UNIVERSITI MALAYA

UM PLEDGES SUPPORT & COMMITMENT IN THE REALIZATION OF:

SUSTAINABLE DEVELOPMENT GOALS

UM Eco-Campus Core Areas:

UNIVERSITI MALAYA ECO-CAMPUS & UM LIVING LABS

CAMPUS SUSTAINABILITY REPORT 2018-2019

UNIVERSITY OF MALAYA LIVING LABS

UM ECO-CAMPUS

SUSTAINABLE DEVELOPMENT SOLUTIONS NETWORK

Published by

UM Eco-Campus Secretariat & UM Living Labs
c/o Deputy Vice-Chancellor (Research & Innovation) UM

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Strategic Approach towards Eco-Campus University & Sustainable Development Goals (SDGs): Intervention of Living Lab's Innovative Solutions-Driven Translational Research

1

Keynote Remark

Datuk Ir. (Dr.) Abdul Rahim Hj. Hashim
Vice-Chancellor
Universiti Malaya

In the initial phase of the introduction of the concept of sustainable development, it seems to bring a new mindset in the field of environment and development of the country. In the context of sustainable development, 'development' must keep pace with environmental concern on the background so that the process does not leave a negative impact on people and the environment in particular. For the campus sustainability initiatives, it can be traced back in phases since the 1990s, for example through the establishment of the Malaysia University Consortium for Environment and Development (MUCED), courses offered based on the environment at the faculty level, and also the recognition of the University of Malaya Environmental Secretariat (known as UMCares).

In 2014, the University introduced the UM Living Labs Program for the first time to the campus; a new form of experimental and exploratory in promoting campus sustainability initiatives focus on three key areas: water management (Water Warriors), waste management (Zero Waste Campaign), and landscape & biodiversity management (The RIMBA Project). I hope that such efforts have the potential to exhibit and to be a model of best practices encouraging all parties (UM management team, staff and students) to work together to achieve a common goal, namely towards a sustainable campus. Basically, the sustainability initiative at the Universiti Malaya is still in the development phase (work-in-progress), and once again I emphasize that it is a process that requires a level of deep understanding and strong commitment from everyone at the Universiti Malaya.

In 2018, a newly established coordinating entity, UM Eco-Campus Secretariat was setup under the advisory of Deputy Vice-Chancellor (Research & Innovation) with full support from Deputy Vice-Chancellor (Development). This unit spearheaded under the leadership of Professor Dr. Sumiani Yusoff with a motto of 'Be Different, Be The Change' is responsible in coordinating all campus sustainability initiatives and programs for the whole campus with the aims to transform Universiti Malaya as one of the eco-friendly campuses in Malaysia and in the World. I would like to congratulate UM Eco-Campus Secretariat for their dedicated time, energy and tenacity to keep the campus sustainability progress on the right track. This is reflected in UI GreenMetric World University Rankings 2018 as the 36th World's Most Sustainable University and 1st Asia's Most Sustainable University in City Centre Setup for two consecutive years.

With a new sustainability mindset, **I am pleased to share a document entitled Universiti Malaya Eco-Campus & UM Living Labs – Campus Sustainability Report 2018-2019;** a document in a form of both formal and informal reports of achievements and challenges that we faced over the course of 1 year. This report entails closely with the aspirations of UM Eco-Campus Blueprint (UMECB) eight (8) Core Areas namely: landscape and biodiversity management, waste management, water management, energy management, transportation management, green procurement, education management, and change management in governance, participation, and communication. The entire campus community, especially the stakeholders should take proactive measures to ensure the sustainability of such commitment and achievements of the University's progress hand-in-hand with outstanding academic performance and research achievements. All in all, UM pledges full support on the realization of Sustainable Development Goals (SDGs) by the year 2030.

Thanks to everyone for their willingness and efforts to work together to propel our beloved Universiti Malaya with another step forward toward a sustainable and eco-campus university.

YBHG. DATUK IR. (DR.) ABDUL RAHIM HJ. HASHIM
Vice-Chancellor
Universiti Malaya
vc@um.edu.my

2


UNIVERSITI MALAYA
SUSTAINABLE DEVELOPMENT GOALS
17 GOALS TO TRANSFORM OUR WORLD
University of Malaya (UM), the oldest public university in Malaysia was founded in 1905. UM is also the premier Research University (RU) in Malaysia. It is a comprehensive university with multidisciplinary learning (from Sciences, Arts and Humanities) that houses more than 27,000 students and 5,800 academic staff (20 over faculties, institutes, academies and research centres).
As a global community we face an array of global challenges. These challenges often stream down to the fundamental task of making progressive decisions today and tomorrow, that will place people and the planet on course for a better future. In University of Malaya, the word 'sustainability' has been and always be part-and-parcel of our vocabulary and a common embedded goal; financial sustainability, campus societal well-being and environmental commitment.
We are proud to share some of our successful stories over the years of 2016-2019 on campus sustainability commitments and contributions:
• UM as the 36th World's Most Sustainable University for Universitas Indonesia GreenMetric World University Rankings (UIGM) 2018 – 1st Best University in Asia for City Center Category for two consecutive years, 4th Best University in Asia Category
• UM received 1-Diamond Rating for Best Practice 1 (Carbon Reduction of 1-9%) for the Low Carbon Cities Framework (LCCF) by the then Ministry of Energy, Green Technology and Water (KeTTHA)
• UM awarded as One of the five Best Green Campus in Malaysia at Sustainable Campus Convention 2017 by SWCorp (Solid Waste Management Corporation Malaysia)
• UM launched the University of Malaya Eco-Campus Blueprint (UMECB) in 2017 in-conjunction with the celebration of UM111@Sustainability Science
• UM was appointed the Principal Consultant for the training of 1,000 Green Volunteers for the Kuala Lumpur 2017 SouthEast Asia Games and Para-ASEAN Games
• UM have embarked on the Banning of Single-Use Plastics Policy by Phases in 2018 with full enforcement in to be aligned with Malaysia's Toward Zero Plastic Roadmap 2018-2030 by Ministry of Energy, Science, Technology, Environment & Climate Change
University of Malaya charted a significant progress in 2018-2019 toward achieving a more concerted pathways toward sustainability in a holistic manner. The formalization institutional setup of University of Malaya Living Labs (UMLL) coordinated by University of Malaya Eco-Campus Secretariat and the establishment of UM Eco-Campus Committee under the advisory of 2 Deputy Vice-Chancellors (Research & Innovation, and Development) has placed UM to weigh-in the importance of environmental and sustainability performance.
Thank you for taking the time to learn about UM's efforts to realize the aspiration to become a premier and world-class eco-campus university. I invite you to join us in our continuous sustainability endeavors.
PROFESSOR DR. NOORSAADAH ABD. RAHMAN
Deputy Vice-Chancellor (Research & Innovation)
University of Malaya
noorsaadah@um.edu.my
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UNIVERSITY OF MALAYA LIVING LABS
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Welcoming Remark
Professor Dr. Noorsaadah Abd. Rahman
Deputy Vice-Chancellor (Research & Innovation),
Universiti Malaya

3


UNIVERSITI MALAYA
SUSTAINABLE DEVELOPMENT GOALS
17 GOALS TO TRANSFORM OUR WORLD
Assalamualaikum warahmatullahi wabarakatuh & Greetings,
Today, the issue of environment and sustainability poses a challenge faced by all communities in the world. Sustainability Science has its origins in the concept of sustainable development as proposed by the World Commission on Environment and Development (WCED) in 1987 aims to achieve the status of sustainable and balanced society and well-being between physical development and environmental protection. In tandem with such progress and demands, efforts to enhance sustainability science discipline is also increased in the academic field in a form of course offerings, academic publications, and research in multi-field contributed to the sustainability science.
Since the formal inception of UM Eco-Campus Secretariat in 2018 under the advisory of Deputy Vice-Chancellor (Research & Innovation) with support from Deputy Vice-Chancellor (Development) at the Universiti Malaya plays a vital role as a catalyst and central entity to encourage sustainability research, academic programs and initiatives in a holistic and comprehensive manners to solve problems and perspectives relevant toward a sustainable world, social, and human life system.
This campus sustainability report is prepared as part and parcel of UM's continuous commitment and pledge in the realization of University of Malaya Eco-Campus Blueprint (UMECB) a first document produced in University of Malaya 'journey' towards sustainable campus or eco-campus. This journey requires attention, support, cooperation and commitment of all stakeholders and any individual or party willing to support sustainability initiatives in a holistic and inclusive manner. This is aligned with the 17 Sustainable Development Goals (SDGs) at a global level especially in promoting partnership and collaboration from various stakeholders; internal and external.
The campus community should be given opportunity and platform it deserves either at the planning phase, implementation, and continuous development of Universiti Malaya sustainability initiatives. At UM Eco-Campus Secretariat, we believe that the campus community should be informed on performance and progress of the Universiti Malaya annually. It is important to allow each one of them to be given the opportunity to contribute input, ideas, views, or efforts in campus sustainability initiatives.
We hope this document will serve its main purposes as a basic guide and reflection over the course of 1 years achievement and challenges. We would like to express our appreciation and thanks to every members of UM Living Labs, UM campus community and public for their relentless support over the years.
'Be Different, Be The Change'
PROFESSOR DR. SUMIANI YUSOFF
Chairperson, UM Eco-Campus Secretariat & UM Living Labs
University of Malaya
sumiani@um.edu.my
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UNIVERSITY OF MALAYA LIVING LABS
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Introductory Remark
Professor Dr. Sumiani Yusoff
Chairperson, UM Eco-Campus Secretariat & UM Living Labs
Universiti Malaya

4

UNIVERSITI MALAYA

OUTLINE

- Introduction to Universiti Malaya
- Introduction to Sustainable Development Goals (SDGs)
- Introduction to Sustainable Development Goals (SDGs)
- Global Sustainability & Environmental Issues 2019
- Roles of Higher Institutions & Contributions to SDGs
- Organization Details & Initiatives
- UM Eco-Campus Secretariat
- UM Living Labs Grant Programme (UMLL)
- Initiatives & Contributions to SDGs
- Way Forward & Recommendations
- Conclusion

5

ABOUT UNIVERSITI MALAYA

UNIVERSITI MALAYA

VISION

To be an internationally renowned Institution of Higher Learning in research, innovation, publication & teaching

MISSION:

To advance knowledge and learning through quality research and education for the nation and for humanity

Campus Population

2,344	3,526
Academic Staff	Non-Academic Staff

24,463
Students Enrolment (international & local)

*as of June 2019

Land Area

890.77
acres (excluding Universiti Malaya Medical Centre)

HISTORICAL FACTS

University of Malaya was established on **1st January 1962**.

On June 16th 1962, University of Malaya celebrated the installation of its **first Chancellor, Tunku Abdul Rahman Putra Al-Haj, who was also the country's first prime minister.** The first Vice-Chancellor was Professor Oppenheim, a world-renowned Mathematician.

Currently, **His Royal Highness The Sultan of Perak Darul Ridzuan, Sultan Nazrin Muizzuddin Shah is the Chancellor of the University of Malaya.**

YBhg. Datuk Ir. (Dr.) Abdul Rahim Hj. Hashim was appointed as the twelfth Vice-Chancellor of the University of Malaya on 1 November 2017.

6

UNIVERSITI MALAYA

Document is available online:
http://portal.um.edu.my/doc/canseleri/ppsg_upload/pelan%20strategik/UM%20Strategic%20Plan_2016-2020_07052018.pdf

UMIQUE: ENVIRONMENT & NATURE

BOTANICAL GARDENS / RIMBA ILMU
Rimba Ilmu is an 80-hectare botanic garden located within the Universiti Malaya, campus. The words Rimba and Ilmu are of the Malaysian language that literally means Forest of Knowledge.

MUSEUM OF ZOOLOGY, FACULTY OF SCIENCE
The Museum of Zoology is home to a precious collection of insects (50,000 insects), 150 mammals (144 species), 600 birds (261 species), 445 reptile specimens (186 species), and 2,000 specimens (mostly freshwater species)

ULU GOMBAK FIELD STUDIES BIODIVERSITY CENTRE
The Universitl Malaya Field Studies Centre of the Ulu Gombak Biodiversity Centre, sited on 120-hectares of secondary and primary forest is a veritable fount of biological & ecological knowledge, with the area's fauna and flora extensively studied and documented throughout the site's 40-year history.

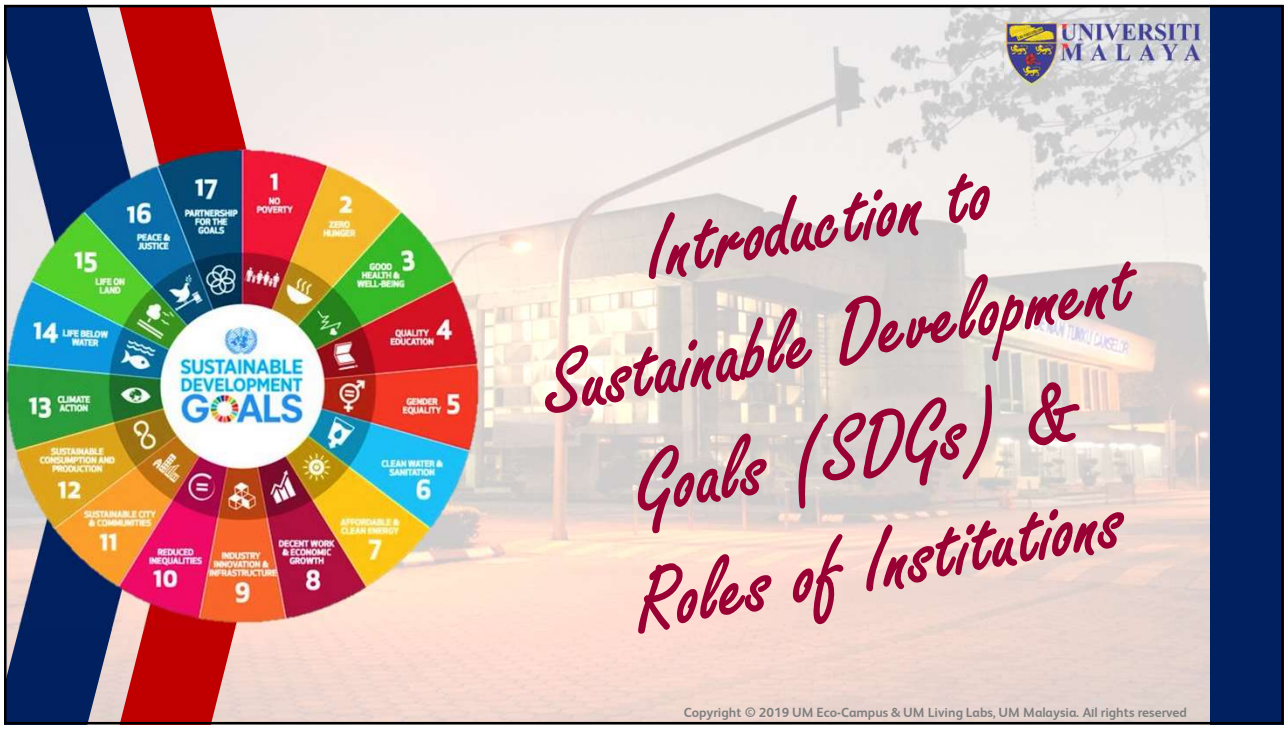
GLAMI LEMI BIOTECHNOLOGY RESEARCH CENTRE
The Universiti Malaya Biotechnology Research Centre located in Glami Lemi, Jelebu Negeri Sembilan is established in 2013; a host to variety of research activities on biotechnology, agricultural and agrofood sectors.

7

UNIVERSITI MALAYA

UNIVERSITI MALAYA: RANKINGS AND RATINGS

8


UNIVERSITI MALAYA
Introduction to Sustainable Development Goals (SDGs) & Roles of Institutions
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9


UNIVERSITI MALAYA
SUSTAINABILITY TODAY:
UNITED NATIONS SUSTAINABLE DEVELOPMENT GOALS (SDGs)
SUSTAINABLE DEVELOPMENT GOALS
EPU
2015
2016
2030
26 September
January
17 Goals
169 Targets
230 Indicators
PEOPLE
End poverty and hunger in all forms and ensure dignity and equality
PROSPERITY
Ensure prosperous and fulfilling lives in harmony with nature
PEACE
Foster peaceful, just and inclusive societies
PARTNERSHIP
Implement the agenda through a solid global partnership
PLANET
Protect our planet's natural resources and climate for future generations
5 Sustainable Development Dimensions
On September 25th 2015, countries adopted a set of goals to end poverty, protect the planet and ensure prosperity for all.
Each goal has specific targets to be achieved over the next 15 years (by 2030)
For the goals to be reached, everyone needs to do their part: governments, the private sector, civil society and people like you.
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10

11

GLOBAL SUSTAINABILITY ISSUES 2019

CLIMATE CHANGE

Human activity is now the prime driver of change in the Earth System e.g. greenhouse gas levels, ocean acidification, deforestation and biodiversity deterioration.

AIR POLLUTION

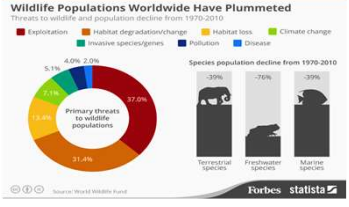
PLASTIC POLLUTION

800 species worldwide are affected by marine debris, **80%** of that litter is **PLASTIC!!!!**

WATER POLLUTION

It has been estimated that **2.1 billion** people have **lack access to safely managed drinking water services** and even over **4.5 billion** people **lack safely managed sanitation services.**

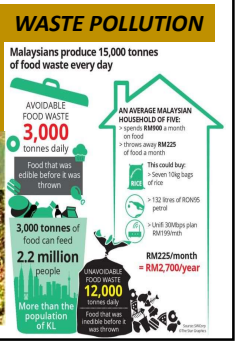
HABITAT & BIODIVERSITY LOSS



WASTE POLLUTION

Currently, about **2.01 billion metric tons** of municipal solid waste (MSW) are produced annually worldwide. The World Bank estimates overall waste generation will **increase to 3.40 billion metric tons** by **2050.**

97% of food waste ends up in a landfill. This waste decomposes anaerobically which creates methane, a greenhouse gas that is 21 times more harmful than carbon dioxide.

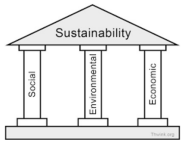


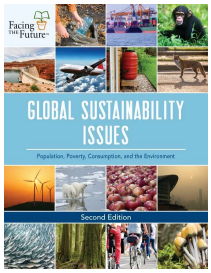
12

Global Sustainability Challenges & The Role of Universities

- **sustainable development** not only deals with environmental issues, but economic, social and cultural issues as well.
- Given the **increased demands placed on societies and the environment** due to, among other factors, increased human migration, increased urbanization and industrialization as well as the ongoing depletion of non-renewable resources, it is clear **that global action is needed to create a more sustainable future**.
- Given its primary role as knowledge producer, **higher education can serve as a powerful means to help create a more sustainable future.** Thus, the concept of 'education for sustainable development' has become, in recent years, one of the core educational initiatives to help address many of the problems associated with human development.
- Indeed, **higher education's role in creating a sustainable future will presumably take on a greater precedence** as the world continues to become increasingly globalized and interdependent.

Education becomes paramount in achieving all the SDGs





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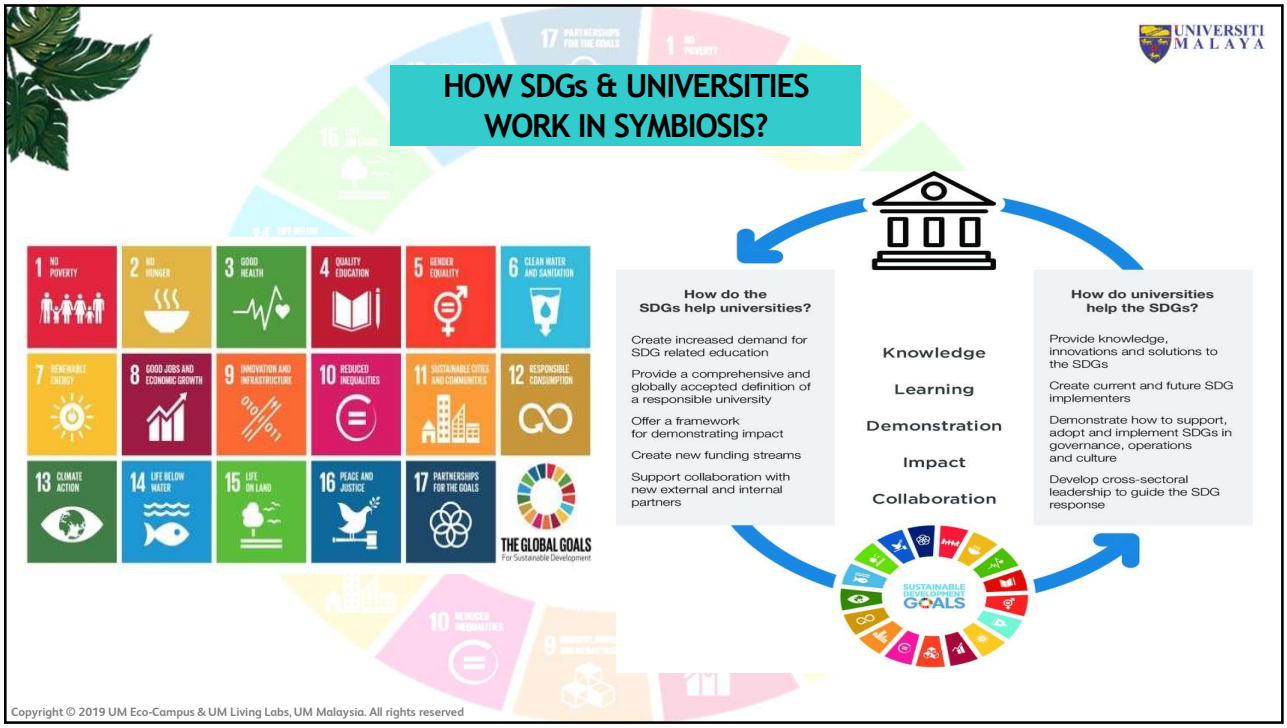
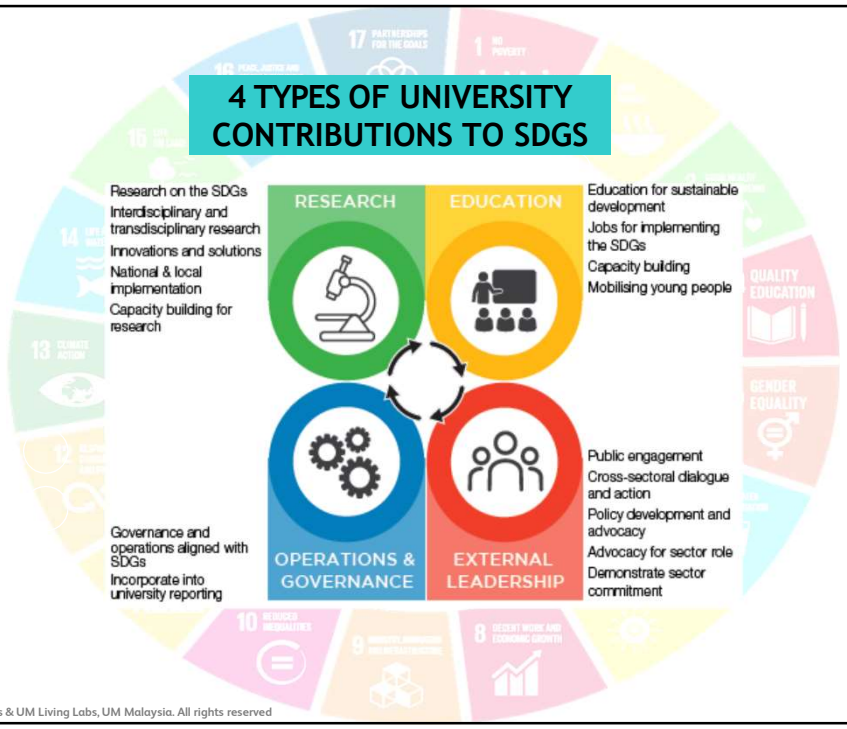


14

4 TYPES OF UNIVERSITY CONTRIBUTIONS TO SDGS



15

ECO-CAMPUS / SUSTAINABLE CAMPUS PRINCIPLES:

1. Integrated Approach to Generate Global Environmental Benefits
2. Multi-Scale Partnerships at Global to National to Municipal Levels for Scaled-Up Results
3. Cross-Sector Engagement to Ensure Results at All Levels and for All Stakeholders

ELEMENTS NEEDED:

1. Transformational Impact
2. Leveraged Resources
3. Political Will & Leadership

ENVIRONMENTAL BENEFITS:

1. Climate Change Mitigation: Decarbonization of Carbon Through Low Carbon Solutions
2. Biodiversity & Land Degradation: Integrated Land Use Planning to Prevent Habitat Loss / Degradation in Campus
3. Food System: Surplus Food can be Rechannelled to Support Students in Need (Food Bank Program), food waste can be converted to organic compost (CIRCULAR ECONOMY MODEL)
4. Plastic Pollution: Employing a Circular Economy Approach that Address Material and Design Engineering: Consumer Use, Recovery and Recycling
5. Resilience: Urban Development Design that is able to absorb potential shocks / disasters

ECO-CAMPUS / SUSTAINABLE CAMPUS PRINCIPLES

16

MALAYSIAN INSTITUTES OF HIGHER LEARNING & SCHOOL'S IMPACT TO THE ENVIRONMENT

UNIVERSITI MALAYA

Greening of Campus. Why is it Important?

20 Public universities

495 Private universities / colleges

36 Polytechnics

10,208 Schools

Toxic chemicals used in laboratories, fertilisers, insecticides, and pesticides are abundant on campuses.

Chemicals depleting the ozone layer, causing increased human, animal, and plant exposure to ultraviolet radiation, are common in cooling and refrigeration systems, automobiles, libraries, and fire extinguishers.

Transportation to and from campus can lead to congestion, noise, and air quality problems for local communities

Universities and colleges also generate **vast amounts of radioactive, solid and hazardous wastes.**

GREENHOUSE GASES (GHG) EMISSION

Source: http://eprints.lse.ac.uk/18893/1/Overcoming%20barriers%20to%20campus%20greening%28lsero%29.pdf

17

ABOUT UM ECO-CAMPUS

UM ECO-CAMPUS

Datuk Ir (Dr) Abdul Rahim Hashim
Vice-Chancellor UM

Professor Dr. Faisal Rafiq Mahamd Adikan
DVC (Development)

Professor Dr. Noorsaadah Abd. Rahman
DVC (Research & Innovation)

Professor Dr. Sumiani Yusoff
Chairperson, UM Eco-Campus & UM Living Labs

Mrs. Nur Fatchah Raudhah Ariffin
Assistant Registrar

Mr. Mohd Fadhli Rahmat Fakri
Project Officer

Ms. Aireen Zuriani Ahmad
Research Assistant

Tagline:
'Be Different, Be the Change'

UNIVERSITI MALAYA

Vision

To be a leader in greening initiatives in University of Malaya

Mission

To support UM staffs and students to ensure that as a University we work together to build, sustain, and improve our capability in sustainable development agendas

Official launch of the University of Malaya Eco-Campus Blueprint (UMECB) – 22April2016

UMECB: an important referral document in coordinating and facilitating all necessary action plans for campus sustainability initiatives in UM

UM Eco-Campus Core Areas:

18

UM ECO-CAMPUS ACHIEVEMENTS

UNIVERSITI MALAYA

UM RANKED 36TH WORLD'S MOST SUSTAINABLE UNIVERSITY IN UI GREENMETRIC WORLD UNIVERSITY RANKINGS 2018

Improved by 12.2% as compared to 2017 achievements. Maintained the status as the 1st Most Sustainable City-Centre University in Asia, Malaysia's Best Water, Waste, Education & Research, and Energy & Climate Change Management. UM Eco-Campus Standing Committee (UMECS) is established in 2016

UM RECEIVED THE GREEN ERA AWARD 2015

UM (UM Zero Waste Campaign) received The Green Era Award at in Berlin, Germany – 2015: recognize true global sustainable exemplars that have been innovative & creative in pursuing the sustainable imperative

ESTABLISHMENT OF UM SUSTAINABLE DEVELOPMENT SOLUTIONS NETWORK (UM SDSN)

UM is a member of SDSN Malaysia Chapter since 2014
Currently hosted by Sunway University's Jeffrey Sachs Centre for Sustainable Development

UM ACKNOWLEDGED AS 1 OF THE 5 NATIONAL ECO-CAMPUS UNIVERSITY

UM, 1 of the 5 universities in Malaysia awarded with the Special Award for *'Kelestarian Kampus Hijau':* 25 May 2017 by SWCorp

UM ECO-CAMPUS

UM APPOINTED AS OFFICIAL TRAINER FOR KL2017 SEA GAMES & ASEAN PARA GAMES GREEN VOLUNTEERS

Training on environmental issues, sustainable waste management, recycling and Separation-at-Source (SAS) for KL2017 Green volunteers consist of 1000 university and college students

UM AWARDED WITH DIAMOND RATING FOR LCCF

UM was awarded 'Diamond Rating: Best Practice 1' by KeTTHA at IGEM 2017 (13 Oct 2017): LCCFAS aims to support the government policy in reducing 45% of carbon emission per GDP per capita by the year 2030

19

UNIVERSITY OF MALAYA

UI GreenMetric World University Ranking

Congratulations

UM RANKED #36 WORLD'S MOST SUSTAINABLE UNIVERSITY IN UI GREENMETRIC WORLD UNIVERSITY RANKINGS 2018

*out of 719 institutions worldwide

UM listed among 431 universities that show sustainability leadership by providing evidence

36th World's Most Sustainable University

ACHIEVEMENTS:

95% Water Management Initiatives	87.5% Education & Research Initiatives (Sustainability)	79.2% Waste Management Initiatives	76.7% Setting & Infrastructure Initiatives	65.3% Transportation Management Initiatives	58.3% Energy & Climate Change Initiatives

- Best Water Management in Malaysia
- Best Waste Management in Malaysia
- Best Education & Research (Sustainability) in Malaysia
- 2nd Best Energy & Climate Change in Malaysia

1st Asia's Most Sustainable University in City-Centre Setup

4th Asia's Most Sustainable University

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UNIVERSITI MALAYA

UI GreenMetric World University Ranking

36th World's Sustainable University

1st Asia's Most Sustainable University in City-Centre Setup

4th Asia's Most Sustainable University

Other notable achievements:

11th World's Best Water Management

28th World's Best Education & Research (Sustainability)

20


UM Living Labs Grant Programme
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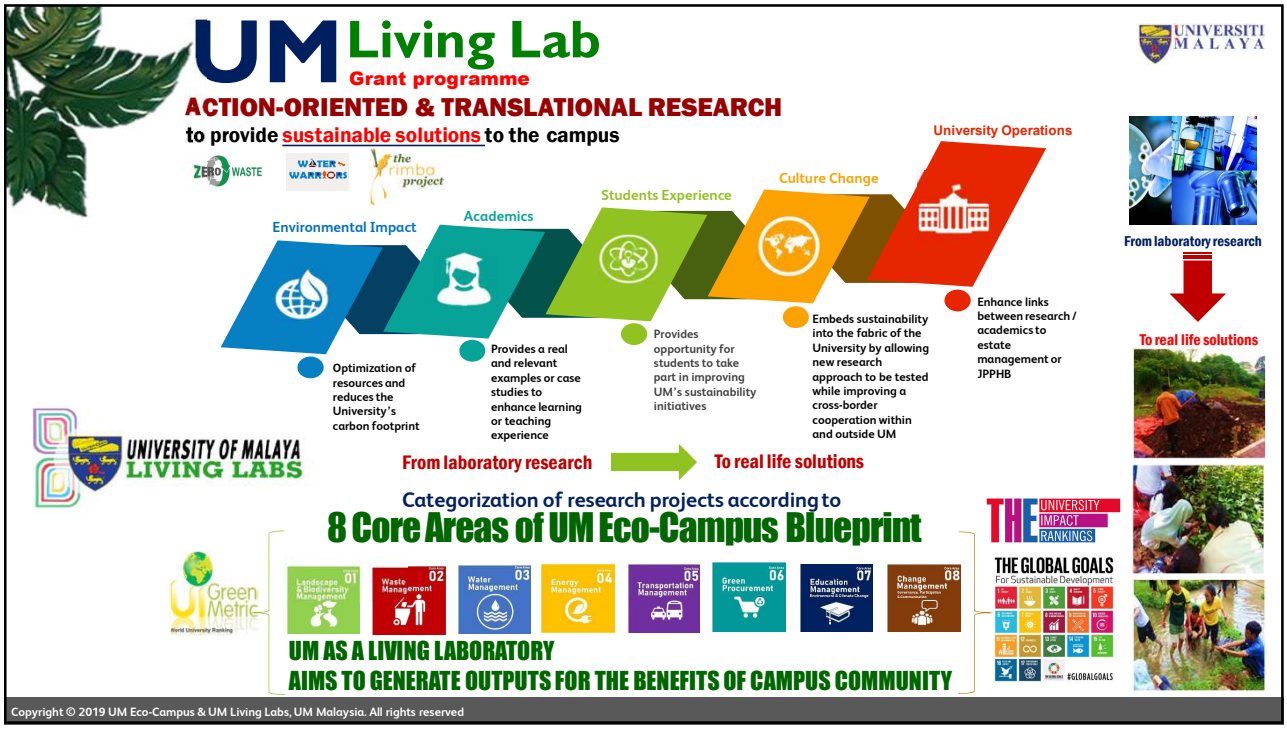
21


UM Living Lab
Grant programme
ACTION-ORIENTED & TRANSLATIONAL RESEARCH
to provide sustainable solutions to the campus
ZERO WASTE
WATER WARRIORS
the rimba project
Environmental Impact
Academics
Students Experience
Culture Change
University Operations
Optimization of resources and reduces the University's carbon footprint
Provides a real and relevant examples or case studies to enhance learning or teaching experience
Provides opportunity for students to take part in improving UM's sustainability initiatives
Embeds sustainability into the fabric of the University by allowing new research approach to be tested while improving a cross-border cooperation within and outside UM
Enhance links between research / academics to estate management or JPPHB
UNIVERSITY OF MALAYA LIVING LABS
From laboratory research
To real life solutions
From laboratory research
To real life solutions
Categorization of research projects according to
8 Core Areas of UM Eco-Campus Blueprint
01 Landscape & Biodiversity Management
02 Waste Management
03 Water Management
04 Energy Management
05 Transportation Management
06 Green Procurement
07 Education Management
08 Change Management
UI GreenMetric
THE UNIVERSITY IMPACT RANKINGS
THE GLOBAL GOALS
For Sustainable Development
#GLOBALGOALS
UM AS A LIVING LABORATORY
AIMS TO GENERATE OUTPUTS FOR THE BENEFITS OF CAMPUS COMMUNITY
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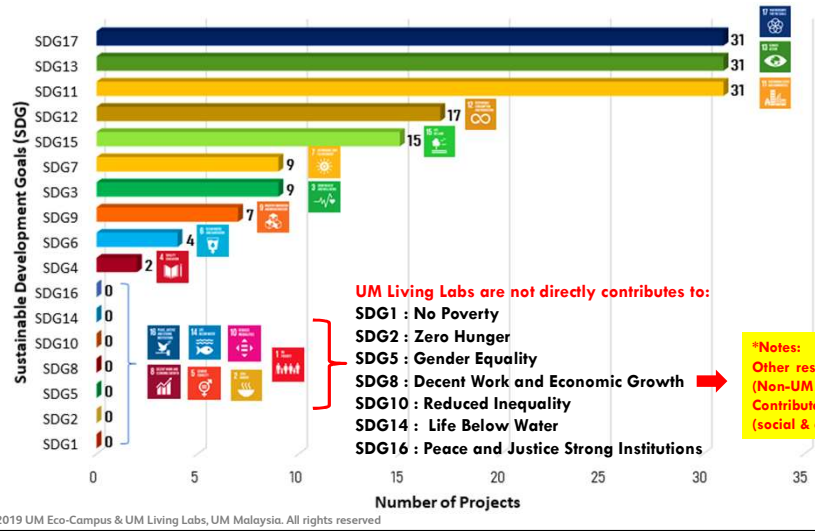
22

UM LIVING LAB PROJECT CONTRIBUTIONS TO SDGS (2015- PRESENT)



Most UM Living Labs have contributed to:

SDG11 : Sustainable Cities and Communities

SDG13 : Climate Change

SDG17 : Responsible Consumption and Production

UM Living Labs are not directly contributes to:

SDG1 : No Poverty
SDG2 : Zero Hunger
SDG5 : Gender Equality
SDG8 : Decent Work and Economic Growth
SDG10 : Reduced Inequality
SDG14 : Life Below Water
SDG16 : Peace and Justice Strong Institutions

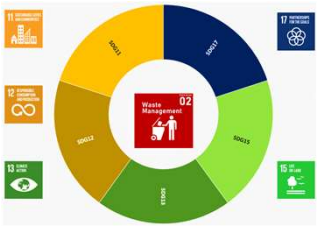
***Notes:**
Other research & initiatives in UM (Non-UM Living Labs): Contributes directly to these 7 SDGs (social & economic SDGs-based)

23

UM LIVING LAB PROJECT CONTRIBUTIONS TO SDGS (2015- PRESENT)

CORE AREA 01: LANDSCAPE & BIODIVERSITY MANAGEMENT

CORE AREA 02: WASTE MANAGEMENT



CORE AREA 03: WATER MANAGEMENT

CORE AREA 04: ENERGY MANAGEMENT

CORE AREA 05: TRANSPORTATION MANAGEMENT

CORE AREA 06: GREEN PROCUREMENT

CORE AREA 07: EDUCATION MANAGEMENT

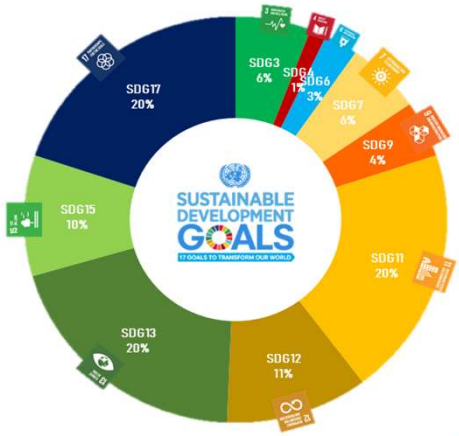
CORE AREA 08: CHANGE MANAGEMENT

24

UM LIVING LAB PROJECT CONTRIBUTIONS TO SDGS (2015- PRESENT)

ADDITIONAL AREA : GOOD HEALTH & WELL-BEING

SUMMARY OF UMLL CONTRIBUTIONS TO SDGS



25

1 The RIMBA Project: Biodiversity conservation by reconciling cities and nature

Core Area 01 Landscape & Biodiversity Management

3 GOOD HEALTH AND WELL-BEING
11 SUSTAINABLE CITIES AND COMMUNITIES
13 CLIMATE ACTION
15 LIFE ON LAND
17 PARTNERSHIPS FOR THE GOALS

Guided walks

City nature challenges

Rimba Ilmu Visits

MOU Signing with DBKL

Providing solutions on sustainability issues for biodiversity & landscape management

26

2 Healthy Soil for a Healthy Environment; Reducing Dependency on Chemical Fertilizer Consumption in University Malaya Using Organic Materials

Core Area 01 Landscape & Biodiversity Management



Kursus Pengurusan Pembajaan dan Penggunaan Bahan Organik untuk Tanaman bersama UM ZWC

UM Living Labs Site Visits

World Scout Environment Programme (WSEP) and Transfer Knowledge Programme with Pertubuhan Peladang Port Dickson

Awareness on importance of organic amendment in environment during UNIVERSITY OF MALAYA RESEARCH CARNIVAL (UMRC)

Providing solutions on landscape management : Soil treatment, organic compost, Biochar

27

3 EcoSlope: Slope eco-engineering technique towards sustainable and green landscape

Core Area 01 Landscape & Biodiversity Management


Demonstration on plants transplanting with ISB staffs & students

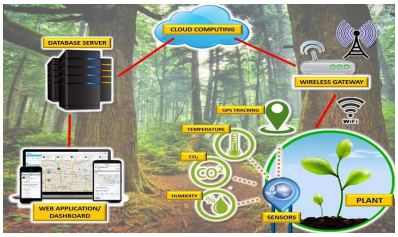

Students involvement: Transplanting exercise during practical class

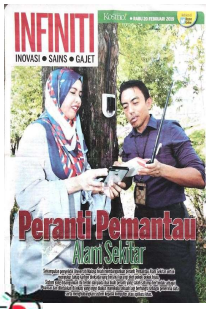
Keynote speaker: The 23rd Biological Science Graduate Congress

National Consultation Project UM-Plus

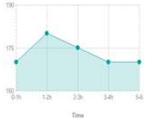
Reducing soil erosion and increasing soil carbon storage and green surface

4 Carbon Storage Mapping Initiatives through Real Time GPS Tracking and IOT Monitoring





The Sensor Design



Reducing global energy use while absorbing and fixing CO2 from the source or atmosphere

28

1 UM Zero Waste Campaign

UM ZERO WASTE CAMPAIGN

UM ZWC Organic Compost

As an income generation to the university

Waste Management 02

11 SUSTAINABLE CITIES AND COMMUNITIES

12 RESPONSIBLE CONSUMPTION AND PRODUCTION

13 CLIMATE ACTION

15 LIFE ON LAND

17 PARTNERSHIPS FOR THE GOALS

ZWC's Guidelines on Food, Green & Wood Waste Separation and Collection

ACHIEVEMENTS OF UM ZWC SINCE INCEPTION (2009 - now)

Environment

Total waste diverted:
> 900 ton

Total carbon emission reduction:
> 4,917,493 KG CO_2-eq

Economy

Total waste disposal cost saved
: >RM365,220

Income generation from training and compost sale:
>RM29,000

Social

- Total revenue / charity sponsor: >RM35,000
- Total visitors: >11,000

29

2 Managing kitchen waste using Black Soldier Fly (BSF): An Alternative Approach Towards Zero Waste in Campus

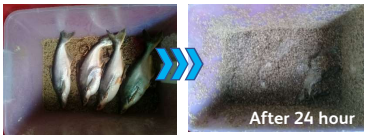
The system

Feed with kitchen waste

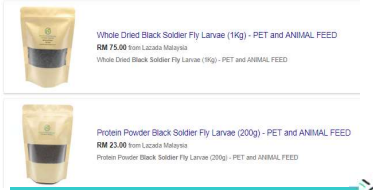
Waste Management 02

40 larvae = 4.19g

Feed with fish



Total BSF collected: ~5kg



Reduce environmental problem (kitchen waste) while BSF and fly larvae can be commercialized for income generation

3 Safe Disposal of Unused Medications - Working Towards a Green Pharmacy in the University of Malaya Medical Centre

World Pharmacy Day (Exhibition)

Health Promotion Campaign

Total amount of medicine donated back to UMMC (706kg)

Reduce environmental problem by disposing medications properly while reducing medicine wastage

UM Living Lab Site Visit at University of Malaya Medical Centre (UMMC)

30

4 Recycled Plastic Aggregate as Replacement for Conventional Aggregates in Concrete

80% of green plastic replacement

80% of blue plastic replacement

Sustainable design for low-cost house from plastic aggregates

Core Area 02 Waste Management

Control

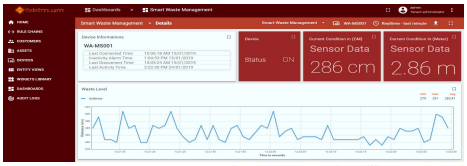
80% of black plastic replacement

UM Living Lab Site Visit

Dissemination of Plastic Aggregates Utilization Workshop

Reduce environmental pollution due to the release of poisonous chemicals from plastics

5 Smart Waste Management System using Internet-of-Things (IOT)



Waste detection sensor is an initiative of UM Living Labs to manage waste systematically

UM Living Lab Site Visit

Optimization of waste collection efficiency

31

1 UM Water Warriors

Core Area 03 Water Management

6 CLEAN WATER AND SANITATION

11 SUSTAINABLE CITIES AND COMMUNITIES

12 RESPONSIBLE CONSUMPTION AND PRODUCTION

13 CLIMATE ACTION

17 PARTNERSHIPS FOR THE GOALS

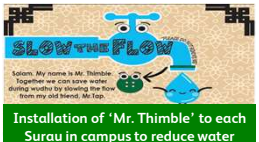
Pollution Mapping of Campus Watershed

Wetland & Stream Constructions as part of water bodies conservation

Sungai & tasik clean up

Upcycling of 'gasing' from plastic bottle opener

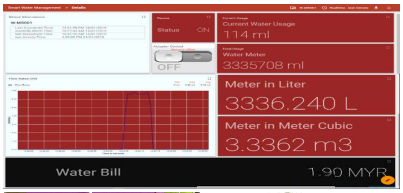
Rainwater Harvesting System



Installation of 'Mr. Thimble' to each Surau in campus to reduce water consumption

Reduce water consumption and improve water quality management in campus

2 Water monitoring via Internet of Things



Water sensors at FSKTM (Research prototype)

UM Living Lab's new initiative to control water consumption efficiently

Poster presentation during UMRC to educate people and increase awareness

32

Energy Management 04

7 AFFORDABLE AND CLEAN ENERGY

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

11 SUSTAINABLE CITIES AND COMMUNITIES

13 CLIMATE ACTION

17 PARTNERSHIPS FOR THE GOALS

1 Energy Conservation Culture in University of Malaya Campus

Workshops, brochures, button badges and etc to educate people and increase awareness

Energy management for sustainable resource

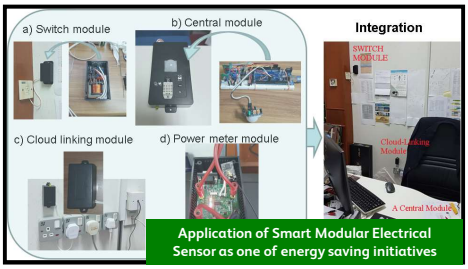
2 Optimising Energy Cost With Evolution Computing Based Building Energy Management System

Solar panel at rooftop of WISMA R&D parking areas

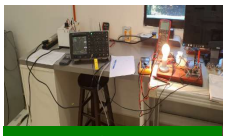
Generating renewable energy through solar panel

3 Smart Modular Electrical Energy Monitoring and Management System

UNIVERSITI MALAYA



Application of Smart Modular Electrical Sensor as one of energy saving initiatives



Customized Energy Meter

Switch & Central Modules

Brief demonstration during UMLL Site Visit

UM Living Lab's initiative to control energy consumption from lights and air conditioners as well as to increase its efficiency

33

Integrating Green Into The University of Malaya's Procurement Process: A Move Forward

Centre for Transportation Research

UNIVERSITI MALAYA

Bike-in-lane signage

Sharrow markings

Handbook for bus drivers

Bus tracking apps

13 CLIMATE ACTION

11 SUSTAINABLE CITIES AND COMMUNITIES

17 PARTNERSHIPS FOR THE GOALS

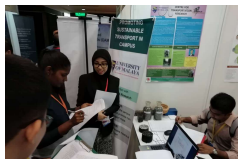
Environment 05 Transportation Management

Informative sign poles

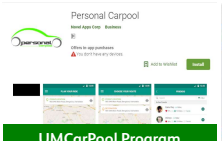
Bicycle maintenance workshop

Bicycle workshops and maintenance

Shuttle buses as main public transport in UM campus



Exhibitions to raise awareness



UMCarPool Program

UMWalker Initiative Challenge

Minimize the motorized vehicle number within campus and reduce transportation carbon footprint.

