil. The maximum strength was exhibited by K-10L after soaking as it was improved by 18.46% (997 to 1181 Kpa) after 52 days of soaking. The increases in swelling behaviour and the decreases in UCS could be attributed to the formation of ettringite which grew between soil particles and caused the destruction of the soil sample structure.



GEIC 2020: 029

## **Deterioration Weathered of Tunnel Face Excavation using Image Analysis**

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### **ABSTRACT**

Most research into tunnel excavation is manually determined by an engineering geologist which is geological mapping. Two key tasks of tunnel excavation are geological mapping and rock mass classification. Image analysis is introduced to make the process of geological mapping much easier. Working Face software is used as a process for image analysis. Value of a\* (5-10) and b\* (15-25) along with RGB images needed for image analysis as input data. Using an RGB image as input, this system can assess the deterioration of weathering. The percentage of the rock weathering grade of the tunnel face is also evaluated by this process. The weathering grade is divided into 6 grades, and colors define each grade such as black represent grade 1 and red represent grade 6. The findings are correlated with JH classification. The correlation between weathering grade percentage and JH classification will discussed in this paper. This research also focuses on granite rock. The deterioration weathered of tunnel face excavation can show both qualitative and quantitative results by using this method. The aim of this study is to make the process of tunnel excavation investigation much easier for engineering geologist.

## GEIC 2020: 030

### Influence of Cielab Colour Space Variation on Weathered Granite

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#### ABSTRACT

Weathering is a process changing rock to sediment, vary in colour, and disintegrates the rock, and breaks it into pieces. Colour changed on the rock surface are essential as a traditional method of weathering analysis. Weathering degree, a crucial parameter in rock mass measurement, provides a significant source of possible error because it depends mostly on geologist or geotechnical engineers' visual observation and subjective evaluation. Weathering usually reduces rock mass strength and accelerates the disintegration. Highly weathered granite typically shows mineral grain separation, iron oxide discolouration, increased friability, and clay mineral formation. The shape and size of discoloured areas on the rock mass surface may indicate the relative age of fractures as well as groundwater penetration and flow processes. However, to eradicate human error in weathering assessment, state-of-the-art imaging techniques may be required. In this study, colour changes were digitally calculated using the Red, Green, Blue Digital Color (RGB) values of rock surfaces. More precisely, digital colour CIELAB colour space variations were then analysed to determine rock weathering and colour changes. Rock colours and influence of surface colours have long been used in rapid, realistic and descriptive identification of rock masses and surface weathering using a colourimeter. CIE L\*a\*b parameters express spectrophotometer measurement. The vertical L axis is the lightness, and the other two parameters are a\* and b\*. FRU Colourimeter WR18 with 40mm aperture was selected explicitly in this research as it can be used for broad textured, irregular and rough surfaces. Value of rock slope L, a\* and b\* was calculated and transferred to the machine. In conclusion, weathering grade increase, a\* and b\* values also increased. Rocks also have medium to heavy weathering and are fresh due to chemical weathering because of iron oxide exist. A slight correlation between the three weathered granite slopes existed.

**GEIC 2020: 031**

## **The Arcuate Geometry of The Trans Indus Range: An Integration of GIS and Remote Sensing Technique**

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### **ABSTRACT**

Geometrically, fold-and-thrust belts often deformed in distinct map-view curves known as salient, convex-to-foreland and its equivalence, salient, concave-to-foreland curves. One of such belts is the Trans Indus Range which is the focus of this study. Several theories regarding its arcuate nature of the Trans Indus Range includes the interaction with foreland obstacles, the inheritance of the pre-Himalaya's plate irregularities and the thick-skinned deformation of the Bannu Basin. The geometric features of salient-recess framework define its mode of formation. Therefore, we define the arcuate geometry of the Trans Indus Range aided with remote sensing technique to unveil its arcuate nature. Our findings show the Bannu salient has a symmetric, broad and flat-crested shape with convergent structural trend lines pattern. This work supports that the Trans Indus Range developed in response to the obstruction with buried foreland obstacles.

**GEIC 2020: 032**

## **Prediction of Boulder Generation in Opencast Bench Blasting using Artificial Neural Network and Their Limitation**

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### **ABSTRACT**

This paper discusses the various artificial neural techniques used to analyze 285 blasting data set from limestone quarry in Thailand consisting of blast design data and percentage of boulders as blast performance criteria. In the beginning, the data sets have been divided into train and test sets using genetic algorithm to maintain their statistical properties. Five-fold cross validation technique has been used for the selection of the network configurations and the regularization constant. Step by step analysis of data has been carried out. Four type of models are used for analysis namely- neural networks with whole set of features, neural networks with feature transformation using principal component analysis, neural networks with feature selection using information gain by decision trees and neural networks with feature selection using forward search. Neural network with feature selection using forward search, produced the best results among the four models. However, the model has not been able to produce any significant improvement in the results. The analysis shows that there exists an insignificant correlation and mean square error values with the collected data samples from the blast results of the quarry. The methods to forcibly produce significant mean square error and correlation values, that show apparently good results, have been shown. However, such models are not fit for generalizing the results. These models will not be able to predict the results for new and unnoticed inputs.

