

NEWTON-UNGKU OMAR FUND: APPLICATION ID 59348-455144 (1) WORKSHOP ON LiDAR HAZARD MAPPING AND MONITORING

The Everly Putrajaya, Putrajaya, Malaysia
11-13th March 2017

The workshop on LiDAR Hazard Mapping and Monitoring organised by the Department of Mineral and Geoscience Malaysia (JMG) in collaboration with Newton-Ungku Omar Fund Project Partners on 11-13th July 2017 at The Everly Putrajaya, Putrajaya, Malaysia. The Workshop was supported by the Newton-Ungku Omar Fund under the administration of Malaysian Industry-Government Group for High Technology (MIGHT) and Innovate-UK. The Workshop was officiated by YBhg. Dato' Sri Azizan bin Ahmad, Secretary General, Ministry of Natural Resources and Environment Malaysia (NRE). A total of 44 participants involved in three day workshop whereby the majority is from JMG staff, and the rest from different organizations including Institute of Geology Malaysia (IGM), Geological Society Malaysia (GSM), National Disaster Management Agency (NADMA), and project partners. Representatives from the British Geological Society (BGS) had contributed significantly to the success of this event and became the main presenter during this workshop. 11 papers were presented revolving the subject of Light Detection and Ranging (LiDAR) application and its practice both in tropical and cold climate land. A field visit followed on the second day, where a Terrestrial Laser Scanning (TLS) was carried out on critical slopes in Bukit Permai, Cheras. The event ended with a comprehensive dialogue with Q&A session to address any outstanding issues and as a platform for experience sharing. In a nutshell, the workshop had garnered support from participating agencies and had successfully fulfilled the aim of the project. Participants and attendees had a better outlook and was exposed on the LiDAR technology which had only started to be utilized in the local geoscience industry few years back.

OPENING REMARKS

The workshop commenced with the Officiating Remarks by **YBhg. Dato' Sri Azizan bin Ahmad, Secretary General, Ministry of Natural Resources and Environment Malaysia (NRE)**. In his speech, YBhg. Dato' clearly emphasized on the reinforcement of disaster risk reduction strategies and improve the preparedness before a disaster strike. The Newton-Ungku Omar Fund project is a forward-thinking mission, gained full support of YBhg. Dato' as it pose risk to life and environment. The involvement of different agencies from both Malaysia and the UK will allow transferring of knowledge and dissemination of information to the community, but engagement and communication are fairly important. The stakeholders will play their role in executing the plan to make it into a reality. A project of this kind is essential in the present day where climatic issues are prevalent. Apart from that, this workshop is in line with the National Blue Ocean Strategy (NBOS) envisioned by the NRE to encourage the sharing of skills, knowledge and capacity building.

The Session Keynote was delivered by our honourable guest speaker from BGS, Dr. Helen Reeves entitled The Role of Geoscience in Disaster Risk Reduction. Dr. Helen opened her talk with a brief introduction of BGS followed by its role in geology especially in the context of Sustainable Development Goals and the Sendai Framework for Disaster Risk Reduction (DRR). The Sendai Framework for DRR has four priorities which mainly addresses the issue by understanding the disaster risk, strengthening the disaster risk governance to manage disaster risk, investing in disaster risk reduction for resilience, and finally enhancing disaster preparedness for effective response and to 'Build Back Better' in recovery, rehabilitation and reconstruction. She also explained the Natural Hazards Partnership; an integrated body that works in delivering coordinated assessments, research and advice on natural hazards for governments and resilience communities across the UK. The 17 Sustainable Development Goals endorsed by the United Nations was also presented in this session but only three elements were highlighted in the matter of Disaster Risk Reduction; Sustainable Cities and Communities, Climate Action and Partnerships for the Goals.