34

Green Procurement 06

Integrating Green Into The University of Malaya's Procurement Process: A Move Forward

Signage to raise awareness


Green Procurement Workshop


Green Procurement Seminar


Green Procurement Awareness Campus in campus

Green Procurement Handbook & Guideline

Green Procurement Calender

Reduce environmental impacts through buying green products

35

Education Management 07

1 Transforming the Role of Surau APIUM for Campus Sustainability Through 'Imarah Green Project


Cleanup Activities


Lestari Shop


Installation of Rainwater Harvesting System

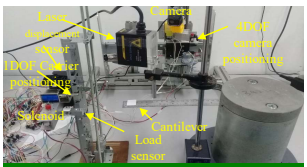
Providing solutions on sustainability issues for Surau & Muslim Community in UM : Efficient use of Energy and Water, Sustainable Waste Management, Enhance green landscape, education (green usrah)


Recycling Bins at Recycling Centre

Urban Garden

Recycled Tires Garden

2 Decentralization of Laboratory Exercise via Remote Application: A-State-of-the- Art Approach towards Efficient Educational Facilities Resource and Energy Management in Academic Institutions



Modified set-up research prototype



Rainbow spectrum experimental set-up

Increase learning efficiency by developing remote experimental facility

36

Change Management 08
Core Area
Governance, Participation & Communication

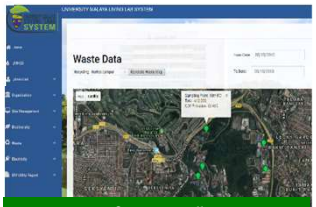
UNIVERSITI MALAYA

12 RESPONSIBLE CONSUMPTION AND PRODUCTION

13 CLIMATE ACTION

7 AFFORDABLE AND CLEAN ENERGY

1 University of Malaya Ecological and Hydrological Data Warehouse Prototype System



Data of Waste Collection

Data of Plants Species in RIMBA Ilmu (Biodiversity)

UM Living Labs System

Providing database system that can store & analyse data collectively

2 The Faculty Sustainability Report Card: Documenting Faculty Sustainability Initiatives Towards UM Eco-Campus

Focus Group Discussion to share and brief ideas on implementation of sustainability report cards around campus PTjs

An initiative that implemented sustainability reporting & documentation

37

Living Labs in UM

UNIVERSITI MALAYA

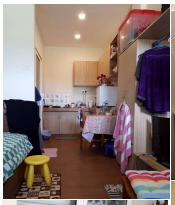
Additional Theme: Health and Well-being

3 GOOD HEALTH AND WELL-BEING

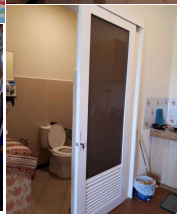
11 SUSTAINABLE CITIES AND COMMUNITIES

17 PARTNERSHIPS FOR THE GOALS

1. Homes for Active Ageing
2. The UM Cancer Farm: A Lifestyle Lab



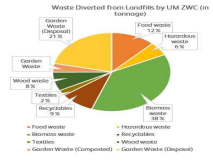
Providing safe & comfortable environment for a good health & well being



38

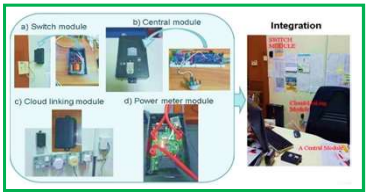
CONTRIBUTIONS OF UM LIVING LABS
ENVIRONMENTAL PERFORMANCE OF UM LIVING LABS

Wood Waste Collection: **5-12 ton/month**
Total Recyclable Textile Waste: **15,564kg**



Total CO_2 emission reduction : > 4,917,493 KG CO2-eq

Total Solid Waste Diverted from Landfills in a year: **>900 tonnes**



- **34% reduction** of energy usage for lightings
- **47.8% reduction** of energy usage for air-conditioning

978kg of returned unused medicines
28% safely disposed


100 trees have been planted at Samali Tree Area to **increase Campus' biodiversity area**

Increment of Surau green area **by 10%**

39

SOCIAL IMPACT OF UM LIVING LABS

UM ZWC: Community Composting at Block P20 Pantai Dalam, Bario Sarawak and Sunway SPK community Damansara

Imarah Eco-Surau Programme with Residential Colleges and outside stakeholders

(e.g : JAWI, IKIM, JAKIM)

River & Tasik Varsity volunteering clean up programmes Fishing programme

UM Living Labs Site Visits, Demo & Trainings

UM ZWC received >11,000 visitors

RIMBA Ilmu Guided Walks, Trainings and City Nature Challenge

40


UNIVERSITI MALAYA
APIUM Recycling Centre
Total Recyclable Materials : 570 kg (RM225.45)
UM ZWC Organic Compost
Current total sale: RM29,000
APIUM Lestari Shop
Total green sale : RM 1,367 for 144.3 kg items sold
UM ZWC total waste disposal cost saved: >RM300,000
ECONOMIC PERFORMANCE
RIMBA Ilmu has collected RM 32,339.76 from guided walk, book & merchandise sales
Surau APIUM Green & Edible Garden
RIMBA Ilmu Guided Walk
Upcycled plastic bottle opener into 'Gasing'
For SALE RM10
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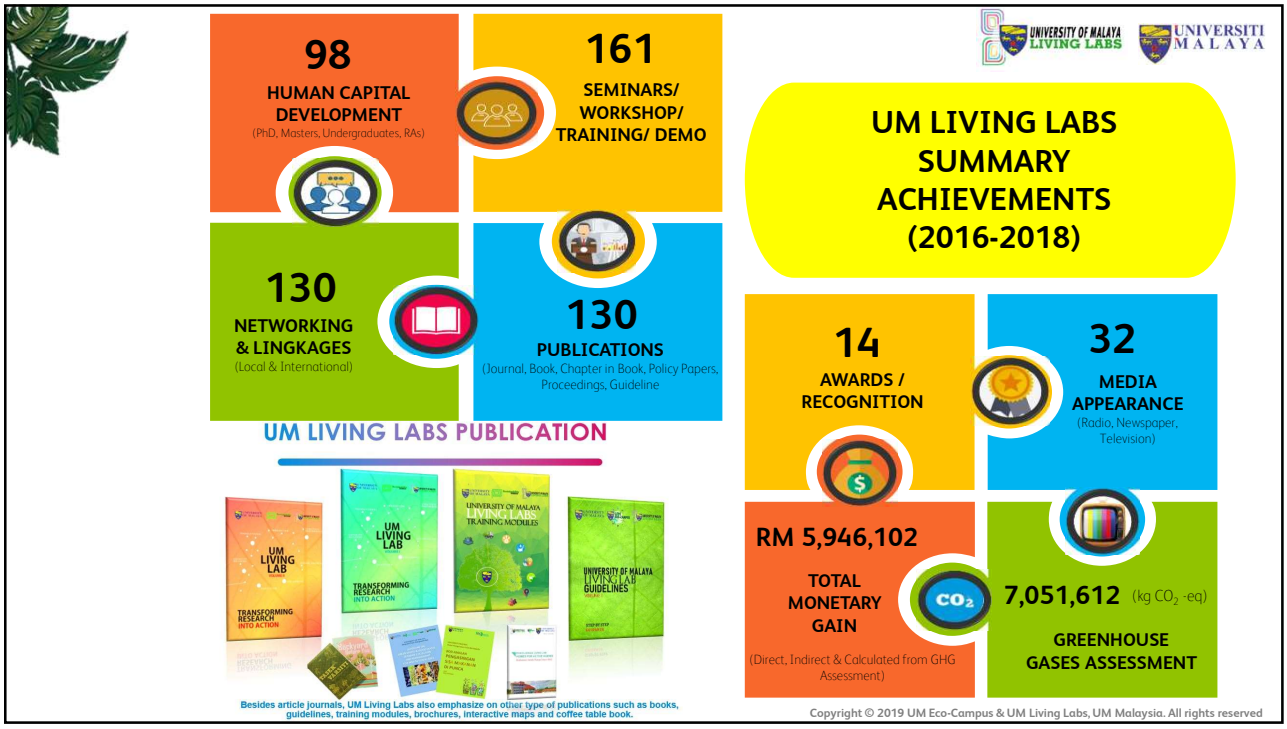
41


UNIVERSITY OF MALAYA LIVING LABS
UNIVERSITI MALAYA
98
HUMAN CAPITAL DEVELOPMENT
(PhD, Masters, Undergraduates, RAs)
161
SEMINARS/ WORKSHOP/ TRAINING/ DEMO
130
NETWORKING & LINGKAGES
(Local & International)
130
PUBLICATIONS
(Journal, Book, Chapter in Book, Policy Papers, Proceedings, Guideline
UM LIVING LABS PUBLICATION
Besides article journals, UM Living Labs also emphasize on other type of publications such as books, guidelines, training modules, brochures, interactive maps and coffee table book.
UM LIVING LABS SUMMARY ACHIEVEMENTS (2016-2018)
14
AWARDS / RECOGNITION
32
MEDIA APPEARANCE
(Radio, Newspaper, Television)
RM 5,946,102
TOTAL MONETARY GAIN
(Direct, Indirect & Calculated from GHG Assessment)
7,051,612 (kg CO_2 -eq)
GREENHOUSE GASES ASSESSMENT
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42

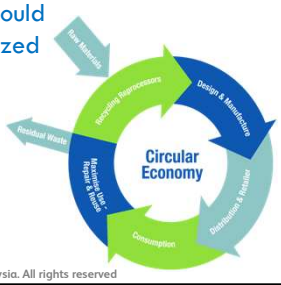
UM LIVING LABS MEDIA APPEARANCES

43

CONCLUSION

Way Forward

- Sustainability is everyone's responsibility.
- Campus sustainability should not be an option.
- All activities must be translatable and impactful for campus environment performance, economic growth, and societal well-being.
- Sustainability initiatives should be rewarded and recognized with proper reward mechanism.



Recommendation

For a successful implementation of projects, a campus living lab should consider:

*1) **Specific contexts and target** which works differently depending on the geographical context.*

*2) **Level of openness and flexibility** of the project to adapt, co-create and evolve over times to foster more innovation.*

*3) **Community participation** to test, evaluate and co-create the innovation outcome of the living lab project.*

*4) **Monitoring of tangible and intangible outputs** which goes beyond ordinary research outputs. Living Lab is an action and transdisciplinary research designed to address specific issues and challenges for the benefits of community and stakeholders.*

*5) **Mixed set of living lab tools and approach** to explore and discover new opportunities.*

44

44

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UM PLEDGED TO SUPPORT AND COMMITTED TO SUSTAINABLE DEVELOPMENT GOALS (SDGs)

45

45

UNIVERSITI MALAYA

WATER WARRIORS

UNIVERSITY OF MALAYA LIVING LABS

UM ECO-CAMPUS

UMLL002-15SUS
UM WATER WARRIORS: INTEGRATED WATER MANAGEMENT

ASSOCIATE PROFESSOR DR. ZEEDA FATIMAH MOHAMAD

Department of Science & Technology Studies,
Faculty of Science UM

zeeda21@um.edu.my

+603-7967 7164

AREAS OF EXPERTISE

Environmental Ethics, Policy Studies, Environmental Protection

RECENT PUBLICATIONS

1. Mohamad, Z. F., Kadir, S. N., Nasaruddin, A., Sakai, N., Mohamed Zuki, F. Hussein, H., Salleh, M. S. A. M., & Sulaiman, A. H. (2018). UM Living Lab Volume 2: Transforming Research into Action. In S. Yusoff (Eds.), Water Warriors Living Lab: Towards an integrated Heartware - Hardware – Software Approach to Water Management. Kuala Lumpur, KL: University of Malaya Press.
2. Muhamad, A., Yakub, M., Yusoff, S., Mohd Nor, R., Mohamad, Z. F., Norasid, M. A., Mansor, N. H., Paad, N. S. (2018). UM Living Lab Volume 2: Transforming Research into Action. In S. Yusoff (Eds.), Transforming the Role of Surau APIUM for Campus Sustainability Through 'Imarah Green Project' (pp. 104-115). Kuala Lumpur, KL: University of Malaya Press.
3. Nik Meriam Nik Sulaiman, Azizan Baharuddin, Noor Zalina Mahmood, Zeeda Fatimah Mohamad, Teh Swe Jyan and Azizi Abu Bakar (2016) Intercultural dialogues on Integrated Watershed Management: A case of the JSPS Asian Core Programme. In Munir Shuib and Koo Yew Lie (Eds) The Role of the University with a Focus on University-Community Engagement, 135-150. Penang: Penerbit Universiti Sains Malaysia (ISBN: 978-967-461-098-2)
4. Sakai, N., Mohamad, Z. F., Nasaruddin, A., Kadir, S. N. A., Salleh, M. S. A. M., & Sulaiman, A. H. (2018). Eco-Heart Index as a tool for community-based water quality monitoring and assessment. Ecological Indicators, 91, 38-46. (ISI-Indexed)
5. Mohamad, Z. F., Nasaruddin, A., Kadir, S. N. A., Sakai, Mohamed Zuki, F., Hussein, H, Mohamed Salleh, M. S. A. M., & Sulaiman, A. H. (2018). Heartware as a Driver for Campus Sustainability: Insights from an Action-oriented Exploratory Case Study. Journal of Cleaner Production [Accepted] (ISI-Indexed)
6. Biodiversity Map of Tasek Varsiti
7. Birds of University of Malaya (Collaboration Water Warriors and The Rimba Project)
8. Backyard Wildflower (Collaboration Water Warriors and The Rimba Project)

CO-RESEARCHERS (FACULTY)

1. Professor. Dr. Abdul Halim Sulaiman (retiree)
2. Dr. Hazreena Hussein (Faculty of Built Environment)
3. Dr. Fathiah Mohamed Zuki (Faculty of Engineering)
4. Siti Norasiah Abd Kadir (Faculty of Science)
5. Affan Nasaruddin (Faculty of Science)

Core Area of UM Eco-Campus Blueprint

Contribution to Sustainable Development Goals (SDGs)

Research Assistant

Mrs. Siti Norasiah Abd Kadir
(B.Eng Biomedical Engineering (Malaya), asiahabdkadir@gmail.com)

Research Assistant

Mr. Affan Nasaruddin
(BSc Applied Geology (Malaya), Masters in Environmental Management (National University), affan1990@hotmail.com)

PROJECT SUMMARY

Water Warriors (WW) is a Living Lab Action Research Programme for Integrated Water Management at the University of Malaya. It applies the "heartware-software-hardware" governance approach to deal with water sustainability issues on campus. Our past work focused in reviving and conserving water bodies in campus such as Tasek Varsiti, Sungai Mustafa and Sungai Pantai and some efforts in reducing water consumption. Our long-term dream is to expand Water Warriors into an Educational and Information Centre in dealing with water sustainability issues.

UM WATER WARRIORS: INTEGRATED WATER MANAGEMENT
(PHASE 4)
30 August 2019 (Friday)

Water Warriors
Rumah No. 2, Lorong 16/10B,
Universiti Malaya
50603 Kuala Lumpur
http://umwaterwarriors.wixsite.com/tasek

TEAM MEMBERS

Affan Nasaruddin
Project Officer (foundet)

Siti Norasiah Kadir
Research Assistant (founder)

Muhammad Shahrul Amin Mohd Salleh
Core Volunteer (former RA)

Daniel Zainal
Former intern

Aisha Miera
Assistant

Assoc. Prof. Dr. Zeeda Mohamad
Researcher (PI)

Dr. Abdul Halim Sulaiman
Researcher (former PI)

Dr. Fathiah Mohamed Zuki
Researcher

Dr. Hazreena Hussein
Researcher

Water Warriors is a **Campus Sustainability Living Lab for Integrated Water Management.**

WATER WARRIORS

Supply:
Conservation of Water Bodies

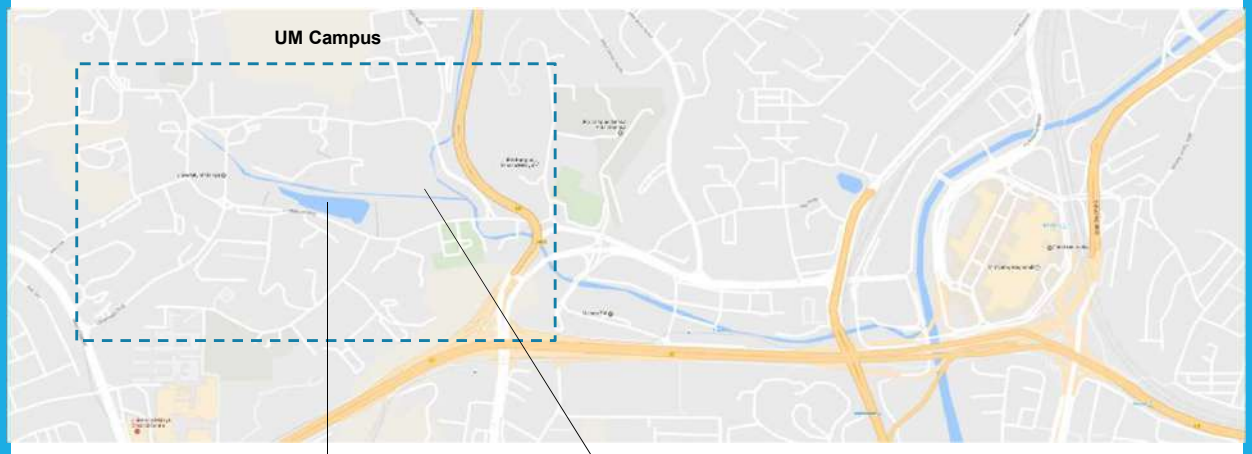
Conservation of water bodies on campus (lake & rivers)

Demand:
Water Consumption

Enhance the efficiency of water consumption on campus

Integrated supply-demand water conservation programme

Conservation of water bodies on campus and nearby areas in KL



- Water Warriors in its **4th Phase** as a UM Living Lab.

- Objectives for **2018/2019** are to:

1. Enhance pilot projects (from Phase I, II and III) for both conservation of water bodies and water consumption.
2. Integrate WW's activities into long-term projects under the RMK11 (2017 – 2020) and DBKL.
3. Develop WW as an income generating entity and working with international bodies to enhance recognition for eliciting external funds.

Project target achievement:

CONSERVATION OF WATER BODIES
REDUCTION OF WATER CONSUMPTION
INTEGRATED ACTIVITIES

Innovation, Technology Transfer

Networking & Linkages

Community Engagement

Capacity Building

KPI (CONSERVATION OF WATER BODIES)

No.	Categories	Key Performance Indicators	Progress and Status of KPI
1	**Project Target Achievement**	**Conservation of Water Bodies:**	
		1. A constructed wetland and stream project at Tasek Varsiti, under DBKL (RMK11 project)	**Completed in July 2019**
		2. Projek Tebatan Banjir under DBKL (RMK-11 project)	**Completed in July 2019**
		1. Construction and development of UM Water Educational and Information Centre (Phase 2). This is to support to the National Level River of Life (ROL) programme.	**Completed**
		• An interpretive space Tasek Varsiti and Sungai Pantai for the conservation of Sungai Klang Watershed.	**Completed, continuous**
		• Pollution Mapping of Campus Watershed	On-going, continuous
		• River Clean-up activities	On-going, continuous
		• Citizen science programs with the campus community and general public	On-going, continuous
		4. Prototype of an upcycling plastic machine to convert plastic waste from rivers into valuable items.	**Completed**

KPI (Conservation of Water Bodies)

A constructed wetland and stream project at Tasek Varsiti

Purpose:

- **Water supply to the lake**
- Flood mitigation
- Habitat creation; increase biodiversity
- Natural process filtration
- Increase blue and green area (carbon capture & storage)

KPI (Conservation of Water Bodies)

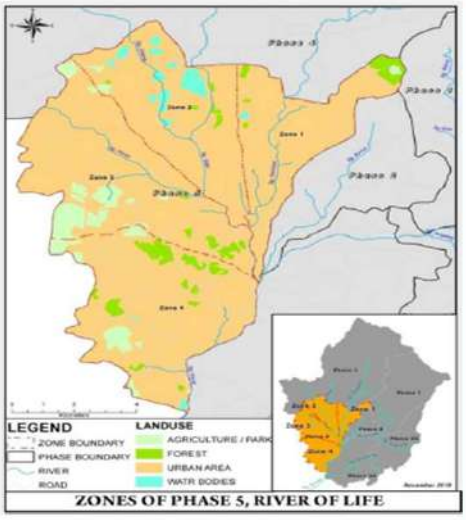
Projek Tebatan Banjir under DBKL

16,000 metre cube (m3) concealed flood detention pond underground

KPI (Conservation of Water Bodies)

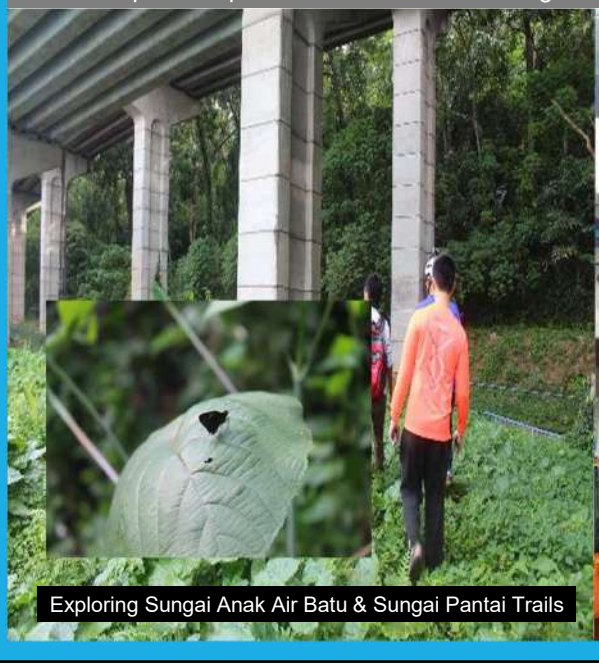
Construction and development of UM Water Educational and Information Centre (Phase 2). This is to support to the National Level River of Life (ROL) programme

- ✓ Establishment of ROLPOP5_UM group within campus
- ✓ As an active player in implementation of ROLPOP at universities & schools level
  - ✓ environmental auditing, river & lake monitoring, pollution reduction and implementation of BMPs related to river basin management within and outside campus vicinity.
- ✓ Lend a subject-matter expertise in river & lake monitoring by becoming host or facilitator for any relevant programme to ROL & ROLPOP
  - ✓ Rimba ilmu
- ✓ Share or suggestion propose action plan to enhance the outcomes of ROLPOP especially related to education institutions target group.
- ✓ Exchange education and information materials between UM and ROLPOP for mutually agreed programme/activities.
- ✓ Promoting & sharing information related to ROL&ROLPOP to UM partners, agencies & students.



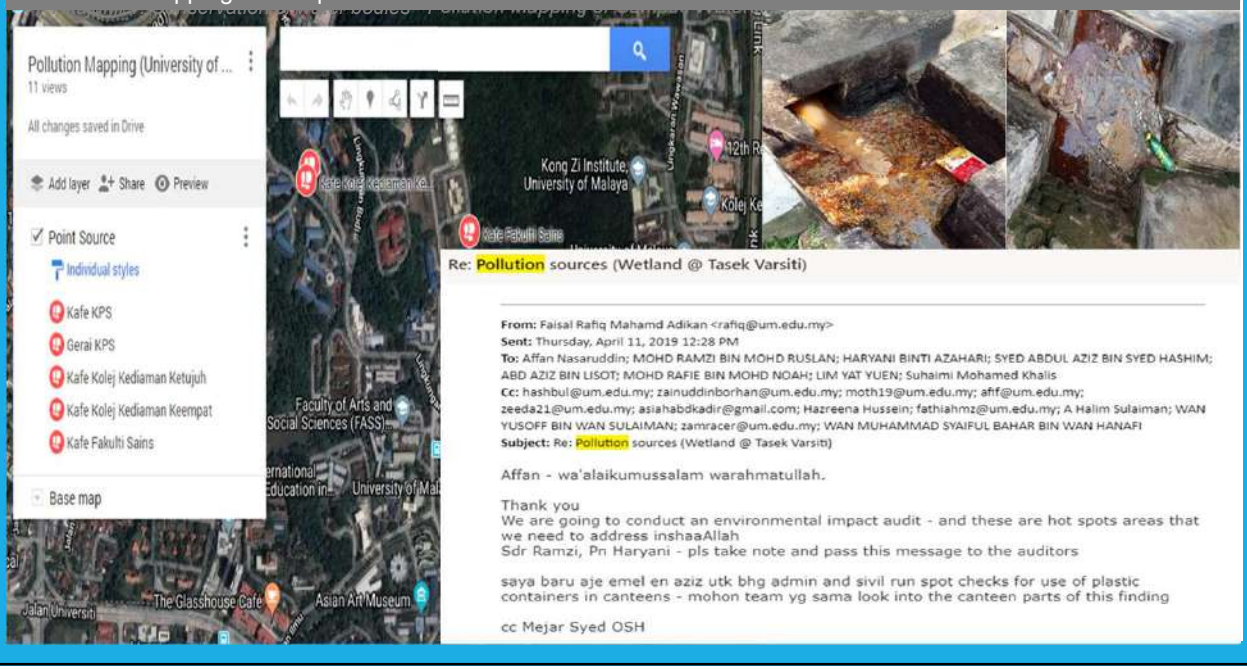
ZONES OF PHASE 5, RIVER OF LIFE

1. An interpretive space Tasek Varsiti and Sungai Pantai for the conservation of Sungai Klang Watershed.


Exploring Sungai Anak Air Batu & Sungai Pantai Trails


Exploring Sungai Anak Air Batu & Sungai Pantai Trails

2. Pollution Mapping of Campus Watershed



3. River Clean Up Activities

4. Citizen science programs with the campus community and general public

Launching of Friends of Sungai Klang; WW led Friends of Sungai Pantai

KPI (Conservation of Water Bodies)

Prototype of an upcycling plastic machine to convert plastic waste from rivers into valuable item

KPI (REDUCTION OF WATER CONSUMPTION)

No.	Categories	Key Performance Indicators	Progress and Status of KPI
1	**Project Target Achievement**	1. Enhancing the performance of Mr Thimble (low flow device installed from previous phase) at selected musollahs in UM. Improvement will be based on findings obtained from a user survey conducted by WW in 2018.	**On-going**
		1. Enhancing the use of rainwater harvesting systems (installed from previous phases) at selected PTjs in UM	**On-going**
		1. The Living Lab will contribute to following aspects of the UI Green Metric as follows: • Water conservation program • Sustainability events • Sustainability organizations (student) • Sustainability website	**Completed,** continuous keeping record.

KPI (Reducing water consumption)

Enhancing the performance of Mr Thimble (low flow device installed from previous phase) at selected musollahs in UM. Improvement will be based on findings obtained from a user survey conducted by WW in 2018.

Video: Introducing Mr. Thimble

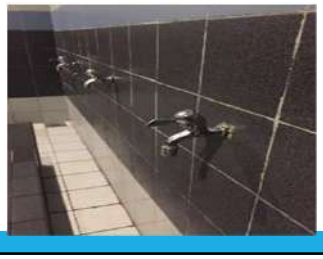
Signage


Taps with aerator replacement

Feasibility Study for continuous improvement
(Liyana Yamin, 2018)

Collaboration with SPAN

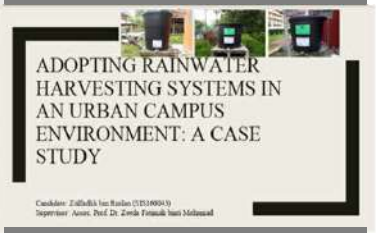
6 selected surau – Rakan Surau SPAN
- APIUM
- PPUM (Surau Adeeniah)
- Canseleri
- KK11
- KK12



KPI (Reducing water consumption)

Enhancing the use of rainwater harvesting systems (installed from previous phases) at selected PTjs in UM

Kursus Mencerap Data



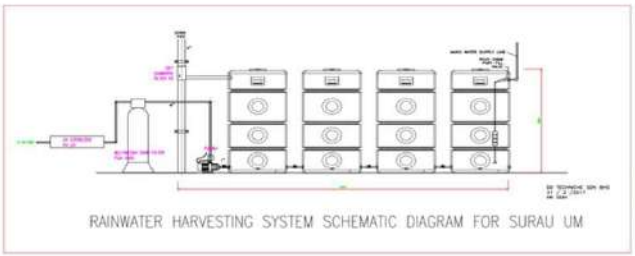
Feasibility Study for continuous improvement
(Zulfadhli Ruslan, 2019)

Improvement project (upcoming) – JPPHB & WW

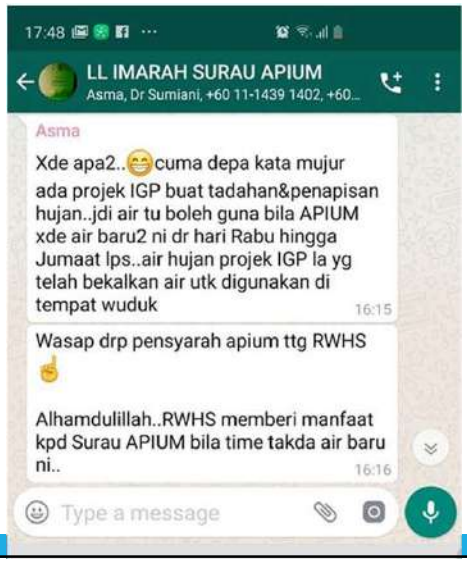
- Maintenance and retrofit
- Installation of water meter for each tank
- Proper handing over to PTj
- Monitoring and enforcement
- Preparation of simple maintenance guidelines

Installation and Performance Monitoring of Specially Designed Rainwater Harvesting System at the Surau Akademi Pengajian Islam (for ablution)

The system



Demonstration



Cadangan Program Penjimatan Air

- Audit Pengurusan Sistem Air (Leakage Survey)
- Cadangan Penambahan Sistem Penuaian Air Hujan (SPAH)
- Permudahkan Sistem Laporan Kebocoran/Kerosakan
- Mempertingkat Penggunaan Sistem Penuaian Air Hujan (SPAH)
- Cadangan Pembinaan Reservoir Sistem Penuaian Air Hujan (SPAH)
- Kempen Kesedaran Penjimatan Air

Tahun/ Bulan	Penggunaan (m^3)			Peratusan Beza	Bil Semasa (RM)			Peratusan Beza	Catatan
	2017	2018	2019		2017	2018	2019		
Januari	205,371	176,428	188,595	6.90%	350,486.15	301,092.02	303,637.95	0.85%	
Februari	219,535	193,703	200,621	3.57%	374,658.45	330,573.55	322,999.80	-2.29%	
Mac	143,329	195,801	189,274	-3.33%	244,605.25	334,154.00	304,731.14	-8.81%	
April	135,230	224,722	232,213	3.33%	230,783.50	383,510.55	373,862.95	-2.52%	
Mei	164,080	220,635	132,617	-39.89%	280,018.95	374,404.35	343762.35	-8.18%	
Jun	134,840	220,844	179,676	-18.64	230,117.95	355,558.85	289,278.35	-18.64	
Julai	132,210	155,130	101,259	-34.73	225,629.60	249,759.30	163,027.00	-34.73	
Ogos	81,440	166,052			138,985.50	267,343.70			
September	191,198	203,007			326,298.51	326,841.25			
Oktober	211,006	229,250			360,102.85	369,092.50			
November	228,080	207,987			389,241.35	334,859.05			
Disember	236,583	208,750			403,752.53	336,087.50			
JUMLAH	2,082,902	2,402,309	1,124,255		3,554,680.08	3,963,276.62	2,101,299.54		
PURATA/BULAN	173,575	200,192	174,894		296,223.34	330,273.05	300,185.65		

Quality objective JPPHB: Reducing the demand on utilities by 3%/year (water =metre cubic)

Sumber: JPPHB

KPI (INTEGRATED)

No.	Categories	Key Performance Indicators	Progress and Status of KPI
1	**Project Target Achievement**	1. An upgraded Section 16 house as an operational office cum educational, workshop and citizen science centre for Water Warriors and The Rimba Project. 2. Recognition by Academy Sains Malaysia through collaborative work on place-based citizen science for watershed management with Cardiff University.	**Completed in April 2019** **On-going, till May 2020**

An upgraded Section 16 house as an operational office cum educational, workshop and citizen science centre for Water Warriors and The Rimba Project

Recognition by Academy Sains Malaysia through collaborative work on place-based citizen science for watershed management with Cardiff University.

Newton-Ungku Omar Fund: Advance Fellowship & Humanities 2018. "The application of systems and place based methods for enhancing citizen science as a participatory approach for watershed conservation". Collaboration with Sustainable Places Institute (PLACES), Cardiff University.

Grant by MIGHT & ASM
Newton-Ungku Omar Fund:
Advanced Fellowship(Social Sciences & Humanities

The Academy of Sciences Malaysia: THE ACADEMY OF SCIENCES MALAYSIA, a statutory body established under the Academy of Sciences Malaysia Act 1994 and having an address at 20th Floor, West Wing, MATRADE Tower, Jalan Sultan Haji Ahmad Shah off Jalan Tuanku Abdul Halim, 50480 Kuala Lumpur, Malaysia

The Recipient: DR ZEEDA FATIMAH MOHAMAD
Department of Science and Technology Studies
Faculty of Science
University of Malaya
50603 Lembah Pantai
Kuala Lumpur

Application Number: AF170073
Date: 2018

This Agreement is made on the date set out above subject to the terms set out in the schedules listed below which the Academy of Sciences Malaysia, the Recipient and the Recipient Institution undertake to observe in the performance of this Agreement.

The Academy of Sciences Malaysia shall award the Grant to the Recipient and the Recipient Institution shall manage and distribute the Grant for the purposes of funding the Project described in Schedule 1 on the terms and conditions of this Agreement.

The Recipient acknowledges that, where it will carry out the research project under this Fellowship in partnership and/or collaboration with, or will pass some or all of the Grant to, either directly or indirectly, any individuals or organisation(s) not being a party to this Agreement (including Co-Recipient/Collaborator as described in clause 4 of Schedule 1) and this Fellowship is conditional in all respects upon the signing of this agreement.

30 July – 14 August 2018

6 – 18 August 2019

Contribution to UI Green Metric 2018

No.	Categories	Key Performance Indicators	Progress and Status of KPI
4	**Community Engagement**	• Water educational engagement activities to support River of Life Public Outreach Programme, Phase 5 • Sustainability Educational programmes • Clean-up events	**Continuous till 2020** **Continuous** **Continuous**

Sustainability Educational programmes (more than 20 programmes conducted)

Booth exhibition during Minggu Haluansiswa 2018/2019

Sustainability Slot during Minggu Haluansiswa 2018/2019

Eco-campus tour: visitation from IIUM

World Water Monitoring Day at Tasek Varsiti

World River Celebration @ Masjid Jamek

Sayangi Sungai Selangor in conjunction of World River Day 2018 at Kuala Selangor

Bunus Fun Walk 4 River

Booth exhibition during Towards Livable, Resilient & Competitive Cities International Conference 2018

Nature Quest with Idrissi International School

Nature Art Program with MAZ International School

Sharing session under Associate Prof. Dr. Zeeda class on Green Technology

Booth exhibition during International Greentech & Eco Products Exhibition & Conference Malaysia (IGEM)

Interviewed by Brickfields Asia College students & Sungai Mustafa clean up session

Nature Quest with UM Tropical Camp at Tasek Varsiti

Booth exhibition during Karnival Pendidikan Selangor at Shah Alam Convention Centre; part of STEM Malaysia

Invited speaker for Konvensyen Memperkasakan Pihak Berkuasa Tempatan at PICC by Majlis Bandaraya Petaling Jaya (MBPJ)

Invited as a 'stream guide' at Bukit Persekutuan

Clean-up events
Tasek Varsiti & Sungai Pantai
More than 10 events






No.	Categories	Key Performance Indicators	Progress and Status of KPI
2	**Capacity Building**	• Capacity building on place-based citizen science for WW under Newton-Ungku Omar Fellowship Research Programme and SDG Lab.	**Completed**
		• Water Citizen Science training workshops for volunteers, within and outside of campus.	**Completed in May 2019**
		• UM as a demonstration site for the River of Life programme, Phase 5	**Continuous till 2020**

Internal Capacity Building on Place-based Citizen Science under Newton Ungku Omar Advanced Fellowship

Water Citizen Science training workshops for volunteers, within and outside of campus

&

Various capacity building activity based on UM's position as Demo site for ROLPOP Phase 5

No.	Categories	Key Performance Indicators	Progress and Status of KPI
5	**Networking and Linkages**	**Internal:** The RIMBA Project, Zero Waste Campaign (ZWC), Residential colleges, Sahabat UM (UMCares), Inspirasi Kawa, Kuala Selangor, Sustainability Science Research Cluster, Sustainable Development Solutions Network (SDSN), The Office of Deputy Vice Chancellor (Development), Department of Development and Estate Maintenance (JPPHB), Sports Centre, The Community and Sustainability Centre – UMCares, Office of Safety and Health (OSH) Registrar's Department, Rimba Ilmu, Institute of Science Biology (ISB) Faculty of Science, Faculty of Built Environment **National:** National Hydraulic Research Institute of Malaysia (NAHRIM), Perbadanan Putrajaya,Global Environment Centre (GEC), Lembaga Urus Air Selangor (LUAS), Suruhjaya Perkhidmatan Air Negara (SPAN), Air Selangor, Hartalega. **International:** International Lake Environment Committee (ILEC), Future Earth, Cardiff University, Thames21, Centre for Ecology and Hydrology, Keep Wales Tidy	**Completed** **Completed** **Completed**

Suruhjaya Perkhidmatan Air Negara (SPAN)

I.R4.0 team (FSKTM, FS, FK)

Cardiff University

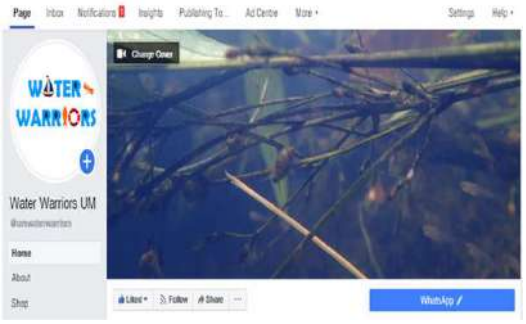
Friends of Klang River Basin

Thames21

Centre for Ecology & Hydrology

Keep Wales Tidy

No.	Categories	Key Performance Indicators	Progress and Status of KPI
6	**Publications**	1. Biodiversity Survey Report.	**On-going**
		2. Online database	**Completed,** continuously update
		3. Updated website	**Completed,** continuously update
		4. Social media: Facebook page, Instagram	**Completed,** continuously update
		5. Newspaper articles	**2 completed**



Facebook Page: 3,484 followers

Upgraded website (2019)

Instagram: 759 followers

Seeding Awareness of Sustainability
News Straits Times (30 January 2019)

Sungai Pantai: Urban River Biodiversity (on-going)

Others

Training Session on Building Consumption Input System (BCis) at Malaysia Green Technology Cooperation (MGTC),

Involvement in Projek Pembangunan Telaga Tiub Air Tanah untuk Kajian Sumber Air Negara di bawah Projek 'National Water Balance Studies' under Jabatan Mineral & Galian Selangor

Supervised water quality samplings around campus

Coordination meeting for UI Green Metric

Consultation

Penyediaan Kertas Strategi Transformasi Sektor Air Negara Rancangan Malaysia Kedua Belas – Kementerian Hal Ehwal Ekonomi (MEA)

Jawatankuasa Pelaksana Pemuliharaan Sungai-Sungai di Negeri Selangor – Lembaga Urus Air Selangor (LUAS) (2019)

IUCN firefly specialist group's workshop: considering Key Biodiversity Areas (KBA) for fireflies

UNIVERSITY OF MALAYA

Invited External Environmental Audit with OSHE UM

NEW PROJECTS

- "Surau Rakan SPAN" (5 surau selected) – SPAN (October 2019)
- Rainwater harvesting system improvement – JPPHB (September 2019)
- Treatment of leachate at ZWC using constructed wetland – JPPHB (September 2019) – water innovation
- Strategic water saving/reduction – JPPHB (on-going)

EXIT STRATEGY

- **Long term Retention of founders:**
  - Founders nurtured as UM staff to develop the living lab further as an action research centre within an academic setting.
  - Developing WW as a linked but independent income generating entity e.g. university-based NGO, social enterprise (income generation through consultancy, educational activities and external grants)

- **Without Long term Retention of founders:**
  - Prepare JPPHB and relevant PTjs to take over projects in the future as water conservation strategies are institutionalized under UMECB.
  - Interested PTjs/researchers to take over and further develop particular areas already initiated by WW.

LL004-15SUS
ZERO WASTE CAMPAIGN: INTEGRATED & SUSTAINABLE MANAGEMENT MODEL DEVELOPMENT IN UNIVERSITI MALAYA CAMPUS

PROFESSOR DR. SUMIANI YUSOFF
Institute of Ocean & Earth Sciences (IOES),
University of Malaya

sumiani@um.edu.my +603 – 7967 7981

AREAS OF EXPERTISE

Life Cycle Analysis (Life Cycle Assessment and Management, Sustainable Development, Environmental Management Systems, Ecological Footprint Analysis, Solid Waste Management, Environmental Impact Assessment)

CO-RESEARCHER (FACULTY)

1. Ms. Mairuzasmara Fariza Azlan (UM ZWC)
2. Mr. Abdul Rahim Hamid (UM ZWC)

RECENT PUBLICATIONS

1. Yusoff, S. (2018). UM Living Lab Volume II. Kuala Lumpur, KL: University of Malaya Press.
2. Yusoff, S. (2018). UM Living Lab Volume I: Transforming Research into Action. Kuala Lumpur, KL: University of Malaya Press
3. Nayaka, R. R., Alengaram, U. J., Jumaat, M. Z. & Yusoff, S. (2018). Microstructural investigation and durability performance of high volume industrial waste based masonry mortars. (ISI-Indexed)
4. Arshad, F., Tan, Y. A.& Yusoff, S. (2017). A Cradle-To-Gate Study Of GHG Emissions From The Transportation Of Palm Oil, Palm Olein And Palm Stearin Using The Life Cycle Assessment Approach. Journal Of Oil Palm Research, 29(1), 120-129. (ISI-Indexed)
5. Ee, C. J., Chuen, O. C., Yusoff, S. & Mohd, N. S. (2016). Life Cycle Assessment of Waste-To-Energy: Energy Recovery From Wood Waste in Malaysia. Polish Journal of Environmental Studies. (ISI-Indexed)
6. Chee Guan, Ng & Sumiani Yusoff, 2015. Life Cycle Inventory of Institutional Medium-Scaled Co-Composting of Food Waste and Yard Waste in Tropical Country. Sains Malaysiana 44(4):517-527. (ISI-Indexed)
7. Chee Guan, Ng & Sumiani Yusoff, 2015. Assessment of GHG Emission Reduction Potential from Source- separated Organic Waste (SOW) Management: Case Study in a Higher Educational Institution in Malaysia. Sains Malaysiana 44(2):193-201. (ISI-Indexed)

Core Area of UM Eco-Campus Blueprint

Contribution to Sustainable Development Goals (SDGs)

PROJECT SUMMARY

With the growing number of universities, the population of each campus is significant and generate waste that causes adverse impact to the environment. It is estimated that waste from all academic institutions amounted to approximately 1,500 tonnes per day, which represents 5-10% of the total waste generated in Malaysia. Universities worldwide are embracing the move towards sustainability, including UM as the premier university in Malaysia which set an agenda for sustainable development goals since year 2009. University of Malaya Zero Waste Campaign (UM ZWC) as one of the university's longest and most consistent sustainability living lab, it is developed to spearhead the development of a sustainable waste management model in the campus and ultimately achieve the status of a zero waste campus.