GEIC 2020: 033

## Cross-Gradient Joint Inversion of 2D Resistivity and Seismic Refraction Method for Subsurface Delineation

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### ABSTRACT

The shallow subsurface is very complex and making interpretation of the subsurface using only one type of geophysical data is often not a suitable option. In this study, cross-gradient joint inversion of 2D resistivity and seismic refraction method were conducted to delineate a subsurface at Indah Kembara, Universiti Sains Malaysia (USM) Pulau Pinang. Joint inversion method using cross-gradient function as a constraint was applied to separate resistivity and seismic inversion results. The joint inversion optimization problem is solved using Gauss-Newton approach. The cross-gradient function is incorporated as a constraint to obtain structurally similar models and at the same time to fit the measured data reasonably. Geological method such as particle size distribution (PSD) method (hydrometer analysis and mechanical sieving) was also conducted to assist the interpretation. Percentage of clay, silt and sand can be obtained through PSD graph and can be used for soil classification. The results show that the cross-gradient joint inversion method managed to produce resistivity and velocity models that are structurally similar to each other compared to individual inversion models. The cross-gradient joint inversion profile shows three resistivity zones with value of 150-500  $\Omega\text{m}$  (Zone A and C) and 5-100  $\Omega\text{m}$  (Zone B) and three velocity zones with value of 0.4-0.7 km/s (Zone A), 0.8-1.3 km/s (Zone B), and 1.4-1.7 km/s (Zone C). Through these comparisons, it is demonstrated that the joint inversion method helps to reduce the uncertainty and non-uniqueness inherent by a single inversion and also can give a comprehensive interpretation of the subsurface. Results from PSD analysis also has contributed into the interpretation of the geology of the study area where Zone A was identified as silty sand and Zone B is identified as silt and clay.

GEIC 2020: 034

## Discontinuities Assessment and Hazard to Blasting Work in A Granite Quarry, Johor

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### ABSTRACT

An evaluation on geohazard and risk of blasting operation at a granite quarry in Johor was carried out to assess a safer quarry operation. The approach of this study involves series of field investigation and data analyzed involving rock face mapping and characterization, kinematic analysis as well as weathering profile and classification. The quarry face was classified into 6 panels based on the likelihood of hazard posed, by observation at the site. Based on the field measurements revealed that three most common mode of failure with high-risk potential found is wedge, planar and circular failure with percentage occurrence of 50% to 75%, 20% to 50%, and 20% to 30%, respectively. Based on current excavation face direction, there are three critical panels with high-risk potential failure namely Panel A, B and F. Panel A consist of three wedges, a planar and a circular failure possibilities. Panel B consist of two wedges, a planar and circular, respectively. Panel F consist of three wedges and a planar failure. Therefore, orientation of blasting for Panel A, B and F are recommended to redirect from 263° to 270°, 280° to 300°, and 240° to 270°, respectively to minimize the potential hazard. These recommendations are proposed to based on likelihood in reducing the potential failure from high risk and moderately risk to lower risk potential during rock face excavation and blasting works.

**GEIC 2020: 035**

**Effect of Moisture Content To The Strength Of Rock Material for Various Rock Types and Weathering State**

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**ABSTRACT**

Moisture availability in rock mass alter the mechanism by heating and cooling process can cause weathering. Variation of moisture absorption of weathered rock is an important issue in the tropical climate that changes in rock properties. This study addresses the determination of physical properties of rock material. This research is aimed to analyze moisture content based on the lithology and its weathering state in relation the strength of the rock material. A systematic approach of assessment was structured, initiated with field studies and geological data collection at three studied sites in Sedenak in Johor, Bentong in Pahang and Ulu Kinta, Perak. The field studied were accompanied by rock mass characterization, including geological mapping and discontinuity study. It followed by a series of laboratory testing for geomechanical properties of rock materials. In addition, the moisture content and the strength of rock material were monitored in wet and dry condition and recorded to assess the performance of different lithologies and weathering state. The results of rock material properties were analyzed in order to establish the possible relationship. This study prove that the moisture content has significant effect on the rock strength. From this study, highly weathered rock mass very influence to the moisture content as compared to slightly weathered, moderately weathered and completely weathered rock mass.