SESSION 1- PAPER PRESENTATION

The session commenced with a paper presentation by **YBhg. Dato' Zakaria Mohamad, representing Southeast Asia Disaster Prevention Research Initiative (SEADPRI-UKM)** focusing on Landslide Hazard and Risk Assessment in the Tropics: Malaysia's Experience. The presenter started off by discussing the quantitative hazard and risk assessment and problematic aspects of geological risk assessment. Generally a multi-hazard approach is required to tackle different issues of various characteristics. Dato' Zakaria covered the issues and problems of landslides in the tropics thoroughly and showed a case study led by JMG in Kundasang, Sabah that incorporates the usage of TLS on the recent landslide. The presenter discussed about a geotechnical hazard and risk, as well as landslide hazard and risk mapping and analysis. The challenges in the context of landslide hazard and risk are shared with the attendees and he concluded the presentation by suggesting a comprehensive and effective data management is crucial for supporting hazard and risk assessment and decision-making system.

The following presentation is by **Peter Hobbs and Dr. Helen of BGS** on Introduction to BGS's approaches for geohazard mapping & monitoring. The presenters shared their mapping methodology and techniques in assessing geohazard with the use of remote sensing such as aerial photography, satellite optical & radar, terrestrial laser scanning, airborne laser scanning and unmanned laser scanning (UAV). Several case studies were also presented and the result of this research is accessible LiDAR data on various portals for public awareness and preventive measures by the stakeholders. The remote sensing techniques applied by BGS has helped in collecting landslide data at national, regional as well as site specific scales and improved the knowledge of the spatial and temporal distribution of landslides tremendously.

Mr. Zamri Ramli of JMG presented on LiDAR application in Landslide Hazards Mapping: JMG approaches. The presenter commenced his presentation by showing the landslide overview in Malaysia and its occurrences, followed by brief introduction on LiDAR instrumentation. Mr. Zamri explained JMG's specification during the data collection stage and the outcomes of LiDAR's data

after being processed. Several deliverables in terms of factor maps derived from datasets are shown to give viewers a clearer picture on the application of LiDAR. The presenter shared a step-by-step method on landslide hazard mapping practiced by JMG and a preview of an advanced comprehensive hazard and risk management tool developed by JMG, called the National Geospatial Terrain and Slope Information System (NaTSIS).

Mrs. Maziana Muhammad, from AAM Geospatial Sdn. Bhd. delivered a talk on Airborne Laser Scanning: Data Acquisition Practice in Malaysia. Mrs. Maziana opened the talk with a brief introduction on the company's background and the role in geospatial-related works. The presenter then explained in details the principles of LiDAR and several examples in managing road design, flood modelling, town planning, river rehabilitation and slope hazard mapping in Malaysia. The application of LiDAR expands beyond that, as it is very useful in the agricultural industry to monitor vegetation as well as to map transmission towers in the area.

Mr Lim Chor Sheng of GPS Lands Sdn. Bhd. presented on Terrestrial Laser Scanning (TLS): Data Acquisition Practice in Malaysia. The presenter showed a simplified workflow for TLS data capture and its application in the country which includes in slope scanning, engineering and as-built survey, topographical mapping & settlement monitoring and 3D aerodynamic simulation. Mr. Lim ended his talk by explaining the benefits of using TLS apart from the various projects his company had managed.

The afternoon session followed with five paper presentations led by **Peter Hobbs and Dr. Helen Reeves** of BGS. Peter Hobbs commenced the talk on Terrestrial LiDAR & GNSS: Surveying Principal, Data Acquisition & Processing Techniques. The presenters gave an overview on the equipment used by BGS in the UK and made a quick comparison among them. Mr. Hobbs elaborated on the principles of both LiDAR and GNSS, followed by a graphical explanation of the processing and visualization of survey data. Both the presenter delivered two case studies on application of Airborne/Terrestrial LiDAR & UAV Photogrammetry of different areas; Aldbrough and Hollin Hill. The research is important to highlight how the data is obtained from the field by different instruments and the challenges that occur during this process. The last presentation entitled Application of BGS's digital SIGMA Mobile System for Geohazard Mapping introduced by Mr. Hobbs and Dr. Helen. This talk focused on BGS hazard mapping and research that incorporates a multi-stage approach. They discussed about the usage of SIGMA mobile system in the field and how it made data acquisition and storing process more convenient today. The presenters mentioned about a Landslide Domain map produced by BGS to subdivide the Great Britain into areas of similar landslide process and examine the susceptibility on a more regionally specific basis.

