



## UTM HIGH IMPACT RESEARCH @ ROYAL BELUM - TEMENGOR FOREST COMPLEX, GERIK PERAK



A COMPILATION OF SCIENTIFIC EXPEDITION ACTIVITIES IN 2013-2015

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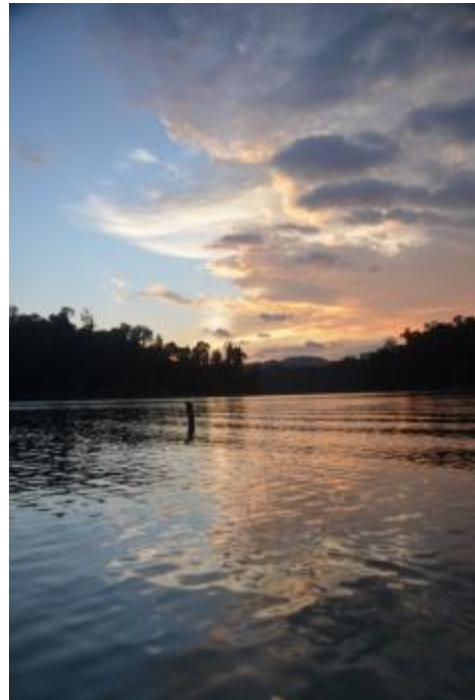
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## 1.0 Introduction

University Teknologi Malaysia (UTM) is recognized as the largest engineering-based university and promoted leading-edge research, with a vision to educating technologists and professionals, towards the development of creative human resources and advanced technological innovations in Malaysia.

UTM has taken a step forward to address the local, national and global issues in the Belum-Temengor Forest Complex (BTFC) focusing on the issues lie in the Royal Belum State Park, Gerik Perak. As one of renowned research university in this country, UTM through one of its progressive and new branding school, namely UTM Razak School of Engineering and Advanced Technology, herein refer to UTM Razak School has made a significant step by developing a research consortium consists of several public universities and research institutes known as UTM TRANSROYAL.

Given the complexity of terrestrial and aquatic ecosystem of the area, the use of modern and advanced technology is critically needed to empower and strengthen the strategy for advancing the eco-tourism in BTFC. The region is also known as an environmentally sensitive area rank one under the National Physical Plan, identified as part of central forest spine for wildlife corridor, internationally recognized as a Biodiversity Hotspot and important bird area, and many more.

Despite the largest continuous forest complex in Peninsular Malaysia, only few attempts have been made to conduct a centralized high impact research particularly in applying modern geospatial technology coupled to engineering, social sciences, earth sciences and applied sciences to address the real problems related to terrestrial and aquatic ecosystem in the support to resource management, sustainable developments and climate changes studies. It is in line with continuous efforts of the government to internationalize the local research, to increase the high impact publications especially dealing with the preservation and controlling the source of national mega-biodiversity and ecosystem.

The establishment of UTM TRANSROYAL has an objective to promote trans-, multi-, and inter-disciplinary research in the Royal Belum-Temengor forest area aiming at high impact contribution. Secondly it focuses to transfer the knowledge and technology from research to the benefits of nation, state and community. Lastly, this cooperative team is explicitly endeavour high impact research on climate changes, border security, sustainability, biodiversity and ecosystem, and also rural technology emphasizing on the use of advanced geospatial and mapping technology.

Since its first established in March 2013, many engagement, meeting, discussion, field campaigns, and relevant research activities have been cooperatively carried out. A detailed research activity of TRANSROYAL is listed in the appendix. In 2014, UTM TRANSROYAL has conducted three scientific expeditions aiming at collecting and compiling scientific data in BTFC. The first, second and third series of intensive field campaigns were performed on March 24-28, 2014; June 23-27, 2014; and 17 September-01 October 2014, respectively.