Research Assistant

Ms. Mairuzasmara Fariza Azlan
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mairuzasmara@gmail.com

Research Assistant

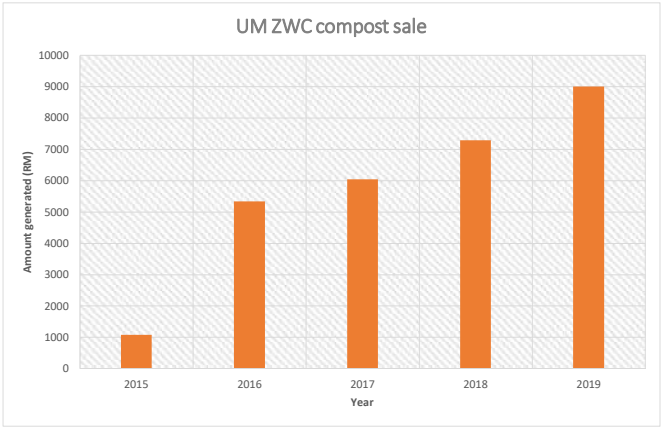
Mr. Abdul Rahim Hamid
(BSc.in Environmental Health & Safety) UiTM (Puncak Alam)
abdulrahimhamid94@gmail.com

OBJECTIVES

1. To develop policy and innovation system to divert solid waste from disposal in landfill for resources and energy recovery
2. To streamline recycling activities and strategize efforts to increase recycling rate
3. To create awareness and inculcate best practice of waste separation at source among the campus community
4. To form strategic partnership with various stakeholders to develop integrated waste management system

ACHIEVEMENTS OF UM ZWC SINCE INCEPTION
(2009 – now)

INCOME GENERATION FROM REVENUE OF UM ZWC ORGANIC COMPOST SALE (YEARLY)



Total of UM ZWC compost sale since 2015 until July 2019 = RM28,744.00

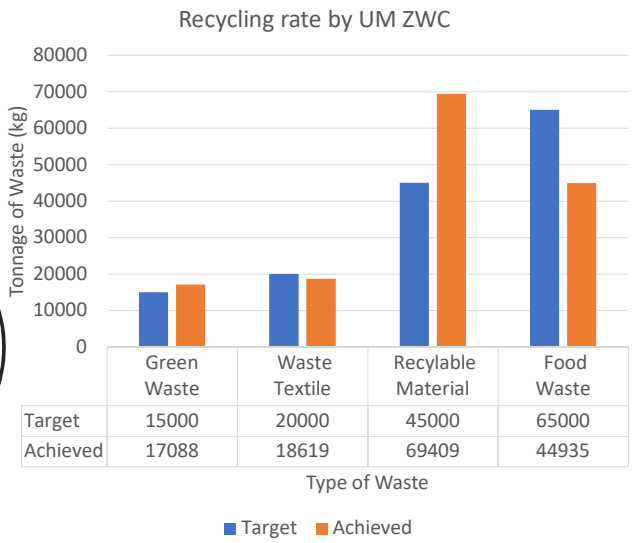
No.	CATEGORY	TARGET/KPIs (1 year)	ACHIEVEMENTS (1 year)
1	Project target achievement	FW = 65,000 kg	FW = 44,935 kg
		GW = 15,000 kg	GW = 17,088 kg
		WT = 20,000 kg	WT = 18,619 kg
		RM = 45,000 kg	RM = 69,409
		TOTAL = 145,000 kg	**TOTAL = 150,051 kg**
		Compost sale & Training = RM3,000	**Compost sale & Training = RM9,000**
2	Capacity building	10 sessions	26 sessions
3	Innovation/ Technology/ Knowledge transfer	2 technology transfer	4 sessions
4	Community engagement	3 sessions	3 sessions (p20, Bario, Taman Sri Sentosa)
5	Networking and linkages	2 networking and linkages	17 networking and linkages
6	Publications	2 presentation / proceeding	21 presentations (1 proceeding) 1 journal paper (submitted) 2 proceeding papers (submitted) 3 fact books (submitted)
7	Policy paper/ Guideline/ Standard	1 guideline / standard	1 guideline – Food waste composting

Project target achievements

Diverted **150,051 kg** of waste from disposal in landfill

Generated **RM9,000** from UM ZWC training and compost revenue

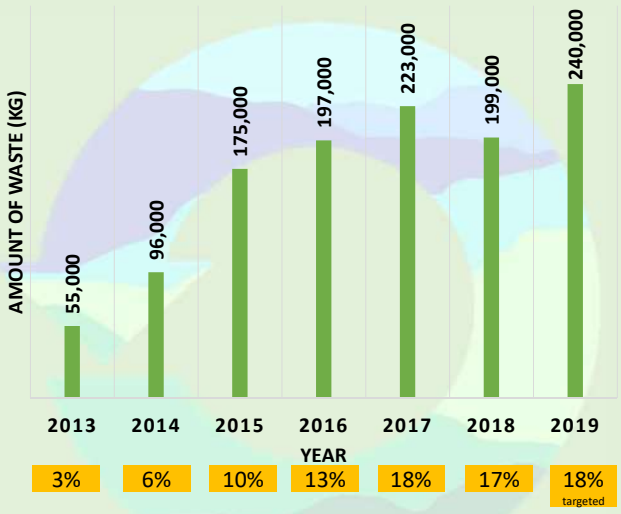
UM ZWC
Project Target
Achievement



Carbon saved: > 300,000 kg CO_2-eq

Waste disposal cost saved: > RM50,000.00

Waste treatment and recycling by UM ZWC



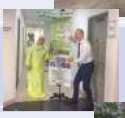
Recycling rate:	3%	6%	10%	13%	18%	17%	18% targeted

Notes

- *Food waste composted with "open air static pile composting method"*
- *Green waste composted with "open air static pile composting method"*
- *Digested: Anaerobic digestion using Cowtec AD*
- *Wood waste is collected by TSP Waste Management Sdn Bhd for energy recovery at a paper mill*
- *Used clothes is collected by Life Line Clothing Sdn Bhd for reuse and recycle*

TRAINING AND DEMONSTRATION

No.	DATE	ACTIVITIES	PHOTO(S)
1	14 Sept 2018	Training and demonstration to International Islamic University Malaysia (IIUM) students	
2	4 Oct 2018	Training for Idrissi School under UMCares Tropical Camp program	 
3	6 Oct 2018	Demonstration and training for P20 community in Pantai Dalam, KL	
4	10 – 13 Oct 2018	Training and demonstration for Bario community in Sarawak	 
5	26 Oct 2018	Training to Professor Dr. Matsumoto and Dr. Mayasari from Kyoto University, Japan together with Dr. Fauziah (ISB) with her students	
6	30 Oct 2018	Training to CEO of Alam Flora, Dato' Zain	 
7	31 Oct 2018	Training and demonstration to Cenergi SEA staffs	
8	21 Nov 2018	Training and demonstration to Pelabuhan Tanjung Pelepas (PTP) staffs that came from Johor	
9	23 Nov 2018	Training for "Waste Less, Save More" programme at Faculty of Arts and Social Sciences	 
10	12 Jan 2019	Demonstration of waste separation at source in Arts Policy, Cultural Democracy and Artist Communities Programme at Pusat Kebudayaan Universiti Malaya	 
11	17 Jan 2019	Training and demonstration to the students from University of RCE Tongyeong, South Korea	 

NO.	DATE	ACTIVITIES	PHOTO(S)
12	27 feb 2019	Training and capacity building to researchers from IIUM and UMT	 
13	27 Feb 2019	Capacity building on integrated waste management to KISEE Delegation from Korea	
14	8 March 2019	Awareness program for officers from CIMB Foundation	
15	18 Mar 2019	Training and demonstration to the representatives from Universiti Malaysia Pahang	
16	22 March 2019	Awareness and capacity building to the Rotary Club Bukit Kiara	
17	27 Mar 2019	Capacity building for UM staff from JPPHB in "Kursus Pengurusan Pembajaan dan Penggunaan Bahan Organik Untuk Tanaman"	 
18	30 Mar 2019	Training and demonstration to Leo Clubs including 9 schools in Klang Valley	 

NO.	DATE	ACTIVITIES	PHOTO(S)
19	5 april 2019	Awareness program with Dr. Paul Cornett from American Environmental Health Studies Project	
20	12 april 2019	Training and capacity building for SWCorp staff that interested to transfer the knowledge of composting to Langkawi community	 
21	17 Apr 2019	Awareness program and integrated waste management system training to the students from Environment and Recycle Club, SMK Seri Pantai.	
22	06 May 2019	Awareness program for students from Faculty of Engineering	
23	09 May 2019	Training on integrated waste management system for INTEC Education College representatives from Shah Alam, Selangor.	 
24	01 Jul 2019	Training and demonstration to students from Philippines Science High School	 

NO.	DATE	ACTIVITIES	PHOTO(S)
25	22 july 2019	Awareness program and demonstration on foo waste treatment to delegates from India	 
26	08 Aug 2019	Capacity building and awareness program on recycling in University of Malaya campus in collaboration with Alam Flora Sdn. Bhd	 

INNOVATION/TECHNOLOGY/KNOWLEDGE TRANSFER

#1 Knowledge transfer on implementation of integrated waste management system at P20 community in Pantai Dalam **(Completed)**






#2 Food Bank program in collaboration with TESCO Malaysia **(Completed)**

COMPLETED

Meeting with Food Aid Organisation (FOA)

COMPLETED

TESCO

Initial communication with potential collaborator, TESCO Malaysia

COMPLETED

Meeting between FOA and TNC (HEPA)

COMPLETED

Meeting between UM Eco Campus and TNC (HEPA)

COMPLETED

Project execution and management by HEPA UM in collaboration with Food Aid Foundation supported by UM Eco Campus and UM ZWC

#3 Knowledge transfer on food waste composting to 4 communities in Bario, Sarawak (**Completed**)

1 – Kampung Bario Asal community

2 – Bario Primary School community

3 – Pekan Bario community

4 – Pa'derong community

Reperesentatives from Kampung Bario Asal community

Reperesentative from Pekan Bario community

Reperesentative from Pa'derong community

Reperesentatives from Bario Primary School community

#4 Knowledge transfer on technology of food waste composting in urban area (in progress, 15%)





UM ZWC COMMUNITY ENGAGEMENT

Community	Community involvement and participation	Impact
P20 Pantai Dalam, Kuala Lumpur	70 people **Targeted group** • Housewives • Business owner (SME)	Successfully implemented awareness and motivation on separation at source at P20 local area. This project had full-support from YB. Fahmi, MP Lembah Pantai
Bario, Sarawak	120 people **Targeted group** • Primary school students • Housewives • Community leaders	Successfully setting up compost pile at each targeted location in Bario, Sarawak as technology transfer
Taman Sri Sentosa, Kuala Lumpur	100 people **Targeted group** • Housewives • Business owner (SME)	Initiated preliminary discussion with the local community in Taman Sri Sentosa with the support from YB. Fahmi, MP Lembah Pantai


YB. Fahmi, the Member of Parliament (Lembah Pantai)


Mascorn and Satay Putera


Alam Flora Sdn Bhd


Food Aid Organisation (FOA)


Cenergi SEA Sdn Bhd


Kyoto University, Japan


Pelabuhan Tanjung Pelepas (PTP), Johor


IIUM and UMT


Delegacy from Korea Institute of Sustainable Design and Educational Environment (KISEE)


CIMB Foundation


Rotary Club Bukit Kiara


American Environmental Heath Studies Project


International Islamic University Malaysia (IIUM)


Leo Clubs (including 9 schools in Klang Valley)


SWCorp


SMK Sri Pantai


INTEC College

17 NETWORKING AND LINKAGES

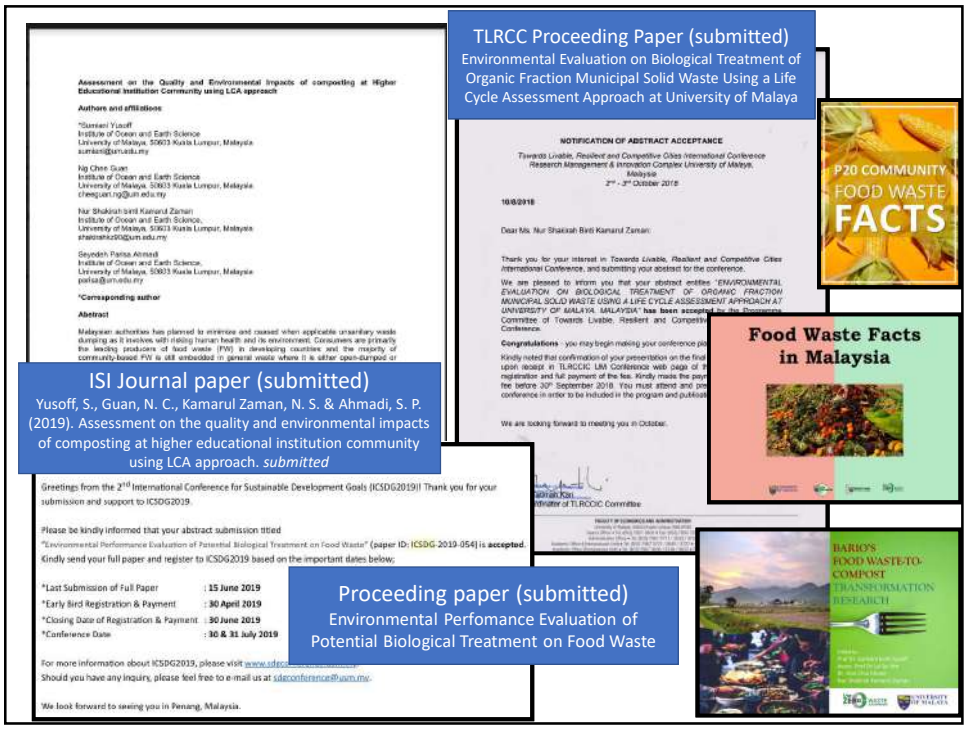
PUBLICATION(s)

21 presentations
1 ISI journal paper
2 proceeding papers
3 Fact books

21 PRESENTATIONS

1	PRESENTATION. Jaron Keng. (2018). Integrated Waste Management and UM Zero Waste Campaign at UM Zero Waste Campaign site. 14 September 2018.
2	PRESENTATION. Ng Chee Guan. (2018). Integrated Waste Management and Recycling activities by UM Zero Waste Campaign at UM Zero Waste Campaign site. 4 October 2018.
3	PRESENTATION. Sumiani Yusoff. (2018). Integrated Food Waste Management and UM Zero Waste Campaign at Block P20, Kuala Lumpur. 6 October 2018.
4	PRESENTATION. Sumiani Yusoff. (2018). UM Eco Campus and UM Zero Waste Campaign in Malaysia's RCE Symposium at UCSI University Kuala Lumpur Campus. 8 October 2018.
5	PRESENTATION. Jaron Keng. (2018). Solid Waste Management and Composting at SK Bario, Sarawak. 10-13 October 2018.
6	PRESENTATION. Sumiani Yusoff. (2018). University of Malaya Living Labs and UM Eco Campus. Forum on Malaysia's Roadmap Towards Zero Single-Use Plastics at KL Convention Centre. 17 October 2018.
7	PRESENTATION. Sumiani Yusoff. (2018). Initiatives of UM Zero Waste Campaign at UM Zero Waste Campaign site. 26 October 2018.
8	PRESENTATION. Sumiani Yusoff. (2018). Community Composting project at Research Management and Innovation Complex building. 30 October 2018.
9	PRESENTATION. Jaron Keng. (2018). Integrated Solid Waste Management and Food Waste Treatment at UM Zero Waste Campaign site. 31 October 2018.
10	PRESENTATION. UM Zero Waste Campaign Initiatives in UM campus at Research Management and Innovation Complex building. 21 November 2018.
11	Sumiani Yusoff. (2018). University of Malaya Zero Waste Campaign and Green Campus Initiatives. Public Lecture on Awareness Campaign and Integrated Solid Waste Management at Faculty of Art and Social Sciences. 23 November 2018.
12	PRESENTATION. Sumiani Yusoff. (2019). *Initiatif UI GreenMetric dan UM Zero Waste Campaign. Bengkel Perancangan Initiatif Kelestarian UiTM*. 13 January 2019.
13	PRESENTATION. Mairuz Azlan. (2018). UM Zero Waste Campaign as as one of Living Labs in UM at UM Zero Waste Campaign site. 17 January 2019.


22 April 2019. Reinventing the campus: Bridging Collective pathway towards Eco-campus and sustainability
27 April 2019. Presentation on Integrated Waste Management System at musolla.
15 August 2019. Presentation on potential of food waste for resources and energy sources
31 July 2019. Proceeding on Sustainable Eco-Campus
22 July 2019. Presentation on sustainable consumption
25 April 2019. presentation on food bank
April 2019. Presentation on potential of food waste in compost production
8 March 2019. Presentation on f
waste treatment as a potential o
circular economy


TLRCC Proceeding Paper (submitted)
Environmental Evaluation on Biological Treatment of Organic Fraction Municipal Solid Waste Using a Life Cycle Assessment Approach at University of Malaya
ISI Journal paper (submitted)
Yusoff, S., Guan, N. C., Kamarul Zaman, N. S. & Ahmadi, S. P. (2019). Assessment on the quality and environmental impacts of composting at higher educational institution community using LCA approach. *submitted*
Proceeding paper (submitted)
Environmental Perfomance Evaluation of Potential Biological Treatment on Food Waste
P20 COMMUNITY
FOOD WASTE
FACTS
Food Waste Facts in Malaysia
BARIO'S FOOD WASTE-TO-COMPOST TRANSFORMATION RESEARCH

Guideline – Food Waste Treatment: Takakura Home Composting (In Progress)

FOOD WASTE TREATMENT:

Takakura Home Composting

CONTENT

I. Introduction
1. Food waste facts
2. Food waste management
3. Food waste treatment
   a. Anaerobic Digestion
   b. Composting
   c. Mechanical Biological Treatment
4. Advantages of food waste treatment

II. Takakura Home Composting
1. What is Takakura Home Composting?
2. Process of Takakura Home composting
3. Uniqueness of Takakura Home Composting

III. Organic Compost
1. What is organic compost?
2. Use of organic compost (Compounds in organic compost and their use in plants)
3. How to use organic compost on plants?

MINI FIELD TEST OF UM ZWC ORGANIC COMPOST

Plants labelled with C and D are the only plants that use UM ZWC organic compost. The plants show the highest growth rate compared other plants.

Indicator

A – Control
B – Fertilizer
C – Compost + Fertilizer
D – Compost + Reduced Fertilizer (20%)
E – Biochar + Fertilizer

MEDIA APPERANCES

VISITS to UM ZWC site: >800 people

(Sept 18' – July 19')

GANTT CHART 2018-2019

Period	Jan-Feb	Mar-Apr	May-June	Jul-Aug	Sept-Oct	Nov-Dec
Planning for the year's activities						
UM ZWC Open Day event in conjuntion with Earth Day						
Implementation of dry mixed recyclables collection						
Training & communication with stakeholders						
Upgrading of UM ZWC composting facility and UM waste transfer station						
Development of UM Food Bank project						

Way forward

- Planned to work with more communities
- Projected to increase recycling rate by collaborating with Alam Flora Sdn. Bhd.

UMLL005-15SUS
THE RIMBA PROJECT: BIODIVERSITY CONSERVATION BY RECONCILING CITIES AND NATURE

DR. SUGUMARAN MANICKAM
Institute of Biological Sciences
Faculty of Science, University of Malaya

maran@um.edu.my +603-7967 4665

AREAS OF EXPERTISE

Biological Sciences, Biodiversity and Ecology (Conservation and Taxonomy)

RECENT PUBLICATIONS

1. Sugumaran Manickam, David Tan and Benjamin Ong, 2018. Holding onto a mission for conservation and education. In: D. Tan, ed. 2018. SCHEMA case studies. Kuala Lumpur: United Nations University-International Institute of Global Health. pp.13-16. (Non-ISI)
2. Benjamin Ong and Faisal Rafiq Mahamd Adikan, 2018. Challenging land use paradigms in a university context. In: D. Tan, ed. 2018. SCHEMA case studies. Kuala Lumpur: United Nations University-International Institute of Global Health. pp.17-20. (Non-ISI).
3. Benjamin Ong Jia Ming, Nurul Fitrah Marican, Sugumaran Manickam and Vanessa Ting Ching Ching, 2017. The Rimba Project: Putting urban biodiversity conservation on the map. In: [Living Lab edited volume; fully referenced details with SuSci]
4. Benjamin Ong Jia Ming, 2017. The Backyard Before You, 2017. The Rimba Project, University of Malaya
5. Sugumaran Manickam, Siti Norasiah Abd Kadir, Affan Nasaruddin, Benjamin Ong, Venssa Ting, Nurul Fitrah Marican, Hamidah Mat, Natasha Tajuddin, 2018. Backyard Wildflowers. [Poster]
6. Sarinder Kaur Dhillon, Sugumaran Manickam, Halijah Ibrahim, Melasutra Md Dali, and Maszairizam Masri, 2017. A Virtual Reality Application on Plants in University of Malaya. In: [Living Lab edited volume; fully referenced details with SuSci]

CO-RESEARCHERS (FACULTY)

1. Mr. Benjamin Ong Jia Ming (Urban Biodiversity Initiative [UBI], benjamin@dimanajua.com)
2. Ms. Nurul Fitrah Mohd Ariffin Marican, The Rimba Project, fettrah01@gmail.com)
3. Associate Professor Dr. Zeeda Fatimah Mohamad (Department of Science and Technology Studies, zeeda21@um.edu.com)
4. Associate Professor Dr. Sarinder Kaur Kashmir Singh, Department of Bioinformatics, Institute of Biological Sciences, sarinder@um.edu.my
5. Mr. Tan Kai Ren, The RIMBA Project, tankairen@outlook.com)

Core Area of UM Eco-Campus Blueprint

Contribution to Sustainable Development Goals (SDGs)

PROJECT SUMMARY

The Rimba Project (RIMBA) is a campus greening and biodiversity conservation project working with the UM Deputy Vice-Chancellor (Development) and Estates Department (JPPHB) to improve greening and landscaping practices, and with the Rimba Ilmu Botanic Garden in nature education and outreach. RIMBA aims to increase awareness and appreciation of biodiversity in the city. RIMBA's objectives are to document and promote urban nature within and outside the University of Malaya campus, to enhance Rimba Ilmu's conservation and nature education facilities, and to conduct nature education and outreach initiatives. RIMBA aims to produce educational materials such as guides, and continue its tree/plant documentation and awareness initiatives by broadening the effort to Lingkungan Budi trees. RIMBA will maintain its online presence by creating and communicating content relevant to Rimba Ilmu, conservation and/or urban biodiversity on social media and its website. RIMBA's conservation nursery initiative will see its plants documented and inventorised, and run community engagement (CE) programmes. Lastly, RIMBA will continue providing guided walks and awareness programmes in Rimba Ilmu and UM. Conservation follow-up with JPPHB will be maintained, and RIMBA will continue to push for a campus greening policy via its Greening Roundtable initiative.

Research Assistant

Mr. Tan Kai Ren
Final Year Ecology and Biodiversity, Institute Biological Sciences, Faculty of Science,UM
tankairen@outlook.com

rimba

the RIMBA project

Final Report: August 2019
for
Living Lab Grant Evaluation

A Brief History of *The Rimba Project*

2011 UM Biodiversity Map
Limited release UMCARES publication

Late 2013 Dr. Zeeda's call
No systematic approach to documenting and promoting campus biodiversity.
Mission of new project was to address:
Campus greening and biodiversity documentation
Capacity building of students and staff

Apr 2014 On Earth Day, RIMBA officially starts as a UMCares flagship project

Oct 2014 UM Biodiversity Week—Mass volunteer recruitment

Dec 2014 The Section 12 Project—Convincing the higher powers

Feb 2014 Living Lab Research Grant—The Rimba Project with 3 staff members under new "twin-TNC" funding/management system

The Rimba Project: Objectives 2015

conserve educate

1. ***Integrating campus greening, conservation and landscape management.***
2. ***Supporting nature education and outreach at Rimba Ilmu.***
3. ***Capacity building for citizen science and conservation.***

Items	Progress
UM forest cover report (2018 update) – UIGM	Completed
Baseline carbon stock calculation of UM forest fragments	Completed
1 half-day workshop/seminar or equivalent	Completed
10 guided walks in Rimba Ilmu or equivalent	Completed
1 interpretive nature education poster	Completed
2 community engagement programmes	Completed
1 MoU/MoA	Completed
1 print/digital publication: book, booklet, chapter in edited volume OR peer-reviewed paper	Completed
1 nature education module OR 1 biodiversity report	Completed
Income generation: RM1,000	Completed

rimba

Project Target Achievement

- **UM forest cover report.** This year, we merged the KK11 and KK12 forest fragments, and introduced a new site (no. 10) east of Padang Varsiti.
- UM's forest cover stands at approximately 32%, and **increase of 2%** from the initial FRIM report in 2013.
- The forest edges along the SPRINT Highway **remain threatened** by encroachment, especially due to construction of billboards.

Table 2. Change in forest cover of 14 sites from 2014 to 2018 (1 ha = 10,000 m^2).

No.	Location	July 2014 Area (m^2)	April 2016 Area (m^2)	Oct 2018 Area (m^2)
1	Bt Arang/R. Ilmu	641,352	641,352	672,000
2	Bt Cinta/Sprint	106,000	106,000	116,000
3	KK4/Sec 16	95,742	81,055	98,700
4	KK8/Sec 16	61,691	54,676	72,300
5	Law/KK1	37,778	30,850	38,100
6	Eng/PJ Gate	27,423	19,527	29,600
7	APM/Science	27,140	25,837	30,200
8	INTAN/Arts	26,617	16,394	27,600
9	KK11/KK12	31,539	28,878	47,400
10	Padang/Sprint	-	-	6,310
11	FPP/PJ Gate	9,784	9,784	12,300
12	KK7 (west)	7,923	6,730	8,310
13	FBL/Arts	6,825	6,825	9,120
14	KK7 (east)	5,334	5,230	7,560
	TOTAL	**1,085,147**	**1,033,137**	**1,175,500**

rimba

Project Target Achievement

Table 3. Carbon stock calculation of UM Forest Fragments (1 ha = 10,000 m2)

No.	Location	Area (m^2)	Area (ha)	Carbon Stock (tonne)	Percentage (%)
1	Bt Arang/R. Ilmu	695,429	69.54	7,642.76	58.44
2	KK3/KK8 (Link)	182,899	18.29	2,010.06	15.37
3	Bt Cinta/Sprint	121,073	12.11	1,330.59	10.17
4	KK11/KK12	46,017	4.60	505.73	3.87
5	APM/Science	34,116	3.41	374.93	2.87
6	INTAN/Arts	32,853	3.29	361.05	2.76
7	Law/KK1	23,855	2.39	262.17	2.00
8	Eng/PJ Gate	21,479	2.15	236.05	1.81
9	FPP/PJ Gate (UMSC)	13,739	1.37	150.99	1.15
10	PPUM/Federal	6,320	0.63	69.46	0.53
11	Padang/Sprint	6,155	0.62	67.64	0.52
12	KK7 (east)	5,987	0.60	65.80	0.50
	Total	1,189,922	118.99	13,077.24	100.00

Baseline Carbon Stock Calculation in UM. The total carbon stock that the forest fragments in UM possess shown in Table 3 is an underestimation of the actual amount of carbon as it is only the measurement of the living carbon stock (Choo, 2016). The soil organic carbon (SOC) was not considered. An estimation of the SOC in forest fragments found in UM is 76 t C ha-1, similar to a rehabilitated forest plot in Kenaboi forest reserve in Abdullahi's (2018) study. The addition of SOC will increase the estimate of the total carbon stock in UM's forest fragments to 185.90 t C ha-1 or 22,120.24 t C. With a valuation at USD $7 per tonne of Carbon (Matthew et. al, 2018), these forest fragments have an estimated valuation of $154,841.68 or **RM636,399.30** (USD 1= RM 4.11).

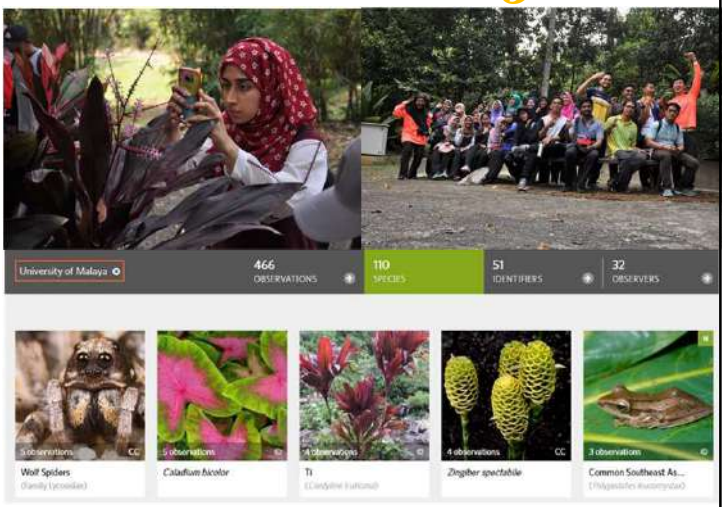
rimba

Capacity building

60 *participants*

5 *sessions*

Rimba Ilmu Biodiversity Survey (RIBS) is a capacity building workshop that spans across two days with 5 sessions. Our objective is **to expose our volunteers to the iNaturalist app that we will be using for the upcoming City Nature Challenge 2019.**



rimba

Capacity building

9 *half-day workshops*

iNaturalist workshop is a detailed training programme that aimed to help the public and our partner in the Klang Valley City Nature Challenge 2019 to understand how to use the iNaturalist platform. The training covers how to create projects, how to submit good data, how to take pictures and how can they use iNaturalist for their own activities in the future.

rimba

Innovation/technology Knowledge transfer

***1** nature education poster*

***13** guided walks*

rimba

Innovation/technology Knowledge transfer

***18** community engagements*

SL2 community park programme is a community engagement programme organised by UTAR that brings several organisations including Putra Hospital Kajang, Majlis Perbandaran Kajang, Malaysian Nature Society, SL2 Residential Association and The Rimba Project.

A weekly activity that allow volunteers to be involved in activities such as the maintenance of the Rimba Ilmu Botanic Garden

2 ***nature education module***

rimba

Innovation/technology Knowledge transfer

Example of tree tag sponsored via crowdfunding

This tree upkeep activities involved straightening the trees, some minor pruning and leaf mulching

Innovation/technology Knowledge transfer

City	Observations	Species	People
"Cape Town, South Africa"	53763	4588	1141
"La Paz, Bolivia"	46931	3005	1500
"San Diego County, CA, USA"	38241	3019	1188
"San Francisco Bay Area, CA, USA"	38028	3183	1947
"Tena, Ecuador"	37965	2653	1185
"Klang Valley, Malaysia"	37916	3020	518

Observations: 37,916 (6th)
Species: 3020 (6th)
Observers: 518 (19th)
Identifier: 388
Research Grade Observations: 2931
Research Grade Species: 577

Among cities with the similar population size with us (>5 million people), we are placed No.2 in Observations and No.5 in Species!

Among cities with similar area size with us (2500-5000km2), we are placed No.2 in both Observations and Species, and No.3 in Observers.

By climate, Klang valley is No.2 in Observations, No.1 in Species and No.3 in Observers among cities near the Equitorial.

We are **top in Asia in Observations** and 2nd in both Species and Observers

This year, we recorded **1707 new species** in Klang Valley that were not recorded before the CNC 2019.

We also had 177 new identifiers in Klang Valley! Which means we have more seasoned naturalist joining us!

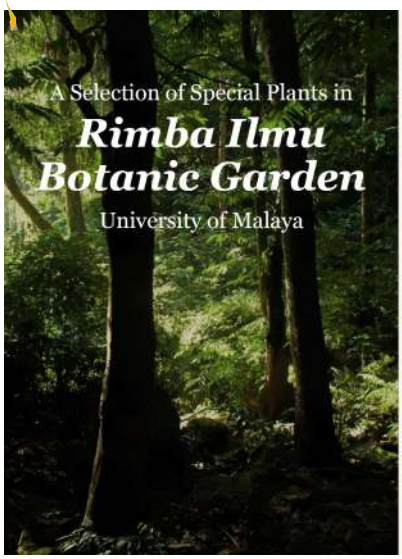
Among cities that participated in 2018 CNC, we are 2nd in terms of the **increase in Observations with 12,629** observations more than the previous year! Besides, we are also the city with the most number of species increased!

Each of our participants are recorded 73.2 observations on average which is at the 6th place among the cities!

Article

rimba
urban biodiversity

Digital publication



A Selection of Special Plants in
Rimba Ilmu Botanic Garden
University of Malaya

Tan Kai Ren
&
Sugumaran Manickam

UNIVERSITY OF MALAYA · RIMBA ILMU · the rimba project

rimba
urban biodiversity

Networking & Linkages

City Hall signs MoU to promote food production by local communities

NEW STRAITS TIMES

DBKL to produce local food through neighbourhood community project

1 ***MoU***

DBKL LA21 Office – Projek Kebun Kejiranan LA21 KL

Sinar

Metrai MoU tambahan Projek Kebun Kejiranan LA21

rimba
urban biodiversity

Media Appearances


優大聯合4機構
展開植樹勞作活動


拉曼大學與多個機構 攜手植樹綠化環境

rimba
urban biodiversity

2019 Plan

Project achievement
UM green cover report
Total area on campus covered in planted vegetation and total area on campus for water absorption besides the forest and planted vegetation (%) – criterion sets by UI GreenMetric World University Ranking
Tagging trees along the main road in UM (at least 50 trees) – with JPPHB

Innovation/technology/ knowledge transfer
1 creative nature education programme (i.e poetree/theatre)
10 guided walks in Rimba Ilmu or equivalent
Urban wildlife roadkill mapping (digital)
1 site of wildflower patch
Nature around us
Maintenance of Rimba Ilmu website

2 community engagement
tree maintenance and gotong-royong

Publication
1 video documentary

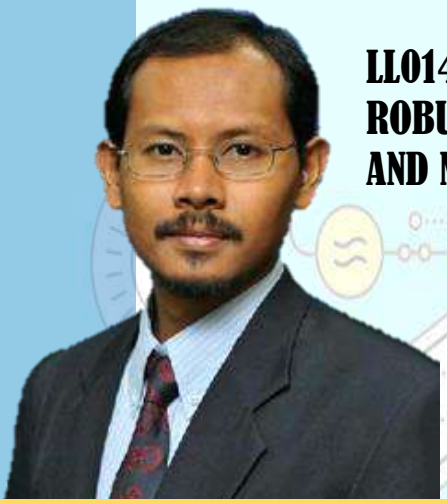
Policy Papers/ Guidelines/ Standards
University of Malaya Biodiversity Action Plan or Report on Long-tailed Macaque Sleeping Tree

Others
Income generation – RM 2,000

UNIVERSITI MALAYA

UNIVERSITY OF MALAYA LIVING LABS

UM ECO-CAMPUS



LL014-16SUS
ROBUST SMART MODULAR ELECTRICAL ENERGY MONITORING AND MANAGEMENT SYSTEM FOR ENERGY SAVING

DR. MOHD YAZED AHMAD

Department of Biomedical Engineering,
Faculty of Engineering, University of Malaya

myaz@um.edu.my

+603-7967 7695

AREAS OF EXPERTISE

Smart Space, IoT Embedded System, Instrumentation, Wireless Power Transfer

RECENT PUBLICATIONS

1. MR Basar, MY Ahmad, J Cho. An Improved Wearable Resonant Wireless Power Transfer System for Biomedical Capsule Endoscope, IEEE Transactions on Industrial Electronics, 2018.
2. UM Living Lab Volume I: Transforming Research Into Action (2018), University of Malaya Press, Kuala Lumpur
3. Guideline on Energy Monitoring and Management for Energy Saving in University of Malaya (2018) – UM Eco-Campus Secretariat & UM Living Labs

CO-RESEARCHERS (FACULTY)

1. Dr. Fathi Alias
(UM Power Energy Dedicated Advanced Centre UMPEDAC, fathi@um.edu.my)
2. Professor Dr. Faisal Rafiq Adikan
(Faculty of Engineering, rafiq@um.edu.my)
3. Dr. Ahmad Khairi
(Faculty of Engineering, khairi@um.edu.my)
4. Dr. Khairunnisa Hasikin
(Faculty of Engineering, khairunnisa@um.edu.my)

Core Area of UM Eco-Campus Blueprint

PROJECT SUMMARY

In this study, we aim to further improve our proposed smart adaptive electrical power monitoring and management system under the purview of UM Living Lab Project. The system consists of easy-to-install power-monitoring units along with sensor modules. The sensor modules provide key parameters for power saving algorithm. The unit has capability to automatically control and set the optimum temperature for the air conditioning units and turns it off when it is not needed especially when there is no recipient within the monitored room or space. Depending on the presence of human in the room/space, other appliances such as fluorescent lamp can be conveniently switched off. Although this technique sounds simple, however, until now such system is not been fully investigated and implemented campus-wide. The component cost for such a system is minimal as compared to benefits and saving that it could offer. Our first phase study indicated that a systematic saving by at least 4 % was possible. For this second phase of UMLIVING LAB PROJECT we targeted to achieve saving by at least 8 %, equivalent to monetary savings surmount to RM240,000.00 considering Faculty of Engineering University of Malaya alone. This study suggests with that amount of monetary savings, UM could utilize it for other important areas such as to promote further research in green technology, improving campus-wide facilities, promote students and staff engagement to increase productivities, etc.

Contribution to Sustainable Development Goals (SDGs)

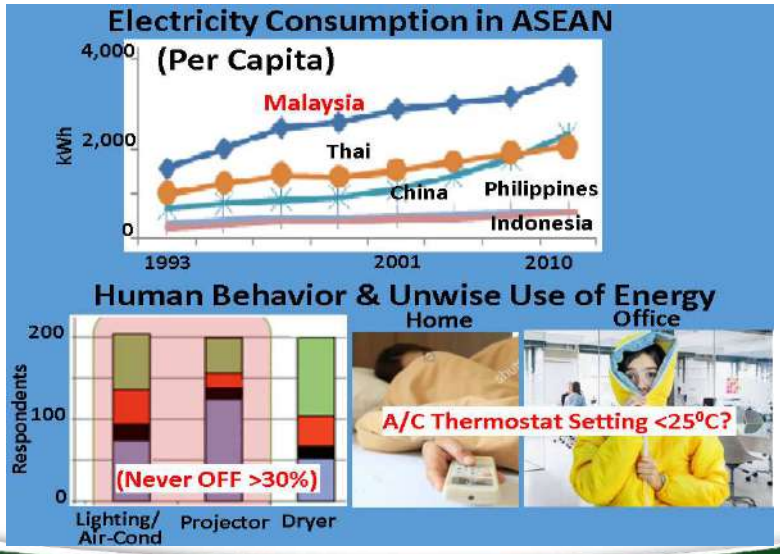
Research Assistant

Ms. Nur Riayana Jasni
(BSc. Electronic Engineering, Faculty of Electrical and Electronic Engineering UTHM)
nurriayanajasni@gmail.com)


Sustainability Science
SWITCH MODULE
Cloud-Linking Module
A Central Module
Robust Smart Modular Electrical Energy Monitoring and Management System for Energy Saving.
By: Dr. Mohd Yazed Bin Ahmad, Faculty of Engineering, UM

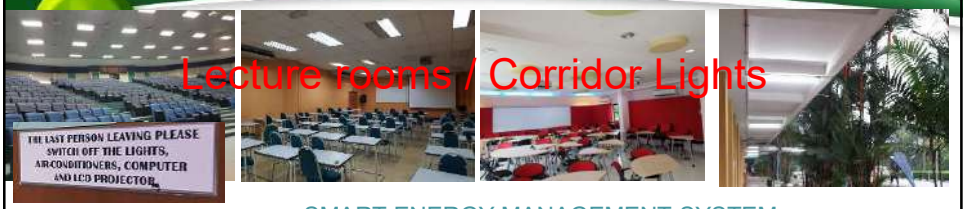

UNIVERSITY OF MALAYA LIVING LABS
Outline
1) PROBLEMS & OPPORTUNITIES
2) Objectives
3) Methodology
4) Activities & Gantt Chart
5) Outcomes
6) Budget
7) Future Plan
8 Core Areas
8 CORE AREAS OF UM ECO-CAMPUS BLUEPRINT (UMECB)
UNIVERSITY OF MALAYA
UNIVERSITY OF MALAYA LIVING LABS
UM ECO-CAMPUS
UM LLGP

PROBLEMS & OPPORTUNITIES



PROBLEMS & OPPORTUNITIES

1. Introduction (Cont'd)

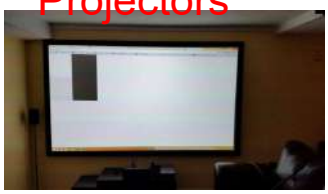


Lecture rooms / Corridor Lights

SMART ENERGY MANAGEMENT SYSTEM IS NEEDED!!!

Desired features:
- Simple to deploy & user friendly
- Existing building
- No renovation / rewiring
- Minimal maintenance
- Reliable

Projectors



Air conditioning Split units

Benefits: Reduce unnecessary operating cost, Reduce CO_2 Emission, Convenient, & comfort, correct temperature setting, Prolong life time of electrical appliances (Light bulb, Projector, A/C, etc,)

2) Objectives

AIM: *To develop smart modular adaptive electrical power management system (Simple to deploy, User friendly, Minimal maintenance, Reliable, and affordable) for energy saving in current and future buildings especially in University of Malaya.*

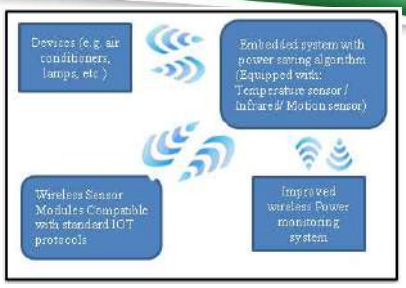
Objectives:

- *To **improve previous design** (modular adaptable power monitoring units and sensor modules – Robust & Reliable)*
  - *sense temperature, light intensity, physiological state and comfort level of human/recipient inside a space.*
- *To enable system **expandability & Easy maintenance***
  - *Compatible with existing open source/commercial IOT systems., Switch Module for multi-switch*
- *To conduct a **pilot study***
  - *evaluate practicality and the efficacy of the proposed system to the existing systems.*

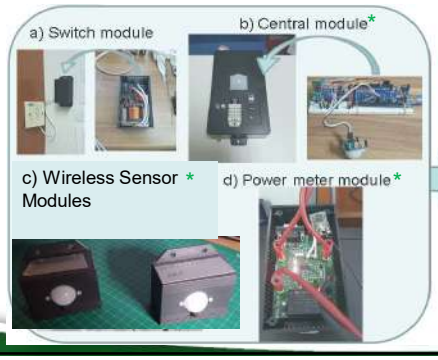
To deploy to buildings in UM for better energy reduction impact.

3) Methodology

HOW DO WE SAVE ENERGY?

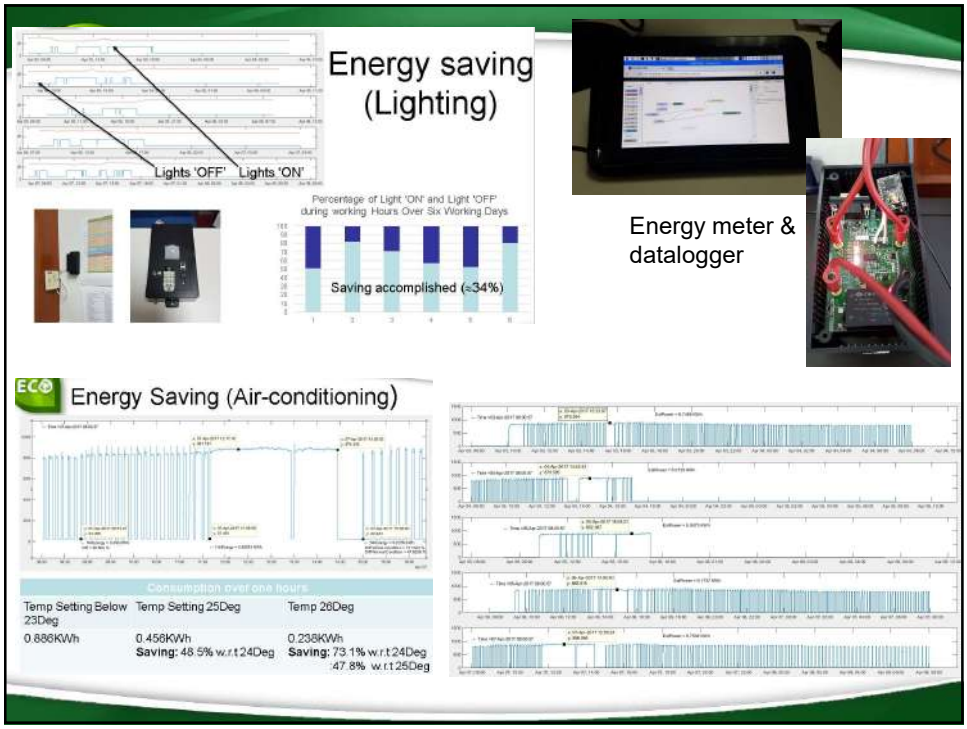


Sustainable Energy Hierarchy



Integration

Compatible with open source system



Activities:

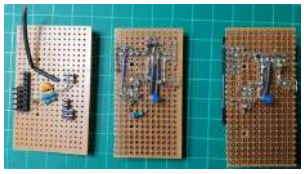
- Improving modules:
  - Switch module
    - Reduce microprocessor current
    - Reduce transient effects
  - Sensor module
    - Eliminate False detection, ultra-low power
  - Central module
    - Coordinate multiple sensors, ultra-low power
  - Energy meter
    - Adaptive logging

Switch Module

Switch module at Block D, FK

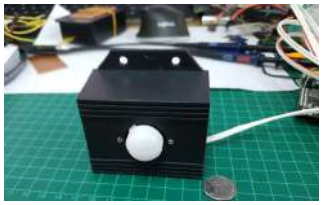
Switch module at Embedded System Lab Block C, FK

Sensor Module/ Central Module



Earlier version

Improved version



Current version (Suitable for Mass production)

Energy Meter






Customize Energy Meter

Networking & Linkages

Discussion with Orthobiz Sdn. Bhd.

Discussion with TDP Engineering


Discussion Outcome with QASK Engineering

Discussion with QASK Engineering

4) Gantt Chart & Activities

Activity	Months											
	1	2	3	4	5	6	7	8	9	10	11	12
Collect data without the implementation of the proposed system (more buildings)	✓	✓										
Identify strategic area and appliances, improving the previous module		✓	✓	✓	✓							
Fabricate & test improved robust version				✓	✓	✓						
Integration over the existing open source						✓	✓	✓				
Conduct case study extend to more buildings								✓	✓	✓		
Publications											✓	✓

5) Outcomes

No	Category	(Expected results)	
1	Project Target Achievement (Measurable / Quantifiable, e.g: % reduction, savings etc)	Tangible data that supports: **UMECB, UIGM, and LCCF** • Power saving at least by 8%, Financially we could save around RM240,000.00 per year. • Reducing CO2 Emission by approximately 8%	90%
2	Capacity building (e.g. seminar, demonstration, training)	Demonstration & Workshop on how the system works.	100%
3	Innovation/technology/knowledge transfer	Robust version of modules	90%
4	Community Engagement	Can be adopted in the existing buildings in our university including residential colleges. It is of interest for domestic use to help community reducing their electricity bills thus at the same time reducing CO2 emission in our country.	100%
5	Networking & Linkages	Involvement from private company, collaboration with other project, other university stake holders.	100%
6	Publications (e.g. journal paper, book)	At least one publication	100%
7	Policy Papers / Guidelines/ Standards	A guideline on usage of smart monitoring system	80%
8	Others	Prototype / Possible income generation from IP, and commercialization. Enable system integration with existing open source/commercial IOT systems.	100%

7.How to sustain this project

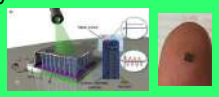
- Apply related grants Internal/External
  - Submitted proposals
    - Prototype Grant (Proposal Presented)
    - IIRG (Proposal Presented)
- Modules for trainings
- Involvement from students as volunteers.

Future PLAN

Conduct comprehensive Energy Management case study
- Deploy the developed modules to strategic locations
- Continuous monitoring & Saving..

Optimize Sensor modules for totally free maintenance
- Smart data transfer mechanism
- Energy harvesting
- Smart energy management at IR4.0 aspect
- Bigdata management
- AI, Deep-Learning

Security



Team Members

Dr. Ahmad Khairi
Expertise: Process Control
Department Of Biomedical Engineering
Faculty Of Engineering

Dr. Mohd Yazed Ahmad
(Project Leader)
Expertise: Instrumentation
Department of Biomedical Engineering
Faculty Of Engineering

Prof. Dr. Faisal Rafiq Adikan
Expertise: Integrated Optical Devices
Department of Electrical Engineering
Faculty of Engineering

Dr. Khairunnisa Hasikin
Medical Informatics
Department Of Biomedical Engineering
Faculty Of Engineering

Dr. Fathi Alias
Expertise: Power Electronics
Um Power Energy Dedicated Advanced Centre (umpedac)
Deputy Vice Chancellor(research & Innovation)

UNIVERSITI MALAYA

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UM ECO-CAMPUS

LL023-16SUS
UNIVERSITY OF MALAYA LIVING LAB SYSTEM (UMLB)

DR. SORAYYA MALEK
Bioinformatic, Institute of Biological Sciences,
Faculty of Science, University of Malaya

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AREAS OF EXPERTISE

Ecological Informatics
Water quality predictive modeling
Data mining biodiversity and water

CO-RESEARCHER (FACULTY)

Dr. Pozi Anak Milow (Institute of Biological Sciences, Faculty of Science, UM, pozimilow@um.edu.my)

RECENT PUBLICATIONS

1. University of Malaya Living Lab System in "UM Living Lab – transforming research into action" (2018) Sumiani Yusoff (ed). UM PRESS
2. University of Malaya Living Lab System in "UM Living Lab – training Module" (2018) Sumiani Yusoff (ed). UM PRESS
3. Ecosystem Monitoring Through Predictive Modeling in Encyclopedia of bioinformatics and computational biology: Abc of bioinformatics. (2018). S.l.: Elsevier

Core Area of UM Eco-Campus Blueprint

Contribution to Sustainable Development Goals (SDGs)

PROJECT SUMMARY

University of Malaya living Lab system (UMLLS) and its sub module The University of Malaya Hydrological System (UMH20) allows for effective and efficient maintenance and monitoring of data produced in the University of Malaya that requires well-documented, validated, and coherent data archives. UMLB system facilitates reports generation and data visualization for KETTHA and University Green Index's that is in line with Low Carbon Cities Framework (LCCF). Meanwhile UMH20 is an environmental system in the campus for the protection and conservation of water bodies in University of Malaya. UMLB and UMH20 application generic and is not limited to University of Malaya environmental and water bodies and can be used for other water bodies and universities that are interested in managing environmental data.