GEIC 2020: 036

## Assessment on Tunnel Construction Approach: Effects to the Ground Condition

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### ABSTRACT

In tunnelling, excavation advances are achieved by applying the thrust force of hydraulic jacks to the installed tunnel linings, which instantaneously also act as reaction wall during TBM tunnel construction. Sometimes, due to the friction of ground and the TBM, it is necessary for the jack forces exceed limitation protocols in able to continue excavation. Excessive high or low jack-forces could cause unexpected deformations or heave and excessive stress or collapse of the face pressure, respectively. Hence, the stability of overall tunnel construction is in doubt. Therefore, the jack forces design applied to the tunnel lining needs to be revisited. This paper presents the effect of lining thickness and jack forces to ensure the stability of tunnelling. Numerical modelling of staggered tunnel lining segments in soft ground model were carried out with ABAQUS software. In the findings, when the tunnel lining thickness is reduced, the settlement of the ground surface is increased. In addition, jack force is also found as one of the reasons of the tunnel to distort and the effect is more visible on the rings with the reduced thickness.



GEIC 2020: 037

## Investigation of bedrock at hilly area using CAP-SASW method

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### ABSTRACT

Locating hard layers or bedrock is particularly important in deep subsurface exploration. However, due to scale effect of conventional testing, it sometimes difficult to provide greater overview of subsurface condition. This motivates a method that is capable of providing better resolution to certain depth. This paper present an investigation of bedrock using nondestructive method at hilly area as a supportive method to existing borehole. The borehole recorded granite at respectively at 25 and 24 m. CAP-SASW method that is employed successfully mapping the interested area. The result showed that the granite is considered as slightly wheatered rock with shear wave velocity ranging from 850-1600 m/s.

GEIC 2020: 038

## The Evolution of Spectral Analysis of Surface Wave Method: A Review

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### Abstract

Spectral Analysis of Surface Wave (SASW) method for in-situ non-destructive testing of stiffness profiles of soil and pavement sites has undergone various improvements since its inception during the 1980s. Improvements have been in both data-acquisition (sampling and sensors) as well as in data-processing (forward calculation and inversion algorithm) aspects. The present study explores the relative effectiveness of using SASW and its automation. Precise recording of amplitude value has the potential to further improve the effectiveness and develop the surface wave testing methods. Different approaches for interpreting the dispersion curve and their potential regarding sensitivity to noise, reliability and capability of extracting significant information was investigated. Finally, the suitable algorithms, finite element modelling, data acquisition and processing and the inversion procedure for providing the reliable and robust stiffness profile was illustrated in this study.

**GEIC 2020: 039**

**Ground Magnetic Investigation on Archaeological Site at Bukit Choras, Kedah, Malaysia**

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**ABSTRACT**

South Kedah takes the spotlight as many archaeological artefacts related to Buddhism were discovered in this region. While most sites occupy in South Kedah, Bukit Choras oddly outlies from the rest. The unusual locality of historical human activities at Bukit Choras triggered a detail research to be done using integrated geophysical methods. This research focuses on exploring the subsurface to identify the location of supposed buried Buddhist archaeological structures in Bukit Choras. Site survey has identified some brick-structures that could be seen on the ground while partly buried, thus preserving the invaluable structures throughout the years. As the structures utilize fired clay bricks, this feature was exploited in choosing the best geophysical methods. Due to the archaeological remains are made of high magnetic susceptibility ground magnetic methods were selected to locate the brick structures and their extensions. 33 magnetic survey lines were conducted with 40 stations per line (1 m interval), bringing about 1320 magnetic stations in total. Based on analytic signal maps generated from magnetic data, high magnetic anomalies distributed at eastern, northern and western part of the study area with value of  $> 50$  nT/m. The potential anomalies were suspected consist of laterite soils/compacted laterite (fired clay bricks) which is rich in iron oxide that influence the different in magnetic intensity values. The finding of this research will help in further archaeological excavation and contribute to new history of the area.