This document is the first comprehensive compilation of scientific and technical as a result of several series of field campaigns, compiled by UTM TRANSROYAL and publicly released. This scientific report is also aiming at providing a better description of direct- and indirect finding on the use of technology and knowledge related to terrestrial and aquatic ecosystem. UTM TRANSROYAL, with the support of many international partners, has taken a great step to expand its capacity and capability in promoting multi- disciplinary research and forwarding contribution at local, regional, national and global scales.

## 2.0 Research cluster: Geo-Biodiversity and Ecosystem

This section reports the research work under Geo-Biodiversity and Ecosystem research cluster, which is headed by Dr. Rozaimi bin Che Hasan, from all three expeditions in 2014.

### Research team members:

1. Dr. Rozaimi bin Che Hasan – Universiti Teknologi Malaysia (UTM) Kuala Lumpur
2. Prof. Emeritus Dr. Faezah Mohd Shaharom – Universiti Malaysia Terengganu
3. Prof. Dr. Mohd Razali bin Mahmud – Universiti Teknologi Malaysia (UTM) Skudai
4. Prof. Madya Norsila binti Daim – Universiti Teknologi MARA (UiTM) Perlis
5. Jamil bin Tajam – Universiti Teknologi MARA (UiTM) Perlis
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7. Dr. Khamarrul Azahari Razak - Universiti Teknologi Malaysia (UTM) Kuala Lumpur
8. Dr. Zulkiflee Abd. Latif, RMI, Universiti Teknologi MARA (UiTM) Shah Alam
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### Executive Summary

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The richness and high biodiversity of Royal Belum are the most precious gift that needs to be protected for future generation. Royal Belum is needed to support flora and fauna, minimize impact of global warming, maintaining the forest ecosystem as well as a source of income to the locals through tourism. By realizing its significance to the environment as well as the community, a strategic and systematic approach is needed for a long term protection plan. Such approach required scientific knowledge on types and numbers of species, spatial and temporal distributions, how species adapt and react to climate change and how tourism activities have an impact to Royal Belum ecosystem. However, to date, paucity of this information to the local authority, researchers and decision makers will potentially hamper process of protecting species, environment, and the community that heavily depend on Royal Belum and its ecosystem. Motivate from this aim, cluster of Biodiversity and Ecosystem of TRANSROYAL Research Group, UTM Razak School of Engineering and Advanced Technology, Universiti Teknologi Malaysia (UTM) has taken the initiatives to conduct a high impact scientific study at this area. This was achieved through series of scientific expedition carried out since 2012. Among the main focus of this high impact research are; tree species identification and forest biomass estimation, investigation of lakebed properties, water quality, and studies on aquatic habitats. This cluster has been working closely with teams from Tropical Map Research Group (UTM Johor), Universiti Teknologi MARA (UiTM) Perlis, UiTM Shah Alam, Universiti Kebangsaan Malaysia (UKM) and Institut Penyelidikan Kenyir (IPK), Universiti Malaysia Terengganu (UMT). Apart from local partners, this cluster has been strongly supported by the international collaborator from University of Twente, the Netherlands that provides experts and knowledge in remote sensing technology. The research group by IPK has focused their study on aquatic fauna, research of fish parasites, fish diversity and stratification composition of fresh water mussels and finally on macro invertebrates diversity. Research done by IPK was generally focused at Sungai Kenarong or specifically at the downstream of Kenarong stream. UTM contributed their expertise in acquiring spatial data of the lakebed and depths using underwater sonar technology at few locations in Belum-Temengor Lake. Results will be used as proxy to predict sediment types of the lakebed and to investigate fish habitats and other aquatic plants. Team from UiTM Perlis has emphasized study on water quality. For this, study on physico-chemical and nutrient properties was conducted at 19 selected sampling stations representing the open water body of Belum-Temengor Lake to assess status of water quality. This