Research Assistant

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University of Malaya Living Lab System (UMLBS) : A SYSTEM APPROACH TO MANAGING UNIVERSITY OF MALAYA GREEN INDEXS DATA

Sorayya Malek
Cham Hui
Pozi Milow

Introduction

- University of Malaya living Lab system (UMLBS) and its sub module The University of Malaya Hydrological System (UMH20) allows for effective and efficient maintenance and monitoring of data produced in the University of Malaya that requires well-documented, validated, and coherent data archives.
- UMLB system facilitates reports generation and data visualization for KETTHA and University Green Index's that is in line with Low Carbon Cities Framework (LCCF).
- Meanwhile UMH20 is an environmental system in the campus for the protection and conservation of water bodies in University of Malaya.
- UMLB and UMH20 application generic and is not limited to University of Malaya environmental and water bodies and can be used for other water bodies and universities that are interested in managing environmental data.
- University of Malaya is a pioneer in using a system approach in managing university green data.

Objectives

- *To test, implement and evaluate the avaliable modules of UMLB online to be used by University of Malaya reserachers and admistrative units.*
- *To enhance the existing system modules to cater for UI green index and KETTHA report and data generation.*
- *To enhance existing system to incorprate data collection, establishing baseline and reporting of findings of the baseline for LCCF data on University Malaya.*

Developed System

- The University of Malaya Living Lab system (UMLB) http://umlivinglabsystem.com will aid in reports generation and data visualization for UI Green Index and Kettha.
- This is in line with Low Carbon Cities Framework (LCCF) that is already implemented in University of Malaya.
- The system will archive data that needs to be used to ensure effective management of university Malaya carbon emission.
- The the system includes data management, data collection, establishing baseline and reporting of findings of the baseline.
- The current system consist of :
  - Waste
  - Biodiversity
  - Electricity
  - Landscape
  - UMH20 water module

Biodiversity Module

The biodiversity module allows uploading of biodersity data as well as real time species check in using mobile phone. The data stored will be used to generate various reports one example is carbon emission. Species richness and biodiversity at a particular area can be displayed on Google earth which is an important information for Biodiversity management

Waste Management Module

"UMLBS and UMH2O module overview

Waste data can be displayed based on their sampling point location and the details of the waste generated can be viewed using a pop up window. The report can be saved in an excel format. Besides display on map various graphical report on waste can be generated as well. UMMLS also allows report generation for e.g LCCF

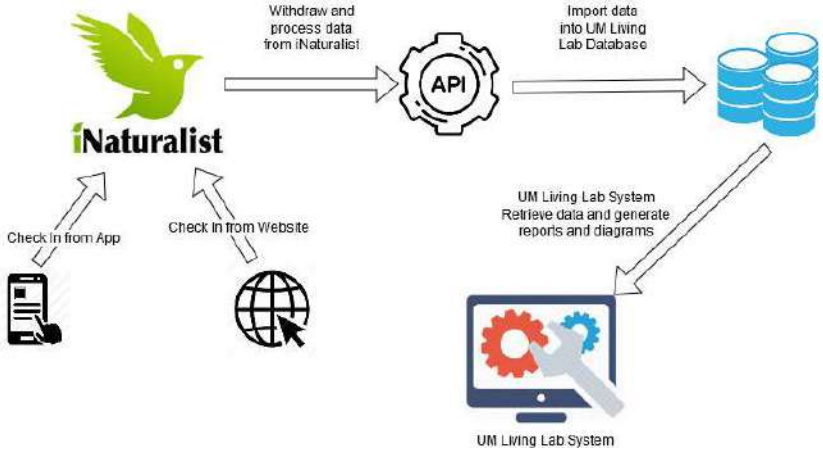
Electricity Module

The module allows data archival of all information needed to generate various electricity reports. The electricity usage and EEI and EBI can be displayed for each sampling point on Google earth. The reports can be downloaded in excel.

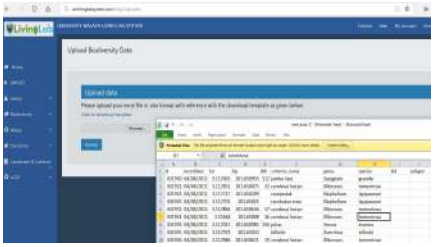
UMH2O

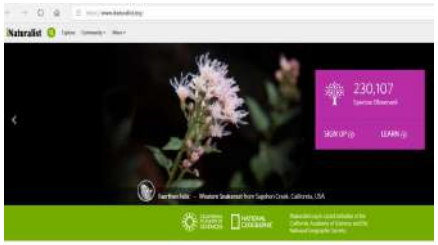
UMH2O allows water quality management using WQI index that is represented using varying color and shape on Google earth platform. The shape and color is auto generated based on the water quality status. The data can be downloaded using simple excel file. Pop up window containing detailed information of the water quality status can be viewed. This method of water monitoring can be applied to any type of water bodies.

Biodiversity Module

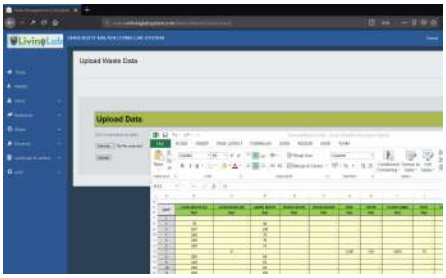


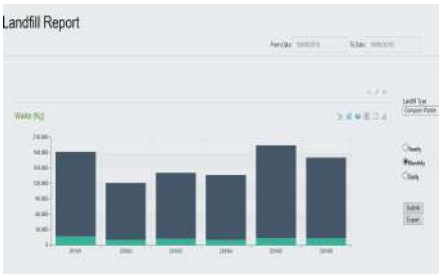
Biodiversity

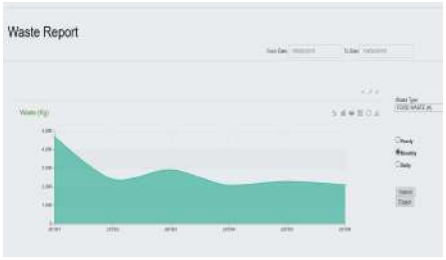


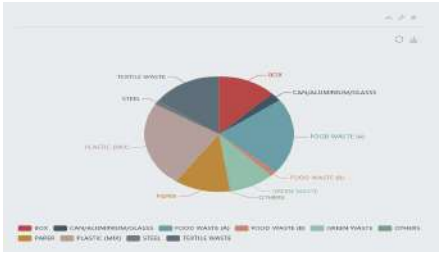


Waste

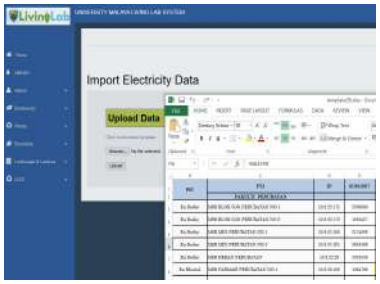


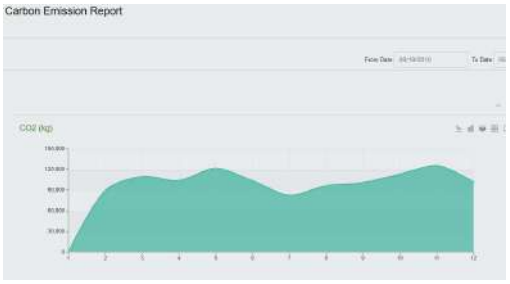


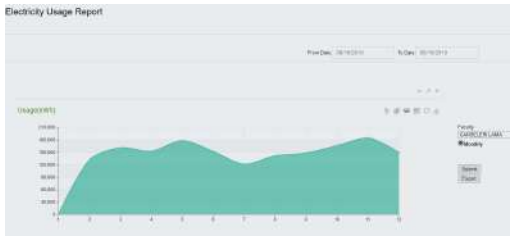


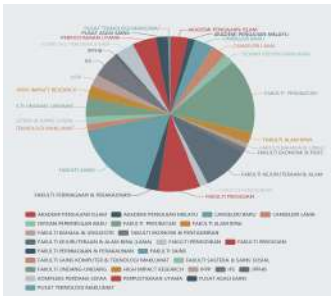


Electricity



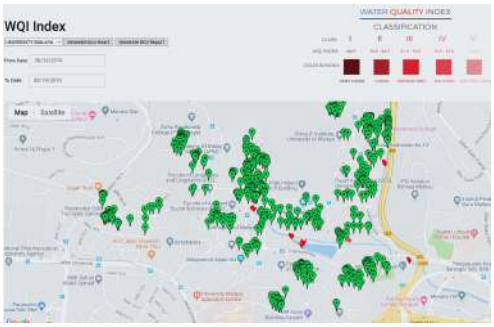


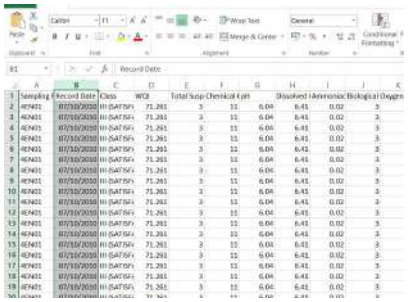




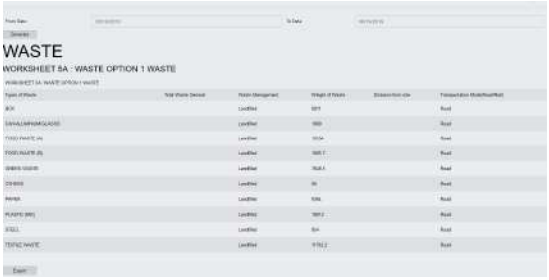
LANDSCAPE

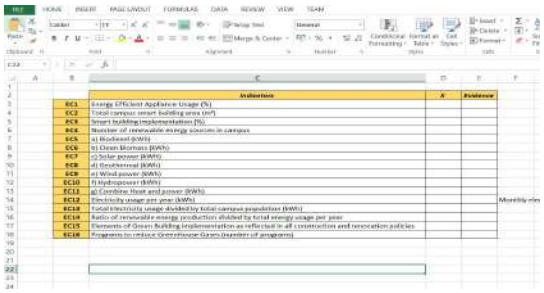
UMH20





LCCF Green INDEX





KPI

Category	(Please state expected results)
Project Target Achievement (Measurable / Quantifiable, e.g: % reduction, savings etc)	Effective management of data required for LCCF and diamond ratings. Total carbon emssion calculation for University of Malaya.
Capacity building (e.g. seminar, demonstration, training)	• Seminar for administrative units and researcher in University of Malaya for water, biodiversity, waste , electricity , eco campus and LCCF based data management. • Seminar on Energizing Sustainable Development April 25 2019 • KLCC exhibition IGEM October 2018 • Invited speaker on Biodiversity Data Management Dec 2018
Innovation/technology/knowledge transfer	UMLB system http://umlivinglabsystem
Community Engagement	The UMH20 can be used for surronding river water quality management and University of Malaya community in determining the carbon emission for the University.System is on testing phase and will be used to collect data on waste , electricity and biodiversity.
Networking & Linkages	
Publications (e.g. journal paper, book)	Book Chapter Journal submitted
Policy Papers / Guidelines/ Standards	Help file and youtube vidoe on using the system System training manual
Others	LY2017003875 copyright for UMH20 Copyright for UMLB system

Project continuation Plan

a) Install and test the system in JPPHB server
b) Test the system out in the real environment setting and other universities
c) Test the system usage for generating Green Index's data for 2019
d) Train the JPPHB ad Eco campus staff in managing system for monitoring University of Malaya Lake , electricity module
e) Add intelligent system to predict E.coli in water using machine learning approach
f) Enhancement on Waste module – include financial module to calculate waste and transportation costs
g) Electricity Module –make system more dynamic and able to be used by JPPHB electrical department
h) Landscape – import the GIS biodiversity of UM and landscape GIS
i) Water module. The current system has the module for energy consumption in university of Malaya for each administrative building and residential colleges. The water consumption module will be added and based on the data stored water savings can be calculated automatically.
j) Improve the reporting for LCCF and Green Index

Activities

Conclusion

- The UMLB (University of Malaya Living Lab) system is developed to archive fragmented data (biodiversity , Energy , Waste) to be processed and presented into a standardized format for data transfer and manipulation to solve the issues of data standard, data sharing and data incompleteness.
- The second phase of UMLB system will cover transportation, landscape and water module. Users and researchers can access the system easily with internet connections for data exchange and generation of reports and calculation of carbon emission.
- Visualization of data captured can be useful for the University of Malaya management to plan ahead for achieving a higher ranking for LCCF diamond ranking.

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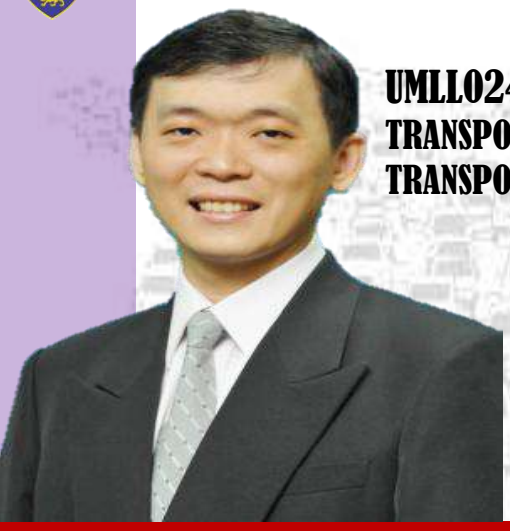
UM ECO-CAMPUS



UMLL024-16SUS
TRANSPORTATION SYSTEM MANAGEMENT: DEVELOPING A SUSTAINABLE TRANSPORT SYSTEM IN UNIVERSITI MALAYA CAMPUS

IR. DR. YUEN CHOON WAH
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AREAS OF EXPERTISE

Traffic and Transportation (Motorcyclist behaviour, motorcycle traffic system), Traffic and Transportation (Traffic Transportation, ITS)

CO-RESEARCHERS (FACULTY)

1. Associate Prof. Dr. Rosilawati Zainol (Faculty of Built Environment, rosilawatizai@um.edu.my)
2. Dr. Onn Chiu Chuen (Faculty of Engineering, onnchiuchuen@um.edu.my)
3. Dr. Suhana Koting (Faculty of Engineering, suhana_koting@um.edu.my)

RECENT PUBLICATIONS

1. Mo, K. H., Alengaram, U. J., Jumaat, M. Z., Lee, S. C., Goh, W. I., Yuen, C. W. (2018). Recycling of seashell waste in concrete: A review. Construction and Building Materials 162, 751-764. (ISI-Indexed)
2. Yap, S. P., Chen, P. Z. C., Goh, Y., Mo, K. H., Yuen, C.W. 2018. Characterization of pervious concrete with blended natural aggregate and recycled concrete aggregates. Journal of Cleaner Production 181: 155-165. (ISI-Indexed)
3. Onn, C. C., Mohd, N. S., Yuen, C. W., Loo, S. C., Koting, S., Abd Rashid, A. F., Karim, M. R. & Yusoff, S. 2017. Greenhouse gas emissions associated with electric vehicle charging: The impact of electricity generation mix in a developing country. Transportation Research Part D Transport and Environment. (ISI-Indexed)
4. Mo, K. H., Ling T. C., Alengaram, U. J., Yap, S. P., Yuen, C.W. 2017. Overview of supplementary cementitious materials usage in lightweight aggregate concrete. Construction and Building Materials 139: 403-418. (ISI-Indexed)
5. Yuen, C. W., Karim, M. R., Saifizul, A. (2014). Investigation on Motorcyclist Riding Behaviour at Curve Entry in the Down Slope Terrain. KSCE Journal of Civil Engineering. (ISI-Indexed)

Core Area of UM Eco-Campus Blueprint

Contribution to Sustainable Development Goals (SDGs)

PROJECT SUMMARY

The trends of motorization in universities are matching those in society and in some ways are worsened by changes in higher education itself as the admission of greater numbers of mature students probably raises the proportion of car-owning students. Because of it, UM community needs to embark on more sustainable campus planning. The objective of this study is to develop an innovative sustainable transport system to solve the traffic problem within the campus. As an outcome from the previous research, a smart shuttle bus schedule and the "Sharrow" marking was introduced to assist the campus community. The deployment of shuttle bus service is fully based on the passengers' demand and thus can reduce the number of bus trip travel per day. The implementation of "Sharrow" or shared lane for cyclist was aimed to provide and highlight the legal rights for cyclists to use the roadway with other motorist, besides to alert motorist to respect and ensure the safety cyclist. At this stage, we shall propose an innovative, sustainable transport policy which aims to reduce the dependency of motorized vehicle, especially cars within the university campus, and suggestions to rationalize the utilization of campus parking. The challenges, constraints, solutions and ways to propose a traffic management policy and encourage the usage of non-motorized in both social and engineering perspective will be encompassed in this survey. Traffic study, questionnaire survey, bicycle and pedestrian infrastructures study will be carried out to look for the solution in various aspects. Furthermore, a fundamental study and survey on the current parking demand and parking bays distribution within the campus also will be conducted in this project.

Research Assistant

Mrs. Fifie Haniezah Hamdan
(Bachelor Degree of Civil Engineering, Faculty of Civil Engineering UTM Skudai, fifiehaniezah@gmail.com)

LL024-16SUS

TRANSPORTATION SYSTEM MANAGEMENT

Develop a Sustainable Transport System in University of Malaya Campus

FINAL PRESENTATION
(20TH AUGUST 2019)

PRINCIPAL INVESTIGATOR:
IR. DR. YUEN CHOON WAH

UM Living Lab LL024-16SUS

RESEARCH BRIEF

RESEARCH BRIEF

Purpose of Study

- To develop an innovative sustainable transport system in order to solve the traffic problem within the campus.

Coverage of Study

- To cover on challenges, constraints, solutions and ways to promote the use of non-motorized transport mode while reducing the dependency on the usage of private cars within the campus in both social and engineering perspective

Inclusion

- A fundamental study and survey on the current parking demand and parking bays distribution within the campus will also be conducted in this project

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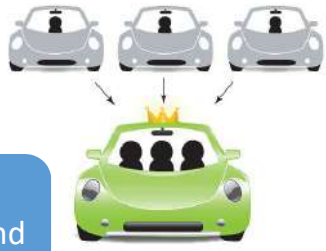
RESEARCH OBJECTIVE

RESEARCH OBJECTIVE



To develop a system to reduce the motorized vehicle trips within the campus.

To propose a campus transport policy.

To create awareness and promote campus community to reduce usage of motorized transport mode in campus.

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RESEARCH PROGRESS (UP TO DATE)

RESEARCH PROGRESS UP TO DATE

Activities	MONTH											
	1	2	3	4	5	6	7	8	9	10	11	12
Activity 1												
Activity 2												
Activity 3												
Activity 4												
Activity 5												
Activity 6												

Completed

In Progress

Activity 1: Literature Survey
Activity 2: Site Study
Activity 3: Carpool program survey, registration & proposal drafting
Activity 4: Data Analysis & Site Preparation for "Sharrow" Expansion
Activity 5: Workshop and Roadshow on Campus Transport Policy
Activity 6: Mitigation Measure Proposal & Policy Recommendation

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SUMMARY OF KPI ACHIEVEMENTS

SUMMARY OF KPI ACHIEVEMENT - page 1

		DETAILS	ACHIEVEMENT
1	Project Target Achievement	Target to achieve 80% of residential colleges' students take NMT/PT as their main transport mode. Target to reduce in-campus travelling of UM staff by 10%.	-81 students signup for the carpool program. However, results on their transport mode cannot be seen yet since carpool program only can start when new semester starts. - 20 staffs signup for carpool program.
2	Capacity Building	Conduct workshop, conference, exhibition, event and seminar such as public awareness seminar to promote sustainable transport system in university.	Conducted 1 Bicycle Workshop & 5 Carpool Roadshows Around UM Campus

SUMMARY OF KPI ACHIEVEMENT – page 2

		DETAILS	ACHIEVEMENT
3	Innovation/ technology/ knowledge transfer	Implementation of "Sharrow" & Car-pool in campus.	9 Staff Carpool Group Has Been Matched based on their address but only 2 groups agreed to proceed to join discussion. -upon discussion, some issues has been identified thus, more participation is needed in order to run the carpool program.
4	Community Engagement	University Malaya Community (Staffs and Students)	Open to all University Malaya community

SUMMARY OF KPI ACHIEVEMENT – page 3

		DETAILS	ACHIEVEMENT
5	Networking & Linkages	Lingkages within campus, TNC HEPA, JPPHB, residential colleges, Obike, UniRide	TNC HEPA has acknowledged carpool roadshows. Will link with JPPHB once Carpool Program initiated
6	Publications (eg. Journal Paper, Book, Policy)	One Publication	-1 Book chapter on Sustainable transport system in UM campus through Carpool Program mode
7	Policy Papers / Guidelines / Standards	Transport Policy in UM campus	- UM Transport Guidelines 2019
8	Others	Participation in various conference, exhibition and event to promote sustainable transport system in university.	-participated Research Carnival 2018 -participated Malaysia Urban Forum 2019

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PROJECT FUTURE PLAN

PROJECT FUTURE PLAN

We will proceed with the student carpool program upon the start of new semester.

Carpool program will be continuously run to recruit more carpoolers.

In future, we shall focus on developing a sustainable parking plan in UM Campus.

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UM ECO-CAMPUS

RESEARCH ACTIVITIES

Carpool Roadshows 1 (Faculty of Engineering)

UM Living Lab LL024-16SUS

Carpool Roadshows 2 (Faculty of Built Environment)

UM Living Lab LL024-16SUS

Carpool Roadshows 3 (Faculty of Education)

UM Living Lab LL024-16SUS

Carpool Roadshows 4 (Main Library UM)

UM Living Lab LL024-16SUS

Carpool Roadshows 5 (Faculty of Science)

UM Living Lab LL024-16SUS

Bicycle Workshop (Block U, Faculty of Engineering)

UM Living Lab LL024-16SUS

Bicycle Workshop (Block U, Faculty of Engineering)

UM Living Lab LL024-16SUS

Discussion with App developer (Faculty of Engineering)

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Carpool Group Discussion

UM Living Lab LL024-16SUS

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UM ECO-CAMPUS

CONCLUSION

- Staff carpool program has been matched and proceed with further discussion but some issues has been identified:
  - Irregular timing leaving UM Campus
  - lack of driving options causing members to have difficulties if there's only 1 person can drive.
  - rerouting their usual route to UM is making them reluctant to proceed.
  - Lack of participant therefore lack of group options to match the carpoolers.
- Further recruitment need to be done to ensure carpoolers have better driving options and more routes to cover.
- Some incentives or benefit need to be introduced to prospective carpoolers to attract them to join carpool program.
- More specific carpool matching need to be considered in order to get a right group match for carpoolers.

Thank you!

UM Living Lab LL024-16SUS

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UM ECO-CAMPUS

UMLL030-16SUS
SAFE DISPOSAL OF UNUSED MEDICATIONS – THE WAY FORWARD

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marylee@ummc.edu.my +603-7967 4933

AREAS OF EXPERTISE

Pharmacy Practice (Pharmacy Practice, Hospital Pharmacy, Community Pharmacy)
Clinical Pharmacy (Clinical Pharmacy)

RECENT PUBLICATIONS

1. Safe Disposal of Unused Medications – Working toward a Green Pharmacy in the University of Malaya Medical Centre, Transforming Research into Action, UM Living Lab Vol. 1 (Book Chapter).
2. University of Malaya Living Lab Training Module.
3. Development and validation of the return and disposal of unused medications (ReDIUM) questionnaire in Malaysia, Asia Pacific Journal of Public Health 2018, pg 1-13
4. The effectiveness of an intervention to increase the knowledge, attitude and practice regarding the return, reuse and disposal of prescribed medications in Malaysia [writing in progress]
5. Guidelines on the Proper Disposal of Unused Medications.

CO-RESEARCHERS (FACULTY)

1. Prof. Dr. Sim Si Mui (Faculty of Medicine, debrasim@ummc.edu.my)
2. Assoc. Prof. Dr. Lai Siew Mei, Pauline (Faculty of Medicine, plai@ummc.edu.my)
3. Dr. Tan Kit Mun (Faculty of Medicine, kmtan@ummc.edu.my)
4. Madam Che Zuraini Sulaiman (University of Malaya Medical Centre, zuraini@ummc.edu.my)
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6. Madam Nur Azrida Azhari Wasi (University of Malaya Medical Centre, azrida@ummc.edu.my)

Core Area of UM Eco-Campus Blueprint

PROJECT SUMMARY

Medications which are expired or no longer in use will be discarded. This contributes to wastage of medical resources. Furthermore, unlike the other household waste, medications contain chemicals that may cause harmful effects on living organisms and pollute the environment when they are thrown into our sewage system or landfill. Hence, besides preventing medication wastage, ensuring safe disposal of these unused medications is crucial to produce a sustainable healthcare system. This project is divided into three sections. The first section is to continue monitoring the amount of medications currently returned by the public. The second section is to intensify efforts to (i) continuously promote the return of unused medication campaigns around UMMC using posters, buntings and videos; and (ii) educate the public to practice safe disposal of unused medications by depositing them in designated locations. The third section is to work with the healthcare professionals such as the pharmacists and/or physicians who, through their prescribing and/or dispensing activities, indirectly contribute toward the problem of unused medications.

Contribution to Sustainable Development Goals (SDGs)

Research Assistant

Ms. Woon Soo Chin @ Woon Sau Kuen
(Diploma- Advanced Course in Medical Laboratory Technology – Medical Statistics, Faculty of Medicine, UM
soochinwoon@hotmail.com

Safe Disposal of Unused Medications

- The way forward

*(Grant no: **LL030-16SUS**)*

Lee Hong Gee (Pharmacy, UM)
Sim Si Mui (Pharmacology, UM)
Tan Kit Mun (Medicine, UM & UMMC)
Lai Siew Mei Pauline (Primary Care Medicine, UM & UMMC)
Che Zuraini Sulaiman (Pharmacy, UMMC)

SM Sim/ML/190819

RM2 million worth of expired drugs have been disposed by MOH

Malaysia

Return unused medicine to avoid wastage, Health Minister urges

AUGUST 10, 2016

PUTRAJAYA, Aug 10 — Patients with unused or unutilised medicine are advised to return it to the clinics and hospitals to reduce wastage of medication, said Health Minister Datuk Seri Dr S. Subramaniam.

He assured that the unused medicine, either in sachet or packet, were safe and it would be the discretion of the pharmacists to ensure how the medicine can be used

"Medicine in packets that are not opened and not expired are safe. There is no safety issue... how to use it will be the discretion of the pharmacists," he said at a media conference here today.

Subramaniam assured that the unused medicine, either in sachet or packet, were safe and it would be the discretion of the pharmacists to ensure how the medicine can be used. — Bernama pic

Dr Subramaniam also urged patients to bring along their unused prescribed

Profit Loss

Planet Spoilt

People Sick

SM Sim/ML/190819

What was done from 2016-2018

A. Knowledge attitude and practice (KAP) of the public on how to manage unused medications

I. Development and validation of **ReDiUM questionnaire** – a tool to measure K.A.P. of the public concerning unused medications. (Published in Asia Pacific Journal of Public Health) Sim ReDiUM validation 2018.pdf

II. Public survey on the K.A.P. on the handling of unused medications (Final year pharmacy student's dissertation)

III. Intervention programme to educate the public on the safe disposal of unused medications and measure the outcomes

B. Audit – what was returned by the public

I. Records of all medications returned by the public Analysis of medications returned (Final year pharmacy student's dissertation & Oral presentation)

II. Guidelines on the safe disposal of unused medications at UMMC – submitted to the UM Living Lab admin

SAFE D.U.M.P

SM Sim/ML/190819

Objectives

Overall Aim:

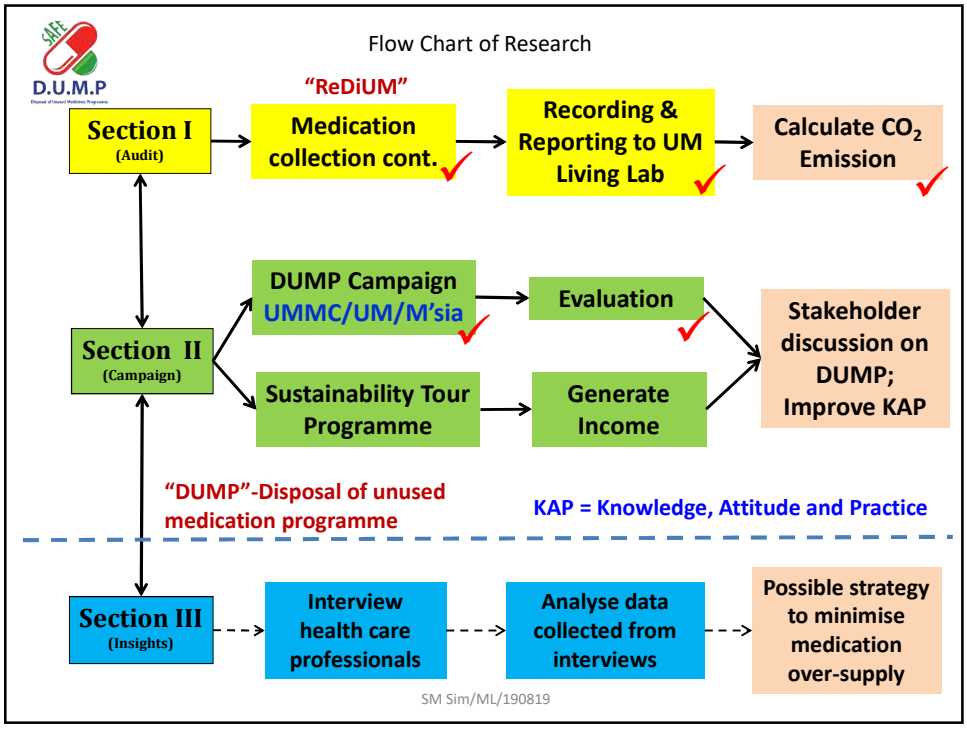
- to develop sustainable ways to reduce medication wastage & minimise the negative impact of unused medications on environment & public health

Specific Objectives:

1. To explore the roles of prescribers and dispensers in helping to enhance the awareness of UMMC outpatients on the need to reduce medication wastage and to return unused medications to UMMC Pharmacy for safe disposal;
2. To develop and implement an intervention programme that engages the UMMC communities to improve their Knowledge, Attitude and Practice (KAP) towards the return and disposal of unused prescribed medications;
3. To reduce medication wastage and/or increase cost saving by 15% through either reduced possession or increased return of unused medications to UMMC outpatient pharmacy

SAFE D.U.M.P

SM Sim/ML/190819



Expected Results and Benefits

Catogories	Key Performance Indicators (KPI)
Project Target Achievement (A)	We will be able to record the total weight of medication waste returned by the public/patients every month for the next 12 months. (Target 15%)
Capacity Building (B)	Besides seminars and poster exhibition, we will be part of the UMCARES programmes – "Campus sustainability tour" programme
Innov / Tech/ Knowledge Transfer (C)	Disseminate relevant information and project findings to medication prescribers
Community Engagement (D)	Targetting a least 2 on-site campaigns per year to promote safe disposal of unused and expired medication; possible on-air and online publicities. (Join effort with other non-governmental organisations to run the campaign)
Networking and Linkages (E)	More collecting points for unused and expired medications at UMMC and/or campus; and possible expansion to include general practitioner clinics and community pharmacies.
Publications (F)	**At least 1 journal publication** and/or book chapter to be drafted
Policy Papers / Guidelines/ Standards (G)	To update the existing Safe DUMP guidelines
Others (H)	To recruit and train 2 undergraduates to work on this project.

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A	Records of all medications returned by the public to UMMC & Safe DUMP Campaign	Total weight = 577.6 kg (Jan to Jul 2019) & 71.05kg
B	No activity	No activity
C	Joint Insights via Experts 2018	Pn. Che Zuraini (11-12 August 2018)
D	1. BFM radio station 2. World Pharmacy Day 2018 3. Health Promotion Campaign organised by final year Pharmacy students 4. Safe DUMP Campaign 5. Oriental Daily News 6. Make-It-Right-Movement 7. Bunting and Posters	1. On-air interview – Prof. Debra Sim 2. UMMC (25-27 Sept 2019) 3. 12th College, UM & Community hall in Taman Sri Manja (28 -29 Sept 2018) 4. Foyer, Auditorium Pedanasiswa, UM (24 & 25 June 2019) 5. Published on 23 June 2019 6. Logo, video, bunting & brochure 7. UMMC clinics
E	Community pharmacy Collaboration	Since Jan 2019
F	1. ReDiUM questionnaire validation 2. Intervention programme educating public	1. Published in Asia Pacific Journal of Public Health Sim ReDiUM validation 2018.pdf 2. Journal submission
G	Safe disposal of unused medications guidelines & Book chapter version 2	Published by UM Living Lab & online
H	Pharmacy final year projects (2 titles)	Reasons for having unused Anti-diabetic and hypercholesterolemia medications.

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Expected Results and Benefits

Catogories	Key Performance Indicators (KPI)	
Project Target Achievement (A)	We will be able to record the total weight of medication waste returned by the public/patients every month for the next 12 months. (Target 15%)	☺
Capacity Building (B)	Besides seminars and poster exhibition, we will be part of the UMCARES programmes – "Campus sustainability tour" programme	↓
Innov / Tech/ Knowledge Transfer (C)	Disseminate relevant information and project findings to medication prescribers	☺↓
Community Engagement (D)	Targetting a least 2 on-site campaigns per year to promote safe disposal of unused and expired medication; possible on-air and online publicities. (Join effort with other non-governmental organisations to run the campaign)	☺
Networking and Linkages (E)	More collecting points for unused and expired medications at UMMC and/or campus; and possible expansion to include general practitioner clinics and community pharmacies.	☺↓
Publications (F)	**At least 1 journal publication** and/or book chapter to be drafted	☺
Policy Papers / Guidelines/ Standards (G)	To update the existing Safe DUMP guidelines	☺
Others (H)	To recruit and train 2 undergraduates to work on this project.	☺

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Budgets

Vote	Amount (RM)	Remark
11000 – Wages & Salary	**16,200.00**	1 RA = RM 18,000.00/mth x 9 mths
21000 – Travel Expenses ….	**0.00**	-
25000 – Rental	**0.00**	-
27000 – Supplies & Other Materials	**2,000.00**	Stationery and souvenirs for the campaign. Printing of education materials such as booklets, pamphlets, posters, etc.
28000 – Minor Repair	**0.00**	-
29000 – Professional Services & Other Services	**2,000.00**	Ethics application fee; honorarium for temporary staff for campaigns, transcribing ; and for making more audio-visual aids to be used in campaigns
Balance from 2017/2018	**1361.19**	
Total	**21,561.19**	

Spent = RM 20,991.49 **Bal. = RM 569.70** **% Spent = 97.36%**

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What to do in 2019-2020

Promotions & Campaigns,

1. **Mega Safe DUMP campaign** – One of the shopping mall in Petaling Jaya
2. **Make-It-Right-Movement (MIRM)** – Memorandum of Understanding (MOU)
3. **Collaboration with other organisations;** e.g. Malaysian Pharmaceutical Society
4. **Community pharmacies** Collaboration

Research Projects and Production of Educational Materials

1. **Final year projects for pharmacy students** - to offer 2 more projects:
   (a) The disposal method of expired medications by the community pharmacies.
   (b) The types and number of unused antibiotic medications returned to the UMMC outpatient pharmacy
2. **MIRM** – Modification of **logo** & **video**; New **bunting** & **brochure**

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Mega Safe DUMP campaign

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Challenges Ahead

1. Medications are governed by **Poisons Act and Regulation**
   – Need to follow

Restrictions:

a) Cannot create collection points like the other recyclable goods easily.
b) Not ethical to reuse returned medications even though not expired yet.

2. **Manpower** within the pharmacy department in UMMC
   – Pay OT to staff for sorting returned medications
3. Where to **safely discard** the expired and unusable medications?
   - **Costly** to send for incineration
3. Mega campaigns – Need **funds** and **supports**

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World Pharmacy Day

25-27/9/2018

D.U.M.P

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Health Promotion Campaign

12th College's community hall in UM

D.U.M.P

28-29/9/2018

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Community hall in Taman Sri Manja

Safe DUMP Campaign - UM

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Campaigns via Media

17/1/2019

23/6/2019

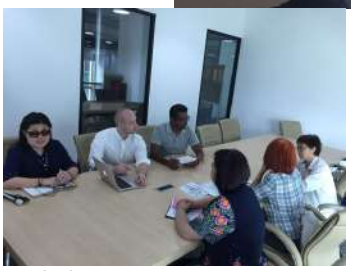
SM Sim/ML/190819

Collaboration with Community Pharmacy

Make-it-right-movement

7/1/2019

18/4/2019



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What was done from 2018-2019

Promotions & Campaigns,

1. **BFM radio station** - On-air interview – Prof. Debra Sim **(D)**
2. **World Pharmacy Day 2018 -** Universiti Malaya Medical Centre - **(D)**
3. **Health Promotion Campaign** organised by 4th yr Pharmacy students – 12th College, UM & ommunity hall in Taman Sri Manja [28 -29 Sept 2018] **(D)**
4. **Safe DUMP campaign** – Foyer, Auditorium Pedanasiswa, UM **(D)**
5. **Oriental Daily News** (Published on 23 June 2019) **(D)**
6. **Community pharmacy** Collaboration **(E)**

Research Project and Production of Educational Materials

1. **Joint Insights via Experts 2018** – Panel discussions among Head of Pharmacy from various MOH hospital (11-12 August 2018) – Pn. Che Zuraini **(C)**
2. **Pharmacy final year projects** - by 2 final year pharmacy students – Reasons for having unused Anti-diabetic and hypercholesterolemia medications. **(H)**
3. **MIRM** – Modification of logo & Video; New bunting & brochure **(D)**
4. **Intervention programme** to educate the public – Journal submission **(F)**
5. **Bunting and Posters – UMMC clinics (D)**

SM Sim/ML/190819

UMLL031-16SUS
TRANSFORMING THE ROLE OF SURAU APIUM FOR CAMPUS SUSTAINABILITY THROUGH IMARAH GREEN PROJECT

DR. ASMAWATI MUHAMAD
Applied Science with Islamic Studies Programme,
Academy of Islamic Studies (APIUM)

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+603-7967 6189

AREAS OF EXPERTISE

Quranic and Hadis Studies, Islam and Science (Tafsir, Environment/Sustainability from Islamic perspective)

RECENT PUBLICATIONS

1. UM Living Lab Volume II: Transforming Research into Action, UM Living Lab (Training Modules), Asmawati Muhamad (2017) Sustaining Human-Nature's Interaction for Shaping the Better World: Qur'an and Sunnah Perspective.

2. Proceeding of the Scholar Summit, Universitas Indonesia, Jakarta. Asmawati Muhamad & Abdul Halim Syihab. (2017). Revisiting the Islamic Heritage of Environmental Wisdom: Vital Aspects on Harmony of Man with Nature, dalam Nurulwahidah Fauzi (ed.), Peradaban Islam di Asia: Isu-isu Sejarah, Pendidikan, Sains, Ekonomi, Politik & Sosial, Nilai: Penerbitan USIM.

CO-RESEARCHERS (FACULTY)

1. Prof. Dato' Dr. Mohd Yakub @ Zulkifli bin Mohd Yusoff (APIUM : zulkifliy@um.edu.my)
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3. Assoc. Prof. Dr. Mohd Roslan Mohd Nor (APIUM : m_roslan@um.edu.my)
4. Assoc. Prof. Dr. Zeeda Fatimah Mohamad (Faculty of Science: zeeda21@um.edu.my)
5. Dr. Muhamad Alihanafiah Norasid (APIUM : imtiaz_alhuffaz@um.edu.my)
6. Dr. Nurul Husna Mansor (APIUM : nurulhusna@um.edu.my)
7. Dr. Nur Shahidah Paad (APIUM : shaaz2301@um.edu.my)

PROJECT SUMMARY

Imarah Green Project: Surau APIUM has been conducted under the UM Living Lab Programme since 2016 to advocate eco-mosque concept and promote green practices among APIUM students in particular and the public at large. In the golden age of Islamic civilization, the masjid (mosque) maktab and madrasah (religious school) are among the most visible symbols of education in Islam. In this regard, contemporary Muslim scholars have emphasised that the masjid can play an important role for a lifelong learning in Muslim society, including the cultivation of environmental practices from an Islamic perspective. To date, the project has realized this vision by: (1) Measuring the reduction of water consumption in the Surau, (2) Quantifying total recyclable materials (papers, plastics, aluminium) recycled through APIUM Recycling Centre & total textiles and clothes recycled through Lestari Shop, and (3) Increasing numbers of planted vegetation in the Surau APIUM's surrounding (4) Translating the impact of these activities into GHG's reduction as outlined by the UM Eco-Campus Blueprint. We have also intensified efforts on capacity building of Imarah Eco-Friends (IEF) as the agent of change in sustainability practices. We believe that strategic partnership among stakeholders in reviving the role of mosque can have big multiple effects to society and provide tangible solution to address environmental sustainability issues effectively.

Core Area of UM Eco-Campus Blueprint

Contribution to Sustainable Development Goals (SDGs)

Research Assistant

Ms. Nor Aishah Abu Hassan
Bachelor of Islamic Studies and Science (Environmental Science and Management), Academy of Islamic Studies APIUM
noraishah1994@gmail.com

UM LLGP FINAL REPORT PRESENTATION:

TRANSFORMING THE ROLE OF **SURAU APIUM** FOR CAMPUS SUSTAINABILITY THROUGH '**IMARAH GREEN PROJECT**

(LL031-16SUS)

Prepared by:
DR. ASMAWATI MUHAMAD

20 August 2019

TEAM RESEARCHERS:

DR.ASMAWATI MUHAMAD
APIUM

ASSOCIATE PROF. DR. ZEEDA FATIMAH BINTI MOHAMAD
FACULTY OF SCIENCE

PROF. DATO' DR. MOHD YAKUB @ ZULKIFLI BIN MOHD YUSOFF
APIUM

DR. MUHAMAD ALIHANAFIAH BIN NORASID
APIUM

PROF. DR. SUMIANI BINTI YUSOFF
FACULTY OF ENGINEERING

DR. NURUL HUSNA BINTI MANSOR
APIUM

ASSOCIATE PROF. DR. MOHD ROSLAN MOHD NOR
APIUM

DR. NUR SHAHIDAH BINTI PAAD
APIUM

SPECIAL HIGHLIGHTS

- Brief introduction and objectives
- Gantt Chart & KPI
- Summary of KPI/ *Aku janji*
- Expenditure
- Issues / problems encountered in fulfilling KPI & Future Plan
- Picture of activities

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INTRODUCTION TO IMARAH GREEN PROJECT

- **Imarah Green Project: Surau APIUM** has been conducted under the UM Living Lab Programme since 2016 to **advocate the eco-mosque concept and promote green practices among APIUM students** in particular and the public at large.
- In the golden age of Islamic civilization, the masjid (mosque), maktab and madrasah (religious school) are among the **most visible symbols of education** in Islam. In this regard, contemporary Muslim scholars have emphasised that **the masjid can play an important role** for a lifelong learning in Muslim society, including the **cultivation of environmental practices from an Islamic perspective.**

"Traditional Islamic institutions like *masjid*, *maktab* and *madrasah* have great potential **to translate environmental education and action** as an integral part of the Islamic way of life….some selected environmental awareness campaigns which were based at mosques, i.e., the **Green Ramadhan campaign** in Chicago, a **water awareness campaign** in South Africa and a **recycling initiative** in Canada. Those efforts have shown that the ecological teachings of Islam have been revived and **demonstrated the central role of mosque to reach out the Muslim community** from all walks of life."(Mohamed, N. 2014).



IMARAH GREEN PROJECT: OBJECTIVES

1. To **highlight Surau APIUM as an eco-model** to be replicated by other mosque in the outside community.

2. **Intensifying capacity building for Imarah Eco-Friends** throughout eco-mosque training workshop and community engagement programmes.

