

Synthesis

EXPLORING RESEARCH • INSPIRING INNOVATION

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• Canselor's Putra Building

Putra Blok in Projek Rintis
My Beautiful New Home

Human Capital Management
in Construction Industry

Housing Research Centre (HRC)

Independent Sewerage Treatment
Plant (i-STP) for Remote Settlements

Pavement Technology Fibre Mastic
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Principle of Islamic Neighborhood

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Building Our
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Building our homes and communities

In order to live in peace, we need to put senses in our communities. Peace is about giving and accepting harmony vibes all around us, it comes from many directions but it is definitely should have started within ourselves. While taking care of the communities, the technologies in Malaysia have been evolving rapidly. One of the indications of the developing country is the building technology.

As for example, Dubai has built Burj Khalifa; China has it's the Great Wall; Paris is well known for the beautiful Eiffel Tower, and Malaysians are proud of our KL Tower and PETRONAS Twin Towers. These building marks of respective countries carry the proud of the nation to the eye of the world.

There are many inventions that contribute beautifully with our communities. For instance, in UPM, technology benefits the community such as Putra block. Recently, students from UPM work with Triple A Engineering Sdn. Bhd in constructing 23 units of Putra Blok houses for Orang Asli.

In this issue, Synthesis will focus on the strong bond between the building technology and communities. It will explain how technology lessens the communities' burden.

The issues that will be covered are Human Capital Management in Construction Industry, Housing Research Centre, Independent Sewerage Treatment Plant (i-STP) for Remote Settlements, Pavement Technology Fibre Mastic Asphalt (FMA) and featuring the special story of Antarctica Expedition experienced by UPM researcher. Enjoy your reading!

Letters to Editors

If you have any comments and suggestions about the content of the publication, please e-mail to synthesis@upm.edu.my. The editors reserve the right to edit articles before publication.

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Putra Blok in Projek Rintis

My Beautiful New Home

At Perkampungan Orang Asli, Ulu Milot, Pos Betau, Kuala Lipis, Pahang



Putra Blok houses for Orang Asli at Ulu Milot, Pos Betau, Kuala Lipis, Pahang. These Putra Blok houses will replace the existing wood and bamboo houses.

In contrast to the framed building system, Putra Blok is a non-framed building. This system is made of the mortarless interlocking hollow block to produce a load-bearing wall system. The buildings using Putra Blok have no beam and columns. The use of this technique for housing offers cheaper units with a large margin of savings.



Through this project, UPM has the opportunity to extend the research by observing the construction process, identifying difficulties during construction and find potential improvement on Putra Blok. Thus, a few groups of students from both Civil Engineering department and Architecture Faculty will be involved to experience the real construction process. It is our mission from this project that My Beautiful New Home (My BN Home) as being named will be a great experience for our students, more comfortable shelter for Orang Asli and bring good name for UPM to the community.

Projek Rintis is a project offered by the Ministry of Finance through Jabatan Kemajuan Orang Asli Malaysia (JAKOA) of using the local product that established by universities to build new settlements for orang asli. There are a few projects offered and UPM won one by Putra Blok. We are supported by our industry partner Triple A Resources Sdn. Bhd, who will be the contractor of the project. The project costs RM1.2 million for 23 units of



Human Capital Management in **CONSTRUCTION INDUSTRY**

The project was entrusted to the team with a value of approximately RM1.6 million. Construction industry is an important sector for a nation's growth. In 2016, this industry contributed a growth of 9.5% from the overall total labor force in Malaysia which catered an average of 1.2 million job opportunities.

This report contains a complete analysis of forecasted demand and supply of personnel in Malaysia's construction sector classified into Malaysia Standard Classification of Occupations (MASCO) and Act 520 CIDB. Construction Personnel Modelling System (CoPMoS) is developed as a guideline to forecast the numbers of required personnel. CoPMoS provides information on construction personnel, trends and challenges of the construction industry in Malaysia. The Human Capital Management Study In Construction Industry in Malaysia is carried out by using a series of comprehensive methodologies, combinations of primary and secondary study methods.

Primary data is collected using two channels, online and field work. Verification was conducted through focus group discussions and protocol interview sessions with key stakeholders namely government



“The Human Capital Management Study In Construction Industry in Malaysia is carried out by using a series of comprehensive methodologies, combinations of primary and secondary study methods.”

agencies, ministries, employers' unions, construction company managers, construction personnel and related training providers.