**GEIC 2020: 040**

## **Influence of El-Nino adapted rainfall event on partially saturated slope behaviour**

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### **ABSTRACT**

This paper investigates the effect of El-Nino rainfall pattern on the unsaturated slope behaviour in terms of the generation of pore-water pressure and factor of safety. The El-Nino usually carry dry weather and reduced rainfall causing to the occurrence of a high rainfall event. This phenomenon is common in Malaysia and it has hit the nation for so many years. Throughout the event, a landslide is prone to take place and may lead to fatal accidents. Typically, Malaysian soil is classified residual and have high vadose zones especially during the dry period. Due to high-intensity rainfall, the reduction in soil suction can be seen happening drastically, thus reducing the soil strength. This study aims to capture the unsaturated slope behaviour and stability due to the influence of El-Nino adapted rainfall event. The objective is to determine the significant rainfall intensity that affects the soil suction and the factor of safety via modification using the idealised rainfall approach and El-Nino adapted event. In this paper, a series of real rainfall in 2006 from the Department of Irrigation and Drainage (DID) Malaysia was used, labelled as the actual rainfall on numerical slope models. The slope geometry is illustrated according to a failed slope in Kolej Ibrahim Yaakub, UKM and the soil parameters and flow characteristics are gathered from the literature. By considering a very low groundwater table, the actual rainfall shows no significant reduction of pore-water pressure. Nevertheless, as the rainfall pattern is reformed with an idealised approach and adapted to the El-Nino rainfall event, the pore-water pressure and factor of safety estimated reduced. Captivatingly, El-Nino adapted rainfall for December 2006 event with lower average monthly intensity but continuously showed high rainfall intensity in the beginning and ending phase. The adapted rainfall has affected the pore-water pressure with 3 kPa different and the factor of safety decreased down to 1.95. It is significant that the change and decrease in the slope behaviour and stability, respectively, are caused by the unsaturated soil properties and the rainfall intensity itself since the level of groundwater level is too deep to influence the results.

**GEIC 2020: 041**

## **2-D Resistivity and Time Domain Induced Polarization (TDIP) for Shallow Subsurface**

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### **ABSTRACT**

Resistivity method concerns with resistivity (in  $\Omega\text{m}$ ) of soils/rocks in term of the ability to resist the flow of the electrical current. While the Time Domain Induced Polarization (TDIP) deals with chargeability (in ms) that indicates the strength of polarization effects experienced by ions in the vicinity of metallic grains in soil/rock. 2D resistivity and Time Domain Induced Polarization was conducted with objective to assess and differentiate the subsurface features by electrical properties. Different subsurface features might have same ability to resist the current flow and therefore it may lead to wrong interpretation in distinguishing these features. Integration of 2D resistivity and TDIP successfully classified the shallow subsurface features. Results show that highly conductive area (clay and water saturated zones) have low resistivity ( $<10 \Omega\text{m}$ ) which allow the current to flow through it. However, TDIP can differentiate these materials through their chargeability properties. Clay saturated area has higher chargeability ( $>10 \text{ms}$ ) compared to water saturated area ( $<10 \text{ms}$ ). As for coarse materials and boulder, both will give high resistivity ( $>3500 \Omega\text{m}$ ) due to their ability to resist the current flow. In this case, lower chargeability ( $<10 \text{ms}$ ) is corresponding to the presence of coarse material and high chargeability ( $>100 \text{ms}$ ) is caused by the presence of boulder. Besides, fracture is also detected with low to intermediate resistivity ( $300\text{-}3500 \Omega\text{m}$ ) and low chargeability ( $1\text{-}10 \text{ms}$ ) while alluvium gives both intermediate resistivity and chargeability ( $10\text{-}800 \Omega\text{m}$  and  $10\text{-}80 \text{ms}$ ) respectively. Volcanic tuff bedrock is also identified with high resistivity ( $>3500 \Omega\text{m}$ ) and intermediate chargeability ( $30\text{-}200 \text{ms}$ ).

GEIC 2020: 042

## Hardening Soil Model Parameters for Sands and Clays from Laboratory Testing

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### ABSTRACT

In recent years, the emergence of various numerical tools has assisted engineers in predicting and solving geotechnical problems. The accuracy of predicting soil failure or deformation depending on the skill in modelling and precise assumptions. This paper presents the computation of Hardening Soil (HS) model parameters from conventional laboratory testing on sand and clay. Conventional laboratory tests refer to oedometer testing, Consolidated Drained (CD) and Consolidated Undrained (CIU) Triaxial Tests. The parameters determined are the Mohr-Coulomb effective strength parameters, secant stiffness from triaxial tests, unloading/reloading stiffness, tangent stiffness from oedometer and power for stress level dependency of stiffness. In the case of lack of data, correlations can be made to obtain the desired parameters. The results from laboratory testing are then simulate using PLAXIS SoilTest tool to evaluate their differences and sensitivity. Finally, calibrated HS model parameters would lead to higher accuracy of results when simulated in numerical models.

**GEIC 2020: 043**

## **Rock Mass Classification for Tropically Weathered Limestone in Sri Lanka for Blastability**

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### **ABSTRACT**

Sri Lanka is a tropical country which experiencing distinctive wet and dry seasons throughout the year. As limestones in Sri Lanka is frequently exposed to rain, limestone absorbs water and forms carbonic acid. With various geological discontinuities such as faults, folds, joints, water flows through these cavities. The weathering process along these cracks or cavities takes place at faster rate. This further enhances process of dissolution resulting in change in geomechanical properties of limestone. This paper presents the classification of rock mass for tropically weathered limestone Sri Lanka to assess blastability. Limestone deposit at Aruwakkalu based on rock structure is classified as (i) heavily cracked, frequent weak joints, weakly cemented layers (ii) Thin, well-cemented layers with tight joints (iii) Massive intact rock. This limestone deposit is also classified as bedding plane dipping into the slope face, bedding plane dipping into cut slope face and other cases. Existing system of rock mass classification at Sri Lanka is described in this paper. Thus for Aruwakkalu limestone deposit, rock mass can be classified based on type of rock structure, Blastability Index (BI), RQD%, degree of weathering and degree of hardness. Average powder factor of 0.15 kg/t can be correlated with Blastability Index.