3. **Communicating cultural translation of pro-environmental behaviour from Quran and Sunnah teachings** and **improving GHGs data collection at Surau APIUM.**

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YEAR		2018					2019						
CATEGORY	KPI	SEPT	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG
PROJECT TARGET ACHIEVEMENT	Water Conservation	√	√	√	√	FINAL EXAM SEM I, 2018/19 & SEM BREAK (2.1 – 17.2)	√	√	√	√	√	√	√
	Greening & Biodiversity Enhancement		√	√	√		√	√	√	√	√	√	√
	Waste Management (RC/LS)	√	√	√	√		√	√	√	√	√	√	√
CAPACITY BUILDING	Special Talk /Tazkirah						√ Slot Eko-Surau (kk12) : Pendidikan Kelestarian menurut Ajaran Sunnah 20.2.19	√ Slot Eko-Surau (KK8): Kelestarian Surau 9.3.19	√ Bicara Santai Tadabbur Alam (MITA 2019) 11.4.19	√ Slot Eko-Surau (KK5): Edisi Ramadan 7.5.19		√ Syarahan Khas: Pemuliharaan Biodiversiti Menurut Islam Dr. Fachruddin 19.7.19	
	Training workshop	√ Sustainability Workshop IEF/PMA / APIUM students		JAWI Officials Rescheduled					√ Progam Pembanguna n Kapasiti Eko-Surau UM (collabration with UM Eco-Campus) 26.4.19				
	Meetings	√ Welcoming new students & open for membership	√ Briefing Session with IEF members 5.10.19				√ Meeting IEF 1.0 in 2019 (IEF high committee and IEF unit leader) 22.2.19	√ Meeting with UM EFM co-organizer 5.3.19	√ Meeting IEF (Discussing April event) 4.4.19	√ Meeting with JAWI Director 16.5.19	√ Meeting with Mosque Management Division 19.6.19	√ Meeting with Mosque Management Division 23.7.19	

YEAR		2018					2019						
CATEGORY	KPI	SEPT	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG
KNOWLEDGE TRANSFER	Demonstration (Wudhu')					FINAL EXAM SEM I, 2018/19 & SEM BREAK (2.1 – 17.2)	√ 28 Feb 2019						
	Speaker Corner						√ In conjuction with WECARES Campaign 25.2.19			√ Ramadan Without Wastage 9.5.19			
COMMUNITY ENGAGEMENT	Green Sale/ Eco Free Market	√ GS	√ GS	√ GS	√ GS		√ Eco Free Market at Pantai Eco Park, Lembah Pantai (Sambutan Hari Wilayah Persekutuan) 23.2.19	√ UM Eco Market with PPR Kerinchi, NGO EFM, Masjid Khadijiah 9.3.19	√ GS & LS EFM (in conjunction with SESDG 2019) 25.4.19	√ EFM Ambang Aidilfitri 18.5.- 31.5.19	√ EFM (Pasca Raya Eidilfitri) 13.6 -17.6.19		√ GS
	Clothes Donation to welfare institutes	√ (Orang Asli, Sg. Siput Perak) 20.9.18			√ (Anak Rohingya, Sekolah Bimbingan Alternatif, Kajang 14.1.19		√ Misi Kemanusiaan ke Palu, Ibsan Foundation (NGO), Bangi 30.1.19	√ Jejak Inspirasi 2.0 (Kolej Kediaman ke-12) 22.3.19	√ EFM UITM Jasin, Melaka 15.4.19	√ Ramadan Appeal Charity (Fakulty of Dentistry) 10.5.19 SRA Al-Hidayah, Perak 11.5.19			
	Gotong-Royong		√ 15 Okt. Gotong Royong IEF 1.0		√ 2 Dec. Mini Gotong royong by units.		√ Gotong – royong (GR) UG 22.2.19	√ GR UG & RC 14.4.19 16-17.4.19	√ GR UG & LS 24.5.19				
GUIDELINES	Garis Panduan Masjid Lestari Hijau: Imarah Green Project												√ In progress (waiting for finalizing-JAWI)

YEAR		2018				2019							
CATEGORY	KPI	SEPT	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG
PUBLICATIONS	Qur'anic Messages on Environmental Sustainability: An Expository Study of Its Relevance					FINAL EXAM SEM I, 2018/19 & SEM BREAK (2.1 – 17.2)						√ Published by Al-Bayan Journal (SCOPUS)	
	Chapter in a book												In progress
	Pilot Test & Distribute Questionnaire			√	√								
	Observation			√	√								
	FGD with IEF members							√ 21.3.19					
	Data Analysis						√	√	√				
	Write up first draft article												In progress (Discussion)
OTHERS	Environmental Awareness Campaign With Islamic Contents (Pamphlet/Poster/Video)	√	√	√	√		√ Week of Caring Eco Through Social Media Campaign 25.2. – 1.3.19	√		√		√	
	Booth Exhibition	√ IEF Promotion Club	√ Karnival Al-Quran & Hadis 2018	√ UM Research Carnival @DTC					√ MITA 8-12.4.19 & SESDG 25.4.19				
PROJECT ASSESSMENT	Submit Report To UM Eco Campus/Final Presentation				√ (3 month progress report)		√ (6 month progress report presentation) 23.2.19						√ Final report submission (in progress)

NO.	CATEGORIES	KEY PERFORMANCE INDICATORS / AKUJANJI	STATUS
1.	Project Target Achievement	1. Saving 10% of total piped water 2. Increasing 10% of recycling rate 3. Increasing 10% of Surau areas with green vegetation	Fulfilled
2.	Capacity Building	Gotong-royong Surau APIUM, proper waste management & 3R practices, Green Sale, Mini Gotong Royong by IEF units, Eco-Surau Slot UMRC, Bicara Santai Tadabbur Alam, Syarahan Khas, Sustainability Workshop, Pembangunan Kapasiti Eko-Surau Kolej UM	Fulfilled
3.	Innovation / Technology / Knowledge Transfer	Mr.Thimble & Rain water harvesting system (collaboration with Water Warrior), Recycling Centre APIUM, Lestari Shop, Eco-Surau & Sustainability info at notice board Surau APIUM, Wudhu Demo, Speaker Corner	Fulfilled.
4.	Community Engagement	IEF, UM Residential Colleges, APIUM community (students, academic staff & admin staff): gotong-royong, gardening, clothes donation & collection, 3R (RC APIUM) and green sale activities (Lestari Shop).	Fulfilled.
		UM Eco Free Market	Fulfilled
5.	Networking and Linkages	Surau APIUM committee, MAIWP, JAWI, GRASS Malaysia, Go Green Malaysia, IKIM, PMAPIUM, PPR Kerinchi community, IKRAM Lembah Pantai, Ibsan Foundation, Bangi, and Pusat Bimbingan Alternatif Al-Islamiyyah, Kajang, NGO Eco Free Market	Fulfilled
		MoU with JAWI	In progress
6.	Publications	Qur'anic Messages on Environmental Sustainability: An Expository Study of Its Relevance ~published by Al-Bayan Journal. Al-Bayān – Journal of Qurʾān and Ḥadīth Studies 17 (2019) 38-59 (SCOPUS) Chapter in book: UMLL (Vol. 3 /4)	Fulfilled In Progress
7.	Policy Papers / Guidelines / Standards	Garis Panduan Masjid Lestari Hijau: Imarah Green Project (Final review by JAWI)	Fulfilled
8.	Others	Human Capital: (Master student) Husnul Hadi bin Khoiruddin (Kelestarian Alam Sekitar Menurut Perspektif Al-Quran dan Al-Hadith: Kajian Pelaksanaan di Sekolah Kebangsaan Bukit Damansara.	On going
		Environmental awareness campaign with Islamic contents, Campaign IEF membership through official IEF t-shirt, News (UM EFM, Urban Garden Medan Ilmu)	Fulfilled
		Campaign APIUM Lestari (by IEF Club)- WECARES, Speaker Corner: Ramadan Without Wastage	Fulfilled

MODUS OPERANDI

KNOWLEDGE TRANSFER

- Booklet: *Garis Panduan Surau Lestari "Imarah Green Project": Surau APIUM*
- Campaign of Islamic Messages: Poster/Banner/Video/ Pamphlet
- Weekly IEF reminder via whatsapp group, fb, Instagram
- Cleanliness Duty Roster of Surau APIUM
- Tazkirah at Surau

CAPACITY BUILDING

- Training workshop: Surau APIUM Sustainability practices 2018 workshop.
- Briefing session 1.0 about journey of IGP and IEF along the way to transform Surau APIUM for sustainability.
- Training: Vertical Farming (adding more vertical farming structure).

COMMUNITY ENGAGEMENT

- Gotong royong
- Gardening: edible garden
- Upcycling shows during booth exhibition.
- Clothes Collection & Donation
- Green Sale
- Eco Free Market

NETWORKING

- Surau APIUM, MAIWP, JAWI, GRASS Malaysia, Go Green Malaysia, IKIM, PMAPIUM, Water Warrior UM, Faculty of Engineering UM, Ikram Lembah Pantai, Faculty of Dentistry, SRA Al-Hidayah,

LL031-16SUS

IMARAH ECO-FRIENDS CLUB session 2018/2019

LL031-16SUS

IMARAH ECO-FRIENDS UNITS

Be Green Be Exemplary

IMARAH ECO-FRIENDS SURAU APIUM

Recycling Unit
- Collect recyclable items
- Campaign for waste separation
  Selling recycling stuff to vendor

Lestari Shop
- Green sale
- Donation & Collection
- Recycle

Urban Garden
- Planting green vegetation
- Vertical farming
- Cleaning and maintaining green backyard of Surau APIUM

Special Task
- Fb: Imarah Eco-Friends Surau APIUM
- Instagram: ImarahEcoFriends
- Promotion & Publicity

GREEN INFRASTUCTURE IN APIUM

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GREEN TECHNOLOGY INSTALLATION

LED LIGHTS

MAIWP gave sponsorship RM10,000 for installation of 285 units LED bulbs (18 wt)

RAIN WATER HARVESTING SYSTEM

Tank capacity:3000 litres,

sand filter , UV filter, water pump, 11 tap waters at wudhu' area are treated rain water.

RWHS initiated from Water Warrior project & JPPHB .

LIVING GREEN WALL

The Ecological Air Cleaning and Cooling Systems: a combination of vertical green system (nature concept) with the utilization of hydroponic air-filtering plant and the evaporative cooling system (engineering concept).

This green innovation is from Dept. of Mechanical Engineering, Faculty of Engineering UM.

MR.THIMBLE:

A 4-hole water restrictor which looks like a "button" just before the aerator in the tap to reduce tap water flow: Volume of water (Litres/sec)

Without Thimble: 0.194

With Thimble: 0.103

It was installed by Water Warrior UM.

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WATER METER READING

SOURCE: SYABAS METER READING

YEAR	MONTH	DATE	METER READING	AMOUNT OF WATER CONSUMPTION (M3)	PRICE (RM)
2018	AUGUST	02.08.2018	01503	47	75.67
	SEPTEMBER	03.09.2018	01550	70	112.7
	OCTOBER	03.10.2018	01620	104	166.4
	NOVEMBER	02.11.2018	01724	76	122.36
	DECEMBER	03.12.2018	01800	119	191.59
2019	JANUARY	03.01.2019	01919	48	77.28
	FEBRUARY	01.02.2019	01967	45	72.45
	MARCH	01.03.2019	02012	95	152.95
	APRIL	02.04.2019	02107	72	115.92
	MAY	01.05.2019	02179	80	128.80
	JUNE	31.05.2019	02259	37	59.57
	JULY	01.07.2019	02296	57	91.77
	AUGUST	01.08.2019	02353		

SOURCE: RWHS METER READING

YEAR	MONTH	DATE	METER READING	AMOUNT OF WATER CONSUMPTION (M3)
2018	AUGUST	02.08.2018	0024212	9
	SEPTEMBER	03.09.2018	0025144	33
	OCTOBER	03.10.2018	0028445	22
	NOVEMBER	02.11.2018	0030648	14
	DECEMBER	03.12.2018	0032051	18
2019	JANUARY	03.01.2019	0033816	6
	FEBRUARY	31.01.2019	0034453	3
	MARCH	01.03.2019	0034796	7
	APRIL	02.04.2019	0035469	16
	MAY	01.05.2019	0037008	4
	JUNE	31.05.2019	0037433	2
	JULY	01.07.2019	0037631	3
	AUGUST	01.08.2019	0037958	

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- Total Water Piped Reduction (L):

137,000.00 L

- Total Saving Price (RM):

RM 220.57

Issues:

1. 23 Mr. Thimble has been removed out of the 38 water taps at the surau: 60% taps without Mr. Thimble).
2. Only 2 stations of ablution area out of 8 stations which were connected Rain Water Harvesting System.

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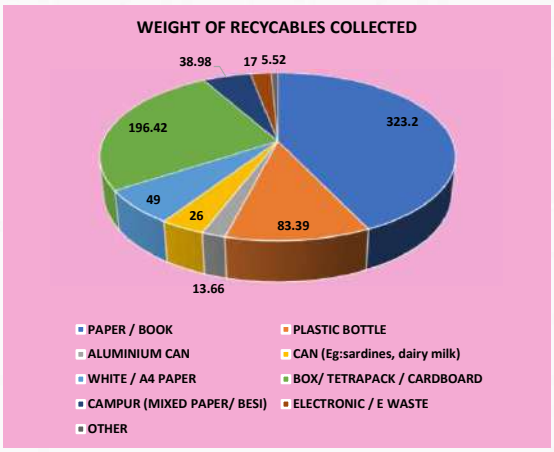
RECYCLING CENTRE

- Total Weight of Recyclables Collected (KG):

750.17 KG

- Revenue generated (RM):

RM 243.95



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LESTARI SHOP

- Total Collection/ Received Recyclable Textile (KG):

1500.00 KG

- Total Distributed Recyclable Textile (KG):

1004.90 KG

(through EFM, White Box RC-12th , donation, Green Sale)

- Number of recipients:

15

(2 individual, 13 agencies)

- Revenue generated from Green Sale (RM):

RM 1,578.00

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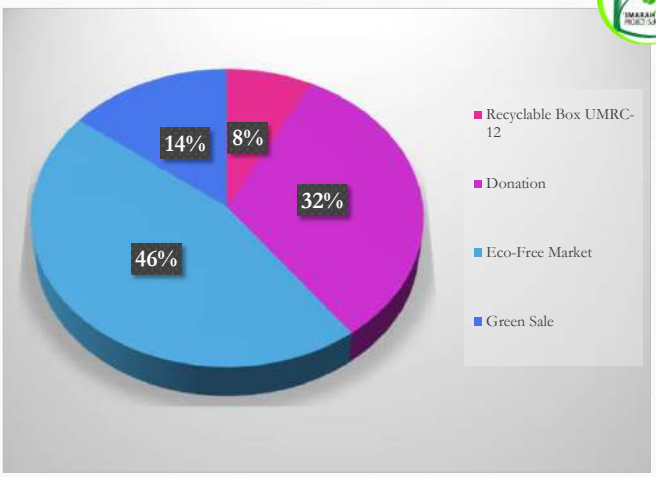
Revenue generated monthly:

2018:
September: RM 26
October: RM 413
November:RM 205
December: RM 94

2019
January: RM 35
February: RM10
March: RM 136
April: RM 302
May: RM 234
August: RM123
Total: 1578

Percentages of total distributed recyclable textiles



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BIL.	NAMA	ALAMAT	NO.TEL	SUMBANGAN		KATEGORI		CATATAN
				JENIS ITEM	KUANTITI	INDIVIDU	AGENSI	PERANAN AGENSI/SERAHAN MELALUI
	FASA 1 DAN 2 (SESI 2016\2017 & 2017\2018) : IMARAH GREEN PROJECT							
1	Wan Hashimah Binti Ahmad	Lot 45,Jalan Haji Shafie, Ijok, 45600 Bestari Jaya, Selangor.	017-207 6726	Pakaian lelaki dan perempuan	2 (t-shirt lelaki) 2 (baju kurung) 1 (telekung) 4 (tudung) & 2 (baju kanak-kanak)	X		Serahan Tangan
2	Puan Murbayah Binti Wagimin	Lot. 2104, Jalan Besar, Kg.Parit Mahang, 45800 Jeram, Selangor	014-250 4758	Pakaian Perempuan	4 (baju kurung) 1 (telekung) & 3 (tudung)	X		
3	AGENSI KASEH4U PIC :Hanis Haziqah binti Mohd Said	Tiada alamat tetap, Beroperasi di Persiaran pejalan kaki Jalan Tunku Abdul Rahman, berdekatan Tune Hotel.	013-585 5913	Buku Ilmiah	30 Buah Buku		X	Mengagihkan makanan dan minuman kepada gelandangan setiap hari Selasa
4	PROJEK LESTARI SYUKUR PIC: Anis Humaira' binti Soppy	Kolej Kediaman Raja Dr. Nazrin Shah, Universiti Malaya, 50603 Kuala Lumpur.	019-946 2723	Pakaian Lelaki	15 (Baju) & 10 (Seluar)		X	Mengagihkan makanan kepada pelajar Universiti Malaya yang kurang berkemampuan pada bulan Ramadan.
5	Pertubuhan Kebajikan dan Pendidikan PERRMATA HATIKU. PIC: Puan Maryam.	No 413, Lorong Haji Idris, Batu 4½ Jalan Gombak, 53000 Kuala Lumpur.	013-951 6122	Pakaian Lelaki dan Wanita	10 helai baju lelaki, 10 helai baju wanita.		X	Sebuah Pusat Kebajikan dan Pendidikan untuk anak yatim, asnaf zakat, dan golongan yang memerlukan.
6	Pertubuhan Kebajikan Islam Peribadi Mulia PIC: Puan Siti Salmiah Ismail	Jalan Desa Impian 6, Taman Desa Impian 43000 Kajang, Selangor.	017-213 7313	Baju kanak-kanak, baju remaja perempuan, tudung	20 (baju kanak-kanak), 8 (baju remaja perempuan), 10 (tudung)		X	Rumah perlindungan bagi anak-anak yatim seramai 60 orang
7	SURAU AL HIJRAH PIC: Nurfarah Amira binti Rahim	Kota Damansara, Jalan Pekaka 8/1 Seksyen 8, 47810, Petaling Jaya.	013-492 9864	Pakaian wanita dan Buku Agama	12 (baju kurung) & 30 (buku).		X	Menyediakan Perpustakaan Mini kepada komuniti kecil di kawasan PPR Pantai Dalam.
8	Pusat Jagaan Rumah Kesayangan. NAMA PENGETUA/PIC: Puan Nor Hafizah bintI Illias	No.15 , Jalan 3/67, Seksyen 3, 46000 Petaling Jaya. [penerima sumbangan: Puan Nur Azlin. 014-7380930]	03-778 57376	Baju kemeja dan seluar kanak-kanak lelaki	15 helai		X	Rumah perlindungan bagi anak-anak yatim dan anak orang asnaf seramai 27 orang
	FASA 3 SESI 2018\2019: IMARAH GREEN PROJECT (LL031-16SUS)							
9	Project Reach To Teach 2.0. PIC: Nursyamimi binti Mohd Shoid	Kampung Orang Asli, Pos Perwor, Sungai Siput, Perak.	013-631 6348	Pelbagai jenis pakaian & tekstil lain seperti selimut	45 kg		X	Projek dibawah NGO IKRAM Lembah Pantai, dalam program menyantuni golongan orang asal.
10	Anak-anak Rohingya. PIC: Cikgu Syahirah Hamdan	Pusat Bimbingan Alternatif Madrasah Al-Islamiyyah, Kajang Selangor	017-457 6502	Buku Ilmiah dan pakaian kanak-kanak	37kg		X	Serahan Tangan
11	Ihsan Foundation . PIC: Irman Bahruden	Sumbangan untuk Misi Kemanusiaan ke Palu, Sulawesi pada bulan Ramadan 2019 ini	017-331 8356	Pelbagai jenis pakaian kanak-kanak, telekung, dewasa	38kg		X	Serahan Tangan
12	KOLEJ KEDIAMAN KE-12 pic: Nurul Aqilla bt Che Omar	Jejak Inspirasi 2.0	017-548 0616	tudung	13 kg		X	Serahan Tangan
13	EFM @UITM JASIN MELAKA PIC: ZUL KAHAR	ECO FREE MARKET MAHASISWA UITM JASIN	019-655 6774	Beg, penyangkut baju, baju kurung	43 kg		X	Serahan Tangan
14	UMDEED & FAKULTI PERGIGIAN UM PIC: PN TG. MAIMUNAH	RAMADAN CHARITY APPEAL PROGRAM - kepada penduduk di pedalaman Kuala Lipis Pahang	012-347 0428	Pelbagai (pakaian wanita, lelaki dan kanak-kanak	45 kg		X	Serahan Tangan
15	Sek. Agama Rakyat Al Hidayah, Bukit Merah Perak PIC: Pn Amira & Pn. Rahimah	Masjid Jamek Tebuk Pancur, 34400 Semanggol Perak	011-1482 3947 / 013-400 5334	pakaian seragam sekolah agama	40 kg		X	Serahan Tangan

URBAN GARDEN

- Total of plants that has been planted:

57

(in pot, plastic bottle, used tyres not included in the planter box)

- Number of planter box (planted plant):

7

(range of 6 - 30 number of plant/1 planter box)
Estimated: 94 plants

- Total number of plants:

151

- Green landscape area:

21 m²





Project Future Plan

1. Executing eco-mosque project in the outside community as stated in the proposed MoU with JAWI.

2. Improving strategy for raising awareness and community engagement in eco-surau project at APIUM and strengthening capacity building among IEF members.

3. Implementing strategic planning for Lestrai Shop profile-raising of its function, operation and contribution to the UM community and outside people.

4. Intensifying knowledge transfer on eco-surau practices at the surau residential colleges in UM.

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AKADEMI PENGAJIAN ISLAM
Shop
MISI
VISI
AN KASUT UNTUK AMAL
PAKAIAN,
BEG TANGA
TALI PINGG
CADAR
MAINAN
1300-22-2258


sebelum
selepas
sebelum
selepas


LESTARI SHOP
Lestari Shop
SITE VISIT


PROGRAM
Pembangunan Kapasiti
EKO-SURAU UM 2019


MEETING WITH JAWI


Utusan Malaysia (15.8.2019)
MEGA MIMBAR 21
'Tadabur' alam di taman mini
Peristiwa
Akhbar Kosmo (1.6.2019)
UM Eco Freemarket terap kepentingan kitar semula
SERAMAI 250 orang penduduk di Projek Perumahan Rakyat (PPR) Kerinchi mengambil bahagian dalam program UM Eco Free Market di Kuala Lumpur baru-baru ini.
Komuniti Kita
SEBAHAGIAN sukarelawan dan penduduk yang mengambil bahagian dalam program UM Eco Free Market yang diadakan di Blok A, PPR Kerinchi, Kuala Lumpur baru-baru ini.
Taman mini surau APIUM jadi medan bicara ilmu memperkukuh amalan lestari
Portal Kampus Sinar Harian (27/6/2019)
Mahasiswa diperkasa kesedaran alam sekitar
Kosmo Online 28/6/2019
KESEDARAN. Lebih 60 orang mahasiswa Universiti Malaya (UM) mengikuti program Bicara Santai Tadabbur Alam sempena Minggu Terbuka Akademi Pengajian Islam Universiti Malaya (APIUM), di UM baru-baru ini.
UM Eco Freemarket santuni komuniti PPR Kerinchi
Sinar Harian (24/4/2019)
Peningkatan inisiatif melestari alam sekitar yang dijuarai oleh pelbagai pihak dan segmen masyarakat dewasa ini

LL034-18SUS
SMART WASTE MANAGEMENT SYSTEM USING INTERNET-OF-THINGS

DR. ISMAIL AHMEDY

Department of Computer System & Technology,
Faculty of Computer Science & Information Technology, UM

ismailahmedy@um.edu.my +603 7967 6440

AREAS OF EXPERTISE

Underwater Acoustic Sensor Networks (Tracking and Monitoring - Protocols and Applications), Embedded Systems (Digital Signal Processing - Wireless Communication), Wireless Sensor Networks (Protocols and Applications)

RECENT PUBLICATIONS

1. Underwater Acoustic Sensor Networks (Tracking and Monitoring - Protocols and Applications), Embedded Systems (Digital Signal Processing - Wireless Communication), Wireless Sensor Networks (Protocols and Applications)
2. Shaik Shabana Anjum, Rafidah Md Noor, Ismail Ahmedy, Mohammed Hossein Anisi and Norazlina Khamis, "Energy Management Techniques for RFID Sensor Networks based on Internet of Things", Lecture Notes in Electrical Engineering, 488, pp. 53-63, 2018
3. Iftikhar Ahmad, Rafidah Md Noor*, Ismail Ahmedy, Syed Adeel Ali Shah, Ejaz Ahmed, Muhammad Imran, Ibrar Yaqoob, "VANET-LTE based Heterogeneous Vehicular Clustering for Driving Assistance and Route Planning Applications", Computer Networks, Volume 145, 9 November 2018, Pages 128-140 (ISI-Indexed)
4. Christopher Chembe, Ismail Ahmedy, Rafidah Md Noor*, Douglas Kunda, Michael Oche, Abubakar Bello Tambawal, Cooperative Spectrum Decision in Cognitive Vehicular Network based on Support Vector Machine, Malaysian Journal of Computer Science, MJCS VOL. 32, NO. 2, 2019 (ISI-Indexed)
5. Said Bakhshad, Rafidah Md Noor*, Adnan Akhunzada, Tanzila Saba, Ismail Bin Ahmedy, Faisal Haroon, Babar Nazir, A Dynamic Replication Aware Load Balanced Scheduling for Data Grids in Distributed Environments of Internet of Things, Ad Hoc & Sensor Wireless Networks, Ad Hoc & Sensor Wireless Networks, Vol. 40, Issue 3-4, pp. 275–296, 2018. (ISI-Indexed)

CO-RESEARCHERS (FACULTY)

1. Assoc. Prof. Dr. Mohd Yamani Idna Idris (Faculty of Computer Science & Information Technology, yamani@um.edu.my)
2. Assoc. Prof. Dr. Rafidah Md. Noor (Computer Science), Faculty of Computer Science & Information Technology, fidah@um.edu.my)
3. Dr. Tey Kok Soon (Electrical Engineering), Faculty of Computer Science & Information Technology, koksoon@um.edu.my)

Core Area of UM Eco-Campus Blueprint

Contribution to Sustainable Development Goals (SDGs)

PROJECT SUMMARY

Smart City involves the integration of several information and communication technology (ICT) along with the Internet of Things (IoT) to manage the city's assets. The local departments, information systems, schools, hospitals, transportation systems and waste management systems are among the city assets. Thus, in order to achieve smart cities, efficiency in waste management system is also one of the important part. Inefficient waste collection system has resulted in environmental pollution and large consumption of source of energy. This is because inefficient waste collection system results in smell pollution, breading of insects, animal scavengers and rodents which also giving rise to range of diseases when some waste bins are left overloaded and uncollected. As one of the efforts to overcome the inefficiency of waste collection system problem, Smart Bin Sensor is introduced in this project. It is an automatic monitoring device that provides timely status of a bin, enables optimal route planning for collections, reduces collection times, saves costs as well as the fuel consumption. The cycle of the Smart Bin Sensor system will start from the monitoring of waste in a waste bin so that the waste will be emptied before they are overloaded. The collection of waste from those waste bins that are almost full will be prioritized and that the waste collection schedule can be customized accordingly. For the collection process, the system will manage on optimizing the route to the waste bins that need to be emptied which will save time and reduces fuel consumption. A wireless sensor is to be installed at the top of the bin for the monitoring process, under the lid and consists of Wi-Fi module which is used to send data collected from the waste bin to the next online system application using Global Positioning Signal (GPS) technology.

Research Assistant

Mr. Muhammad Zar Mohd Zaid Harith (MSC. in Computer Science, Faculty of Computer Science & Information Technology, UM)
muhdzar93@gmail.com

Smart Waste Management System Using Internet-of-Things (LL034-18SUS)

Ismail Ahmedy, Mohd Yamani Idna Idris, Rafidah Md Noor, Tey Kok Soon

Department of Computer System & Technology,

Faculty of Computer Science and Information Technology (FCSIT)

University of Malaya

Introduction

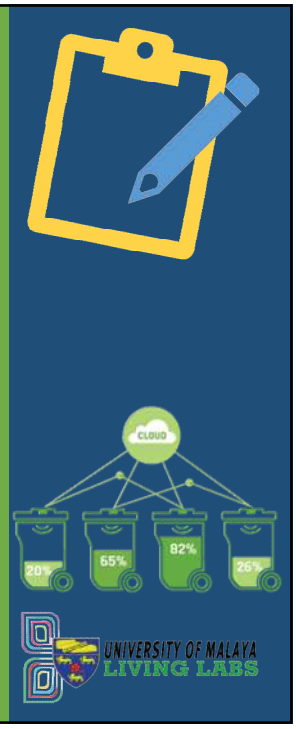
- Internet-of-Things (IoT) approach have proven as the most efficient way for data collection in real-time and highly scalable due to its integrability with any other technology in this era.
- Smart city development takes an active part in implementing IoT based system whether in residential or industrial field. This makes an efficient and smart waste management system is a requirement for smart city development.
- The system is required to provide the best solution from monitoring waste volume to collecting waste daily. IoT based system will collect data from sensors to measure the waste level and weight.
- These data are collected and displayed through an any interactive platform that able to help waste management companies improves their daily task and alert public on total volume of waste produced daily as awareness in reducing waste production.

Objectives

- To develop a smart bin sensor that provides a real-time of status bin through identifying level of waste
- To develop a monitoring application for the stakeholder in monitoring the waste management.
- To design route optimization for waste collection efficiency

KPI Achievement

No	Category	Current Progress
1.	Project Target Achievement (Measurable / Quantifiable, e.g: % reduction, savings etc)	Self-build sensor solutions *(Device – smart bin)*
2.	Capacity building (e.g. seminar, demonstration, training)	Mini Demostration (JPPHB - Stakeholder)
3.	Innovation/technology/ knowledge transfer	Prototype development and system applications – 100% completion
4.	Community Engagement	Exhibition (IoT Conf) MPSJ (Project initiative for PRGS)
5.	Networking & Linkages	Industrial Partnership with Elvira Systems Sdn. Bhd.
6.	Publications (e.g. journal paper, book)	**Conference** SIE2019: Accepted *Prototype Development of IoT based Smart Waste Management System For Smart City* **Chapter in book**: Waste Management System in University of Malaya



Proof-of-Concept

UNIVERSITY OF MALAYA LIVING LABS

Activities: Energizing Sustainable Development Goals (SESDG2019)

25 APRIL 2019
CUBE APIUM

UNIVERSITY OF MALAYA LIVING LABS

Activities: Advantech Malaysia IoT Co-Creation Partner Conference

MITEC, 17th June 2019
As participant & exhibitor

Activities: Zero Waste Campaign

2 Aug 2019
En. Abdul Rahim

LL035-18SUS
MANAGING KITCHEN WASTE USING BLACK SOLDIER FLY: AN ALTERNATIVE APPROACH TOWARDS ZERO WASTE IN CAMPUS

DR. MUHAMAD SHAKIRIN MISPAN
Institute of Biological Sciences (ISB)
Faculty of Science, University of Malaya

shakirin@um.edu.my +603 – 7967 6757

AREAS OF EXPERTISE

Weedy rice (Adaptive traits; seed dormancy; management), Agriculture (Rice; Precision farming; sustainable agriculture), Weed Science (Weed seedbank dynamic; herbicide resistant), Genetics (Ecological genetics; seed molecular biology).

CO-RESEARCHER (FACULTY)

1. Professor Dr. Normaniza Osman (Institute of Biological Sciences, Faculty of Science, normaniza@um.edu.my)

RECENT PUBLICATIONS

1. Mispan, MS., Mahmood, NZ., Zainal Abidin, MI. (2018). Agro-Hero: Promoting green practices to communities for sustainable agriculture. In. UM Living Lab: Transforming Research into Action (vol.2). Ed Yusoff, S. University of Malaya Press.

Core Area of UM Eco-Campus Blueprint

PROJECT SUMMARY

The increasing amount of food waste in Malaysia has brought many environmental issues and solid waste management problems in the country. University Malaya (UM) through a persistent effort from Zero Waste Campaign (ZWC) has spearhead the development of a sustainable waste management model in UM. However, ZWC faced some challenges in their endeavour including uncooperative vendors to segregate kitchen waste, compost nutrient loss due to open air composting and tedious/laborious processes (e.g. manual segregation, shredding, aerating). Therefore, Black Soldier Fly (BSF) composting method is proposed as an alternative complimentary approach to ZWC on managing kitchen waste in UM. BSF can consume a wide range of organic material and turn it into compost while its high protein maggots can be used for feed. The objectives of this project are to (i) explore the feasibility of using BSF to process kitchen waste in UM; (ii) design a proof-of-concept BSF composting system (BSF-CS) for cafeteria; and, (iii) create awareness on the importance of managing kitchen waste among University Malaya communities. This project will assess a number of BSF-CS designs that can be fitted near the cafeteria to reduce the vendor effort to separate food waste. This project will collaborate with Kolej Kediaman Raja Dr. Nazrin Shah and Seleraku Cafe where their food waste will produce compost and feed using BSF-CS. The BSF larvae will be tested as chicken feed in Pusat Penyelidikan Bioteknologi Glami Lemi (PPBGL). Undergraduate students will be involved with this project to promote awareness on food waste management. Ultimately, this project is aimed to (i) design a cafeteria-friendly BSF-CS, (ii) produce 30% of compost and 100kg of BSF feed from the cafeteria kitchen waste, and (iii) reduce transportational cost by 10%. The goal is to have a compost site that is near, odourless, safe and effective for cafeteria.

Contribution to Sustainable Development Goals (SDGs)

Research Assistant

Ms. Noraikim Mohd Hanafiah (BSc. (Hons) Ecology & Biodiversity, Faculty of Science UM)
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Managing kitchen waste using Black Soldier Fly (BSF): an alternative approach towards zero waste in campus

Dr. Muhamad Shakirin Mispan

Prof. Dr. Normaniza Osman

Black Soldier Fly Composting System (BSF-CS)

**for food waste*

OBJECTIVES

1. To explore the feasibility of using BSF to process food waste in University Malaya.
2. To design a proof-of-concept BSF composting system near cafeteria.
3. To create awareness on the importance of managing food/kitchen waste among University Malaya communities.

Activities	2018				2019							
	Sep	Oct	Nov	Dec	Jan	Feb	Mac	Apr	May	Jun	Jul	Aug
Design BSF composting system (BSF-CS)												✓
Evaluate BSF-CS efficiency ***Dr. Norhidayah (FRGS)*** - Compost analysis // BSF based feed analysis												➡
Deployment of BSF-CS prototype on sites - Kolej Kediaman Raja Dr. Nazrin Shah // Seleraku Café									-KIV-			
Product assessment - Compost // BSF based feed												
Performance analysis - Life cycle assessment												
Campaign on "*manage your food waste*"			✓									
Public demonstration for school students on BSF composting									-KIV-			

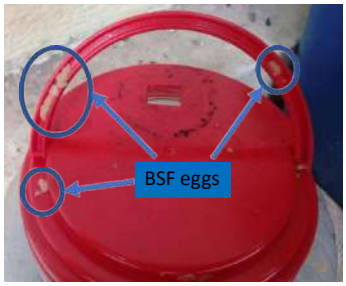
Summary of KPI

Category	(Please state expected results)	Current Status
Project Target Achievement (Measurable / Quantifiable, e.g: % reduction, savings etc)	(i) 30% of compost from the total weight of kitchen waste collected. (ii) 100kg of chicken feed from BSF larvae. (iii) 10% reduction on transportational cost due to introduction of BSF-CS by cutting the cost to transfer the waste to ZWC.	(i) 10kg of "compost" can be produced from ~40kg of kitchen waste during 1 month experiment (25%). (ii) 5kg of BSF larvae produced from current system. (iii) Transportation cost (not yet)
Capacity building (e.g. seminar, demonstration, training)	One public demonstration for school students on BSF composting.	- Organizing one school program in SMK DUMA, Jelebu (Pertandingan Kantin Peringakat Kebangsaan) **-KIV to October 2019**
Innovation/technology/knowledge transfer	A prototype of a cafetaria-friendly Black Soldier Fly Composting System (BSF-CS).	- Done
Community Engagement	One day campaign on "manage your food waste" with undergraduate students from Ecology Biodiversity program, Institute of Biological Sciences.	- 3 technical videos have been produced.
Networking & Linkages	One memorandum of understanding (MoU) with poultry company.	- The poultry company withdrawed.
Publications (e.g. journal paper, book)	One article journal (ISI or Scopus)	- A review paper on BSF is in write-up stage (MJS)
Policy Papers / Guidelines/ Standards	One phamplet on BFS composting in campus.	- Coming soon.

First trial : understanding of BSF

1. First prototype to understand the behavior of Black Soldier Fly (BSF) in campus.

2. This system successfully attracts BSF (BSF eggs spotted).



3. BSF larvae spotted after 2 weeks.

Second trial : play with larvae

1. Second prototype. Aimed to rear larger population of BSF.

2. BSF population in the system.

3. BSF larvae start to escape. These larvae can be harvested for feed. Need more improvement on the prototype: i) More space for the waste to cater higher volume; and ii) ramp to harvest BSF larvae.

Prototype 1: BSF egg trap

A prototype to attract female BSF to lay eggs.

Prototype 1: BSF double bucket system

The system

Feed with kitchen waste

After 1 week

Feed with fish

After 24 hour

Feeding time....

26 December 2018

3 January 2019

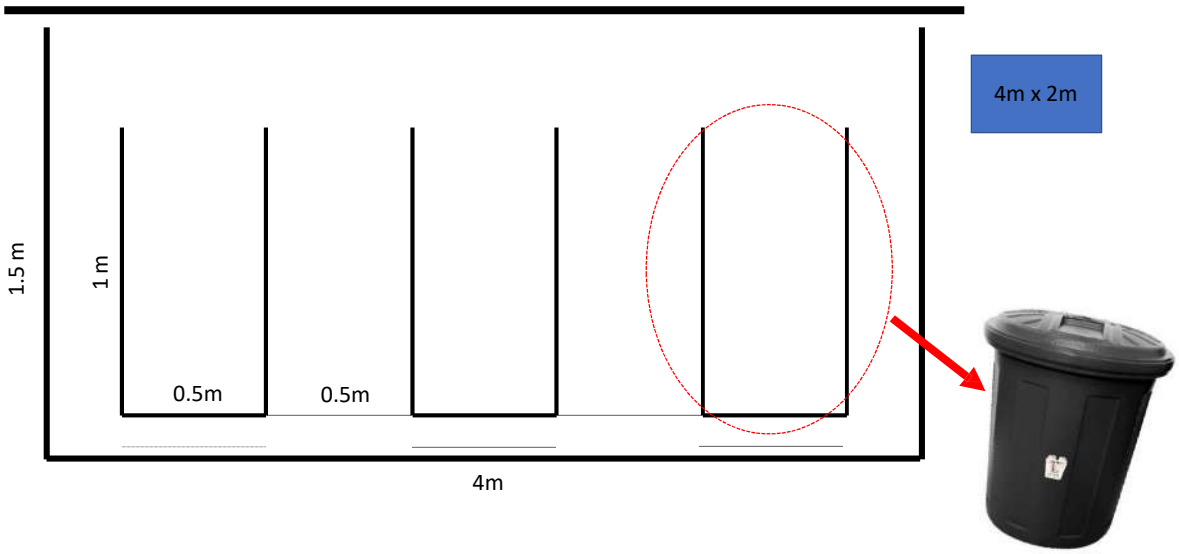
13 January 2019

Total waste weight: ~40kg

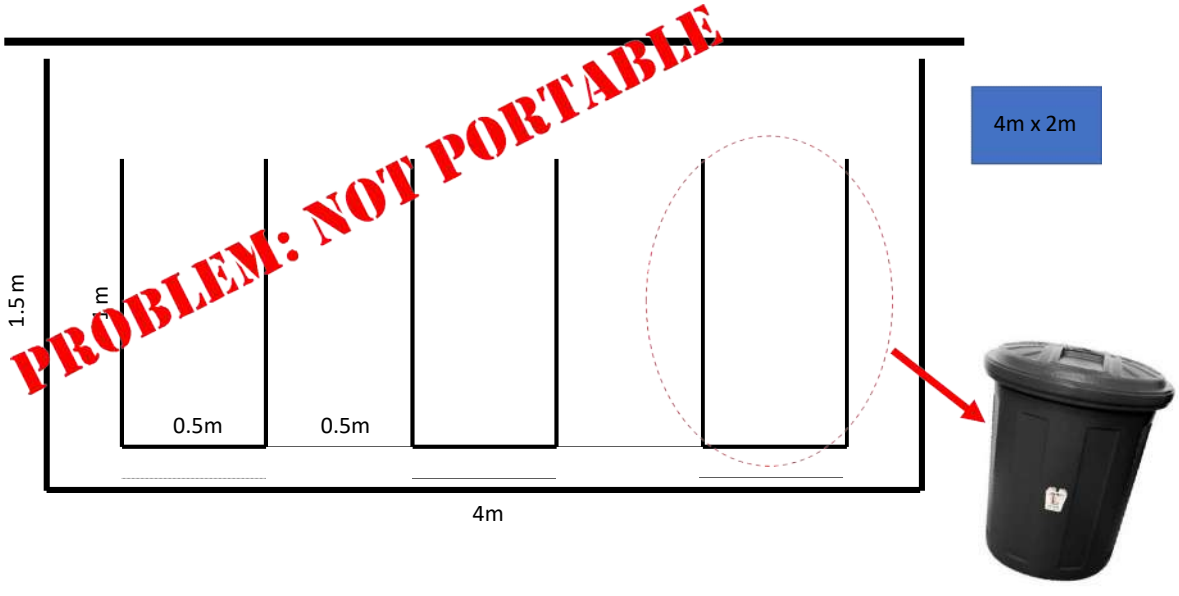
Production....

Total collected: ~5kg

Prototype 2: Go big!!!

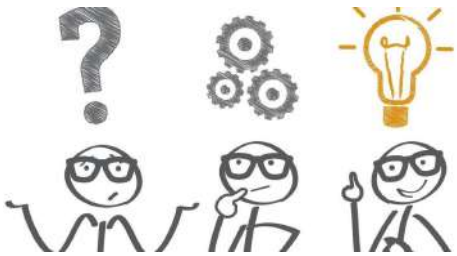


Prototype 2: Go big!!!



Can we use BSF as an alternative approach to effectively manage food waste in our own campus?

-shakirin 2018 -



UNIVERSITI MALAYA

UNIVERSITY OF MALAYA LIVING LABS

UM ECO-CAMPUS

UMLL036-18SUS
HEALTHY SOIL FOR A HEALTHY ENVIRONMENT: REDUCING DEPENDENCY ON CHEMICAL FERTILIZER CONSUMPTION IN UNIVERSITI MALAYA USING ORGANIC MATERIALS

DR. ROSAZLIN ABDULLAH

Institute of Biological Sciences
Faculty of Science, University of Malaya

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+603-7967 4360

AREAS OF EXPERTISE

Agricultural Sciences; Environmental Science, Soil Remediation, Soil Fertility and Crop Nutrition, Compost and Biochar

PROJECT SUMMARY

Landscaping in University of Malaya (UM) has become an important activity to boost the greening of the campus. The use of chemical fertilizers on plants has become a regular practice in to promote the growth of the plant. However, utilization of chemical fertilizers can cause imbalance in the agroecosystem and degradation in the soil quality. Moreover, chemical fertilizers are more resistant in the environment because most of the microorganism decrease following the increase of the chemical fertilizers used. Therefore, there is a need to find an alternative to promote the growth of the plants, without affecting the environment and the agroecosystem. This can be achieved by the co-application by using an organic material such as biochar and compost. Biochar and compost also proven in many experiments to has positive effects on crop productivity, nutrient retention which can improves soil fertility and simultaneously mitigate climate change. Therefore, this study will be focusing on reducing the usage of fertilizer in UM landscaping area and accessing the environmental awareness of students and staff in campus about healthy soil and fertilizer consumption and to enhance the UM Sustainable Development Goals (SDG) as well as UM Low Carbon Cities Framework (LCCF) which to reduce the greenhouse gases production in campus by data collection and calculation for the GHGs reduction. By the end of this study, we are hoping to reduce at least 20% of the fertilizer consumption in UM which is expected to be reduced by at least 1.33 ton/yr. This reduction will result in a reduction of 20% of purchasing fertilizer cost which can save up about RM 1,388.00/yr. As the result, this implementation can increase at least 10% of UM areas with green vegetation by planting more plant and sustainable plantation

CO-RESEARCHERS (FACULTY)

1. Professor Dr. Sumiani Yusoff (Institute of Ocean and Earth Sciences UM : sumiani@um.edu.my)
2. Dr. Mahanom Jalil (Biology Division, Centre for Foundation Studies in Science UM: hanom@um.edu.my)
3. Associate Professor Dr Najihah Mohd Hashim (Department of Pharmacy, Faculty of Medicine UM: najihahmh@um.edu.my)

Core Area of UM Eco-Campus Blueprint

Contribution to Sustainable Development Goals (SDGs)

Research Assistant

Ms. Nur Sa'adah Abdul Halim
(BSc Environmental Science & Management UM,
saadah.halim@gmail.com)

LLG036-18SUS

Healthy Soil for a Healthy Environment; Reducing Dependency on Chemical Fertilizer Consumption in University of Malaya Using Organic Materials

Co-Researcher

Prof Dr Sumiani Yusoff
Solid Waste Management
ZWC

Prof Dr Normaniza Osman
Plant Eco-physiologist
ISB

Dr Rosazlin Abdullah
Soil Science
ISB

Assoc. Prof. Dr Najihah Mohd Hashim
Natural Product Chemist
CENAR

Dr Mahanom Jalil
Tissue Culture
PBIU

En Maszairizam Masri
Penolong Jurutera
JPPHB

Nur Sa'adah Abdul Halim
Biochar UM
ISB

The use of chemical fertilizer, organic fertilizer or biofertilizer has its advantages and disadvantages in the context of nutrient supply, crop growth and environmental quality.

- ✓ Organic fertilizers are slow release nutrient sources. This implies that crops can suffer initial starvation from nutrient immobilization prior to mineralization. Required in large quantities which may not be readily available to small or big scale farmers
- ✓ Inorganic fertilizers ensure quick availability of nutrients to crops and their reckless use can create nutrient imbalance that limits the uptake of other essential nutrients and cause soil acidity leading to low crop yields.

Combined Use of Chemical and Organic Materials

The advantages need to be integrated in order to make optimum use of each type of fertilizer and achieve balanced nutrient management for crop growth.

(Agbede, and Kalu, 1995; Okigbo, 2000; Adekiya et al, 2012; Funda et al, 2011; IRRI 2019).

Objectives

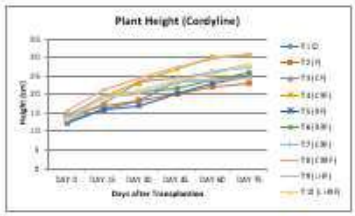
1. Determine fertilizer usage and conducting environmental awareness survey in campus.
2. Trial experiment on combination fertilizer and organic materials (compost and biochar) application in soil at landscaping and nursery area.
3. Determine the GHG reduction by incorporating between 2 elements (Urban Environment and Urban Infrastructure) in LCCF and targeting 4 SDGs.

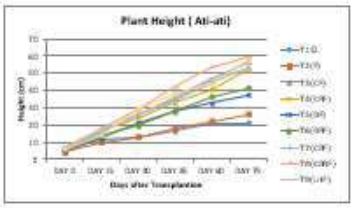
No	Category	(Please state expected result)	Achievement
1.	Project Target Achievement (Measurable / Quantifiable, e.g: % reduction, savings etc)	1. Reduce 20% consumption of fertilizer in UM (425 kg/yr) 2. Reduce 20% purchasing fertilizer cost. (RM 1,388.00/yr)	Achieved
2.	Capacity building (e.g. seminar, demonstration, training)	Demonstration and training for application of compost and biochar at experiment plot.	Achieved
3.	Innovation/technology/knowledge transfer	Awareness and Using the compost produced by Zero Waste Campaign and biochar	Achieved
4.	Community Engagement	Demonstration with community for application of compost and biochar at experiment plot	Achieved
5.	Networking & Linkages	Zero Waste Campaign (ZWC), Community Kg Seri Cheeding, JPPHB	Achieved
6.	Publications (e.g. journal paper, book)	Newspaper article, Journal Book Chapter	In progress In progress In progress
7.	Policy Papers / Guidelines/ Standards	-	-

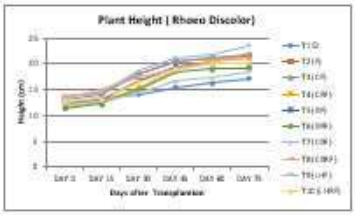
1. Experimental plot

- Plots
  - ➢Nursery plant;
    - *Coleus sp*. (Ati-ati*),*
    - *Cordyline fruticosa sp. (*Jenjuang*)*
    - *Rhoeo discolour sp. (*Nanas Kerang)
  - ➢Landscaping plant; *Syzygium myrtifolium sp.* (Kelat Paya)

- Treatments
  - ➢Control
  - ➢Normal Media + Fertilizer
  - ➢Compost + F
  - ➢Compost + <20% F
  - ➢Biochar + F
  - ➢Biochar + <20% F
  - ➢Biochar + Compost + F
  - ➢Biochar + Compost + <2% F







UM Living Lab Site Visit (29 January 2019): LL036-18SUS

2. Capacity building

(e.g. seminar, demonstration, training)
Kursus Pengurusan Pembajaan dan Penggunaan Bahan Organik untuk Tanaman (27 March 2019) - collaborate with Seksyen Pembangunan Bakat UM

3. Innovation/technology/knowledge transfer;

Awareness on importance of organic amendment in environment (representative of Faculty of Science)
UNIVERSITY OF MALAYA RESEARCH CARNIVAL (UMRC)

3. Innovation/technology/knowledge transfer;

Seminar on Energizing Sustainable Development Goals (SESDG2019) *(25 April 2019)*

3. Innovation/technology/knowledge transfer;

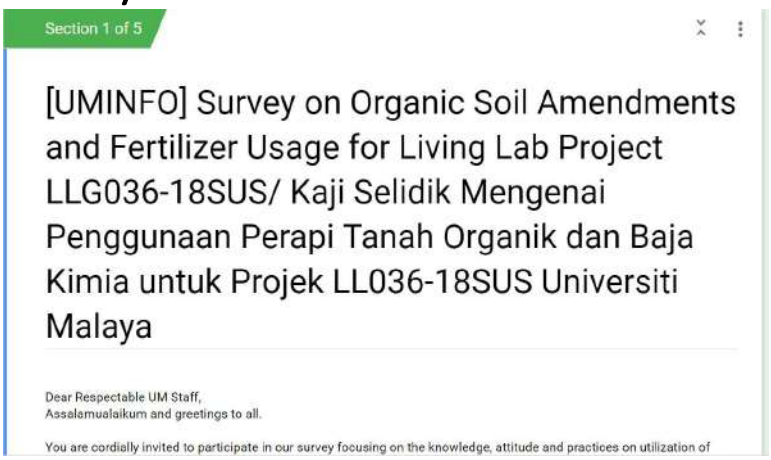
World Scout Environment Programme (WSEP) and Transfer Knowledge Programme with Pertubuhan Peladang Port Dickson 9 Disember 2018

3. Innovation/technology/knowledge transfer;

Soil amendment and fertilizer awareness in UM.