Secondary methodology is used for prediction and modeling purposes to analyze the demand gap and supply of construction personnel. The use of secondary data is optimized using Economic Prediction Model, Model Stock-Flow, Input-Output Table for employee demand, Roll-on Method for employee bidding, Resource

Optimization Model, and external benchmarking. CoPMoS provides inputs to forecast construction personnel in order to realize Construction Industry Transformation Programme (CITP). CoPMoS displays Benchmarking Information, a Human Resource Management Model and a Master Plan of Labor.

The three major wings consist of information on best practice strategy analyzed in other countries, model analysis and projection of

“ A simulation is produced to predict the demand for personnel corresponding with IBS implementation and as a phase to accept Industry 4.0. ”



demand and supply of construction personnel, analysis of training programs and skills overlap for personnel, critical skill requirement analysis, competencies and positions in construction industries besides industries challenges and issues. A simulation is produced to predict the demand for personnel corresponding with IBS implementation and as a phase to accept Industry 4.0.

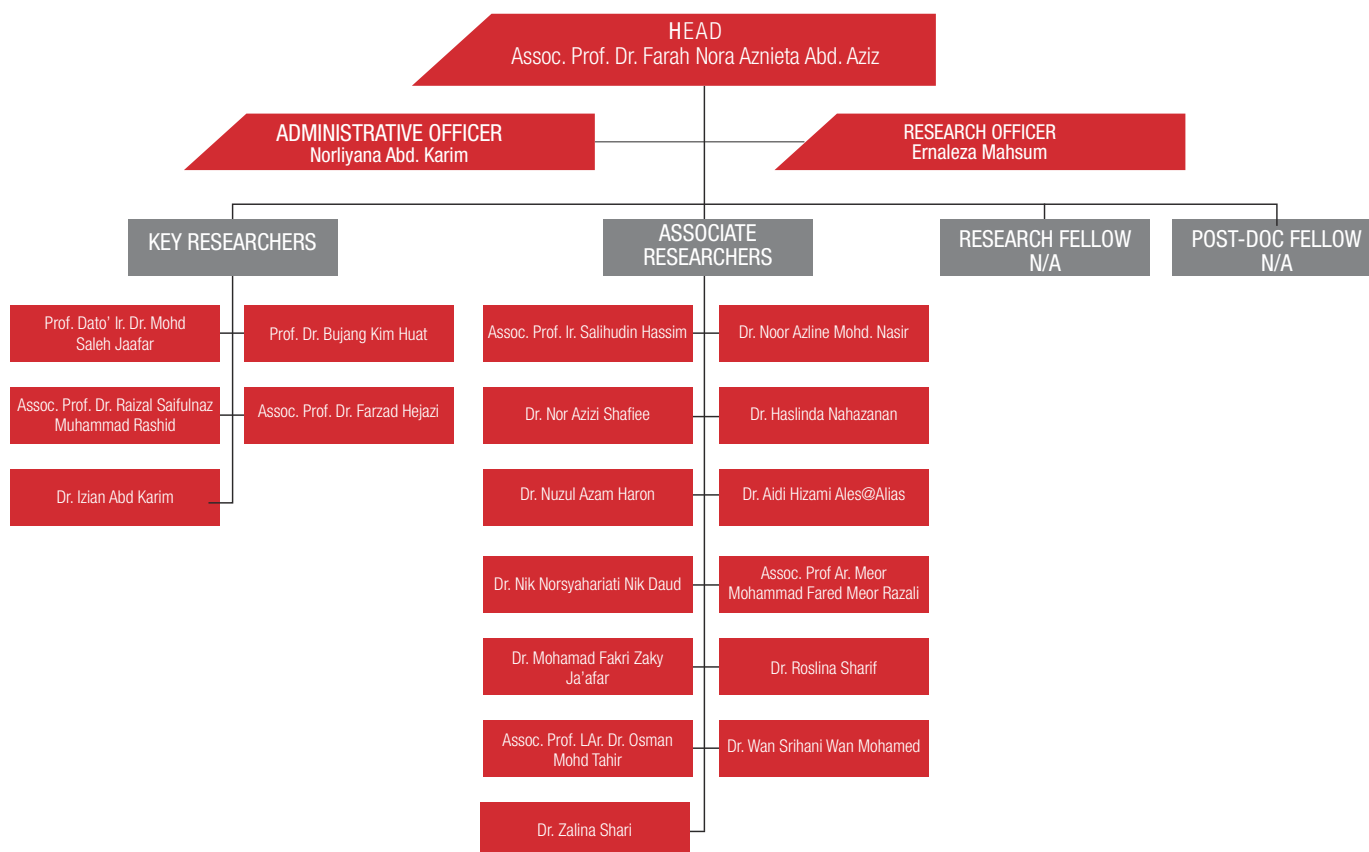
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Since its establishment, HRC has received more than RM10 million grant provisions from the industries and governments agencies. Among major grants are RM1.58 million from The Ministry of Housing and Local Government for a project on Interlocking Load bearing Hollow Block Building System and RM2.59 million for Affordable Quality Housing (AQH) from Construction Industry Development Board (CIDB) and RM600K from Naim Engineering Sdn. Bhd. for Development of Industrialised Building Systems (IBS) for Housing Construction.