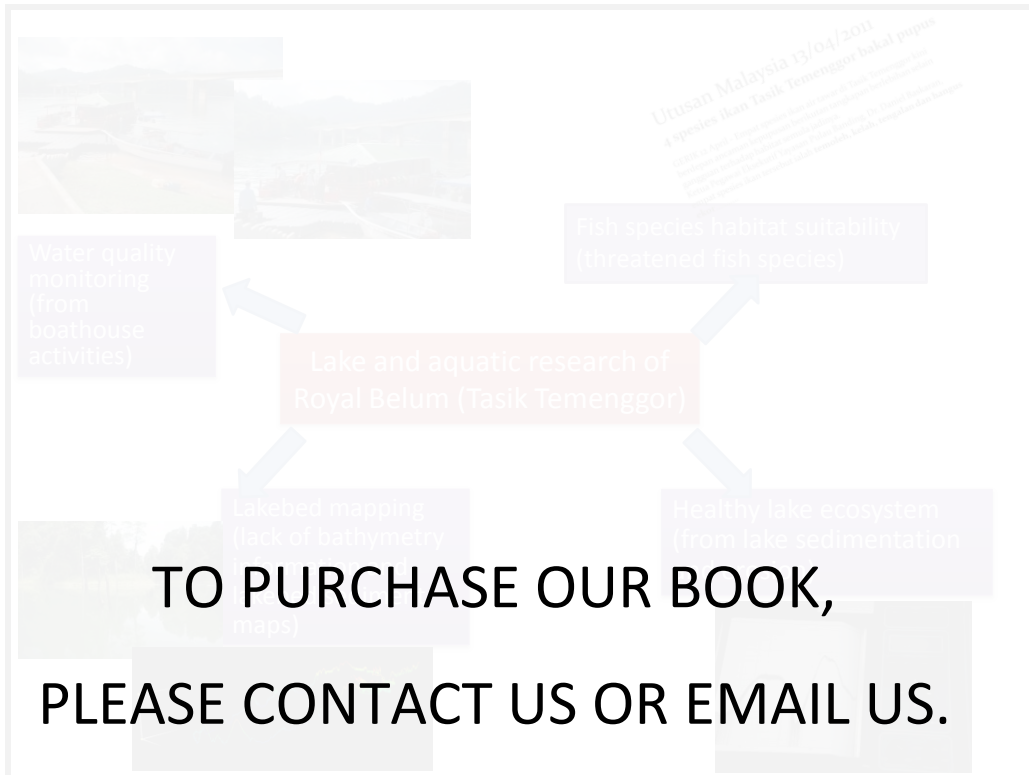
study is important to continuously monitor water quality at streams as well as lake areas for any contamination and pollution activities. Researchers from UKM, UiTM Shah Alam, Tropical Map Research Group and University of Twente, the Netherlands have led a research on forest biomass and tree species identification using remote sensing technique. A combination of data recorded from satellite remote sensing and Terrestrial Laser Scanner (TLS) have been used to gather information about the tree species in Royal Belum where it will be useful for compilation of forest inventory, as well as estimation of forest biomass and carbon. Collaborative, trans and multi-discipline high impact research at Royal Belum led by UTM has greatly improved our ability to investigate in details high values of ecosystem and biodiversity in Royal Belum. These preliminary studies suggest that Royal Belum without a doubt is a great place to discover various information regarding the flora and fauna that flourish in its pristine natural forests.