- Knowledge
- Application
- Practices

Survey distribution


Section 1 of 5

[UMINFO] Survey on Organic Soil Amendments and Fertilizer Usage for Living Lab Project LLG036-18SUS/ Kaji Selidik Mengenai Penggunaan Perapi Tanah Organik dan Baja Kimia untuk Projek LL036-18SUS Universiti Malaya

Dear Respectable UM Staff,
Assalamualaikum and greetings to all.

You are cordially invited to participate in our survey focusing on the knowledge, attitude and practices on utilization of

Final Year Project: Dariyah Zakaria

The finding of this study shows that the knowledge of the respondents on the importance of soil organic amendment on soil fertility and environment **still needs to be improved (62%).** Their **attitude is positive (84%)** on organic soil amendments practices for plants growth, but they are **still dependent on chemical fertilizer** to provide the essential nutrients required for optimum plant growth.

5. Networking & Linkages;

JPPHB & ZWC & Community Lembah Pantai & Seksyen Pembangunan Bakat UM

Interview session with JPPHB staff
Mr Mustafa and Mr Razman in nursery

ZWC

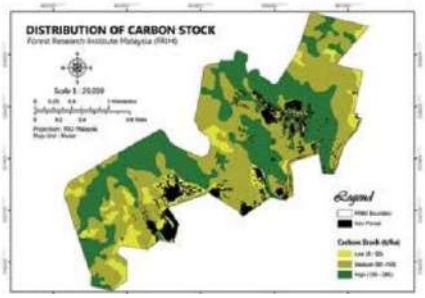
6. Publication; Final Year Project

- 2 thesis Final Year Project
- Journal (Draft)
- Book Chapter in progress
- Media Newsletter in progress

Suggestion for Future Project

- Soil Health Clinic
- The estimate aboveground carbon stock in UM
- (GIS and a set of ground measurement data

CARBON MAPPING



UNIVERSITI MALAYA

UNIVERSITY OF MALAYA LIVING LABS

UM ECO-CAMPUS

UMLL037-18SUS
CARBON STORAGE MAPPING INITIATIVE THROUGH REAL TIME GPS TRACKING & IoT MONITORING

DR. KHAIRUNNISA HASIKIN

Department of Biomedical Engineering,
Faculty of Engineering, University of Malaya

khairunnisa@um.edu.my +603-7967 5220

AREAS OF EXPERTISE

Carbon Storage Mapping, Sensor, GPS Tracking

RECENT PUBLICATIONS

1. Pourshahrestani, Sara; Kadri, Nahrizul; Zeimaran, Ehsan; Gargiulo, Nicola; Samuel, Shani ; Naveen, Sangeetha ; Hasikin, Khairunnisa; Kamarul , Tunku ; Towler, Mark (2017). Comparative efficacy of hemorrhage control of a novel mesoporous bioactive glass versus two commercial hemostats. Biomedical Materials. doi: 10.1088/1748-605X/aa9b3e. (ISI-Indexed)

2. Bagheri S, Termehyousefi A, Mansouri N, Babadi AA, Karim MSA, Kadri NA. (2017) Carbon-Based Nanobiohybrid Thin Film for Amperometric Glucose Sensing. ACS Biomater. Sci. Eng., 2017, 3 (9), pp 2059–2063 DOI: 10.1021/acsbiomaterials.7b00325 (ISI-Indexed)

CO-RESEARCHER (FACULTY)

1. Associate Professor Dr. Nahrizul Adib Kadri (Department of Biomedical Engineering, Faculty of Engineering, UM: nahrizuladib@um.edu.my)

Core Area of UM Eco-Campus Blueprint

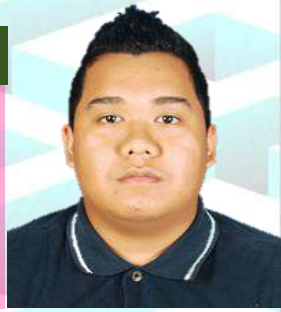
Contribution to Sustainable Development Goals (SDGs)

PROJECT SUMMARY

As part of promoting an eco-campus facility in the University of Malaya, this project intends to develop an automated carbon storage mapping and monitoring system specifically on tree plantation in the faculty. Through this project, a tracking system will be installed in the individual trees at different areas in the faculty and their growth (i.e. diameter & height of the tree) will be monitored and will be quantified to calculate the carbon sequestration rate. Data collection including planted trees location (GPS), growth parameters will be performed, and this information will form the bulk of the database to be processed using analytic engine which will be developed in this study. To date, there is no proper and real time monitoring system on carbon sequestration in the faculty. The proposed system will embed the artificial intelligent architecture in predicting the trends and pattern of carbon sequestration of planted trees. The Internet of Things (IoT) tools will be also implemented to store the collected data for at least twice a year monitoring. By having this kind of system in the faculty, a carbon balanced ecosystem could be achieved with an increment of 20% carbon sequestration rate in the long run and will be able to produce more conducive environment for the faculty members.

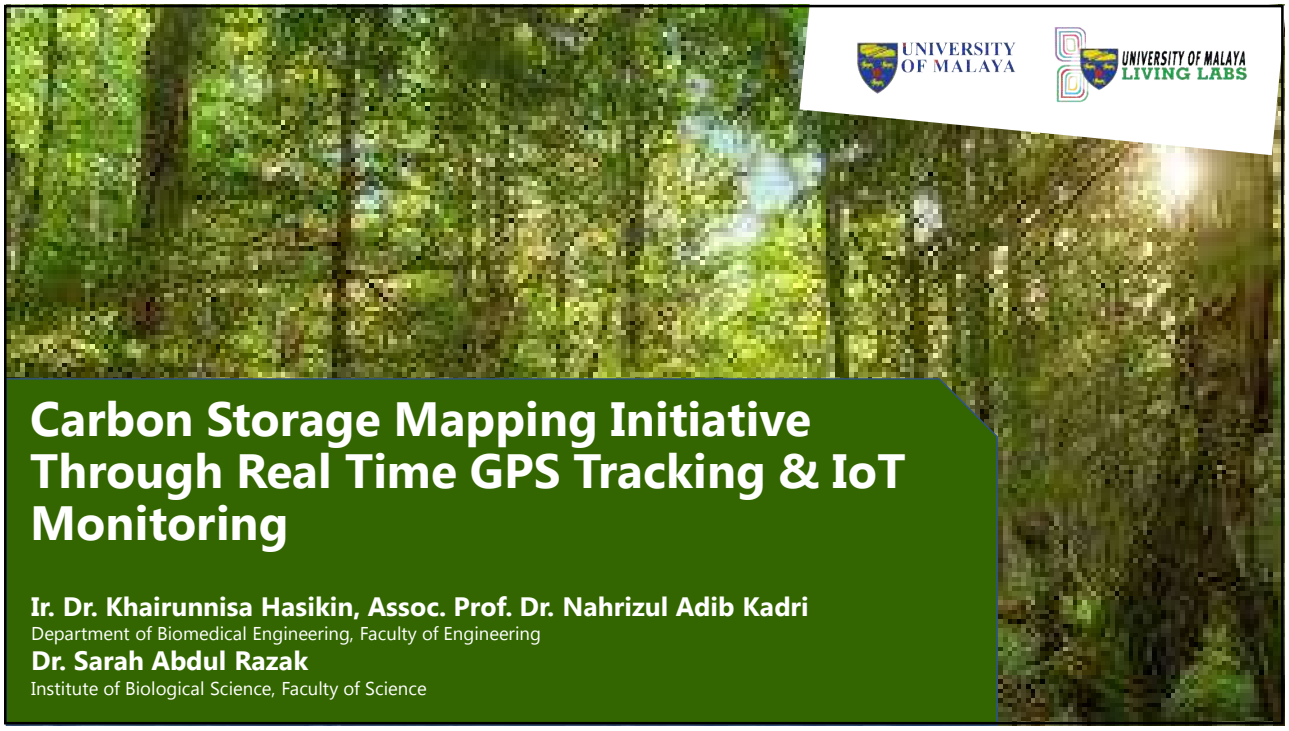
Research Assistant

Mr. Muhammad Basril Muhammad Asri (Sensor Integration)
(Bachelor of Engineering (Manufacturing),
basril.asri@gmail.com)
Nov 2018 – March 2019



Research Assistant

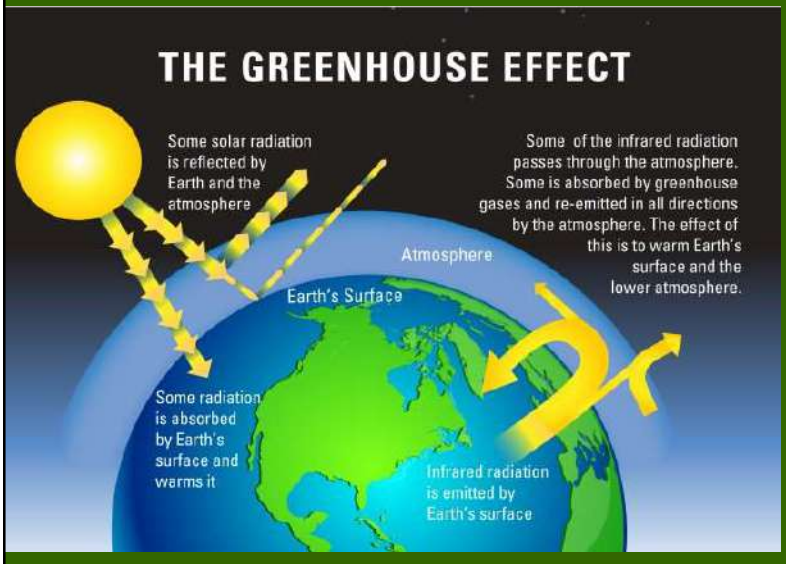
Ms. Nurshafira Hazim Chan (IoT and Carbon Tagging)
(Bachelor of Engineering (Biomedical Engineering),
fyrachan@gmail.com)
February 2019 – Present



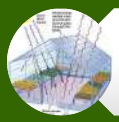
Carbon Storage Mapping Initiative Through Real Time GPS Tracking & IoT Monitoring

Ir. Dr. Khairunnisa Hasikin, Assoc. Prof. Dr. Nahrizul Adib Kadri
Department of Biomedical Engineering, Faculty of Engineering
Dr. Sarah Abdul Razak
Institute of Biological Science, Faculty of Science

Introduction



Reducing global energy use

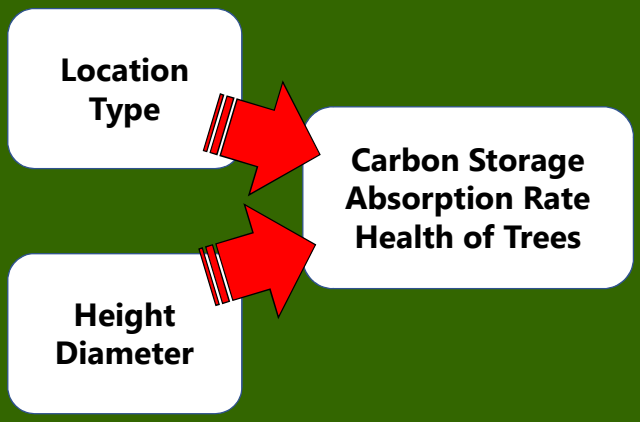


Development of low-carbon or non-carbon emitting new energy

Absorbing and fixing CO2 from the source or atmosphere

- Individual trees act as carbon sinks
- Carbon sequestration analysis

Carbon Storage Mapping Initiative



- Through tree mapping using GPS, database of the type of tree, its species and growth can be recorded and analyzed.
- The information is then being correlated with carbon absorption rate (annual) in order to track the reduction of carbon dioxide in the atmosphere.
- Able to provide stakeholders with more detailed information about CO2 absorption

Objectives

Objective 1

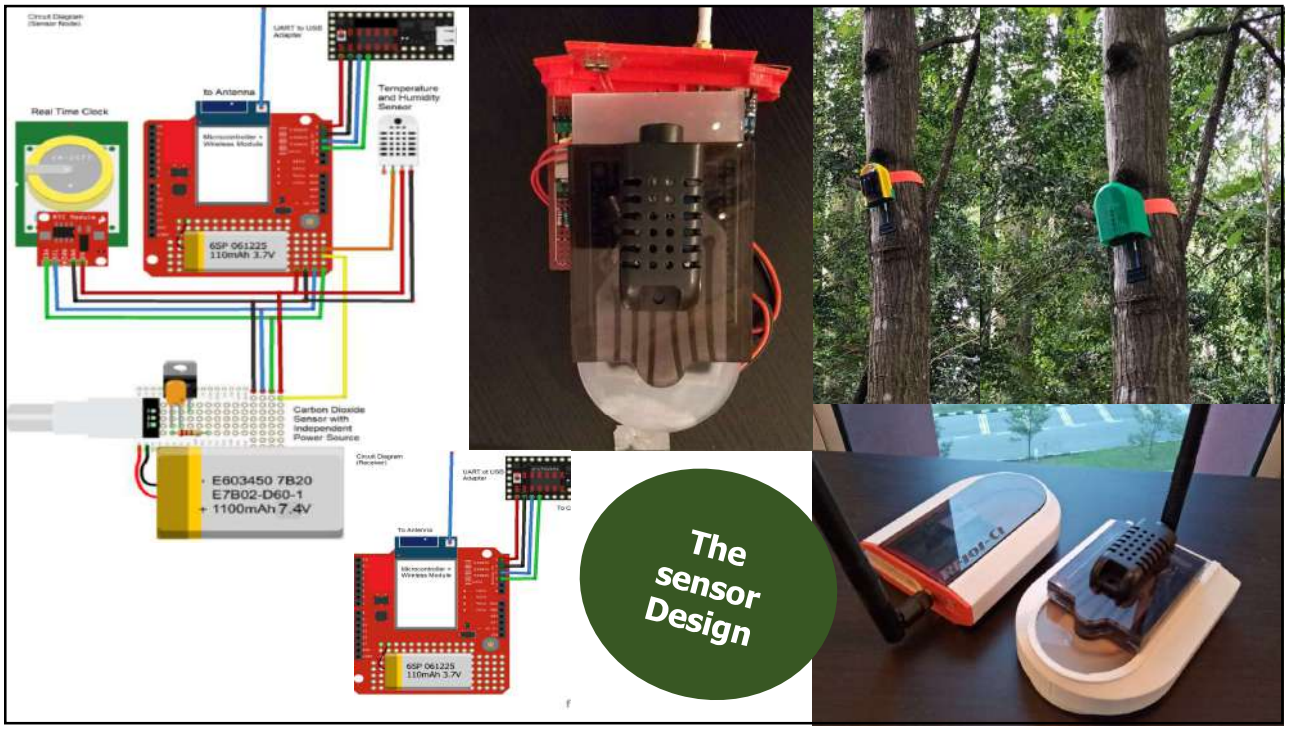
•To map locations of the tree plantation at various locations in UM

Objective 2

•To correlate the growth of trees and species to the sequestration process in term of carbon absorption rate

Objective 3

•To develop a carbon storage mapping initiative using GPS and IOT monitoring system


Real Time Clock
to Antenna
Temperature and Humidity Sensor
6SP 061225
110mAh 3.7V
Carbon Dioxide Sensor with independent Power Source
E603450 7B20
E7B02-D60-1
1100mAh 7.4V
The sensor Design


Data Collection at Rimba Ilmu, UM
Cratoxylum cochinchinense
(GUTTIFERAE)
derum, selunchor, mampat
Myanmar to China, Malay Peninsula, Sumatra, Borneo, Philippines.
Small to medium tree, bark peeling off, deciduous.

SESDG 2019

- Best booth award
- 25 April 2019


Climate Change Mitigation
rough Carbon Sequestration
Data in Mangrove Forests
Dr. Sarah binti Abdul Razak
Sime Darby Plantation
Academy (SDPA)...
Sime Darby Mangrove
Research Center
West Oil Mill
MANGROVE
RESEARCH CENTRE
Presentation
to Sime Darby
For Mangrove
Research Center
13 March 2019


INFINITI
INOVASI • SAINS • GAJET
Peranti Pemantau
Alam Sekitar
Ukur serapan karbon dioksida
KOSMO
20 February
2019

V70 VARSITI BERITA KHAMIS, 14 Mac 2019 BIL 475

inovasi

Peranti mudah alih ukur karbon dioksida

Bantu PBT kenal pasti tumbuhan sesuai untuk tangani kesan rumah hijau

Oleh Mohd Khairul Anam Md Khairudin
khairul.anam@bh.com.my

Kuala Lumpur

Peningkatan satu darjah Celsius dalam tempoh 100 tahun kebelakangan ini dikatakan menjadi punca kepada peningkatan insiden cuaca buruk di seluruh dunia, peningkatan aras laut dan kepupusan biodiversiti global.

Perubahan Bangsa-bangsa Bersatu (PBB) melalui sasaran pembangunan lestari yang digariskan pada 2015 memper untukkan antara sasaran khusus untuk semua negara menangani isu cuaca global secara kolektif menjelang 2030.

Menyedari kepentingan itu, sekumpulan penyelidik dari Universiti Malaya (UM) membangunkan sebuah peranti yang mampu mengukur tahap karbon dioksida yang tersimpan pada pokok dan tumbuhan hijau.

Ketua penyelidik kumpulan itu, Dr Khairunnisa Hasikin, berkata tumbuhan hijau mempunyai kelebihan berbanding hidupan organik lain kerana kemampuannya untuk melakukan fotosintesis.

Beliau yang juga penyarah kanan di Jabatan Kejuruteraan Bioperubatan, Fakuli Kejuruteraan UM berkata, kelebihan itu membenarkan sel tumbuhan hijau untuk menukarkan tenaga daripada sinar cahaya matahari kepada tenaga kimia yang boleh digunakan oleh organisma lain termasuk manusia.

"Lebih penting, proses fotosintesis ini menggunakan karbon dioksida dan mengeluarkannya kepada oksigen serta wap air.

Pengumpulan data

"Sifat semula jadi inilah yang menjadikan tumbuhan hijau sebagai antara pertahanan utama dalam usaha untuk menangani peningkatan tahap karbon dioksida di atmosfera bumi," katanya kepada *BH Varsiti*.

Berkongsi lebih lanjut, Dr Khairunnisa berkata, peranti dibangunkan itu dilengkapi dengan penderia gas karbon dioksida, kelembapan dan modul radio bagi transmisi data.

"Satu set sistem yang dibangunkan ini terdiri daripada dua buah peranti dengan satunya bertindak sebagai pemancar dan diletakkan di kawasan yang ingin diukur, manakala satu lagi bertindak sebagai penerima data serta disambungkan kepada komputer pelayan.

"Komputer pelayan ini akan merekodkan semua data yang diterima ke dalam pangkalan data yang dibangunkan, yang mana dengan menggunakan kelebihan mikro pemproses terbina di dalam setiap unit peranti, pengumpulan data ini boleh dilakukan dalam masa nyata," katanya.

Beliau berkata, penggunaan sistem berkenaan di taman rekreasi dan kawasan hijau di kawasan bandar misalnya boleh memberi senario lebih jelas kepada pihak berkuasa tempatan mengenai [illegible] hijau yang di[illegible]

"Dengan a[illegible] ini, penyelesaia[illegible] menyeluruh dap[illegible] kan oleh semua pe[illegible] tarah dalam menan[illegible] kesan rumah hijau secara bersama," katanya.

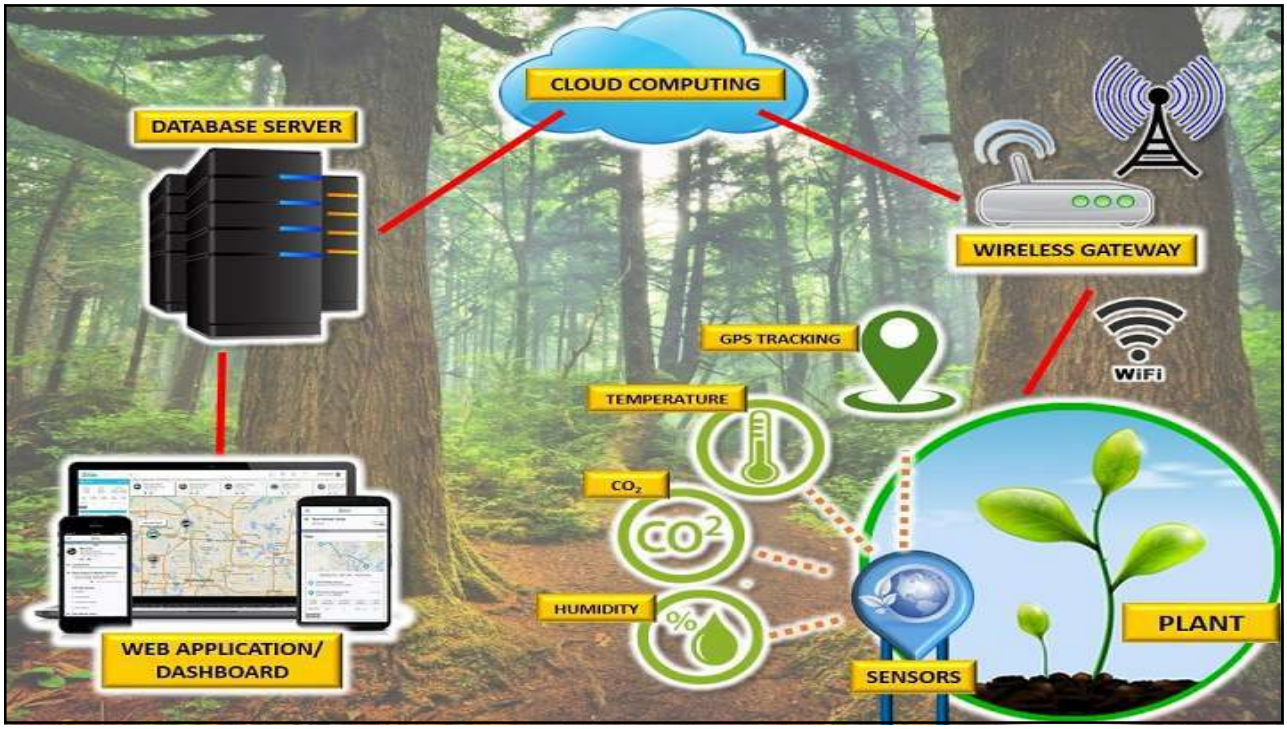
Produk ini berupaya menyukat tahap karbon dioksida pada tumbuhan hijau.

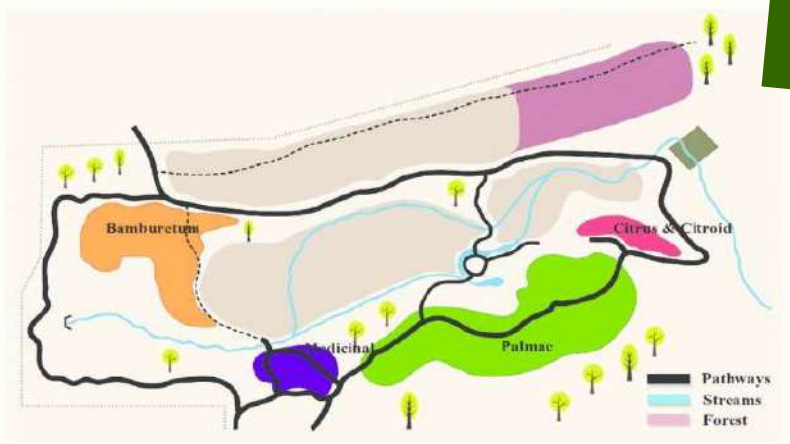
info

Peranti ukur karbon dioksida

+ **Projek** penyelidikan ini merupakan geran UM Living Lab di bawah Kluster Penyelidikan Sains Kejuruteraan UM berjumlah kira-kira RM20,000
+ **Analisis** data raya menggunakan teknik kecerdasan buatan terbaik berpotensi membantu penyelesaian kepada banyak cabaran global seperti Revolusi Perindustrian Keempat
+ **Membuktikan** ke[illegible] dengan penyelidik Universiti Malaya (UniMAP) dan [illegible] penunding te[illegible] MyCRO Sdn [illegible]
+ Kajian pe[illegible] diterukan d[illegible] bersama pad[illegible]

Berita Harian 14 March 2019





The Study Area
Rimba Ilmu

POPULATION:
1600 Species

AREA:
80 Hectares

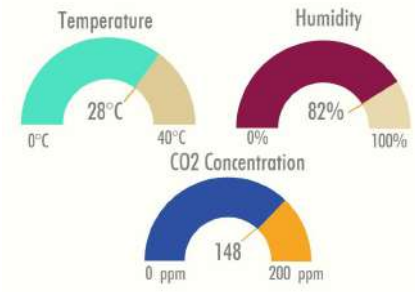
DATA INCLUDED FOR STUDY
50 SPECIES

DATA MONITORING:
HUMIDITY, TEMPERATURE, CO2

Monitoring since Feb – July 2019

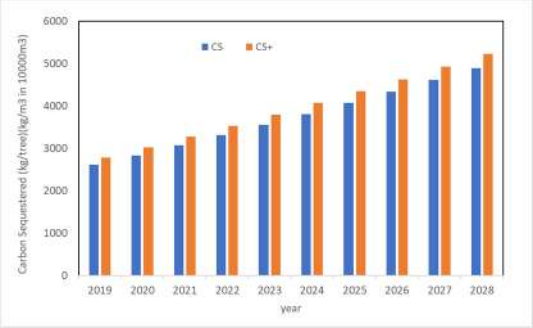
Hydnocarpus humei (salicaceae) - Setumpul

- GPS: 3°7'45''N 101°39'20''E
- Diameter: 0.82m
- Height: 10.5m
- ~ 30 years
- Average Carbon Sequestered: 4679.5 kg/m3 yearly



Analytics and A.I

Hydnocarpus humei (salicaceae) - Setumpul



42%
trees achieved optimum growth (> 30 years)

~17,000 kg/m³
per tree
Average carbon sequestered in a year

~5,000 kg
per tree
Average carbon storage in a year

Project Output

UNIVERSITY OF MALAYA

UNIVERSITY OF MALAYA LIVING LABS

Project Target Achievement & Publication

i) Data analytics on carbon sequestration
ii) Book Chapter – UM Living Lab Volume 3 & 4
iii) Manuscript preparation for journal article – to be submitted in September 2019

Knowledge Transfer

i) Data analytics on carbon sequestration is scarcely available
ii) Anticipation on future condition of ecosystem can be accurately defined for future intervention processes
iii) Nearing carbon neutral

Community Engagement

i) A user friendly tool that can be self-sustained by the staff/student
ii) The instalment of the absorption plantation (Long term) - lower greenhouse effect environment

Project Future Plan

- Vertical garden - planted at existing bus stops in UM – Species: Fern
- 4m height x 3 m width x 2m deep
- Solar panel – energy source
- Rainwater will be collected and automatically redistributed using a built-in irrigation system
- pH, temperature, CO2 & humidity sensors will be added for monitoring
- Estimated carbon can be sequestered 5000 kg/m3 per booth x ~ 12 booths = 60,000 kg/m3

UMLL038-18SUS

EVALUATING WALKABILITY INDEX OF CAMPUS COMMUNITIES TO PROMOTE SUSTAINABLE TRANSPORTATION IN UNIVERSITI MALAYA)

ASSOC. PROF. DR. NASRIN AGHAMOHAMMADI

Department of Social & Preventive Medicine,
Faculty of Medicine, UM

nasrin@ummc.edu.my

+603 – 7967 4927

AREAS OF EXPERTISE

Environmental Protection and Health Impact (Health Risk Assessment), Air Pollution Engineering, Climate Change, Health effect, Indoor and outdoor air quality, C-N-S, VOC, PAHs), Water and Wastewater Processes (water pollution, wastewater treatment, water treatment)

RECENT PUBLICATIONS

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Core Area of UM Eco-Campus Blueprint

Contribution to Sustainable Development Goals (SDGs)

PROJECT SUMMARY

Walkability is a measure of how friendly an area is to walking and besides promoting health, walking is commonly associated with reducing local air pollution and traffic congestion. Creating an environment and designing public walkways to promote walkability in universities is one of the biggest challenges in sustainable campus initiatives. University administrators including the campus planners must continually monitor the built environment attributes that make up a pedestrian-friendly environment, as well as taking into account the campus community's opinions on how to improve walkability on campus. In response to this, this study was designed to identify the important walkability factors of campus community, to map the significant walkability factors of campus community and to derive the walkability index to identify the extent to which the objective physical characteristics of a campus neighbourhood may influence the walking behaviour in University Malaya (UM). In order to understand the level of campus walkability and its relationship with the built environment and campus community preferences, this proposed study will utilize both quantitative questionnaire survey and geospatial analysis. Approximately 500 respondents (campus community) will be chosen to answer the quantitative questionnaire survey to identify the main factors that influence campus walkability. The identified factors will be superimposed on top of UM's base map to derive the walkability index (WI). The GIS-derived WI is then used to classify the extent to which the objective physical characteristics of a campus neighbourhood may be conducive or not to walking behaviour. In this study, the WI which will be formulated will highlight how eco-friendly is the campus to promote sustainable lifestyle. Besides, the WI will also inform the campus administration on the important factors that need to be taken into consideration while designing walkways to promote walkability as a move towards creating low carbon and greener campus environment.

Research Assistant

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Evaluating Walkability Index of Campus Communities to Promote Sustainable Transportation in University of Malaya

THEME:

Transportation System Management / Liveability and Well-being

Principal Investigator

Associate Professor Dr Nasrin Aghamohammadi

Department of Social and Preventive Medicine, Faculty of Medicine, University of Malaya

TEAM MEMBERS

Project Team	Academy/ Faculty/ Centre	Role in Project
AP Dr. Nasrin Aghamohammadi	Department of Social and Preventive Medicine Faculty of Medicine	Principal Investigator
Prof. Dr. Victor Hoe Chee Wai Bin Abdullah	Department of Social and Preventive Medicine Faculty of Medicine	Co-Investigator
Dr. Nisfariza Binti Mohd Noor	Department of Geography Faculty of Arts and Social Science	Co-Investigator
Prof. Dr. Nik Meriam Binti Nik Sulaiman	Department of Chemical Engineering Faculty of Engineering	Project Consultant

PROJECT DETAILS

PROBLEM STATEMENT

Physical inactivity is a major risk factor for many non-communicable diseases in Malaysia. Therefore, promoting participation in moderate-intensity physical activity such as walking is a public health priority. Other than promoting health, walking is commonly associated with many benefits such as reducing air pollution and traffic congestion. **Creating walking-friendly environment to promote walkability in universities** is one of the biggest challenges in the sustainable and green campus initiatives.

NEEDS

- ✓ Identifying campus community preferences about the walkable neighbourhood in the campus.
- ✓ Designing walking-friendly campus neighbourhood.
- ✓ Promoting walking as a green initiative and health priority in the campus.

APPROACH

- ✓ Identification of significant walkability factors via questionnaire survey among campus community.
- ✓ Need assessment of campus community about the opted campus neighbourhood for walking.
- ✓ Derivation of walkability index for UM campus via geospatial analysis using GIS.
- ✓ Collaboration with JPPHB to implement the study findings on real scale.

BENEFITS

PEOPLE
- ✓ Health and well-being of the campus community
- ✓ Walking-friendly environment enhance recreational experience of students

PLANET
- ✓ Lesser pollution and heat from automobiles
- ✓ Lesser traffic congestion inside the campus

PROFIT
- ✓ Contributes to low carbon and greener campus environment
- ✓ Increases aesthetic value of campus neighbourhood.

walkability

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PROJECT OBJECTIVES

NO	OBJECTIVES	STATUS
1	To identify the important walkability factors of campus community in University of Malaya.	**COMPLETED** • Questionnaire preparation and validation (Oct- March) • Pilot study (April) • Field survey – 406 responses to date (May to August)
2	To derive walkability index incorporating significant walkability factors in campus neighbourhood of University of Malaya.	**IN PROGRESS (Expected to complete by September 2019)** • Data analyses • Walkability Index calculation
3	To map the walkability level of campus neighbourhood at University of Malaya.	**IN PROGRESS (Expected to complete by October 2019)**

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PROGRESS OF THE PROJECT

No	Activities	2018			2019									
		O	N	D	J	F	M	A	M	J	J	A	S	O
1	Literature review													
2	Instruments development (Questionnaire)													
3	Validating instruments (expert and statistical)													
4	Pilot study													
5	Data analysis and assess reliability and validity of instruments													
6	Main study (Data collection)													
7	Data management and analysis													
8	Report writing and dissemination of findings													

Proposed

Real

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PROJECT OUTPUT

OUTCOMES	TARGET	ACHIEVEMENT
Project target achievement	Walkability Index	**Data analysis and index derivation in-progress**
Capacity building	RA	**ACHIEVED**
Innovation, technology or knowledge transfer	Walkability Index	**Index derivation in-progress together with data analysis**
Networking and linkages	Deras Abadi Corporation Sdn Bhd (Business group working on development projects)	**ACHIEVED – LOI** • This project will identify significant factors influencing campus walkability which will be addressed in the future projects of Deras Abadi with colleges and universities.
Publications	Promised – 1 ISI	**ACHIEVED** • ISI articles (4) - 1 Published, 1 Under review, 2 In-progress (based on current data analysis) • Chapter-in-book (1)

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THE WAY FORWARD: TOWARDS GREEN CAMPUS

PLANS FOR THE EXTENSION

In line with the mapping of walkability index in GIS (expected to be completed by the end of October 2019), the following were proposed for the extension of the current project for the year 2019-2020.

1. Identify and create **short cut maps** or '**walking-friendly maps**' within University of Malaya campus to educate and facilitate walking among the new comers and campus community.
2. To facilitate the advertisement of 'walking-friendly maps' in UM Website for an easy access of campus community.

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DATA ANALYSES

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PARTICIPANTS' SOCIODEMOGRAPHY (N=406)

Sociodemographic attributes	N (%)
Age group (years old)	
20-29	277 (68.2)
30-39	67 (16.5)
40-49	29 (7.1)
>50	32 (7.9)
Gender	
Male	161 (39.7)
Female	245 (60.3)
Nationality	
Malaysian	387 (95.3)
Non- Malaysian	19 (4.7)
Education	
Informal education	2 (0.5)
Secondary level	10 (2.5)
Tertiary level	394 (97.0)
Occupation	
Student	296 (72.9)
Academic and supporting staffs	85 (20.9)
Others	25 (6.2)
Monthly income (MYR)	
No income	287 (70.7)
≤ 3000	82 (20.2)
3000 - 6000	38 (9.4)
≥ 6000	47 (11.6)
Use motorized vehicle to travel inside campus	
Yes	226 (55.5)
No	181 (44.5)

CONT...

1. A total of complete 406 responses were received.
2. Most of the respondents were female (60.3%) and ranged in age from 20 to 29 years (68.2%).
3. Majority of the respondents were of Malaysian nationality (92.6%) with tertiary education (95.3%). The responses of this survey were mostly acquired from both students (72.9%) and academic and supporting staffs (20.9%) of University of Malaya.
4. More than two third of the participants registered that they have no income indicating undergraduate students of University of Malaya.
5. More than half (55.5%) of the participants also reported the use of motorized vehicles to travel inside the campus.

FACTORS THAT INFLUENCE CAMPUS WALKABILITY ACCORDING TO THE IMPORTANCE SCALE

Factors	Not important	Least important	Important	Fairly important	Very important	Adjusted Score
	N (%)	N (%)	N (%)	N (%)	N (%)	
Street connectivity and accessibility						97.78
There should be multiple routes available to reach one destination	0 (0)	10 (2.5)	56 (13.8)	51 (12.6)	288 (71.1)	
There should be short cuts available to make walking distance shorter	0 (0)	8 (2)	36 (8.9)	48 (11.9)	313 (77.3)	
Traffic safety						89.96
There should be traffic lights to control vehicle flow inside the campus	6 (1.5)	21 (5.2)	49 (12.1)	47 (11.6)	283 (69.9)	
There should be cross walks that enable the students to cross the roads safely	0 (0)	0 (0)	28 (6.9)	33 (8.1)	344 (84.9)	
There should be traffic police available to control the traffic during peak hours	18 (4.4)	60 (14.8)	204 (50.4)	61 (15.1)	63 (15.6)	
Speed limits need to be set and displayed at the road sides	4 (1)	20 (4.9)	58 (14.3)	53 (13.1)	271 (66.9)	
More speed bumps should be available to control the speed of vehicles inside campus	39 (9.6)	65 (16)	207 (51.1)	46 (11.4)	49 (12.1)	
Grass or dirt strip that separates the roads from the sidewalk should be available	4 (1)	12 (3)	38 (9.4)	60 (14.8)	292 (72.1)	
Pedestrian infrastructure						95.80
There should be proper pedestrian walkway all over the campus	0 (0)	0 (0)	18 (4.4)	25 (6.2)	362 (89.4)	
Proper pedestrian signals and signage need to be placed at appropriate places inside the campus	0 (0)	1 (0.2)	29 (7.2)	36 (8.9)	338 (83.5)	
There should be sufficient street lights and lamp posts along the pedestrian walkways	0 (0)	0 (0)	23 (5.7)	38 (9.4)	344 (84.9)	
The pedestrian walkways need to be shaded with either tree canopies or roofs	1 (0.2)	7 (1.7)	32 (7.9)	51 (12.6)	314 (77.5)	
There should be adequate resting places or gazebo along the walkways	11 (2.7)	25 (6.2)	48 (11.9)	212 (52.3)	110 (27.2)	
There should be water dispensers along the walkways	19 (4.7)	39 (9.6)	56 (13.8)	140 (34.6)	152 (37.5)	

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FACTORS THAT INFLUENCE CAMPUS WALKABILITY ACCORDING TO THE IMPORTANCE SCALE

Factors	Not important	Least important	Important	Fairly important	Very important	Adjusted Score
	N (%)	N (%)	N (%)	N (%)	N (%)	
EXPERIENCE						90.55
The landscape surrounding the walkways needs to provide some aesthetics experience to the walkers	6 (1.5)	33 (8.1)	52 (12.8)	197 (48.6)	118 (29.1)	
The cleanliness and maintenance of the walkways need to be maintained	0 (0)	0 (0)	25 (6.2)	52 (12.8)	327 (80.7)	
Shaded walkways are important to maintain acceptable thermal comfort levels of the walkers	0 (0)	7 (1.7)	32 (7.9)	39 (9.6)	328 (81)	
Geographical attributes such as hilly areas and slopes demotivate the students from walking inside the campus	25 (6.2)	69 (17)	191 (47.2)	55 (13.6)	66 (16.3)	
Nuisance of wild animals such as monkeys, monitor lizards and stray dogs demotivate the students from walking inside the campus	10 (2.5)	27 (6.7)	48 (11.9)	42 (10.4)	279 (68.9)	
Availability of beautiful landmarks, murals, wall paintings and buildings attract will attract the students to walk more inside the campus	17 (4.2)	40 (9.9)	85 (21)	210 (51.9)	54 (13.3)	
Availability of street trees and ornamental plants will attract the students to walk more inside the campus	11 (2.7)	28 (6.9)	82 (20.2)	219 (54.1)	66 (16.3)	
LANDUSE						97.37
There should be multiple services and public amenities (food courts, post office, ATM, bank, gyms, etc) available within the campus neighbourhood	0 (0)	4 (1)	37 (9.1)	55 (13.6)	310 (76.5)	
There should be parks, gardens, recreational areas and green space in the campus neighbourhood	0 (0)	5 (1.2)	35 (8.6)	84 (20.7)	282 (69.6)	
Proximity between the faculties, student hostels and administrative buildings should be shorter	5 (1.2)	21 (5.2)	59 (14.6)	59 (14.6)	262 (64.7)	
CAMPUS NEIGHBOURHOOD						60.49
Campus neighbourhood should be fenced and guarded	7 (1.7)	17 (4.2)	56 (13.8)	50 (12.3)	276 (68.1)	
Lesser parking lots will motivate students to walk inside the campus	238 (58.8)	60 (14.8)	35 (8.6)	35 (8.6)	38 (9.4)	

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RANK OF THE WALKABILITY FACTORS

The average scores of the participants' responses on the significant walkability factors based on the underpinning elements were calculated and the factors were ranked based on the highest adjusted scores.

Factors	Adjusted Score	Ranks
Street connectivity and accessibility	97.78	1
Land use	97.37	2
Pedestrian infrastructure	95.80	3
Experience	90.55	4
Traffic safety	89.96	5
Campus neighbourhood	60.49	6

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CONT...

1. Based on the adjusted scores, it can be elucidated that majority of the participants prefer an environment with street connectivity and accessibility as the most opted factor that stimulate them to walk inside the campus neighbourhood.
2. This was followed by a mixed of land-use, pedestrian infrastructure, traffic safety, experience and campus neighbourhood. Although ranks were assigned, it was noted that there were no much differences between the adjusted scoring of the first three factors (street connectivity and accessibility, land use, and pedestrian infrastructure).
3. Therefore, it can be stated that the campus walkability in University of Malaya was more influenced by street connectivity and accessibility, land use, as well as pedestrian infrastructure compared to the other factors.
4. This implies that the planning and designing of walking-friendly campus neighbourhood based on the identified factors will greatly increase campus walkability in the University of Malaya.

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CAMPUS COMMUNITY NEEDS TO INCREASE WALKABILITY IN CAMPUS

Campus community needs to increase walkability in campus	Sufficient	Insufficient	Need	Don't need
	N (%)	N (%)	N (%)	N (%)
Pedestrian infrastructure				
Special lanes or walkways for pedestrian to walk in the campus	38 (9.4)	83 (20.5)	274 (67.7)	11 (2.7)
Shaded lanes or walkways for pedestrians	22 (5.4)	132 (32.6)	248 (61.2)	5 (1.2)
Pedestrian signals/ signage	38 (9.4)	83 (20.5)	275 (67.9)	11 (2.7)
Street lights to walk at night	45 (11.1)	76 (18.8)	280 (69.1)	6 (1.5)
Resting places like gazebo	30 (7.4)	55 (13.6)	285 (70.4)	37 (9.1)
Fenced and guarded campus environment	272 (67.2)	38 (9.4)	76 (18.8)	21 (5.2)
Water dispensers along the walkways	13 (3.2)	38 (9.4)	296 (73.1)	60 (14.8)
Street connectivity and accessibility				
Connected streets within campus area	55 (13.6)	238 (58.8)	113 (27.9)	0 (0)
Short cuts from one place to another place inside the campus	29 (7.2)	83 (20.5)	291 (71.9)	4 (1)
Multiple routes to reach a destination of interest	37 (9.1)	73 (18)	288 (71.1)	9 (2.2)
Traffic safety				
Traffic lights to control traffic flow within campus	276 (68.1)	57 (14.1)	57 (14.1)	17 (4.2)
Cross walks within campus area	55 (13.6)	97 (24)	252 (62.2)	3 (0.7)
Assistance of traffic police to control the traffic flow	48 (11.9)	58 (14.3)	235 (58)	66 (16.3)
Displayed speed limit signals within campus area	48 (11.9)	68 (16.8)	277 (68.4)	14 (3.5)
Speed bumps to control speed limits in campus area	273 (67.4)	49 (12.1)	57 (14.1)	28 (6.9)
Pedestrian signals/ signage	41 (10.1)	84 (20.7)	271 (66.9)	11 (2.7)
Street lights to walk at night	42 (10.4)	73 (18)	289 (71.4)	3 (0.7)

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CONT...