HRC Organizational Structure



Research Centre

materials and earthquake dampers. Currently, there are RM927K research grants ongoing on various aspects of building development including strengthening of a reinforced concrete column, slab optimizations, precast sandwich panels, rubber wall damper and partially pre-stressed concrete element. Research on green materials such as rubber crumb, palm oil fibers, palm oil kernel and waste plastic bottles are focused on as aggregates replacement for PUTRA BLOK.



Projek Perintis on My Beautiful New Home at Perkampungan Orang Asli, Ulu Milot, Pos Betau, Kuala Lipis, Pahang

The impact to the industry is obvious when HRC has successfully introduced to the government on the importance of IBS in Malaysia construction. CIDB has then studied the supply chain of the product before the government enforced on the use of IBS in the industry in 2003. The knowledge of IBS is documented in a book titled Industrialised Building Systems, by former members of HRC, Prof. D.N. Trikha and Prof. Emeritus Abang Abdullah Abang Ali in 2004.

In 2014, members of HRC involved in the second phase of The Mega Science Framework Study for Sustained National Development or Mega Science Agenda: Malaysia 2050 to identify on these housing aspects; Mega Human Settlement, Intelligent, Healthy and Safe Homes and Advanced Building Materials and Technology. The study aims to comprehensively

appraise the strategic role and potential contribution of STI in the country's drive to achieve sustained and sustainable socio-economic progress. The output of this project is a feeder to the government in sustainable development in the country.

Since 2016, HRC is led by Assoc. Prof. Dr. Farah Nora Aznieta Abdul Aziz. The focus of the centre remains in the scope of building development with more on green materials and earthquake resistance. Our key researches are experts in building strengthening, concrete and green

HRC has significantly seen by the industry when its product PUTRA BLOK was commercialized in 2016. The product has gone through 20 years extensive research won gold medal in Geneva in 2001 and patented in 2002 in Malaysia, United Kingdom, and United State. Putra Blok is an innovative interlocking load bearing, hollow block building system, designed to satisfy the modular coordination requirement as part of the 'open' IBS concept. It has been used in National Development Projects such as Public Hall known as 'Pondok Hidayah', 12 units of Rumah Mangsa Banjir at Dabong Kelantan and 58 units house for Projek Kg Sg Durian, Kelantan.

From 2007 to 2017, HRC has produced more than 350 numbers of CIJ publications, 4 books and more than 100 postgraduates. In 2016, HRC has filed a patent on wall damper that mainly use to dissipate earthquake energy and protect building against excessive movement. In 2017, HRC received a patent on the composition of cement for making a concrete product (US9630880 B2). Apart from publications and other research outputs, we also offer laboratory tests like the hot-box thermal test, compression test and tensile test as part of our income generation strategies and sharing facilities with the industry.

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Independent Sewerage Treatment Plant (I-STP) for **REMOTE SETTLEMENTS**

I-STP is an Independent Sewerage Treatment Plant for decentralized water residences. It features a modular detachable system when decentralized solution is required for treating sewage for settlements in remote places. The i-STP is 350 L and is easily transportable using boats to fix the technology below toilets in water villages in Borneo. The treated discharge meets SPAN's (National Water Services Commission) Standard A. Sabah and Sarawak have been chosen to develop this product/technology because Sabah and Sarawak has more than 21,000 housing units at water villages (Evers, 2015).

These settlements produce more than 23.6 litres of sewage daily which amounts to 8.6 trillion litres sewage annually. Water quality surrounding Sabah and Sarawak will continue to be contaminated if urgent intervention action is not expedited.