**GEIC 2020: 044**

## **Rock Mass Classification of Tropically Weathered Karst Limestone of Cambodia for Blastability**

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### **ABSTRACT**

In civil and mining projects, blasting may be necessary for breaking rocks prior to excavation. Due to tectonic activities faulting and folding in rock mass takes place resulting change in physical and mechanical properties of rock. Rocks are further exposed to weathering which affect geomechanical properties of rock mass. Thus, rock mass has different geomechanical and varied physical properties in the same rock mass. Practicing civil and mining engineers should be able to visualize rock mass in the field to get desired blasting results. Rock mass is heterogeneous material having varied geomechanical properties which affect blast fragmentation. Due to geological discontinuities such as faults, folds there can be environmental effect such as fly rock and ground vibration which need to be controlled as there may be local community. This research study is for developing rock mass assessment system for karst limestone of Cambodia which will be useful for design of blast with commons known parameters used by field engineers so that desired result of fragmentation can be obtained. Further this rock mass assessment system will be practical to minimize the effect of fly rock hazard and ground vibration due to blasting. Limestone at Cambodia is explored and initial stage of development. Blastability index (BI) will be compared with recent approaches and these parameters will be considered for rock mass assessment. During initial stage of mining project, detailed information on limestone deposit may not be available. The proposed methodology of rock mass assessment is based on review and will be useful for blast design and prediction of blast performance at Cambodian limestone deposit. Karst limestone in Cambodia is classified into five classes based on exploration data consisting of RQD, degree of weathering, degree of hardness and percentage cavities based on exploration data. Major cavities observed are in cherty limestone and argillaceous limestone. 65% cavities are filled with clay and 35% cavities are not filled with any material. Further exploration data is classified based on block model based on structures identified, hardness of rock and will be useful for co-relating with blastability index. 99% of cavities in karst limestone are found with Argillaceous and Upper cherty limestone. Based on cavity classification, 74% drilling area has average cavities of 0.37% which is least. 9% of drilling area has >20% of cavities or 2% of total area which is highest and concern for blast performance from fly rock, fragmentation and back break point of view.



## GEIC 2020: 045

### Comparative Study of Landslide Cases in Malaysia and Lesson Learnt

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#### ABSTRACT

Landslide events have the devastating impacts on human lives, damage to the physical asset (building, roads and highways), broken of utility supply lines and loss of environmental resources and economic costs. In the period of 59 years from 1961 to 2019, Malaysia has recorded 91 distinct landslide events which caused 721 deaths. Urbanization and the high rate of population growth accelerate the construction of flat ground. In order to cater on this demand, land utilization becomes more important and generally shift toward the hilly area or expands underground. This paper presents the comparative studies between 4 landslide cases to come out with the most common causal factors and rehabilitation methods taken. Studies showed that landslides occurred in Malaysia is mainly due to the intense and prolonged rainfall event. Since Malaysia is experiencing tropical weather, frequent and intense rainfall event is unavoidable. Therefore, the impact of rainfall shall be considered and included in the design to minimize the risk of landslide. Besides, human factors such as deforestation, design error and construction error should also be reviewed to effectively prevent the occurrence of the landslide.

**GEIC 2020: 046**

## **A Controlled Experiment of Hyperbola Size on Buried Objects**

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### **ABSTRACT**

Ground-penetrating radar (GPR) is a near-surface geophysical method used for non-destructive subsurface geologic and engineering studies. The contrast in the relative permittivity of materials leads to a reflection of electromagnetic waves used to obtain the subsurface information. Hyperbola curve is the most frequent reflection image used to detect the embedded object. A controlled experiment were conducted using a shielded antenna Pro-Ex RAMAC system to study the hyperbola size by the factors of medium velocity, object materials, depth, diameter, orientation and vertical and horizontal imaging resolution. A broader hyperbola was formed when a GPR antenna crossed over the object at less than 90°. Besides, high-velocity medium, large diameter, deep target depth and shallow target separation between two objects also formed broader hyperbola. However, the effect of object materials does not show any changes in hyperbola size, but the reflection strength shows differences between the materials. Consequently, the proposed model indicated that the hyperbola size could obtain vital information about the embedded object and guide the GPR survey plan.