Campus community needs to increase walkability in campus	Sufficient	Insufficient	Need	Don't need
	N (%)	N (%)	N (%)	N (%)
Experience				
Attractive landscaping to encourage walking	56 (13.8)	246 (60.7)	71 (17.5)	34 (8.4)
Clean and well-maintained environment or walkways to encourage walking	49 (12.1)	78 (19.3)	279 (68.9)	0 (0)
Canopy shades from trees and roofed walkways to provide cooler and shaded environment for walking	22 (5.4)	102 (25.2)	278 (68.6)	5 (1.2)
Bright and exposed environment to encourage walking	49 (12.1)	66 (16.3)	287 (70.9)	5 (1.2)
Flat planes to encourage walking	78 (19.3)	131 (32.3)	91 (22.5)	107 (26.4)
Maintenance to keep the common wild animals (monkeys, monitor lizards, stray dogs, etc.) away from the walking lanes	25 (6.2)	55 (13.6)	309 (76.3)	18 (4.4)
Street trees and plants to increase shade and cooler environment	31 (7.7)	102 (25.2)	272 (67.2)	0 (0)
Landuse				
Multiple services and public amenities such as bank, post office, ATM, etc. available within campus	60 (14.8)	262 (64.7)	80 (19.8)	5 (1.2)
Sport and recreational parks available within walking distance inside the campus	55 (13.6)	120 (29.6)	221 (54.6)	11 (2.7)
The buildings (faculty, eateries, offices, etc.) are within walking distance	62 (15.3)	90 (22.2)	244 (60.2)	11 (2.7)
Encouragement and promotion of UM to increase walkability in the campus				
Dissemination of information on benefits of walking to the campus community via talks,	14 (3.5)	287 (70.9)	73 (18)	33 (8.1)
Incentives from UM to promote walking inside the campus (merits or certificates based on steps	14 (3.5)	59 (14.6)	291 (71.9)	43 (10.6)
Does UM undertaken any initiatives to encourage and involve the students' participation in	18 (4.4)	173 (42.7)	192 (47.4)	24 (5.9)
Provision of walkability map, walking-friendly routes or short cut maps within the campus	19 (4.7)	68 (16.8)	312 (77)	8 (2)

AP DR NASRIN AGHAMOHAMMADI

UNIVERSITI MALAYA

UNIVERSITY OF MALAYA LIVING LABS

UM ECO-CAMPUS

UMLL039-18SUS
WALKING AS A GREEN TRANSPORTATION MODE IN THE UNIVERSITI MALAYA CAMPUS

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AREAS OF EXPERTISE

Urban Analytics, Urban Wellbeing, Spatial Statistics, Geographic Information Systems (GIS)

RECENT PUBLICATIONS

1. ARTICLE: Su, TT; Azzani, M; Adewale, AP; Thangiah, N; Zainol, R; Majid, H 2019. Physical Activity and Health-Related Quality of Life Among Low-Income Adults in Metropolitan Kuala Lumpur. JOURNAL OF EPIDEMIOLOGY (ISI-Indexed)
2. BOOK: Azlan Shah Ali, Rosilawati Zainol, Anuar Alias, 2018, Alam Bina dan Transformasi Kehidupan Lestari, Penerbit Universiti Malaya
3. CHAPTER IN BOOK: Rosilawati Zainol, Ibrahim Mohd @ Ahmad, Faizah Ahmad dan Nikmatul Adha Nordin. 2014. Mesra Pejalan Kaki di Bandar Warisan. Penerbit Universiti Malaya: Kuala Lumpur. ISBN 978-983-100-699-3.
4. ONLINE MEDIA: Shahanaaz H. (2017). Working on Walking. The Star Online.. http://www.thestar.com.my/news/nation/2017/06/18/working-on-walking-pedestrian-walkways-need-to-get-more-respect-so-that-malaysians-can-walk-safely-a/

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PROJECT SUMMARY

In general, people are reluctant to walk in Malaysia due to the weather conditions. Most of them are only willing to walk as far as 250 meters at any one time. The main excuses would be “Oh, it’s hot to walk here!”, “The hot weather does not permit me to walk!”, “What if it is raining? I’ll be stranded somewhere in the middle of my journey”. The excuses will be on a long list. However, in Singapore, which is located nearer to the Equator, as compared to Kuala Lumpur, Malaysia, people walk everywhere all the time regardless of the hot weather. The common answer would be green coverage in Singapore increases every year. Therefore, this study intends to promote walking through the following objectives: to develop a walking framework, healthy and active living among UM Campus community; to propose a green campus transport policy, and to create awareness and promote walking among the campus community to reduce usage of motorized transport mode on the campus. In achieving these objectives, the study also outlines three main outputs which include, increase the number of trees in UM campus, to reduce the number of traffics within the university campus and to reduce overweight/obesity rate. Meeting these outputs will be in line with the objectives of UM Eco Campus Blueprint, UI Green Metric, the New Urban Agenda commitment, SDG 11 and SDG 3.This study employs a quantitative approach in its methodology. Data collections are done using walkthrough audit and UM Mobile App. This method is seen as the most sustainable method of data collection. Its primary unit of analysis will be UM Campus community which comprises of students and staff. Besides this survey, a walkability index audit will also be carried out using social media with geographic locations. This activity is followed by ground truth verification survey by investigators. Once data has been analyzed, three campaigns will be carried out to act as interventions. These campaigns are planting and adopting a tree within UM Campus, 10000 steps walking challenge and healthy and active living. Then another round of Data collections to be carried out. The results of this data collections will determine whether the objectives of this study are achieved and whether this study has met its

Core Area of UM Eco-Campus Blueprint

Contribution to Sustainable Development Goals (SDGs)

Research Assistant

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WALKING AS A GREEN TRANSPORTATION MODE IN UNIVERSITY OF MALAYA CAMPUS

Principle Invstigator: Associate Prof. Gs. Dr. Rosilawati Zainol
Centre for Sustainable Urban Planning and Real Estate (SUPRE)
Centre for Civilisational Dialogue

LL039-18SUS
Transportation System Management; Landscape and Biodiversity Management

FINAL PRESENTATION (20TH AUGUST 2019)

Research Brief

Walking as a Green Transportation Mode in UM @RZ

Aim

- promote walking among campus community

Objectives

- To develop a green transportation framework to promote walking, healthy and active living among UM campus community
To increase the percentage of greens in campus
- To create awareness and promote walking among the campus community to reduce usage of motorised transport mode on the campus.

Output

- To produce a baseline study on walking infrastructure

RESEARCH PROGRESS

Walking as a Green Transportation Mode in UM @RZ

Research Progress

Activities	MONTH											
	1	2	3	4	5	6	7	8	9	10	11	12
Activity 1												
Activity 2												
Activity 3												
Activity 4												
Activity 5												
Activity 6												

Completed

In Progress

Activity 1: Literature Survey
Activity 2: Site Study and Auditing
Activity 3: Data Analysis
Activity 4: Baseline study and data collections
Activity 5: Interventions (walkable app and monitoring)
Activity 6: Proposal evaluation & Policy Recommendation (Promotion)

Walking as a Green Transportation Mode in UM @RZ

8/20/2019

SUMMARY OF KPI ACHIEVEMENTS

Summary of KPI Achievements

No	Category	DETAILS	ACHIEVEMENT
1	Project Target Achievement	Increased level of awareness on benefits of walking 10000 steps a day on Campus	Distribution of leaflets at the SESDG2019
2	Capacity Building	Participation in 10000 steps a day campaign	Walkable App monitoring
3	Innovation/ technology/ knowledge transfer	Development of Walkable App	Development completed

Summary of KPI Achievements

No	Category	DETAILS	ACHIEVEMENT
4	Community Engagement	Promote campus community to participate in 10000 steps campaign	Still monitoring
5	Networking & Linkages	Lingkages within campus, TNC Development, JPPHB,	TNC Development has acknowledged walking infrastructure appraisal and plant awarding preparation
6	Publications (eg. Journal Paper, Book, Policy)	2 Publications	1 Book chapter 1 Book of Abstract

Summary of KPI Achievements

No	Category	DETAILS	ACHIEVEMENT
7	Policy Papers / Guidelines / Standards	Transport Policy in UM campus	Pedestrian infrastructure baseline study GIS map for UM Campus [Residential colleges, faculties/academies/institutes/administrative buildings, road network, pedestrian network
8	Others		-participated in SESDG2019 -participated in 6th Asia Pacific Conference on Public Health 2019

8/20/2019

PROJECT FUTURE PLANS

Promote Walking

Put up posters at cafeteria on calories burnt if one walks more after having his/her meals

Put up posters bus stops on carbon footprint saved

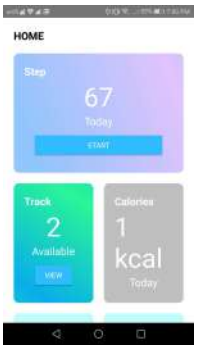
Put up posters at building entrances and exits on 5Rs

Rethink
Refuse
Reduce
Reuse
Recycle

Posters

Walking as a Green Transportation Mode in UM @RZ

RESEARCH ACTIVITIES



Walking as a Green Transportation Mode in UM @RZ

8/20/2019

GIS MAP FOR UM CAMPUS

Walking as a Green Transportation Mode in UM @RZ

	geolocatio	username	umId	gender	weight	height	age	bmi	latitude	longitude	step	track	start	end
2	39129	ahmad_fa	10566	Male	85	181	48	25.94548	3.117888	101.6627	1	143	2019-08-1	2019-08-13 05:21:13.774+00
3	39130	ahmad_fa	10566	Male	85	181	48	25.94548	3.117888	101.6627	2	143	2019-08-1	2019-08-13 05:21:13.774+00
4	21134	aireenzuriani		Female	63	161	25	24.30462	3.117189	101.6627	1	81	2019-07-19	00:35:03.48+00
5	21135	aireenzuriani		Female	63	161	25	24.30462	3.117195	101.6627	2	81	2019-07-19	00:35:03.48+00
6	21136	aireenzuriani		Female	63	161	25	24.30462	3.117218	101.6627	3	81	2019-07-19	00:35:03.48+00
7	21137	aireenzuriani		Female	63	161	25	24.30462	3.117247	101.6627	4	81	2019-07-19	00:35:03.48+00
8	21138	aireenzuriani		Female	63	161	25	24.30462	3.117276	101.6627	5	81	2019-07-19	00:35:03.48+00
9	21139	aireenzuriani		Female	63	161	25	24.30462	3.117315	101.6627	6	81	2019-07-19	00:35:03.48+00
10	21140	aireenzuriani		Female	63	161	25	24.30462	3.117336	101.6627	7	81	2019-07-19	00:35:03.48+00
11	21141	aireenzuriani		Female	63	161	25	24.30462	3.117381	101.6627	8	81	2019-07-19	00:35:03.48+00
12	21142	aireenzuriani		Female	63	161	25	24.30462	3.117414	101.6628	9	81	2019-07-19	00:35:03.48+00
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15	21145	aireenzuriani		Female	63	161	25	24.30						
16	21146	aireenzuriani		Female	63	161	25	24.30						
17	21376	aireenzuriani		Female	63	161	25	24.30						
18	21377	aireenzuriani		Female	63	161	25	24.30						
19	21378	aireenzuriani		Female	63	161	25	24.30						

41645	40987	ykchiam	9560	Female	65	161	40	25.07619	3.128283	101.6506	29	160	2019-08-14	06:46:02.83+00		
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41660	41002	ykchiam	9560	Female	65	161	40	25.07619	3.12838	101.6509	44	160	2019-08-14	06:46:02.83+00		
41661																
41662																

WALKABLE DATA

Walking as a Green Transportation Mode in UM @RZ

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UNIVERSITY OF MALAYA LIVING LABS

UM ECO-CAMPUS

UMLL040-18SUS

DECENTRALIZATION OF LABORATORY EXERCISE VIA REMOTE APPLICATION: A STATE-OF-THE-ART APPROACH TOWARD EFFICIENT EDUCATIONAL FACILITY RESOURCE AND ENERGY MANAGEMENT IN ACADEMIC INSTITUTIONS

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AREAS OF EXPERTISE

Heat transfer and thermal systems
Mechanism design and synthesis
Fluid mechanics

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RECENT PUBLICATIONS

1. Jannifar, A., Zubir, M. N. M., Kazi, S. N., Zulkifli, N. W. M., & Ahmad, N. (2018). Investigation on the feasibility of eliminating harmonic excitation signal en-route to performing experimental modal analysis (EMA) under operational condition. Journal of Mechanical Science and Technology, 32(7), 3009-3021. (ISI-Indexed)

2. Jannifar, A., Zubir, M. N. M., & Kazi, S. N. (2017). Development of a new driving impact system to be used in experimental modal analysis (EMA) under operational condition. Sensors and Actuators A: Physical. (ISI-Indexed)

Core Area of UM Eco-Campus Blueprint

Contribution to Sustainable Development Goals (SDGs)

PROJECT SUMMARY

The present work introduces the concept of performing experimental exercise under remote condition whereby the users are allowed to access an experimental facility via internet communication platform. An existing set-up representing a specific experiment embedded within a course will be refurbished by incorporating 'master-slave' operation. An interface software will be built under web based platform to allow the user to access the experimental setup and interact using internet protocol, thus allowing the user to conduct the experiment without time, space and location constraints. This will not only benefit students in expending their learning platform outside the classroom and laboratory, but also helping the university to reduce its energy consumption due to the decentralization of the experiment, whereby the student can use other organization resources to conduct the experiment

Research Assistant

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Sustainability science

DECENTRALIZATION OF LABORATORY EXERCISE VIA REMOTE APPLICATION: A STATE-OF-THE-ART APPROACH TOWARD EFFICIENT EDUCATIONAL FACILITY RESOURCE AND ENERGY MANAGEMENT IN ACADEMIC INSTITUTIONS

Program: UM Living Lab

Presenter: **Mohd Nashrul Mohd Zubir**

August 30, 2019

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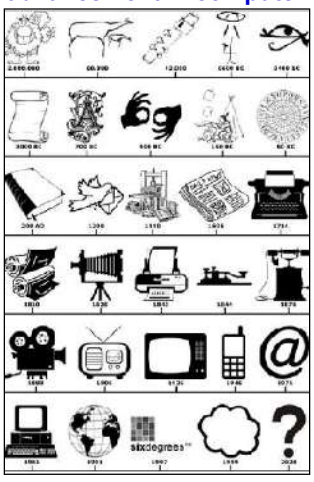
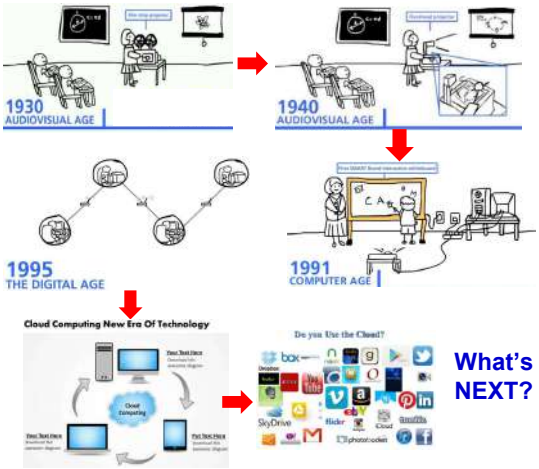
Introduction

Evolution in teaching and learning has been largely attributed to the advancement in computer and internet communication





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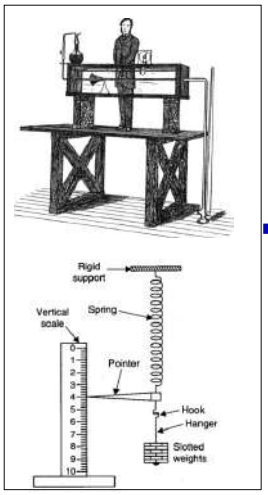
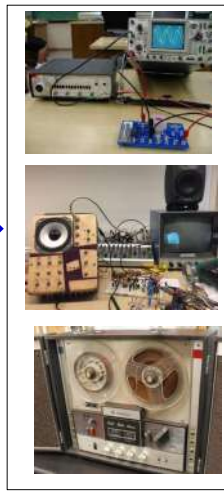
Challenges

"REMOTE LABORATORY"

The way experiment is coordinated and performed has also evolved





Challenge: how to make use of 21st century computer and communication technologies in performing experiment

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What, how, why?

Common Issues in laboratory 3.0

- Time and space constraint (stuffy and hasty)
- Immobile (station based activity)
- Obsolete assessment (report based and not learning based)
- Passive learning (observer)
- Too many participants (distraction) Single session (no 2nd chance)
- Loose linkage with www. resources (crowd sourcing, collaboration, cloud) Lack of creativity and imaginative (critical thinking)

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What, how, why?

What is remote laboratory

The use of telecommunications and computer to remotely conduct real experiments

Physical interaction

Interaction by physical interface

How remote laboratory works?

Why remote laboratory?

Time + Space + Safety + Cost =

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Key features

Advantage of Remote Lab

- Safer (indirect interaction with remote infrastructure)
- Flexible (time and space)
- high compatibility with IR4.0 philosophy
- Effective Cross linking between subject and lab
- Secure (Minimize data plagiarism)

How the community benefit from this concept

- Lab and Information sharing
- community based learning (crowd sourcing)
- Unrestricted level of knowledge acquisition
- Borderless knowledge transfer

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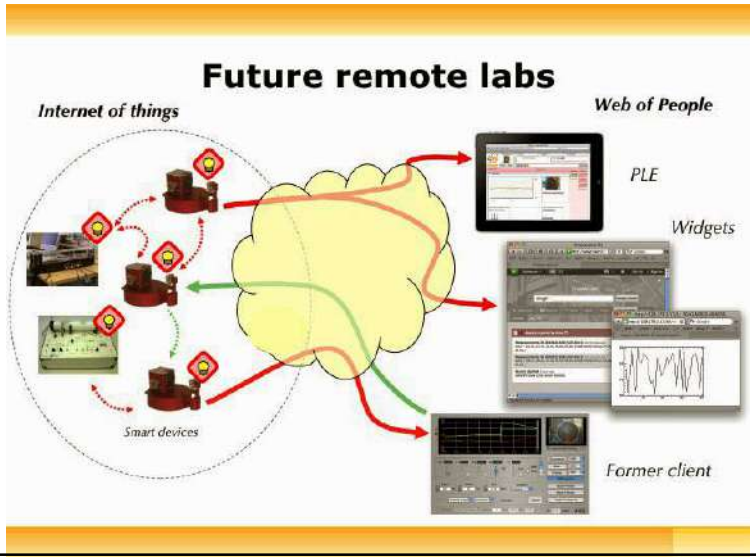
Development



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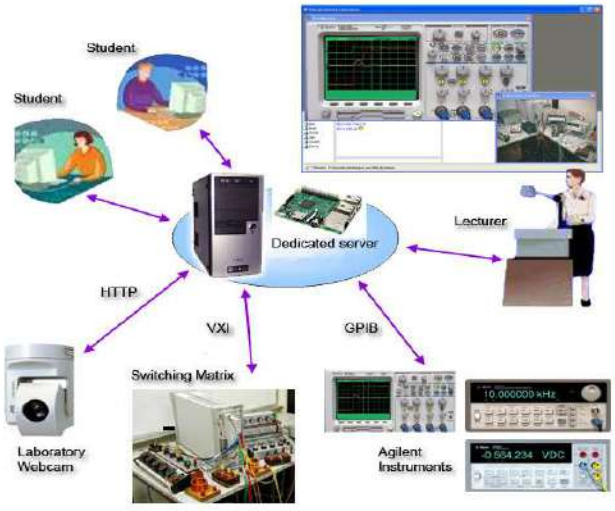


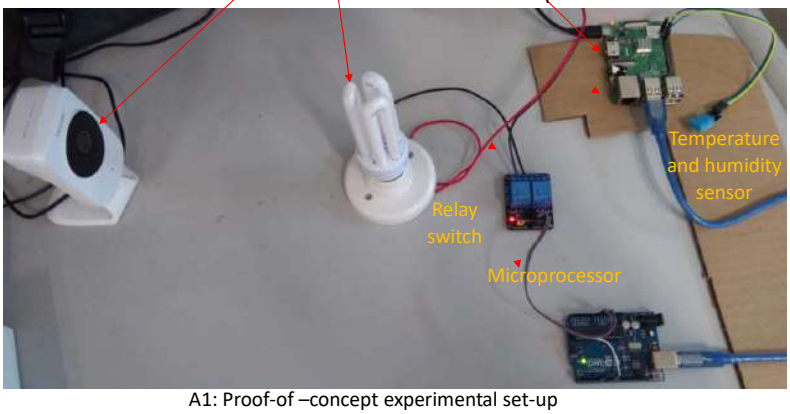
Development

UM Remote lab evolution

Remote lab 2.0

- Grant application – UM LIVING LAB GRANT PROGRAMME (UM LLGP)
- Developing new setup (rainbow spectrum visualization and control)
- Using open sources web software (node-red) to communicate with Arduino hardware
- Using available Arduino compatible sensors and actuators and electronics (Motor, humidity sensors, thermocouples, relays etc.)
- Developing client access modules by asp.net
- Web connection successful

Development

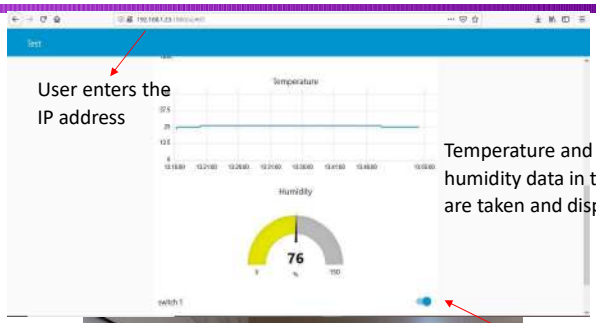


A1: Proof-of –concept experimental set-up

Development

A webpage will appear in a new browser

User interface through web browser



User enters the IP address

Temperature and humidity data in the lab are taken and displayed

Turning on light in the lab using the web browser

Development

Web browser in operation

A camera showing the setup in operation appears in web

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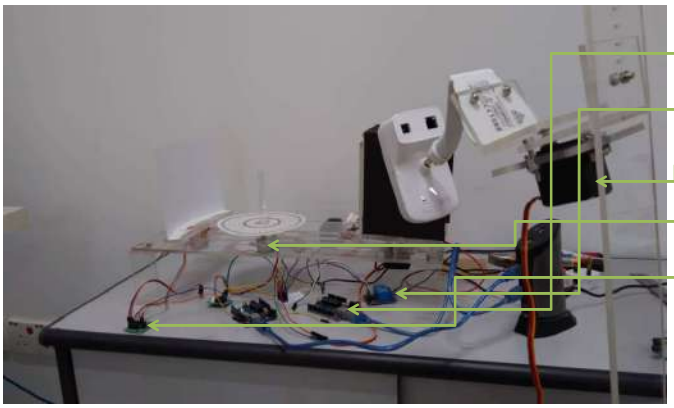
Development

Hardware configuration



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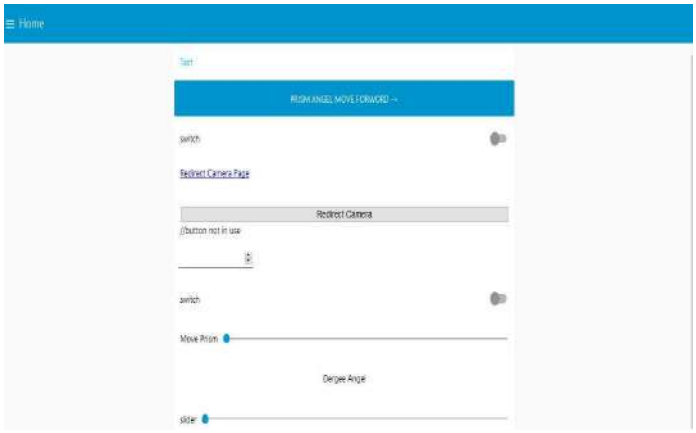
Development

Software configuration



Control page for students to access remote lab facility

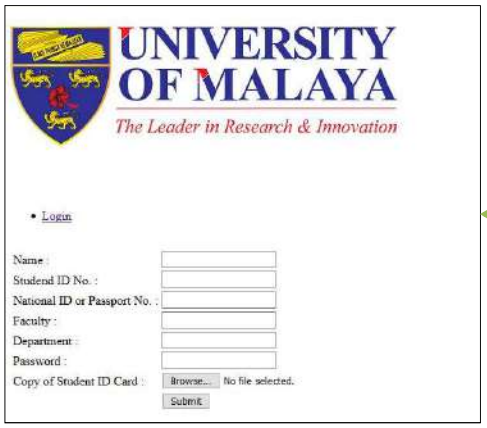
Development

Software development tool

System Developed Based On-
- ASP.Net Framework
- Java Programming Language
- Node-Red
- Node-js
- Java Script

Development

Registration and access module



Student Registration System

Student must have to register first to get access in remote lab facility

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Development

2.5 Registration and access module (Cont.)

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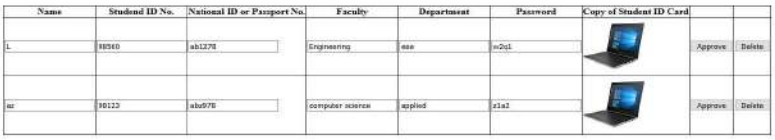
Admin Panel



Sequence of remote lab access

- Student apply for access
- Request go to admin through system.
- System will wait for response from admin
- Admin will verify request,
- Approved student can get access.

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Development

Registration and access module (Cont.)

Student login page

Approved students can login by username and password

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Registration and access module (Cont.)

After login there will be limited session for each student. To enter lab facility student must have to click on link.

Lab Access Link

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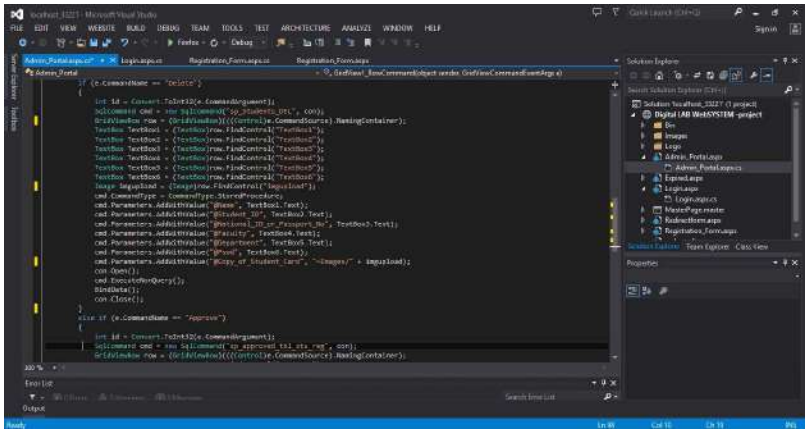
Development

Back end-programming



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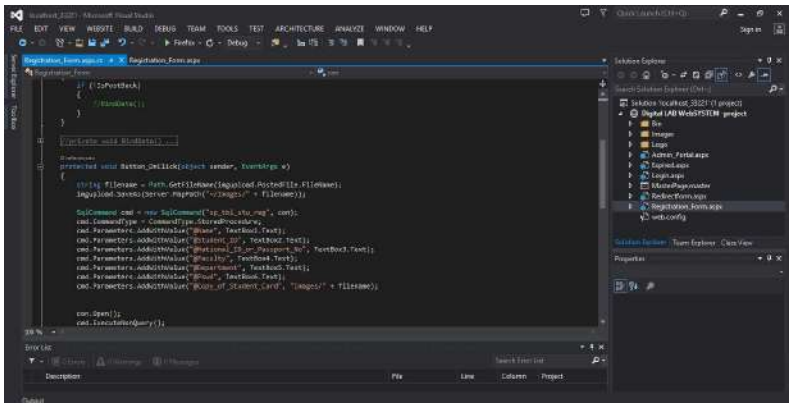
Development-Backend Programming

Back end-programming (Cont.)



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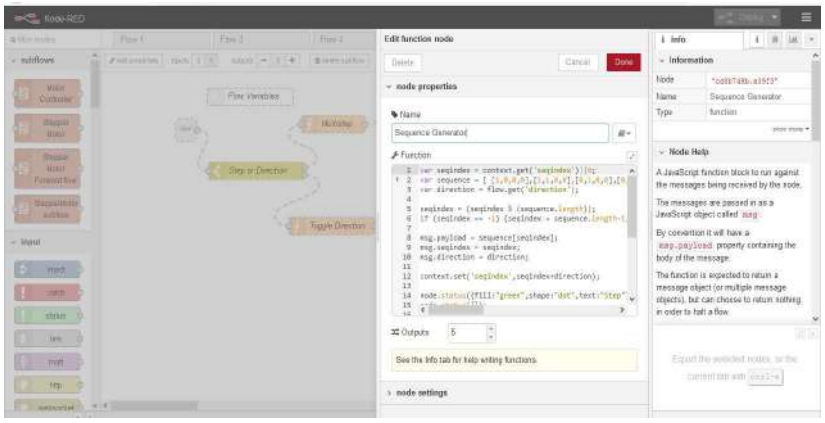
Development-Backend Programming

Back end-programming (Cont.)



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Development

UM Remote lab evolution

Remote lab 2.0 (Weaknesses)

- Node-red has limited interface features (buttons and control), no login and database system
- No active and passive user system (group conduct).
- Raspberry PI Ram and internal storage limited
- Limited freedom to add more facility and tools.

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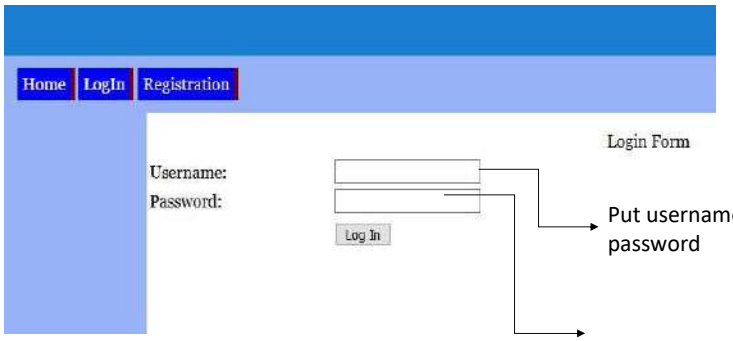
Development

UM Remote lab evolution

Remote lab 3.0

- Improving existing experimental setup (rainbow spectrum visualization and control)
- Specific database system
- Active and passive user system
- Complete control over development (button, control and sensors, data logging, display and storage)
- User-friendly usability
- Complete login system
- Security (access and data)

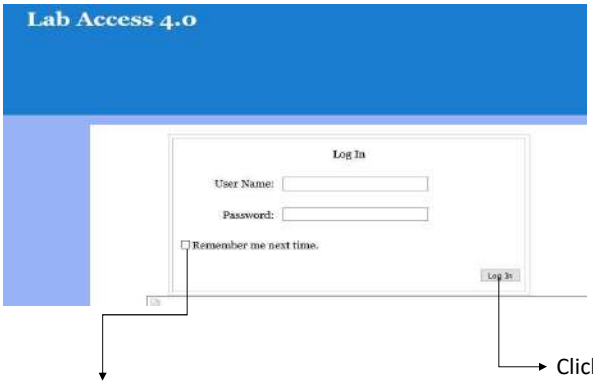
Development



Front page

Development

Lab access layer



Put specific username and password given by Admin

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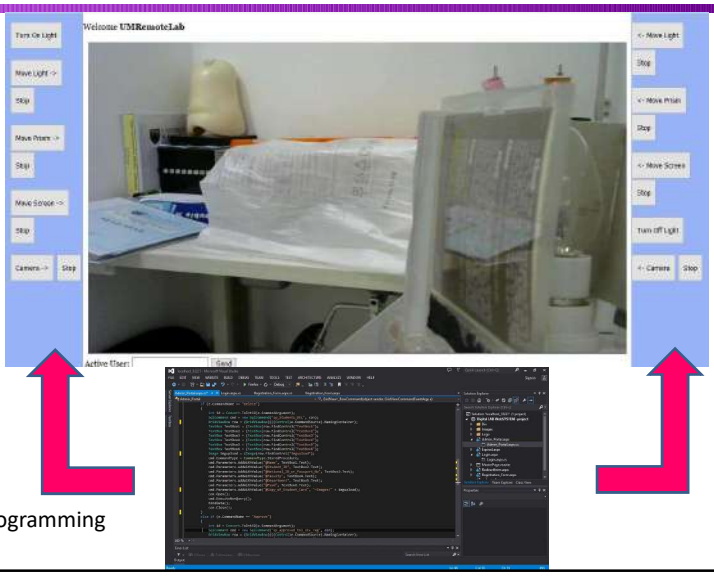
Development

Completed GUI



Back-end programming

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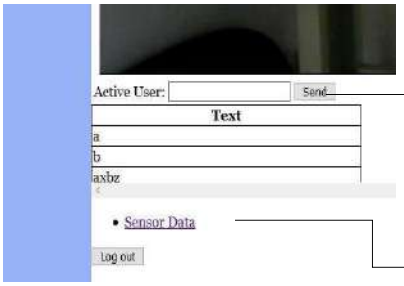
Development



Text box to send message to passive user if necessary

Click on this button to get sensor data

Chatting platform

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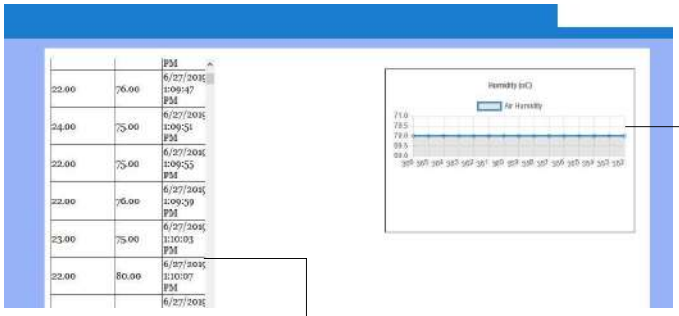
Development



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Project Output (KPI)

Project Target Achievement – **Reduction in >20% of energy consumption in air-conditioning**

Analysis on energy saving by implementing remote laboratory

- conducting laboratory experiment under remote condition produces energy saving in air conditioning load
- Total cooling load for 15 occupants conducting 3 different experiment in a room (5 persons per experiment) = 1428W
- Total energy added due to implementation of remote lab under above arrangement in experiments = 400W

$$Q_{save} = [Q_{total} - Q_{remote} / Q_{total}] \times 100\%$$

$$= [1428W-400W/1428] \times 100$$

$$= 71.9\%$$

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Project Output (KPI)

Capacity Building – **Demonstration on how remote lab is implemented (Shown in slide)**

Innovation / technology / knowledge transfer – **Demonstration of remote lab under cloud technology (Shown in slide)**

Community Engagement – **Facility sharing by academic institutions and related stakeholders (SESDG2019)**

Networking and Linkages – **Collaborative work with other institutions and corporate as well as related companies (Shown in slide)**

Articles/ Manuscripts – **Manuscript preparation On going**

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Project Output (KPI)

Books/ Chapter(s) in Book – **submission of UM Living Labs Book Chapter volume III and IV (Done)**

Intellectual Property / Policy Papers, Guidelines or Standards – **Guideline on performing laboratory under remote condition (attachment)**

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Future plan

- The current project would be a milestone for introducing remote laboratory into the academic and non-academic communities.
- The next task is expending the facility and building more set-ups which would cater students from primary until university levels.
- Also planning to promote this concept to other universities so that they can use our facility which in-turn promoting the research clusters and university as a whole.
- Engaging with media players to promote and demonstrate this concept particularly in televised program
- Searching more funding in the future to expand and develop more remote facility based on the architecture we have developed

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Gallery




UMLiving Lab Evaluation Panel Site visit (6 month progress)

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Gallery

Seminar on Energizing Sustainable Development Goals (SESDG2019)

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Gallery

Visit by delegation from Busan University to the lab

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Gallery

Visit from KOLEJ VOKASIONAL SG. BULOH

Visit from from Kolej Tingkatan Enam Shah Alam (KTESA)

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Gallery

Brainstorming session with UMS counterpart on program with schoolchildren

UNIVERSITI MALAYA

UNIVERSITY OF MALAYA LIVING LABS

UM ECO-CAMPUS

LL041-18SUS
THE FACULTY SUSTAINABILITY REPORT CARD: DOCUMENTING FACULTY SUSTAINABILITY INITIATIVES TOWARDS UM ECO-CAMPUS

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AREAS OF EXPERTISE

Genre Analysis
Professional Discourse
Discourse Analysis

RECENT PUBLICATIONS

1. Norizah, H. & Muhamad Faisal, M.N. (2017). Campus Sustainability, The Need for Change. Journal of BIMP-EAGA Regional Development, Volume 3(1), 13-22.

2. Norizah H., & Muhamad Faisal M. N. (2016). Youth and Sustainability: Leaders of the Future. Proceedings of the 3rd International Conference on Youth (IC YOUTH 2016), 148-152, ISBN No.: 978-967-10933-4-4.

3. Muhamad Faisal Muhamad Noor & Norizah Hassan. (2015). Beliefs, Knowledge, Values, and Youths Engagement Towards Campus Sustainability. Journal of BIMP-EAGA Regional Development, Volume 1(1), 2015 Special Edition.

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3. Dr. Siti Zaidah Zaidah (Faculty of Languages and Linguistics, UM zaidah75@um.edu.my)
4. Dr. Nor Liyana Mohd Shuib (Faculty of Computer Science & Information Technology, UM liyanashuib@um.edu.my)

Core Area of UM Eco-Campus Blueprint

Contribution to Sustainable Development Goals (SDGs)

PROJECT SUMMARY

Universities play a key role in the development of society by changing societies' mindset and practices towards sustainable development. As awareness of sustainability issues increases worldwide, the level of disclosures on the role and involvement, there exist a great need for university efforts to be disclosed and communicated to all university stakeholders including the society. Sustainability reporting is a voluntary tool for disclosing efforts towards sustainable development but little research has been done on sustainability reporting among universities (Fonseca, Macdonald, Dandy & Valenti, 2011; GRI, 2009, 2013; R. Lozano, 2011). The purpose of this study is to find a method of documenting the efforts taken by all the faculties, academies, centres, and institutes at the University of Malaya towards achieving the sustainability goals. UI Green Metric will act as the base for information requirement for the sustainability efforts. A survey questionnaire and in-depth interviews will be conducted with the faculty management to find out all the relevant sustainability initiatives that have been taken by the faculties. The area of education is the focus of this study as this is where the university had scored lower (44.9%) as compared to the other indicators of the UI Green Metric (UIGM, 2017). The results of this study will show the importance of documenting and reporting sustainability initiatives, other than creating a standardized reporting format; that can impact the university's efforts in achieving the eco-campus sustainability goals and the university's ranking in sustainability. The study will also provide insights how effective communication and better dissemination of information are reported by the faculties and how it can be maximized in the efforts of promoting, achieving and improving the university's sustainability goals.

Research Assistant

Mr. Muhamad Faisal Muhamad Noor (BSc Science and Technology Studies, Department of Science and Technology Studies, Faculty of Science,UM faisal@siswa.um.edu.my)

The Faculty Report Card : Documenting Faculty Sustainability Initiatives Towards UM Eco-Campus (UMLL041-18SUS)

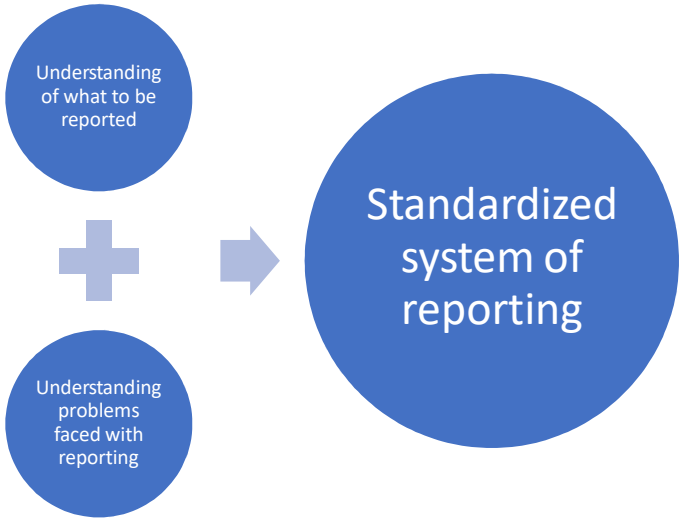
- **PI:**
- Dr. Norizah Hassan (FLL)
- **Co-Researchers:**
  - Assoc. Prof. Dr. Junedah Sanusi (FM)
  - Dr. Siti Zaidah Zainuddin (FLL)
  - Dr. Daniel Chow Ung T'Chiang (FLL)
  - Dr. Nor Liyana Mohd Shuib (FSCIT)
- **Research Assistant:**
  - Muhamad Faisal Muhamad Noor (FS)

UNIVERSITI MALAYA
KUALA LUMPUR

What is a Report Card?

- A standardized tool for information collection.
- This common tool will help in providing proper documentation, credibility and identify what has been done.
- A report card will allow a transparent method of conducting activities and a comprehensive way forward.
- A tool that can be used to foster stronger communication and create awareness among stakeholders and general community.

Summary of Research



Research Objectives

- To investigate the best method to collect data on sustainability initiatives done in University of Malaya
- To build a better communication method in reporting sustainability initiatives among faculties in University of Malaya
- To find a common indicator in reporting sustainable initiatives

Research Question

- How is data best collected to measure sustainable initiatives?
- What is the best method in reporting/communicating sustainability initiatives?
- What are the common indicators in reporting sustainable initiatives?

Expected Outcomes

No	Category	Expected Results
1	Project Target Achievement	A standardized format for reporting and understanding of what to be reported
2	Capacity Building	Conduct talks or training to increase level of awareness and effective reporting
3	Innovation/Technology/ Knowledge Transfer	Improvement of university sustainability initiatives
4	Community Engagement	-
5	Networking and Linkages	Similar scope for all faculties (Linking faculties together)
6	Publications	1 ISI/Scopus publication
7	Policy Papers/Guidelines/ Standards	Standardized sustainability report card
8	Others	Conference presentation

Summary of KPI achievement

No	Category	Expected Results	Note/Status
1	Project Target Achievement	A standardized format for reporting and understanding of what to be reported	Standardized faculty sustainability report card (FSRC)
2	Capacity Building	Conduct talks or training to increase level of awareness and effective reporting	Focus Group Discussion with ARC management, 21st – 22nd March 2019, Learning Space, FLL, UM
3	Innovation/Technology/ Knowledge Transfer	Improvement of university sustainability initiatives	Focus Group Discussion with ARC management, 21st – 22nd March 2019, Learning Space, FLL, UM
4	Community Engagement	-	-
5	Networking and Linkages	Similar scope for all faculties (Linking faculties together)	Focus Group Discussion with ARC management, 21st – 22nd March 2019, Learning Space, FLL, UM
6	Publications	1 ISI/Scopus publication	Writing and submission phase: Framing and understanding Sustainability Reporting
7	Policy Papers/Guidelines/ Standards	Standardized sustainability report card	Standardized faculty sustainability report card (FSRC)
8	Others	Conference/Poster presentation	Seminar on Energizing Sustainable Development Goals, 25th April 2019, AIS, UM

Future plan for project

- The report card will be made into an online system for easier reporting – A trial Excel format has been developed.
- Diversified/expand the report card criteria to cater to other category that do not fit in the current criteria.
- 1 ISI/Scopus paper publication (Barriers and challenges in sustainability reporting).
- Paper presentation at 1 sustainability conference.

Pictures of activities

Research team meeting

Consultation with Mr. Fadhli on the UIGM indicators

Focus group discussion with faculties' management





19/8/2019

Poster presentation at the *Seminar on Energizing Sustainable Development Goals 2019*, 25th April 2019, Academy of Islamic Studies, University of Malaya

Highlights of project in Eco-campus Newsletter and social media (Facebook)

UNIVERSITI MALAYA

UNIVERSITY OF MALAYA LIVING LABS

UM ECO-CAMPUS

UMLL042-18SUS
EMBEDDING SHADES OF GREEN IN UM's REPORTING PRACTICES

ASSOCIATE PROFESSOR DR. ZARINA ZAKARIA

Department of Accountancy,
Faculty of Business & Accountancy, UM

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+603-7967 3812

AREAS OF EXPERTISE

Qualitative Research,
Sustainability
Accountability and Governance

RECENT PUBLICATIONS

1. Zakaria, Z. (2006), Corporate Social Responsibility and Environmental Reporting in Malaysia, in Accounting Theory and Practice: A Malaysian Perspective Edited by Selvaraj, S.S., Hooper, K. and Davey, H, Pearson: Kuala Lumpur

2. Ismaeel, M. and Zakaria, Z. (2019, forthcoming), Perception of Preparers of Sustainability Reports in the Middle East: Contrasting between Local and Global , Meditari Accountancy Research (SCOPUS-Indexed)

CO-RESEARCHERS (FACULTY)

1. Associate Professor Dr Zamzulaila Zakaria (Department of Accounting, Kulliyyah of Economics and Management Science, IIUM zlaila@iium.edu.my)
2. Mrs. Dalila Md Idris (Deputy Bursar, Bursar Department, UM dalila@um.edu.my)
3. Mr. Shamsul Rizwan Ghazali (Senior Assistant Bursar, Bursar Department, UM shamsul_rizwan24@um.edu.my)

PROJECT SUMMARY

Universities have been traditionally known as places where intellectual inquiry and advances in knowledge are paramount. Therefore, there is an expectation that universities would place much emphasis on environmental sustainability reporting to fulfill the needs of a range of stakeholders. The objectives of this study is threefold: 1. To collate relevant information in developing Carbon Management Plan for UM and the way in which such plan is to be embedded within UM Eco-Campus Blueprint and Low Carbon Cities Framework.2. To produce Environmental Sustainability Report for UM (Year 2017) by incorporating relevant elements within the Global Reporting Index which will contribute to 'Education & Research' Criteria (Indicator 7) of UI GreenMetric Index. 3. To promote awareness on benefits of Environmental Sustainability Report and transfer the knowledge of its preparation to UM's community. Using a mixed-method approach, this study will review the available policies and environmental initiatives developed by University of Malaya in reporting these policies and initiatives. In addition, face-to-face interview will be performed with relevant academics and University administrator with the objective of gathering their opinion on developing Carbon Management Plan for UM. We expect the development of Environmental Sustainability Reporting in University of Malaya is not as straightforward as the case in commercial organization, nonetheless, the university setting in itself offer a unique case as it is accountable to multiple and diverse stakeholder groups. University Malaya's involvement in provision of social goods, that faces restriction in funding, may post a constraint in its pursuit of sustainable development agenda. It is important to understand the uniqueness of this setting when rethinking and reforming approaches to university's environmental sustainability agenda. We suggest ways for University Malaya to acknowledge the need for accountability through development of Carbon Management Plant and producing Environmental Sustainability Report whilst remaining true to core academic purposes.

Core Area of UM Eco-Campus Blueprint

Contribution to Sustainable Development Goals (SDGs)

Research Assistant

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EMBEDDING SHADES OF GREEN IN UM's REPORTING PRACTICES

PRESENTED BY :
YEAMIN JACKY
SHAMSUL RIZWAN

PI: DR. ZARINA ZAKARIA

Introduction

- The development of Environmental Sustainability Reporting in University of Malaya is not as straightforward as the case in commercial organization
- Lack of attention on sustainability reporting in the university sector is just starting to be addressed throughout the world
- Previous literature suggests report that although universities often disclose their sustainable development activities, the diffusion of sustainability reporting is still in an early stage as universities continue to be very traditional and conservative in their reporting obligations.

Introduction

- Sustainable development and environmental protection are the themes of new era. One popular policy tool that every country and government use to promote sustainable development and to protect the environment **is Green Procurement (GP)** or **Sustainable Procurement (SP)**
- There is a significant variation in the adoption of sustainable procurement across universities especially in public sectors. Lack of awareness about Green Procurement poses the most significant barrier to implement sustainable procurement
- Despite several inherent issues & barriers, University of Malaya as one of the leading University in Malaysia is establishing and encouraging its stakeholders to implement GP in its current practice

Objective of the Research

- To Implement Green Procurement at UM
- To produce Environmental Sustainability Report for UM (Year 2017/18) by particularly focusing on the **Global Reporting Initiative (GRI)** which will contribute to 'Education & Research' Criteria (Indicator 7) of UI Green Metric Index
- To promote awareness on benefits of Green Procurement and Environmental Sustainability Report and transfer the knowledge of its preparation to UM's community.

What we have done so Far?

- There was one giant step taken in 2015 by Bursar office (Bahagian Perolehan)to introduce Green Procurement.
- They introduced elements of GP in all tender specifications regarding Cleaning services , canteen operator as well as work tender.
- But issues of enforcement arises as it was neither mandatory nor being monitored.
- In April 2019, UM Bursary Office initiated and was assigned as Green Procurement Responsibility centre.
- This started as a pilot project for UM. All procurements by Bursary must have a selected green elements that will be included in the tender documents.
- This will be carried out through several other departments to get a proper feedback. The findings from the project will serve as a basis for reviewing, assessing and identifying challenges and barriers to implement Green Procurement throughout UM.

What we have done so Far?

- Once these are identified, it is expected that it will enable a smooth facilitation for proper solutions in ensuring effective implementation of Green Procurement in University of Malaya
- We have prepared survey questionnaires based on awareness of GP at UM, which are being circulated through UM to acquire further feedback. (Show Survey)
- A Focus Group discussion was conducted along with HOD Bendahari and JPPHB to share and receive the perspective of different departments on GP
- A seminar was held as an introduction to Bursar Office staff to create awareness about GP and it must be supported by everybody in Bursar implementation of GP.
- A book chapter was produced titled as "**Embedding Green into the Procurement Practice of University of Malaya**"

What we have done so Far?

- Preparing a Sustainability Report for UM based on Global Reporting Initiative (GRI).
- The **Global Reporting Initiative (GRI)** is an independent institution whose mission is to develop a globally applicable sustainability reporting guidelines that help organizations to report on the economic, environmental, and social dimensions
- GRI is now the most widely used sustainability reporting framework.
- As **mentioned by GRI itself**, that adhering to the Guidelines can be labour intensive and full reporting may represent a challenge, but initially if we start by focusing on a partial reporting system, slowly over time we can adopt a full report based on GRI disclosures

What we have done so Far?