The i-STP is a design innovation by taking a typical anaerobic-aerobic treatment plant system into a detachable modular system. The chambers could be separated into two parts for easy transportation by boat and install by wrapping the unit around one column specifically the structure below the house's toilet. This wrap-around-column design reduces piping damages due to tidal water fluctuation. The i-STP uses a selected media to help reduce its size from the SPAN's septic tank requirement of 2,000 liter to 350 liter

volume. It utilizes both aerobic and anaerobic waste treatment process for sewage treatment.

The volumetric size of i-STP is 350 liter and is only 17.5% the size of minimal 2000 liter septic tank requirement by SPAN. The i-STP's main advantage is the wrap-around-column modular design. It is in fact, an effective aerobic-anaerobic sewerage treatment plant system commonly used in centralized STP design on land but made into modular shapes for easy transportation by boat and installation under the toilets at timber water villages.

At 350 liter size, the treated sewage discharge meets SPAN's Standard A. Having higher discharged quality of Standard A, as opposed to minimum Standard B for coastal waters, the

i-STP is expected to expedite the improvement of water quality at Sabah's coastal areas.

This technology is ready for commercialization. The Standard A quality discharge has been achieved in field testing of full scaled prototype. Despite this stage, several environmental and social NGOs will be involved in a water quality conservation pilot project in Sabah using i-STP.

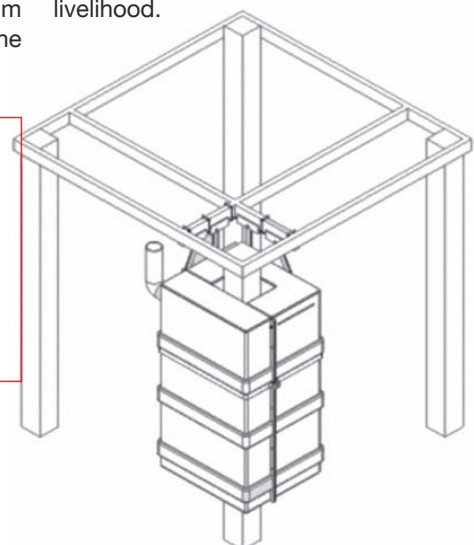
If the water quality in Sabah coastal waters continues to degrade, the situation will affect the seaweed industry which has been valued at RM 1.4 billion by year 2020 (Daily Express, Nov 14 2016) and the fishing industry in Sabah already worth RM 2 billion at the end of 10th Malaysian Plan (Sabah Times, 1 April 2016) will also be affected.

The i-STP intervention takes into consideration the preferences of indigenous residents who are not keen to move inland as their livelihood is from the sea. Through socio-economic development based on healthy seaweed and aquaculture industries, water village communities in Sabah could improve their families' livelihood.



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RM59,305,400

Total Grant Received for Engineering
(2013-2017)

708

Total projects on Engineering
(2013-2017)



Total projects on Engineering
(2013-2017)

80%

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Total Grant Received for Engineering
(2013-2017)
RM59,305,400

Principle of Islamic Neighborhood Planning in order to Create a Better Neighborhood Community

Nowadays, residents who are living in the metropolitan area are gradually become individual and private, especially among communities in their local neighborhoods. Furthermore, it becomes important for all to understand the community social dynamics as a method to enhance planning practices.

Islamic sharia teaching does not merely represent personal religion; they also imply a mode of organizing society and its institutions, as well as a guide for the conduct of individuals within the institutional and social context. The Ummah principle counters an excessive selfishness and individualism beyond morality. Based on the researcher's study, there are some vital principles of Islamic neighborhood planning that can be considered as significant urbanization in Islam. There are several principles that can be highlighted and considered proposed as theoretical framework for formulating Islamic neighborhood community:



Principle	Description
Mosque	<ul style="list-style-type: none"> Normally located at the hub of a neighborhood. The focal point of a growing city. Social community interaction.
Pedestrian walkway	<ul style="list-style-type: none"> Distance apart from main road. Easy access to services and facilities.
Space	<ul style="list-style-type: none"> Open space for activities and event.
Circulation design and pattern	<ul style="list-style-type: none"> The 'death of street' design to enhance privacy.
Privacy	<ul style="list-style-type: none"> Building height should not be disruption to other users of the area. Orientation of window design must avoid facing neighbor privacy.
Neighbor's right	<ul style="list-style-type: none"> Prohibited to harm another's benefit. Respect and preserve of the neighbor's property.