**GEIC 2020: 047**

## **Subsurface Assessment: Correlation between Seismic Velocity and SPT-N**

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### **ABSTRACT**

The purpose of this study is to embark on correlation between geophysical survey (seismic velocity) and borehole data at studied site located in Kota Tinggi, Johor. Kota Tinggi consist of three lithologies; granite (Blumut Granite), volcanic rock (Sedili Volcanic) and sedimentary rock (Dohol Formation). The subsurface profile in the tropical climate produce complex behaviour especially in the weathered zone. Borehole data are more commonly used than other geotechnical methods for subsurface assessment. Four boreholes that were drilled are used to correlate with four seismic velocity profiles to determine relationship between SPT N-value. Seismic velocity for  $5 < N < 15$  influenced by types of material which sandy silt is major for this site. Besides that, seismic velocity for top soil shows value of less than 500 m/s, moderately to slightly weathered zone of 1000 m/s – 2200 m/s, slightly weathered zone of 900 m/s – 26000 m/s, and fresh rock is >5000 m/s. Boulder was able to be detected with seismic value 2000 m/s – 4550 m/s.

**GEIC 2020: 048**

## **Development of GPS Meteorology Infrastructure in Peninsular Malaysia**

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### **ABSTRACT**

This paper presents on the development of Global Positioning System (GPS) meteorology infrastructure in Peninsular Malaysia. Two (2) additional GPS continuous operating reference stations (CORS) have been established within GPS Iskandar network (ISKANDARnet). Moreover, all ISKANDARnet CORS were also upgraded with additional meteorological sensor to provide in-situ surface temperature and pressure measurement. Multipath analysis has been conducted at the two additional CORS as assurance to site suitability. Overall result shows that the average multipath for L1 and L2 GPS frequencies are 0.0750 m and 0.1042 m for ISK5 station and, 0.1644m and 0.2419 m for ISK6 station, which within normal condition for CORS.

**GEIC 2020: 049**

## **Weathering Grade of Rock Slope at East Coast Expressway, Malaysia**

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### **ABSTRACT**

Schmidt Hammer and Humboldt Penetrometer had been widely used to determine the weathering grades and compressive strengths of rocks. In this research, the slopes at KM 149 and KM 152 along the East Coast Expressway were selected. Slope at KM 152 toward Maran cannot be examined with Schmidt Hammer since the material are too soft and no rebound value can be recorded, thereby Humboldt Penetrometer was used. From the result, it shows that slope KM 149 has lower weathering grade and higher compressive strength compare to slope KM 152. Weathering grade for KM 149 is grade III/IV while weathering grade for KM 152 is grade IV & V. The data become a solid reason why slope KM 149 has a bigger angle of slope which is 60<sup>0</sup>. Slope KM 152 was cut in smaller angle of slope which is 25<sup>0</sup>. Moisture content have a solid influence on the compressive strength at slope KM 152 toward Maran. Further study need to be conducted to obtain and investigate the connection

GEIC 2020: 050

## Re-Constructing Strain Map in Malaysia

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### ABSTRACT

Sundaland plate experiencing significant crustal deformation due to series of major earthquakes that might reactivate local old and active faults. Several earthquake and tremors struck part of Peninsular Malaysia and Sabah has resulted in damages and causality. The situation has embarked in the need of crustal deformation monitoring. Besides several studies has been conducted however it undergoes a difficulty to combine long-term crustal deformation analysis. This study aims at constructing a crustal deformation in the form of regional seismic strain map in Malaysia. Crustal velocity field by using 1 year of Global Positioning System (GPS) data as quantified by 80 sites of Malaysia Real Time Kinematic Network (MyRTKnet) has been utilised to generate the strain map. Finally, site interpolated velocities will be conducted to demonstrate pattern seismic strain rate in Malaysia. From the result, the changes of strain rate pattern have been properly analysed to identify old and active fault.

GEIC 2020: 051

## Global Positioning System Measurement Technique: Assessment on Virtual Reference Station Data

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### ABSTRACT

Malaysian Real-Time Kinematic GPS Network (MyRTKnet) is a network of Continuously Operating Reference Station (CORS) to accommodate positioning in survey and mapping works in Malaysia. This network of stations adopted Geocentric Datum of Malaysia (GDM2000) as its reference frame. However, the datum is subjected to natural phenomenon which degrades the consistency of Global Positioning System (GPS) positioning within the network. Meanwhile, Virtual Reference Station (VRS) is one of the GPS measurement technique applied in positioning works in this region which relies on the stability of MyRTKnet. Hence, there is a need to evaluate the performance of VRS technique in the CORS network. This study utilizes the post-process VRS application that includes both static and kinematic mode at selected locations in Johor. It has been identified that the GDM2000 coordinate assigned in the CORS of MyRTKnet leads to difficulty in generating VRS data due to the coordinate bias, causing dispute in the geometry range between satellite position and coordinate of static datum at CORS station. Several test has been conducted to understand the performance of VRS data generated by post-processing mode within three MyRTKnet stations. Baseline vector via 1-hour static processing data depicts an adequate precision at less than 1cm. The study also found that the precision of kinematic solution depends on the quality generated VRS data as short data reduces potential for fixed ambiguity resolution. It is expected that the results and finding in this study will provide understanding of VRS data quality within GPS network with static datum.