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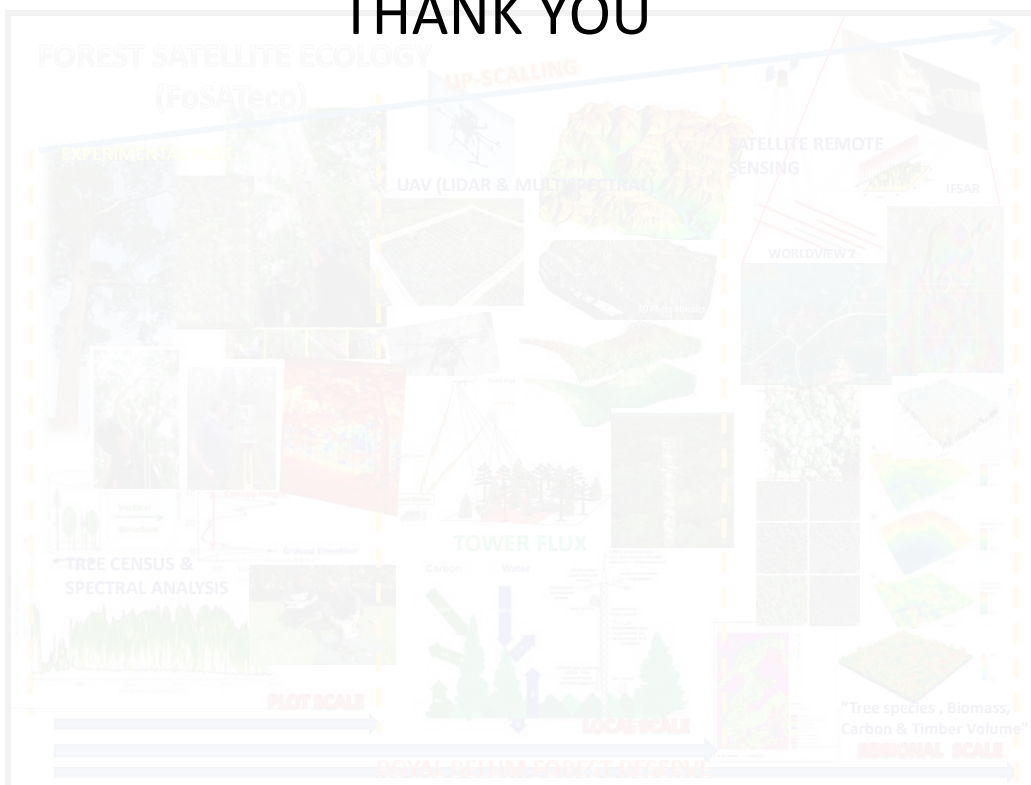
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**THANK YOU**

1. Research plots/ UAV mapping
2. GPS network establishment
3. Visit to old gold mine
4. Site visit to Kg. Semer



**THANK YOU**



**Forest Satellite Ecology:** A conceptual and methodological framework by Abd Wahid Rasib, UTM indicating a series of remote sensors and approaches will be intensively used at plot, local and regional scales in the multi-disciplinary research at the Royal Belum-Temengor Forest Complex, Gerik Perak.

### 3.0 Research cluster: Geo-Sustainability

This section reports the research work under Geo-sustainability research cluster, which is headed by Dr. Khairul Hisyam Kamarudin, from all three expeditions in 2014.

#### Research team members:

1. Dr. Khairul Hisyam Kamarudin - UTM RAZAK School, Kuala Lumpur
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5. Rizalman - Sustainability Campus Unit, UTM Skudai, Johor
6. Hafizah Harun - Fakulti Pendidikan, UTM Skudai, Johor
7. Dr. Anidah Robani – Universiti Teknikal Malaysia Melaka (UTeM), Melaka
8. Siti Rohana Omar - Universiti Teknikal Malaysia Melaka (UTeM), Melaka
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10. Mohamad Safuan Ibrahim - MSc candidate, FAB, UTM Skudai
11. Mohd Jahid

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#### Executive Summary

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This report contains the major publications and research work that have been carried out by the Geo-Sustainability Research Cluster, UTM High Impact Research on Royal Belum (TRANSROYAL) within one year of research grant period. Operating in a small group at the beginning of this project, the cluster has grown significantly both in terms of the number of dedicated researchers, as well as the number of outputs/publications towards the end of its research grant period (i.e. from March 2014 to March 2015). It is also worth mentioning that this cluster had received a strong support from the TRANSROYAL research consortium and researchers from other research clusters.