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The purpose of building a neighborhood Islamic community is to understand the theory and history of Islamic settlement where a community stands for their interaction with Allah as the Creator of the universe. It is important to reveal that the theoretical framework of Islamic principles of neighborhood planning should be implemented with the urban density of early Muslim cities. It symbolized the concept of 'ummah' where the design principles of the Islamic City should be considered in planning and designing the Islamic neighborhood community in order to achieve social interaction within the community.



The teaching of Islam on social interaction is according to the verse Ali Imran, "Hold on firmly together to the rope of God, and be not divided among yourselves," (The Holy Qur'an, 3:103)

The focus interaction among Islam community is to interconnect and communicate strongly with each other. The teaching of Islam throughout The Holy Qur'an and the Prophet's Sunnah portray seriously responsiveness to the concept of neighbors and community where each individually should be accountable to their rights along with the roles and consequence of planning of their community and neighborhoods. To build a good Islamic society, one must have faith of tawhid (oneness) Therefore, the concept of tawhid is established in every aspect – for instance physical, economic, social, cultural, and environmental.

Pavement Technology Fibre Mastic Asphalt (FMA)

Fibre Mastic Asphalt (FMA) technology is an innovation formulated to resolve the issues of durability, longevity of roads and the pavement material use. The main differences of the technology are in term of additives, aggregate (stones) sizes and surface thickness. The cellulose fibre additive named NOVACEL® which processed from Empty Fruit Bunch (EFB) are added to the asphalt mix to increase the strength and durability of the pavement by increasing the binding properties between the bitumen and the aggregates.

FMA technology is highly durable and the pavement can last up to 10 years at the cost similar to the current material. This durable and strong material will reduce the need for maintenance and resurfacing work of the roads. It is doing so by forming a mesh like structural matrix in the material mix. Aggregates sizes are also bigger (coarse) compare to normal asphalt which increases the strength. Coarse aggregates cannot be used previously in normal asphalt because the bitumen will drain down during construction and over time due to lack of sponge effect. However, this is made possible with the cellulose fibre additive that absorbs and holds the bitumen in the mix with coarse aggregates without letting it drain.



The cost of road construction for FMA technology will be similar to the normal asphalt. FMA utilizes the same normal grade 60/70 bitumen with the addition of cellulose fibre and modified aggregate sizes which do not incur any additional cost.

HIGH PERFORMANCE ROAD PAVEMENT

FIBRE MASTIC ASPHALT

Patent Owner



Commercialisation Fund



Licensed Company

NOVAPAVE
PAVING THE FUTURE



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Analysis Expert
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UPM Grabs 3 Gold at the P&P Innovation Carnival

SELANGOR, January 18- Universiti Putra Malaysia (UPM) once again has brought up the name of the university when succeeded with three gold, four silver and five bronze medals at the Teaching and Learning Innovation Carnival (P&P) 2018 K-NOVATION. The innovation competition was organized by Universiti Kebangsaan Malaysia (UKM) from 17th – 18th January 2018 with the theme “Education 4.0: Future-proof Graduates”.

The three gold medal projects were Virtual Micrabes, Bio-Heartware and InGneoSA led by Dr. Chia Suet Lim from the Faculty of Biotechnology and Biomolecular Science, Dr. Wan Norhamidah Wan Ibrahim from the Faculty of Science and Assoc. Prof. Dr. Gayathri Thevi Selvarajah from the Faculty of Veterinary Medicine.

While another gold medal has been awarded to a group of lecturers from the Faculty of Veterinary Medicine and Faculty of Computer Science and Information Technology. The collaboration between two faculties has brought the innovation of InGNeoSA. InGNeoSA can be used as one of the ways for veterinary students to learn



about pet oncology covering all sub-topics: cytology, histopathology, basic terms of oncology, diagnosis imaging, also identify the appearance of tumours in animals such as dogs and cats, drug options and side effects of chemotherapy drugs for pets with cancer.