## GEIC 2020: 052

### The Practical Techniques In Self-Potential Data Acquisition

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#### ABSTRACT

Self-potential (SP) method is a passive geoelectrical method. It measured the natural potential differences which exist between any two points on the ground. The points are measured using an electrode known as the roving electrode and the base electrode. In the SP method, these electrodes are often called ‘porous pots’ which are designed not to create any chemical potential once they contacted on the ground. A reference electrode used as a base electrode, and the second electrode used to measure the potential on the ground. The primary purpose of this paper is to introduce the practical techniques in SP data acquisition. These techniques are the electrode calibration (EC) technique and the optimum electrode time (OET) technique. The EC is to calibrate and to correct the electrode error during data measurement, which able to use multiple electrodes. The OET purpose is to identify the time for an electrode to be equilibrium on the ground. The SP has an electrode configuration on acquiring the electrical potential data such as gradient and fixed base. The gradient technique has some disadvantages in the data quality, such as cumulative error, electrode polarization, drift effect, time-varying potential, soil contact effect and reading errors (Corwin, 1990). In this paper, the fixed based electrode configuration is chosen to obtain the distribution of electrical potential in the subsurface. The study conducted in Padang Senget, Universiti Sains Malaysia, Penang. The SP data were exported from the ABEM SAS4000 system and processed using Microsoft Excel. A tutorial made by S. Barde Cabusson and Anthony Finizola on data reduction for self-potential mapping. The results in this study show that EC was able to be executed using multiple electrodes and proven to be a fast-moving electrode. The acquisition time duration took only 36 minutes compared to common SP survey, which took 53 minutes. Whereas in OET shows promising results where the initial electrical potential value is 0.8550 mV at 0 seconds and increased rapidly towards 2.1290 mV at 200 seconds, the electrical potential value is at steady reading and decreased at the duration of 400 seconds with a value of 2.0160 mV. Hence, it is observed that the OET in the vicinity area is 200 seconds. With these two techniques, it can save time and money, and it can correct the SP data and managing SP data quality control. These techniques are the new practical way for SP data acquisition.



**GEIC 2020: 053**

**New Insights for Subsurface Utility Mappings**

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**ABSTRACT**

Non-destructive methods in subsurface study have widely grown into the favors of many site surveyors, which includes geophysicists, engineers, architects, contractors, and other experts due to the cost and time efficiency of such approach. Facing modernization, the ground foundation, which includes the utilities information is most essential knowledge for professionals to build new infrastructures and to maintain existing infrastructures. However, utility maps are often unavailable or in poor quality, leading to additional cost and time for utility surveys, and sometimes even unwanted harmful accidents. Ground Penetrating Radar (GPR) is the best method for utility mappings. Theoretically, there are other unexplored methodologies that could also produce high quality utility maps, which are Induced Polarization (IP) and Infrared Thermography (IRT). These methodologies need to be thoroughly tested of their capabilities to map underground utilities, so that the options for such surveys are broadened.

GEIC 2020: 054

## Characterization and Classification of Tropical Weathered Shale in Ayer Hitam, Johor for Excavation Purposes

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### ABSTRACT

Tropical weathered rocks exhibit a complex structure and difficult to be interpreted during earthwork excavation due to heterogeneity characteristics, degree of weathering, and structure formation. In fact, the weathering profile of problematic tropical sedimentary rocks of shale in Ayer Hitam, Johor is poorly understood and studied. This study aims to characterize and classify tropical weathered shale in Ayer Hitam, Johor based on qualitative and quantitative assessment for excavation purposes. An outcrop of weathered shale with inclined bedding of 30° to 50° located in Ayer Hitam, Johor was studied. The outcrop with 50 m length and 6 to 10 m high was divided into five sub-panels to map and classify the distribution of weathering grades based on the physical appearance and index properties. Point load test and jar slake index were conducted on various weathering grades. Result indicates the weathered shale profile in Ayer Hitam is an interbedded structure with various weathering grades of II, III, IV and V. The highest point load strength is 4.95 MPa recorded for Grade II. The increase of weathering grade significantly decreased the point load strength up to 94.5% and shows reduction of jar slake value from index 2 to 6. The distribution grade of weathering of weathered shale profile in Ayer Hitam, Johor was successfully classified and mapped. The dominant weathering grades is highly and completely weathered (Grade IV and V), which can be used as a reference for excavation purposes.