During the one year grant period, Geo-Sustainability Research Cluster focuses on **two main research areas**: (1) Community development and resilience studies, and (2) Orang Asli school children skills assessment at two schools (i.e. Sekolah Kebangsaan (SK) Sungai Tiang in Royal Belum and SK Air Banun in Temengor). Under these two main research areas, there were numerous sub-research activities that were carried out. These activities were planned and taken place in conjunction with a series of scientific expeditions to Royal Belum and Temengor Forest Complex that were carried out by the TRANSROYAL research consortium. Full reports are attached.

In brief, the reports are presented in four chapters. The research activities related to community development and resilience studies were conducted with the primary objectives to identify the potentials and challenges of developing sustainable eco-culture tourism (ECT) program for Orang Asli communities of Royal Belum and Temengor areas. The scope or context of local economic development of a rural community through sustainable ECT initiative is very broad, involving multi-dimensional inputs, and many stakeholders (with various interests) need to be involved. As a response to these variety of needs, the participation of relevant stakeholders in decision-making process, as presented in Chapter 2 of the report could coordinate discussion on raising issues in local economic development through sustainable tourism, and to protect local interest and increase stakeholders voices/shares over certain issues of interest. Furthermore, the community is the party, who often receives direct impacts from any policies or planning outcome, as imposed by other parties (especially government agencies and private investors).



Chapter 3 highlights the emerging concept of community resilience and sustainable livelihood, taking a case study of Orang Asli community in rural areas. The concept of community resilience attempts to understand how people respond to internal and external disturbances, whether they are anthropogenic disturbances (human induce) or natural disturbances (i.e. a natural disaster). With the advance of globalization and the urgency of responding to climate change, there is an urgent need to prepare rural communities (or the Orang Asli in this context) to face the threats of both sudden and gradual changes and/or challenges and adopt the development pathways that are conducive to poverty alleviation and innovative uses of natural and human resources.

Chapter 4 provides an overview of the concept of sustainable eco-culture tourism (ECT) including the highlight of three main pillars of sustainable ECT namely; natural and cultural resources, local host community and tourist. Second part of the chapter explains the process undertaken in conducting a fieldwork and survey of local communities in two selected villages namely Kampung Semelor (Temengor) and Kampung Sungai Tiang (Royal Belum) conducted in June 2014. The objectives of ECT project for sustainable development and conservation of biodiversity of Royal Belum-Temengor Forest Complex (RBTFC). Findings of the study indicate a positive response from local communities regarding ECT project especially on economic and social aspects. These include income generation, wider engagement in training programs and promoting local traditional culture and local 'forest-water-based' activities for tourism. Some challenges during ECT project also highlight some issues on poverty, unsolved conflict between people and wildlife and the contest for resources among members of a growing community. Meanwhile, Chapter 5 of this report (also regarded as the subsequent study of Chapter 4) primarily focusing on discussion of the framework considerations for a sustainable eco-culture (ECT) development for Orang Asli communities of Royal Belum-Temengor Forest Complex (RBTFC) in Perak. Review of literature on key success factors of sustainable ECT and inputs from the survey of local stakeholders in RBTFC were used to formulate the sustainable ECT framework. The proposed framework consists of four major action areas namely (1) identification of the 'local champion', (2) establishment of local organisation suitable for ECT, (3) integration of ECT into local economy, and (4) delivering quality of ECT through promotion and marketing. The proposed framework could be considered as an initial roadmap for future works to realise sustainable ECT development in RBTFC.

As for the second research area, which focuses on education of the Orang Asli school children, two schools, Sekolah Kebangsaan (SK) Sungai Tiang in Royal Belum and SK Air Banun in Temengor, were selected as the samples. Observations, interviews and assessments were carried out to investigate the students' cognitive, affective and psychomotor skills. The study identifies pertinent factors that may hinder or encourage the students' academic progress and interests. Reports are attached in Appendix B.

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