SESSION 2- FIELD DEMONSTRATION

A field demonstration on data acquisition using a TLS was held at unused quarry in Bukit Permai Cheras, facilitated by **Dr. Ferdaus Ahmad, Mr. Qalam Azad Rosle, Mr. Wan Salmi Wan Harun, Mr Mohd Farid Abdul Kadir and Mr. Amier Khalid**. The participants had a close-up view on the TLS instrument and the facilitators gave a quick tutorial on how it is used in the field. Part

of Bukit Permai Cheras is classified as a critical slope and ranked as very high hazard slope. It poses risk to the residential building and car park area as evident by a landslide occurrence between 2014 and 2016. The mitigation measures adopted by the authorities along the slope consists mainly of wire mesh, shotcrete and rock bolting. Questions were also raised by participants on the effectiveness and the life-span of the remedial actions taken. The participants were given a real-time view of the TLS scanning application connected through Wi-Fi on their respective phone and managed to get an idea on how the machine works.

SESSION 3- DIALOGUE: REFLECTIONS AND WAY FORWARD

The session was moderated by **YBhg. Dato' Yunus Abdul Razak** from GSM and intended to review the points during the past two days and to address any outstanding matter regarding this context. The Q&A session encouraged multi-communication between different individuals of different agencies which acts as a platform of knowledge sharing and to recap the two-day event. **Mr. Nicholas Jacob** of JMG opened the session with an overview of the National Slope Master Plan by the Public Works Department of Malaysia. YBhg. Dato' Yunus address the issue of the preparedness of the graduates from local university to conduct site investigation and perform basic geological task on field. **Dr. Tajul Anuar** of SEADPRI-UKM suggests that graduates should pursue postgraduate education to specialise in a certain field and hone their interest independently to become a competent geoscientist on field. While **Reuben Lo** of Institute Geology of Malaysia questioned the remediation plan practiced in Malaysia was mostly of short-term. In this case, buffer zone near slopes are basically required in the country, while strengthening of the internal slope could be practiced in the future but needs proper planning and execution. With regards to LiDAR application in Malaysia, **Dato' Zakaria** pointed that although its use is fairly new in Malaysia and mainly used for structural geology mapping and geomorphology, the application is vast and limitless provided a trained geologist is proficient in the data processing.

Representative from the business sector unanimously agreed that building capacity is a priority before providing an excellent after-sale service. Data sharing between agencies and further research are vital to optimize the benefits of this instrument. The members of the floor shared their view on the strengths and weaknesses of this tool based on thoughts and their respective experience. LiDAR has a great potential in this industry and a convenient tool for geoscientist but users should remember to not rely entirely on it as a field-check is necessary. A user not only should master the basics of LiDAR, but it needs to have a trained-eye on site to ensure the results are accurate and represent site. The future roles in LiDAR includes employing a commercial contractor and ensure the in-house capability is up to date, while research and development must be emphasized especially in the role of processing and application development. **Prof Joy** of SEADPRI-UKM suggests developing case studies such as monitoring high priority areas and manipulating borehole data, geophysical surveys and applying multiple partner approach. A good data interpretation paired with a competent user holds the key to a bigger opportunity in this industry. With regards to this, new technology must be assimilated into the undergraduate studies to cultivate interest and promote research initiatives. This includes encouraging dual PhD scheme with universities equipped with experts and sufficient funding.

In a nut shell, the participants were satisfied with the outcomes of the workshop and have generated new collaboration and expanded their networking. The progress of the geophysical hazard team in this project has gained appraisal from the BGS counterpart. Generally, the objective of this workshop has been fulfilled, and we have managed to build capacity among project members, share challenges and suggestions to improve the data optimisation using the LiDAR instrument.

CLOSING REMARKS

The closing remarks was delivered by Mr. Kamal Daril, Deputy of Director General-Corporate and Economic Minerals from JMG. The speaker hoped that the workshop would benefit all the participants and allow to new opportunity in this field, improving the hazard mapping and monitoring in our country. The Newton-Ungku Omar Project is regarded a pioneer project in this region and would lead to an improved disaster management that will become a role model to the neighbouring ASEAN cities. We are looking forward to have a finer local-level forecasting capacity to build Kuala Lumpur as a disaster resilient city in the near future.