**GEIC 2020: 055**

## **A Review on Shaft Resistance of Bored Piles Socketed in Rock Formation**

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### **ABSTRACT**

Bored pile is among the common deep foundation system used in the building construction. In this paper, the design of the geotechnical capacity of the rock on the bored pile system is a review based on the analytical approached by several previous studies. Several empirical relationships have been published for estimating the capacity of rock-socket shaft resistance. Based on the review from the previous work conducted by the previous researcher, it can conclude the maximum rock shaft resistance is best predicted via the Horvath & Kenny method for the Malaysia.

## GEIC 2020: 056

### Multi-Variable Regression Analysis Technique for Prediction of Air Over Pressure Due to Blasting for Granite Quarries in Malaysia

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#### ABSTRACT

Aggregates is a typical building material used for development of infrastructure which is produced from blasted granite rock. However, the production of granite aggregates during blasting works exhibit some of environmental effects such as fly rock, ground vibration, air over pressure and dust. The air over pressure during blasting on rock in quarries produces noise pollution to nearby communities. Therefore, this study aims to investigate different parameters which contribute to air over pressure. Multi variable regression analysis was used to correlate between blasting parameters with air over pressure (AOp). A total of 110 blasts from three quarries were investigated and data were collecting including consisting hole diameter (mm), burden(m), stemming length(m), charge per meter(kg/m), powder factor(kg/m<sup>3</sup>), joint aperture (mm), maximum charger per delay (kg), distance of blast from monitoring point (m) and measured AOp. Result shows that the sensitivity analysis varies from 0.82 to 0.98. The data was analysed with multi variable regression analysis (MVRA) and equation was developed for predicting AOp with 8 input parameters. R<sup>2</sup> with predictor equation and measured value shows 0.66.

**GEIC 2020: 057**

## **An Assessment of Relationship Between Regional Factors and Borehole Productivity In Southern Johor Bahru**

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### **ABSTRACT**

Groundwater exploration in hard rocks requires precise knowledge and skill to successfully extract and manage it because they are usually controlled by multiple parameters. The study aims to investigate the control of regional factors such as lineaments, drainages and topography on borehole productivity of rock aquifer found in Jurong Formation. Google Earth Pro was utilized throughout the assessment for plotting lineaments, measuring distances and identifying topography. It was found that the lineament density has no control on borehole productivity. The proximity of lineament to borehole moderately influence the productivity while the proximity of its cross-point to borehole does not. In addition, the lineaments in orientation of north-south found to be more productive than those in northeast-southwest orientation. The proximity of drainage and topography do not control the borehole productivity in the study area. Conclusively, the rock aquifers in the study are not significantly controlled by regional factors.

**GEIC 2020: 058****Integration of Building Information Modeling (BIM) on Energy Efficiency in Green Building****Mariati Taib<sup>1</sup>, Siti Haida Harris<sup>2</sup>, Nadiah Husain<sup>3</sup>**<sup>1</sup>*University of Science Malaysia, 11800 Gelugor, Pulau Pinang, MALAYSIA. [mariati@usm.my](mailto:mariati@usm.my)*<sup>2</sup>*Sultan Abdul Halim Mu'adzam Shah Polytechnic, Bandar Darulaman, 06000 Jitra, Kedah, MALAYSIA. [sitihaida.harris@gmail.com](mailto:sitihaida.harris@gmail.com)*<sup>3</sup>*International Islamic University Malaysia, Jalan Gombak, 53100 Selangor, MALAYSIA. [drnadiyah@iium.edu.my](mailto:drnadiyah@iium.edu.my)***ABSTRACT**

Carbon emissions and greenhouse gases emitted into the atmosphere are one of the reasons the globe is facing this threatening condition. The adoption of sustainable approach becomes global acceptance as an alternative solution. This paper studies on the perception of professional views on green building energy efficiency. The goal of this study is to recognize the potential integration of the Green Building Index (GBI) with Building Information Modeling (BIM) to reduce the effect of carbon emissions. The use of Green Building Index as energy simulation tools to heighten green buildings adoption may help to mitigate environmental effects. By promoting improved communication between the stakeholders (owner, contractor, building product manufacturer, and design professional), it may result in minimizing cost-related procedures, time-saving and controlling energy needs through improved design. There is a high agreement between practitioners that BIM-GBI provides a better energy model that enables the design team to provide owners with better value and reduce energy needs by informed design. Thus the energy consumption could be decreased by integrating BIM-GBI while the carbon emissions could be reduced as well.