MOU Signing UPM – Metmalaysia in Conjunction with World Meteorological Day

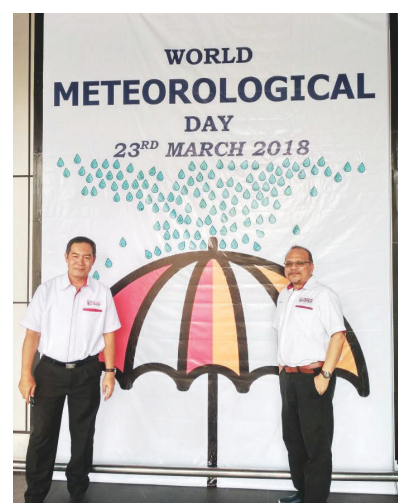
KOTA KINABALU, March 23 – The minister of Ministry of Science, Technology & Innovation (MOSTI) through the Department of Meteorology Malaysia has launched the RakanMet application to reinforce the information transfer system related to weather and climate in Malaysia. Besides that, the memorandum of understanding (MoU) signing ceremony between

Universiti Putra Malaysia (UPM) and MetMalaysia was occurred. This ceremony will be the beginning of more collaborations with MetMalaysia, especially in extreme weather and disaster management issues.

The Minister of MOSTI, The Honorable Datuk Seri Panglima Wilfred Madius Tangau said that the agreement was

made to intensify the cooperative relationship on the meteorology and climate areas. This collaboration covers various fields such as in research, training, development and publishing areas. The agreement also will expand the opportunity on publishing area as the information gain especially on meteorology and climate can be widespread.

Also presence at the ceremony are the Deputy Secretary Mosti, Associate Professor Dr Ramzah Dambul, Director of Met Malaysia, Mr. Alui Bahari, Vice Chancellor of UPM, Datin Paduka Datuk Dr Aini Ideris and Director of MET Sabah, Azemi Daud.





UPM Given RM1M to Boost Aerospace Engineering

Tan Sri Syed Azman Syed Ibrahim, the Managing Director for Weststar Group donated one million ringgit endowment fund to Universiti Putra Malaysia (UPM) towards fortifying support in innovation within Aerospace Engineering and other tactical areas. Vice Chancellor of UPM, Prof. Datin Paduka Dr. Aini Ideris said that formation of such support provides an opportunity for UPM to build synergies in enhancing potential and innovation in the above-mentioned field.

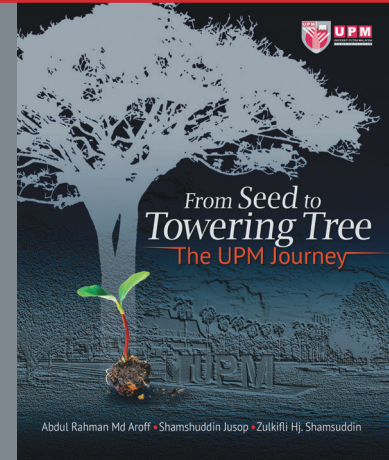
In the signing ceremony of memorandum of agreement (MoA) for the Tan Sri Syed Ibrahim UPM Endowment, she said "This reinforces the university's relationship with the industry in strengthening collaborative networks that can be utilised not only by UPM staff but also by the community," Weststar Group Managing Director, Tan Sri Syed Azman Syed Ibrahim said that the fund was to establish close collaboration between UPM and the largest offshore



Modern Furniture with Batik and Songket

KUALA LUMPUR, March 12 – Batik and songket are famously known as the Malaysia's traditional cultural heritage. They are the famous legacies that belong to Malay ethnics and well-known for its beautiful arts. The idea of reinvention of their applications have created a unique design of furniture uses both batik and songket as motifs. This innovative and creative ideas came from a group of lecturers and students of the Faculty of Design and Architecture (FRSB) at Universiti Putra Malaysia (UPM).

The group has brought forth 12 stunning products such as table lamp, wall deco, armchair, lazy chair, side table, cushion, Siya club chair, stool, table and etc. These innovations were put on show in the Export Furniture Exhibition (EFE) 2018 in Kuala Lumpur Convention Centre (KLCC) recently. They came up with a concept of "Contemporary Aesthetic Inspiration Neo-Living' (KAIN). KAIN represents a unique way of expressing beauty and is inspired by Malaysian Batik and Songket which are then translated and incorporated into the furniture.



From Seed to Towering Tree – The UPM Journey

From Seed to Towering Tree captures UPM's Journey of chronological and academic growth, giving us snapshots of its past and current scenarios. It tells the story of the

University's growing pains and proud achievements, of its tough challenges and resounding successes, of the coming together of learners, teachers, researchers, professionals, administrators and support staff within its halls, and of the generations of leaders in various fields, particularly agriculture, that the institution has produced over the years. It is an uplifting and inspiring tale of UPM's evolution from a humble school into a dynamic transformational university with its sights set on even greater heights.

This book takes its readers on a brief but pleasant and educational walk along the past and present-day pathways of UPM's journey, and gives them a peek at the road ahead.

Title: From Seed to Towering Tree
The UPM Journey

Author: Abdul Rahman Md Aroff,
Shamshuddin Jusop, Zulkifli Hj.
Shamsuddin

ISBN: 978-967-344-739-8

Price: RM148.00



Antartica Expedition

Special Story



natural and disturbed habitats on Signy Island to examine the biogeography and distribution of phenol-degrading bacteria. Soil samples in this study have been collected at different sites around the Signy Research Station and analysed by examining the salinity, pH, temperature, inductivity and dissolved oxygen of the soils. This process only requires small equipments such as pH meter, dissolved oxygen meter, conductivity meter and thermometer. Then, the soil samples will be transported to Malaysia for isolating, screening and characterising phenol-degrading bacteria.

Dr. Siti Aqlima Ahmad is a senior lecturer from the Biochemistry Department, Faculty of Biotechnology, Universiti Putra Malaysia. She is the first female staff to represent UPM to the Antarctica. On top of that, Dr. Siti Aqlima gained a sponsorship from Sultan Mizan Antarctic Research Foundation (YPASM) through 'Berth Support' programme with a fund of £ 25,000.00, which is equivalent to RM 150,000.00. Not just that, the RMC, UPM, has also willing to support her with RM 38,000.00 through the 'Putra Maching Grant'.

Before the expedition begins, she attended the pre-deployment training consisting of survival first aid, job specification, survival techniques, character development and several other classes for 6 days starting from 11th -17th September 2016 at Cambridge University. Her journey to the Antarctic started by joining the Antarctic Berth Support together with British Antarctic Survey (BAS) from 24th Dec 2016- 25th March 2017. Prior to that, she first flew from KLIA Sepang, Malaysia on 20th Dec 2016 to Heathrow, London, to prepare enough tools and materials for Antarctica. This preparation took approximately four days starting from 21st-24th Dec 2016. After that, she continued her journey to Punta Arenas, Chile, through Madrid in Spain, and Santiago in Chile.

She arrived at Punta Arenas on 25th Dec 2016. As soon as the sun rises on the 27th Dec 2016, she again continued her journey to Signy Research Station, Antarctica, via British Military Ship known as the 'HMS Protector'. On 31st Dec 2016 at 9 p.m, Dr Aqlima finally arrived at the Signy Research Station, Antarctica. At present, this research

station has only seven people working, two British scientists (Stacey Adlard and Jesamine Bartlett), one scientist from Japan (Dr. Megumu Tsujimoto), one from Malaysia (Dr. Siti Aqlima Ahmad), along with three BAS staffs that include one station leader (Matt Jobson), one field assistant (Alex Taylor) and one technician (Iain Gordon).

Suitable with the environment provided, she has been conducting a study with the title 'Diversity and Biogeography of Soil Bacteria Degrading Phenol'. This study was conducted in Signy Research Station, Factory Cove, Borge Bay located in the Signy Island. This research station has the latitude position of 60°43'0"S with a longitude of 45°36'0"W. One of the unique features in this facility is that this station supports a variety of projects related to Southern Ocean ecosystems and climate change. Furthermore, it is also rare to find any visitors in the Signy, which therefore allows the study of microbial diversity to be conducted using soil samples at natural (undisturbed) and disturbed areas at ease.

On top of that, since the collaboration between Malaysian scientists and BAS in 1995, Signy Station has been a station for examining the microbial diversity and molecular biology in Antarctic. Hence, soil sampling can be done in a range of



Dr Aqlima completed her research and lived in the Signy Island, Antarctica, for a period of 81 days, which is until 22 March 2017. She went out of the Signy Island via British Antarctic ship known as the 'RRS Ernest Shackleton' to Falkland Islands. She arrived at Falkland Islands on 27th March 2017. After that, on 29th March 2017, she continued her journey to Cambridge, United Kingdom, through Ascension Island. She attended several meetings with her collaborator Prof. Dr. Peter Convey at British Antarctic Survey, Cambridge before she came back to Malaysia on the 1st April 2017.

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Synthesis

EXPLORING RESEARCH
INSPIRING INNOVATION

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