- We had several meetings with different departments in UM namely AASC,HEPA,CITRA,HR to collect information.
- Some of the on going projects had their data available online which we could access through Sustainability@UM website.
- Projects such as UM zero waste campaign, water warriors had very detailed and organized information which were very much helpful in preparation of SR
- So, we tried to utilize the GRI guidelines wherever it was possible in our sustainability report.
- We cross referenced the GRI disclosures with our report by creating a GRI Index which is also one of the requirement by GRI(Show SR Report)

What we have done so Far?

- A survey questionnaire was prepared in relation to awareness of SR at UM, which are being circulated through UM to acquire further feedback. (Show Survey)
- A journal article being prepared based on the experience that has been perceived during the process of making SR. The article is named as **" Developing a University Sustainability Report: Experiences from the University of Malaya"**

Abstract : An increasing number of higher educational institutions have engaged in assessing and reporting their sustainability efforts. This paper presents the process undertaken to prepare the first draft of the University of Malaya Sustainability Report. This article aims to provide a perspective on sustainability reporting and performance management in the university sector making a case for increased accountability, improved management performance and greater innovation in approach. Based on the Global Reporting Initiative (GRI) guidelines, the objective of the exercise was to provide a base and complement other sustainability initiatives taken at the University.

Summary of KPI Achievements

- Initialization of Green Procurement Campaign at UM
- Book Chapter on GP (Show book chapter)
- Poster presentation at Seminar
- Seminar and Focus Group discussion conducted on GP implementation.
- Sustainability report for UM(on process)
- Journal article on SR(on process)

Project future plan

- We aim to finalise the Sustainability Report by next month, since all the data has been acquired and processed.
- We also aim to finish the journal article and submit for publication
- We aim to collect the responses of both the surveys being prepared for SR and GP which are being circulated through UM and use these responses in future projects.

Picture of activities








UNIVERSITI MALAYA

UNIVERSITY OF MALAYA LIVING LABS

UM ECO-CAMPUS

LL043-18SUS
WATER MONITORING VIA INTERNET OF THINGS

ASSOC. PROF. DR. MOHD YAMANI IDNA IDRIS

Department of Computer System & Technology,
Faculty of Computer Science & Information Technology, UM

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AREAS OF EXPERTISE

Image and Signal Processing, Internet of Things, Embedded System, Sensor Networks, Information Security

CO-RESEARCHERS (FACULTY)

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3. Mr. Noorzaily Mohamed Noor (MSC Computer Science), Faculty of Computer Science & Information Technology, zaily@um.edu.my)
4. Dr. Tey Kok Soon (Electrical Engineering), Faculty of Computer Science & Information Technology, koksoon@um.edu.my)
5. Mr. Muhammad Nazrin Napiah (MSC Computer Science, Faculty of Computer Science & Information Technology, nazrin23@gmail.com)

RECENT PUBLICATIONS

1. Mohamad Nazrin Napiah, Mohd Yamani Idna Idris , Roziana Ramli , Ismail Ahmedy "Compression Header Analyzer Intrusion Detection System (CHA - IDS) for 6LoWPAN Communication Protocol" IEEE Access (ISI-Indexed)
2. Muhammad Zar Mohd. Zaid Harith, Noorzaily Mohamed Noor,* Mohd. Yamani Idna Idris,* and Emran Mohd. Tamil Intersection and Complement Set (IACS) Method to Reduce Redundant Node in Mobile WSN Localization, Sensors 2018 (ISI-Indexed)
3. Hisham A. Shehadeh, Mohd Yamani Idna Idris, Ismail Ahmedy, Roziana Ramli and Noorzaily Mohamed Noor, The Multi-Objective Optimization Algorithm Based on Sperm Fertilization Procedure (MOSFP) Method for Solving Wireless Sensor Networks Optimization Problems in Smart Grid Applications, Energies, 2018. (ISI-Indexed)
4. Hisham Shehadeh, Mohd Yamani Idna Idris, Ismail Ahmedy, Multi-Objective Optimization Algorithm Based on Sperm Fertilization Procedure (MOSFP), Symmetry 2017, 9(10), 241; doi:10.3390/sym9100241 (ISI-Indexed)
5. A Mahdi,A W A Wahab,M Y I Idris et al. WDARS: A Weighted Data Aggregation Routing Strategy with Minimum Link Cost in Event-Driven WSNs. Journal of Sensors, Volume 2016 (2016) (ISI-Indexed)

Core Area of UM Eco-Campus Blueprint

Contribution to Sustainable Development Goals (SDGs)

PROJECT SUMMARY

Water is a precious resource and essential element for every organism. Hence, protecting the water supplies from wastage are important and their challenges need to be addressed. According to the news in few years back, a single Malaysian average daily water consumption is almost double the total of 165 litres water requirement recommended by the United Nations. One of the reason is that Malaysia water tariffs are among the cheapest globally. When compared to neighbouring countries like Thailand and Singapore, Malaysia water process are cheaper by at least 36%. Though they are cheaper, the conservation of water can't be taken for granted since clean water is one of the key element to sustainability. Some of the reasons of the water wastages are due to the inefficient water management to problems such as leakages and lack of awareness. The problem such as leakages can become more severe when not taken care off. Leakage can cause a wall or floor to perish away, rusting metal pipe, mole problems and many more. It's not only wastage of natural resources but repairing and cleaning is needed. The problems can be addressed by consistent monitoring and aware user on how much water that have been used. For these reasons, we propose an Internet of Things (IoT) approach to monitor the water usage activity. The IoT consists of sensors nodes connected to the internet that able to provide real time status of the water usage. IoT coupled with analytics would enable data to be analyzed and clustered into distinct pattern. This pattern can be further analyzed and use to predict future pattern to gain useful information. From the IoT, alert will be sent when anomaly pattern such as leakage happen. It can also help in studying the effectiveness of water-saving technology or some initiated campaign.

Research Assistant

Mr. Muhammad Zar Mohd Zaid Harith (MSC. in Computer Science, Faculty of Computer Science & Information Technology, UM)
muhdzar93@gmail.com

WATER MONITORING VIA INTERNET OF THINGS

Researcher(s) : MYI Idris, MN Napiah, MZ Harith, I Ahmedy, AWA Wahab, NM Noor, KS Tey
Department of Computer System & Technology, Faculty of Computer Science and Information Technology, University of Malaya
Email : yamani@um.edu.my

KeTTHA to introduce new non-revenue water policy

Friday, March 31st, 2017 at , Business | Corporate Malaysia

0 SHARES

ALL SYSTEMS GO: (From left) Malaysian Water Association president Syed Moh
Energy, Green Technology and Water Deputy Minister Datuk Seri Mahdzir Khalid, M
Nomis Sim and Molecor business development manager Jason Lee at the Water L

rent leadership crisis in Sela

Out to plug water leaks

Malacca wants to further reduce wastage at the source

SAYS

The average Malaysian wastes about 50,000 litres of water every year

The Star ONLINE Log In

4.27 billion litres water waste via leaky pipes

A single Malaysian average daily water consumption is almost double the total of 165 litres water requirement recommended by the United Nations

WATER LOSS

Physical Loss

a) Pipe burst;
b) Leakage (particularly the old pipe);

Commercial Loss

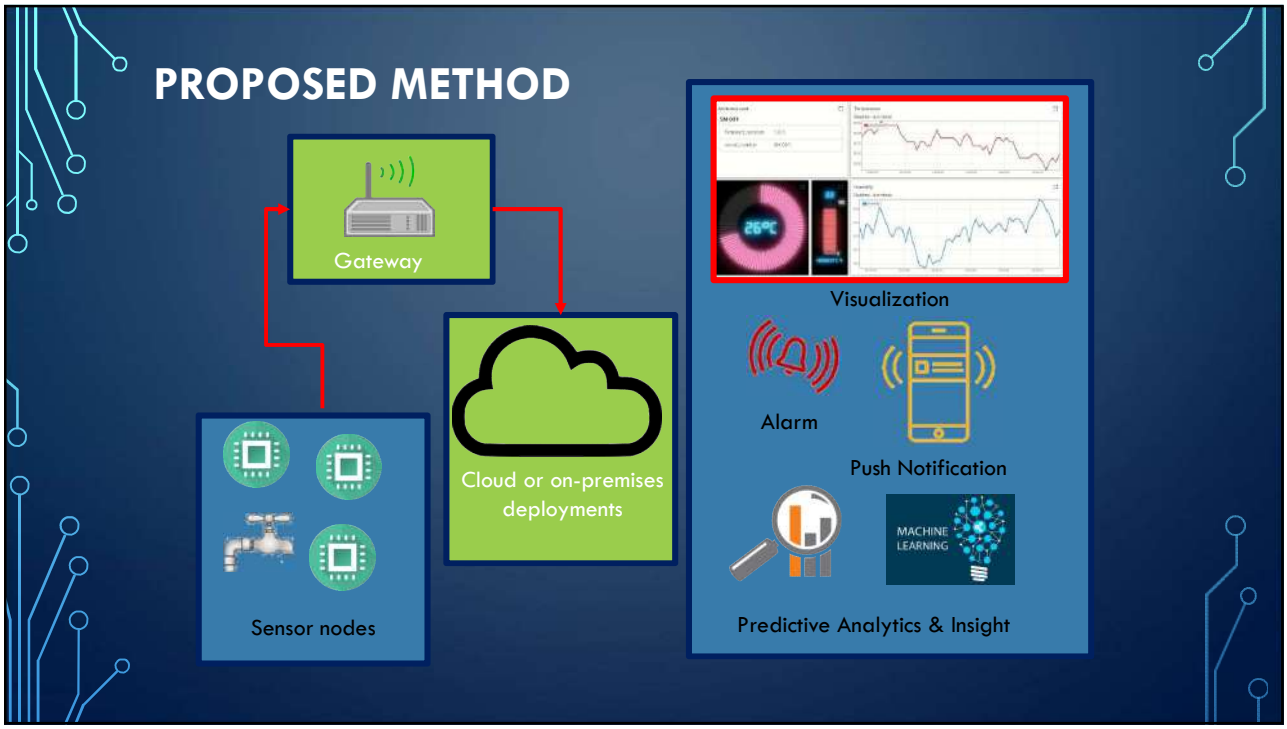
a) Inaccurate meter reading (quantity showed by the old meters is less than the actual);
b) Water theft by illegal tapping;
c) Maintenance of the water supply system through pipe flushing after leakage repair works, reservoirs cleaning and fire brigade use

STATE	NRW (%)
Johor	31.95
Kedah	44.97
Kelantan	48.32
Melaka	29.71
N.Sembilan	49.16
Pahang	59.90
Perak	30.68
Perlis	44.67
Pulau Pinang	19.08
Sabah	49.41
Sarawak	29.52
Selangor	32.49
Terengganu	37.85
NATIONWIDE	36.63

OBJECTIVES

1. To study available water savings method
2. To design water monitoring system based on Internet of Things (IoT)
3. To implement and test the proposed IoT based monitoring system

PROPOSED METHOD



IMPLEMENTATION - HARDWARE

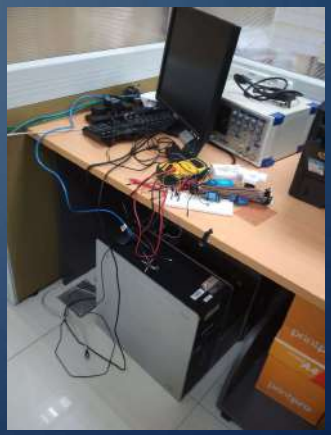
- Microcontroller programming
  - Flow sensor
  - Ethernet/Wifi
  - Actuator trigger
  - MQTT protocol

IMPLEMENTATION – IOT PLATFORM

- Data collection, processing, visualization, and device management is powered by ThingsBoard
- It enables device connectivity via industry standard IoT protocols - MQTT, CoAP and HTTP and supports both cloud and on-premises deployments.
- Scalable, fault-tolerance and high performance.

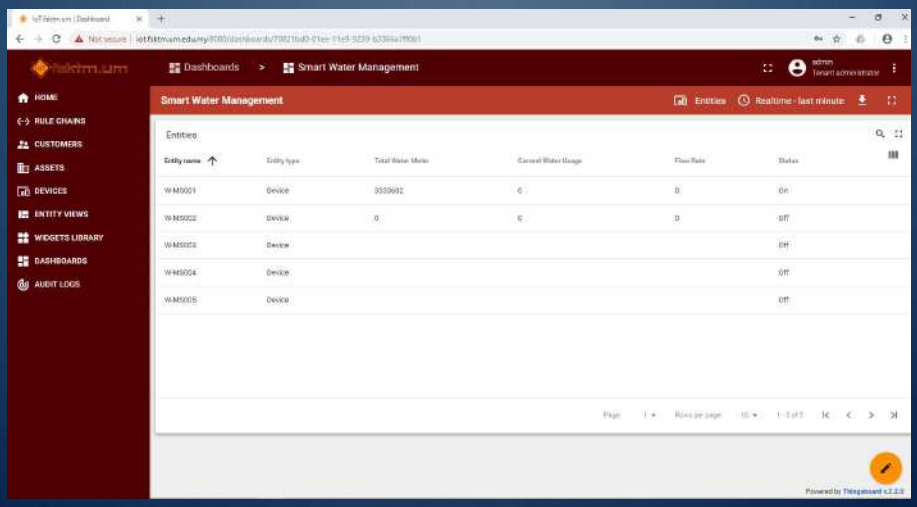
IMPLEMENTATION – IOT PLATFORM

- Server Specification
  - CPU: Intel(R) Core(TM)2 Duo CPU E8400 @ 3.00GHz
  - OS: Ubuntu server 18.04
  - RAM: 6GB
  - With Ethernet port



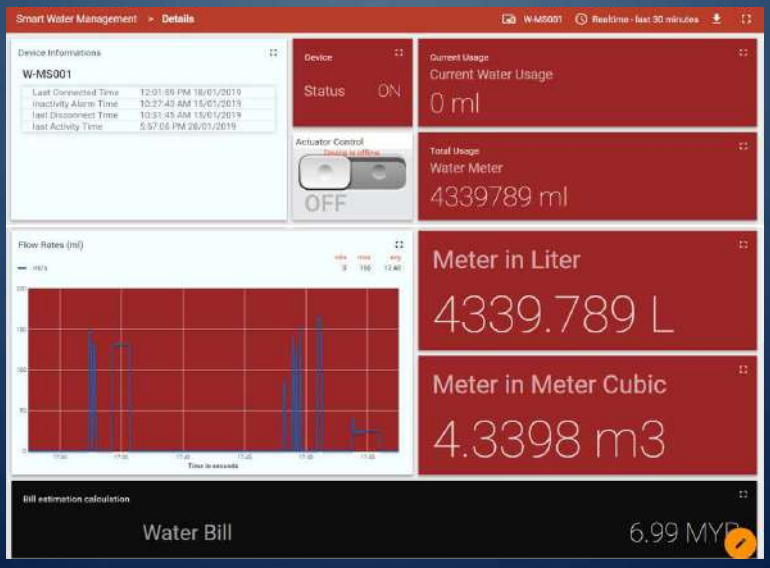
Powered by ThingsBoard

IMPLEMENTATION – IOT PLATFORM



http://iot.fsktm.um.edu.my

IMPLEMENTATION – WATER MANAGEMENT DASHBOARD



DIGITAL DISPLAY THAT SHOWS WATER CONSUMPTION AND AWARENESS CAMPAIGN.

http://iotapp.fsktm.um.edu.my/water_monitoring/water_dshboard.php

Water Monitor & Control Demonstration

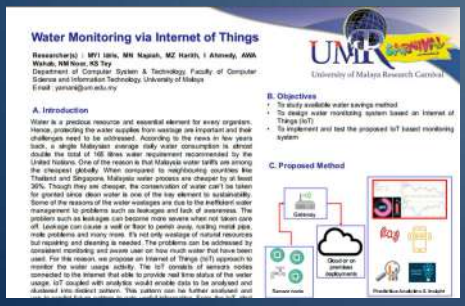
KPI

Project Target Achievement	The proposed system able to measure water usage. - The interface of the system that shows current and total water usage
Capacity Building	Training and demonstration of the prototype. - Talk on Changing Business Landscape in Industrial Revolution (IR) 4.0, on the topic of "Internet of Everything", Petronas Twin Tower, 17th April 2019. - Participate in Advantech Malaysia IoT Co-Creation Partner Conference, MITEC, 17th June 2019.
Technology	Prototype of water monitoring based on IoT
Community Engagement	Water saving campaign and awareness - Participate in University of Malaya Research Carnival (UMRC) on 15 to 17th November 2018. - Participate in Seminar On Energizing Sustainable Development Goals (SESDG2019) on 25 April 2019 @ The Cube APIUM
Chapter in Book	UM Living Labs Book Chapter

FUTURE PLAN

- Use Ultrasonic water meter for more accurate reading
  - Circuit improvement
  - PoE connection hardware improvement
  - Additional hardware
- Use and normally open solenoid for better water blocking
- Exploring the Lora technology for the campus IoT project
- Data logger installation to prevent data loss when internet disconnected
- Use the data collected for monthly or yearly cost prediction
- Improve dashboard/User interface for each point where smart meter implemented
- Provide more notification platform other than telegram
- Use better specs for data collection and web system
- Responsive Digital Display

ACTIVITIES



University of Malaya Research Carnival
(15 – 17th November 2018)

Energizing Sustainable Development Goals
(SESDG2019) (25 April 2019)

Talk on Changing Business Landscape in Industrial Revolution (IR) 4.0. Topic: Internet of Everything, Petronas Twin Tower, 17th April 2019

Advantech Malaysia IoT Co-Creation Partner Conference
MITEC, 17th June 2019

Meeting with Air Selangor, 25th July 2019

UNIVERSITY OF MALAYA

MOHD YAMANI IDNA BIN IDRIS <yamani@um.edu.my>

Re: Meeting Global Top Technologies (GTC)- UM

Nor Badrul Anuar <badrul@um.edu.my> Thu, Jul 25, 2019 at 3:59 PM
To: NOR HIDAYAH BINTI ISMAIL <nor_hidayah@um.edu.my>
Cc: Oyda MAS <shitah@um.edu.my>, "A.S. MD. ABDUL HASEEB" <haseeb@um.edu.my>, IISS ADMINISTRATOR <iiss@um.edu.my>, Suryani Othman <suryani@um.edu.my>, MOHD YAMANI IDNA BIN IDRIS <yamani@um.edu.my>, Ismail Ahmedy <ismailahmedy@um.edu.my>

Selam Puan,

Saya cadangkan AP Dr Yamani dan Dr Ismail untuk turut sama dalam mesyuarat ini.

On Wed, Jul 24, 2019 at 2:23 PM NOR HIDAYAH BINTI ISMAIL <nor_hidayah@um.edu.my> wrote:

Assoc. Prof. Dr. Nor Badrul Anuar Juma'at
Deputy Dean (Research & Development),
Faculty of Computer Science and Information Technology (FSKTM), UM

Dr,

Global Top Technologies (M) Sdn Bhd (GTC) shows their interest to explore collaboration opportunities with **UM Researchers in IoT**.
We appreciate if you could suggest 2-3 relevant researchers from FSKTM that might be interested to engage with the company. One of the researchers will be required to give a 10 minutes presentation that includes relevant experts, facilities, past and current relevant projects and any other relevant info during the meeting.

The meeting has been tentatively scheduled as below;

Event: Meeting Global Top Technologies (GTC)- UM
Date: 02 August 2019 (Friday)

Meeting with Global Top Technologies
The Cube, RMIC, 2nd August 2019

MEETING WITH JPPHB

Meeting with En Wan Muhammad Syaiful Bahar – 17/5/2019 – JPPHB

Water tank visit – 17/7/2019

Meeting with UM Vendor – Iscada - 22/7/2019

UMLL044-18SUS
ECOSLOPE: SLOPE ECO-ENGINEERING TECHNIQUE TOWARDS SUSTAINABLE AND GREEN LANDSCAPE

PROFESSOR DR. NORMANIZA OSMAN
Institute of Biological Sciences
Faculty of Science, University of Malaya

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AREAS OF EXPERTISE

Slope Bioengineering,
Plant Eco-physiology

RECENT PUBLICATIONS

1. Normaniza, O., Aimee, H., Ismail, Y., Tan, G.Y.A and Rozainah, M.Z. (2018). Promoter effect of microbes in slope eco-engineering: effects on plant growth, soil quality and erosion rate at different vegetation densities. Applied Ecology and Environmental Research. 16(3): 2219-2232.
2. Mohammed Saifuddin and Normaniza Osman. 2016. Rooting characteristics of some tropical plants for slope protection. Journal of Tropical Forest Science, 469-478.
3. Mohammed Saifuddin, Normaniza Osman, Rohailah Mohamad Idris and Aimee Halim. 2016.The effects of pre-aluminum treatment on morphology and physiology of potential acidic slope plants. Kuwait Journal of Science. 43 (2): 139-160.
4. Islam, M.R., Wan Jaafar, W.Z., Hin, L.S., Osman, N., Hossain. A., Mohd, N.S. 2018. Development of an intelligent system based on ANFIS model for predicting soil erosion. Environmental Earth Science. 77(186): 1-15
5. Md. Rabiul Islam, Wan Zurina Wan Jaafar, Lai Sai Hin, Normaniza Osman, Moktar Aziz Mohd Din, Fathiah Mohamed Zuki, Prashant Srivastava, Tanvir Islam, Ibrahim Adham. 2018. Soil erosion assessment on hillslope of GCE using RUSLE model. Journal of Earth System Science. 24 (4).

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Core Area of UM Eco-Campus Blueprint

Contribution to Sustainable Development Goals (SDGs)

PROJECT SUMMARY

Erosion and mass movement are commonly recognized as major issues on the cut-slope areas due to land use changes and vegetation clearance. The pressure from human activities along with the effect of weathering process and climate change, increases the frequency and intensity of the slope hazards and potentially affects ecological functions of the slope landscapes. Eco-engineering, a greener slope management technique has been regarded as a powerful tool for effective recuperation. In Malaysia, slope eco-engineering has been practiced in slope stability management by the expressway operators. However, the practiced of impractical vegetation management, so called monoculture system has shown a deteriorating effect on slope stability and the plant itself. Therefore, a mix-culture (high biodiversity) system method is proposed as an alternative slope management in UM. This technique can accelerate the process of natural succession of the slope and would ultimately improve the slope stability in less periods of time. Thus, the key objectives of this research are: (I) to demonstrate a cost effective, high aesthetic value, and a stable slope landscape in UM, (II) to design green slope landscape as potential land area in carbon sequestration (III) to establish proper guideline of succession management of slope eco-engineering practice for JPPHB, UM. This EcoSlope project will implement the plant succession management on the existing bare or less vegetated cut-slopes at the University of Malaya. The expected output of the project is to I) produce UM green and sustainable slope guideline, II) increase 10% of soil shear strength of the slope in UM, III) increase 10% of soil carbon storage, and IV) increase 50% of green surface cover on slope landscape. It is envisaged that after the successful showcase of selected UM slope and the establishment of the guideline to better manage the slope landscape, the practice is applicable to other hilly landscape in the country.

Research Assistant

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UNIVERSITY OF MALAYA

UNIVERSITY OF MALAYA LIVING LABS

UM ECO-CAMPUS

UM LIVING LAB
Final Monitoring Session (12 Months)

LL044-18SUS

EcoSlope: Slope eco-engineering technique towards sustainable and green landscape

Prof. Dr. Normaniza Osman *(Principle Investigator)*
Assoc. Prof. Dr. Hazreena Hussein *(Co-Researcher)*
Aimee Halim *(Research Assistant)*

The Cube, Level 4, Research Management & Innovation Complex, UM
20TH AUGUST 2019

PROJECT INFORMATION

CORE AREA OF UMECB

Landscape and biodiversity

SUSTAINABLE DEVELOPMENT GOALS (SDGS) CONTRIBUTION

SDG13: Take urgent action to combat climate change and its impacts

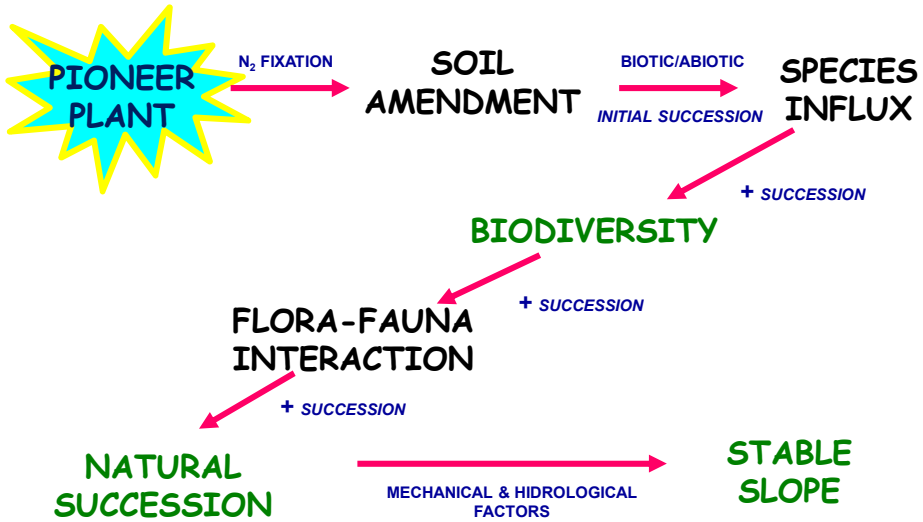
SDG15: Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss

INTRODUCTION

Eco-engineering technique

- Using vegetation for preventing and controlling erosion to stabilize slopes
- Slope problems vary between different geographical regions and have to be specifically tailored.
- Current practice in Malaysia

THEORIES: MECHANISM



(Normaniza et al., 2009)

KNOWLEDGE TRANSFER

Implement the plant succession management

existing bare or less vegetated cut-slopes at the University of Malaya.

Establish the guideline on succession management of slope eco-engineering practice

Long term stabilization

Enhance biodiversity

Sustain green landscape.

RESEARCH OBJECTIVE

- to **showcase/demonstrate** a cost effective, high aesthetic value, and a stable slope landscape in UM
- to design **high biodiversity of green slope** landscape as potential land area in carbon sequestration
- to establish **guidelines of succession management** of slope eco-engineering practice for JPPHB, UM.

GANTT CHART

Activity	1 year											
	Sept	Oct	Nov	Dec	Jan	Feb	Mac	Apr	May	Jun	Jul	Aug
Soil sampling and carbon content analysis												
Landscape design and transplanting on selected slope												
Slope monitoring and maintenance (succession rate, diversity increment and carbon storage estimation)												
Green-slope guideline												
Project completion & final report submission												

PROJECT TIMELINE

Slope survey

Soil test and analysis

Plant survey at Nursery JPPHB

Sept 2018

2019

Nov 2018

15th July 2019

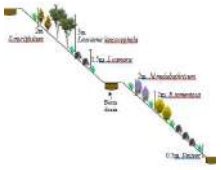
Monitoring & Maintenance

Green-slope guideline

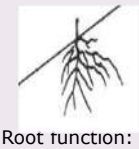
30th July 2019

Completed!

31st Aug 2019

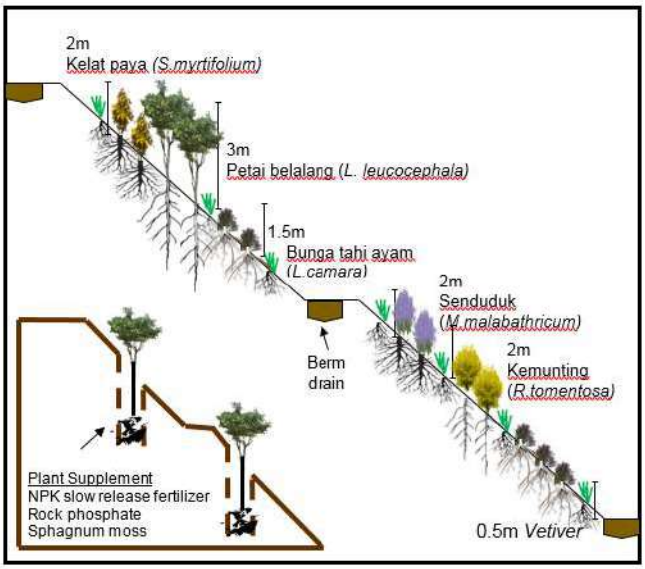


- Landscape design
- Transplanting activity on slope
- Succession management

Slope plants	Attribute	Type of root system	Photo
Shrubs			
Bunga tahi ayam *(Lantana camara)*	• Grow up to 2 metres tall • Hedge plant • Tolerant of high temperature • Provide organic matter which can be used as mulch material	Fibrous M-type  Root function: Soil erosion control	
Senduduk *(Melastoma malabathricum)*	• Grow up to 2.5 metres tall • Pioneer plant with a high dispersal (seed) capacity • Survive in hot temperature, low fertile soil, and survive on severely acidic slope (pH < 3.0)	Fibrous M-type  Root function: Soil erosion control	
Kemunting *(Rhodomyrtus tomentosa)*	• Grow up to 4 metres tall • Survive in harsh environments • High tolerant to light and drought • Require sunny position and soil with pH ~4	Fibrous M-type  Root function: Soil erosion control	

Slope plants	Attribute	Type of root system	Photo
Trees			
Kelat paya (*Syzigium campanulatum*)	• Grow up to 8 metres tall • Hedge plant • Dense growth habit; dense branching system and reddish new shoots.	Tap and fibrous R-type  Root function: Soil reinforcement	
Petai belalang *(Leucaena leucocephala)*	• Grow from 5 to 20 metres tall • Vigorous and fast-growing • Thrives on steep slopes and used in reforestation and soil stabilization projects • Tolerant of a range of soils and • drought • Nitrogen fixer plant	Tap and fibrous (VH-type)  Root function: Soil stabilization	

LANDSCAPE DESIGN



Based on:

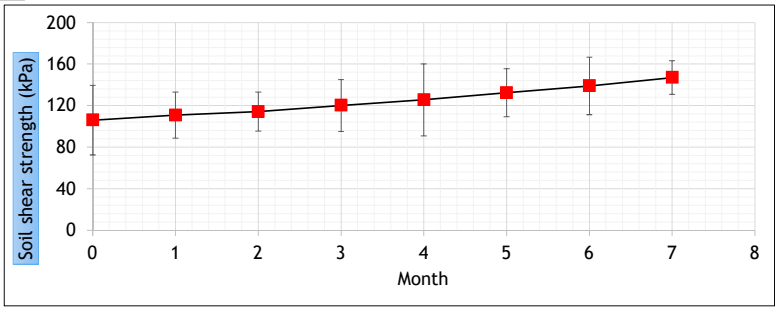
- **Height**
- **Crown size**
- **Flower colour**
- **Root architecture**
- **Texture**
- **Aroma**

PLANTING TECHNIQUE

Microclimate Plant Propagation Technique with modified soil depth (Normaniza and Barakbah, 2011).

OUTPUTS

Project Target Achievement



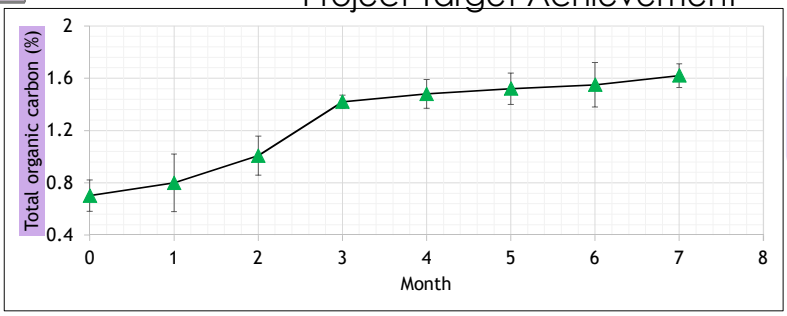
Increasing 10% of soil shear strength
STATUS: **Increased by 39%**

Means of monthly soil shear strength of the EcoSlope plot (Dec 18 - Jul 19)

- Plant diversity of EcoSlope has increased by 33% in which increasing the soil shear strength by 39% after eight months of observation - higher biodiversity of the plant communities boosts root biomass, with knock-on positive effects for slope stability (Ford et al., 2016).
- High diversity of plant species performs a high level of specialization between species, such as species-specific rooting structures (Loreau et al. 20010 that contributes to **erosion control**.

OUTPUTS

Project Target Achievement



Increasing 10% of soil carbon storage
STATUS: **Increased by 131%**

Means of monthly soil total organic carbon of the EcoSlope plot (Dec 18 - Jul 19)

- Right composition of species provides a consistently positive effect on slope soil organic carbon storage which has increased by 131% - high plant diversity tremendously enhances the soil carbon sequestration and sustains the benefits of plant diversity and ecosystem (Chen et al., 2018).
- Starting with a little biodiversity value, EcoSlope provides a useful tool in mitigating climate change, supporting the global Sustainable Development Goals (DSG) no. 13 and 15.

OUTPUTS

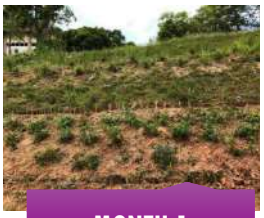
Project Target Achievement

Increasing 50% of green surface cover on slope landscape

STATUS **>50% of green surface cover**


BARE SLOPE


DAY 1


MONTH 1

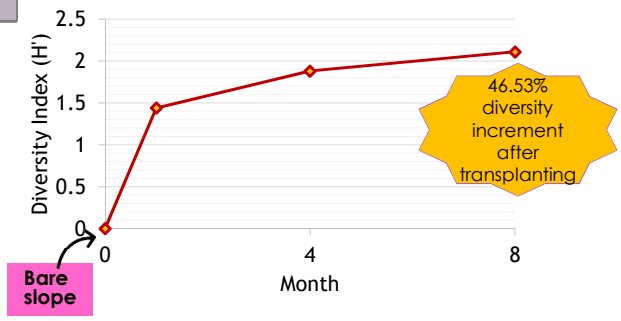

MONTH 3


MONTH 4


MONTH 6


MONTH 8


MONTH 9



Species influx:
wild *senduduk*, climbers, *Semalu*, grass fern, legume shrubs

Plant diversity of EcoSlope has increased by 46.53%, suggesting that the pervasive influence of biodiversity on environmental processes also applies to the ecosystem service of erosion protection.

Capacity building:

EcoSlope showcase

Total area : 100 m²

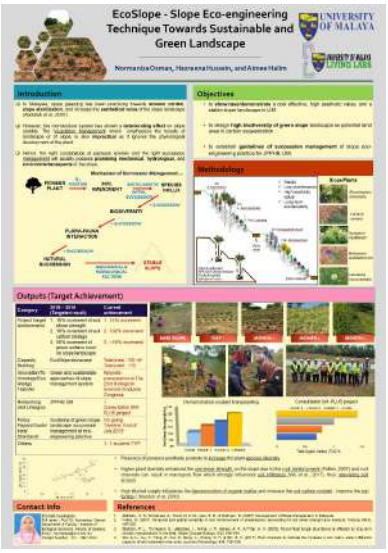
Total number of transplanted shrubs : 170

Rate of succession (species influx/month):

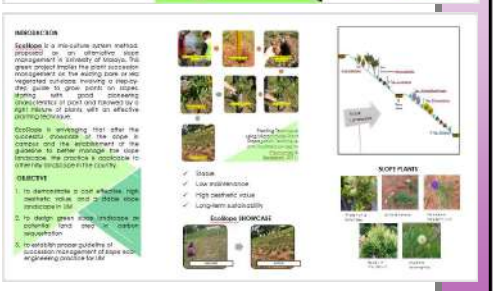
1.5/month

Side context of the EcoSlope

Poster SESDG 2019



EcoSlope Guidelines



EcoSlope brochure

SUMMARY OF KPI ACHIEVEMENTS

No	Category	2018 – 2019 (Targeted result)	Achievement
1.	***Project Target Achievement***	1. 10% increment of soil shear strength 2. 10% increment of soil carbon storage 3. 50% increment of green surface cover on slope landscape	1. 39% increment 2. 131% increment 3. >50% increment
2.	***Capacity Building***	EcoSlope showcase	Total area : 100 m^2 Total plant : 170 Plant diversity increment: 46.53%
3.	***Innovation/Technology/Knowledge Transfer***	Green and sustainable approaches of slope management system	Keynote presentation at The 23rd Biological Science Graduate Congress
4.	***Community Engagement***	1. JPPHB (slope & landscape unit staff) 2. Students – practical activity	✓
5.	***Networking and Linkages***	JPPHB UM	✓
6.	***Publications***	Succession management of UM slope	UMLL Book chapter- EcoSlope: an innovative use of ecological concept in slope landscape environment - *submitted*
7.	***Policy Papers/Guidelines/ Standards***	Guideline of green slope landscape: succession management of eco-engineering practice	*Garis panduan pengurusan teknik eko-kejuruteraan cerun berisiko rendah dan sederhana* - completed
8.	***Others***		1. UM-PLUS consultation project 2. 1 student- FYP 3. Seminar on energizing sustainable development goals (SESDG2019) 4. Biosymposium, ISB, Fac. of Science, UM.

ISSUES/PROBLEMS

11 Feb 2019 – 50m^2 of Ecoslope showcase has been cleared by unknown

Re-planting the disturbed EcoSlope showcase

ACTIVITIES

Engagement (Internal level –UM)

Demonstration on plants transplanting with ISB staffs & students 27 & 29 November 2018

Student involvement: Transplanting exercise during practical class

Poster presentation during Seminar on energizing sustainable development goals (SESDG2019)

Re-planting the EcoSlope showcase with ISB staffs

Latest progress

ACTIVITIES

Engagement (External level)

National

Consultation project UM-PLUS

International

Keynote speaker: The 23rd Biological Science Graduate Congress 18TH – 20TH December 2018

PROJECT SITE (INSITUTE OF BIOLOGICAL SCIENCES)

UMLL045-18SUS
RECYCLED PLASTIC AGGREGATE AS REPLACEMENT FOR CONVENTIONAL AGGREGATES IN CONCRETE

ASSOCIATE PROFESSOR DR. UBAGARAM JOHNSON ALENGARAM

Department of Biomedical Engineering,
Faculty of Engineering, University of Malaya

johnson@um.edu.my +603-7967 7632

AREAS OF EXPERTISE

Civil Engineering Materials
Concrete Technologies &
Sustainable Construction

RECENT PUBLICATIONS

1. Mo, K. H., Yeap, K. W., Alengaram, U. J., Jumaat, M. Z., Bashar, I. I. (2018). Bond strength evaluation of palm oil fuel ash-based geopolymer normal weight and lightweight concretes with steel reinforcement. Journal of Adhesion Science and Technology 38(1): 19-35. (ISI-Indexed)
2. Alnahhal, MF; Alengaram, UJ; Jumaat, MZ; Abutaha, F; Alqedra, MA; Nayaka, RR 2018. Assessment on engineering properties and CO2 emissions of recycled aggregate concrete incorporating waste products as supplements to Portland cement. JOURNAL OF CLEANER PRODUCTION (ISI-Indexed)
3. MF Alnahhal, UJ Alengaram, MZ Jumaat, B Alsubari, MA Alqedra, KH Mo. Effect of aggressive chemicals on durability and microstructure properties of concrete containing crushed new concrete aggregate and non-traditional supplementary cementitious materials. Construction and Building Materials 163, 482-495 (ISI-Indexed)
4. RR Nayaka, UJ Alengaram, MZ Jumaat, SB Yusoff. Microstructural investigation and durability performance of high volume industrial by-products-based masonry mortars. Construction and Building Materials 189, 906-923 (ISI-Indexed)
5. RR Nayaka, UJ Alengaram, MZ Jumaat, SB Yusoff, MF Alnahhal. High volume cement replacement by environmental friendly industrial by-product palm oil clinker powder in cement–lime masonry mortar. Journal of Cleaner Production 190, 272-284 (ISI-Indexed)

CO-RESEARCHERS (FACULTY)

1. Professor Dr. Sumiani Yusoff
   (Institute of Ocean & Earth Sciences (IOES)
   &
   UM Eco-Campus,
   sumiani@um.edu.my)
2. Associate Professor Dr. Nor Hafizah Ramli @Sulong
   (Faculty of Engineering, UM
   hafizah_ramli@um.edu.my)

Core Area of UM Eco-Campus Blueprint

Contribution to Sustainable Development Goals (SDGs)

PROJECT SUMMARY

Plastic is an inexpensive and durable material that is widely used throughout the world with a growing pace. However, they have harmful effects on our environment. Nearly 300 million tons of plastic is produced every year, half of which is for single use. More than 8 million tons of plastic is dumped into our oceans every year. The utilization of recycled plastic wastes can contribute to the environment and consequently, reduce the usage of natural resources. The purpose of this project is to replace natural aggregates by recycled plastic aggregates. By incorporating recycled plastic aggregates in concrete and cementitious products, not only we can benefit from the preservation of the environment by reduction of dumping the plastics but also can increase sustainability by reducing the amount of natural aggregates used in the products.

Research Assistant

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(PhD Candidate,
Faculty of Engineering,
Department of Civil Engineering,
pooyadarvish@gmail.com)

University of Malaya Living Lab Projects

Recycled Plastic Aggregate as Replacement for Conventional Aggregates in Concrete

Principal Investigator
Assoc. Professor Dr. U. Johnson Alengaram

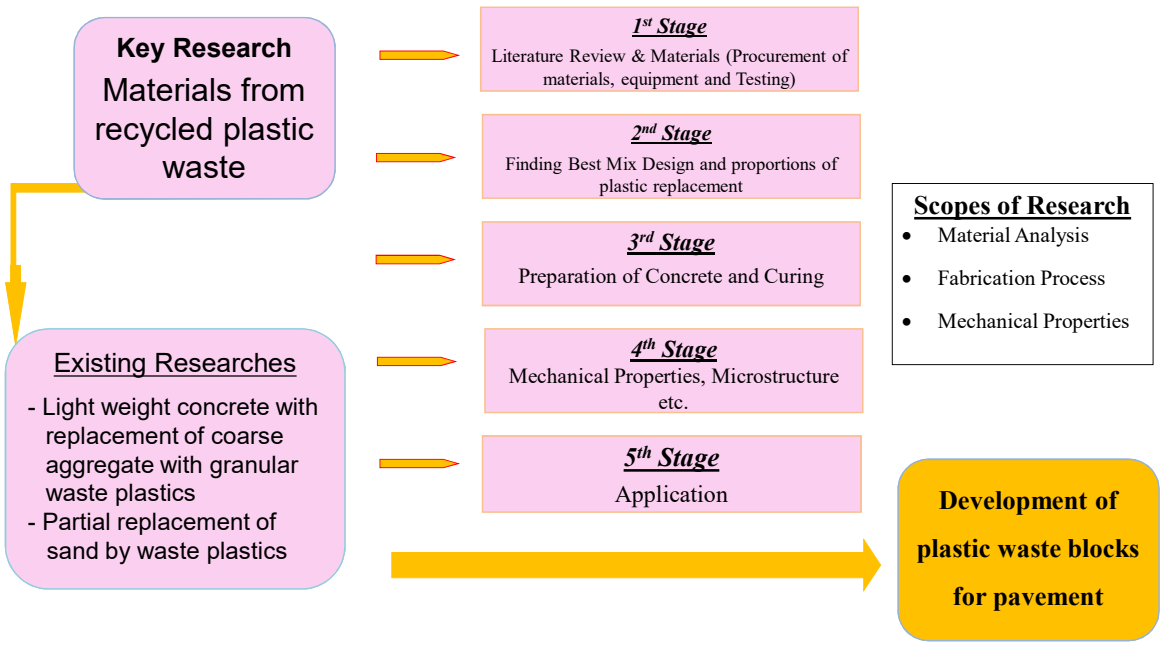
Co-Researchers:
Professor Dr. Sumiani Yusoff
Assoc. Prof. Dr. Nor Hafizah Ramli

Research Assistant
Pouya Darvish (PhD Scholar)
Lee Jin Hao

Objectives

- Characterization of plastics for size, shape and roughness
- Replacing proportionate percentages of fine aggregate (sand) by volume
- Replacing proportionate percentages of coarse aggregate level on structural concrete

Work flow



Previous studies

- ✓ Mechanical properties of the mortars are degraded with the replacement of the plastic fine aggregate which is mostly caused by heterogeneities between the plastic aggregates and the cement paste, especially in the Interfacial Transition Zone (da Silva et al., 2014)
- ✓ With 10-50% replacement of sand in mortar by weight, flexural and compressive strength reduced and thermal insulation performance improved (Iucolano et al., 2013)
- ✓ Study on using plastic aggregate replacement in mortars showed decline in strength and water absorption while impact resistance and shrinkage of mortar was improved with 15% of replacement (da Silva et al., 2014)
- ✓ Microstructural investigations revealed great number of voids between the aggregates and the cement matrix in the mortar (Hannawi et al., 2010; Marzouk et al., 2007)

Plastic aggregates

Plastic aggregates

Aggregates	Bulk Density (kg/m3)
Blue	582.00
Black	560.18
Green	727.45

Plastic aggregates

Aggregates	Specific Gravity(kg/m3)
Blue	967.1
Black	894.5
Green	1100.1

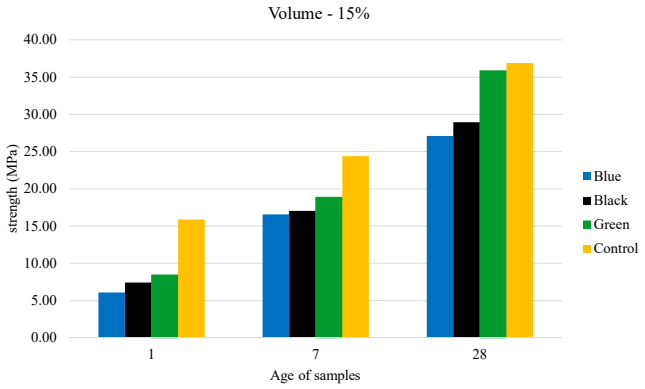
Volume based calculation

Plastic aggregates

Material	Density(kg/m3)	Ratio	Weight %			
Cement	3150	1	25		SG	Values
Water	1000	0.5	12.5		Mining Sand	2.61
Silica Sand	2720	2.5	62.5		M sand	2.75
TOTAL		4	100		Silica Sand	2.72
					POC Sand	2.06
Total Vol	0.0002875	Cement	166.25		POC Coarse	1.7
Total Density	2303.380604	Water	83.125		Crushed granite	2.7
Total Weight	0.662221924	Sand	415.625		Cement	3.15
Round	665				Water	1
Graded sand (g)					Green plastic	1100.1
1.18-2.36	103.9	volume of silica	black	34.2	Black plastic	894.5
0.60-1.18	145.5	0.038200827	blue	36.9	Blue plastic	967.1
0.25-0.6	83.1		green	42.0		
0.15-0.30	83.1					

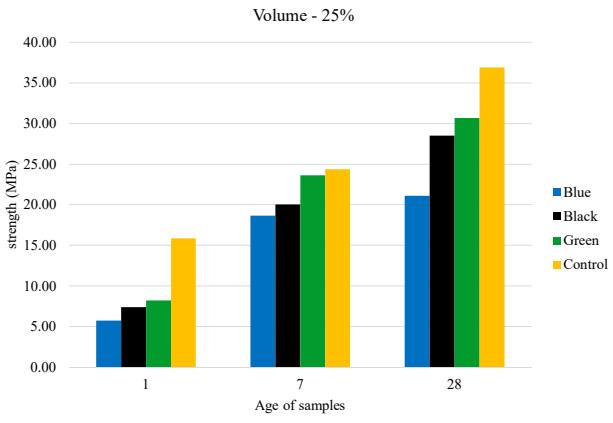
Volume replacement

15%



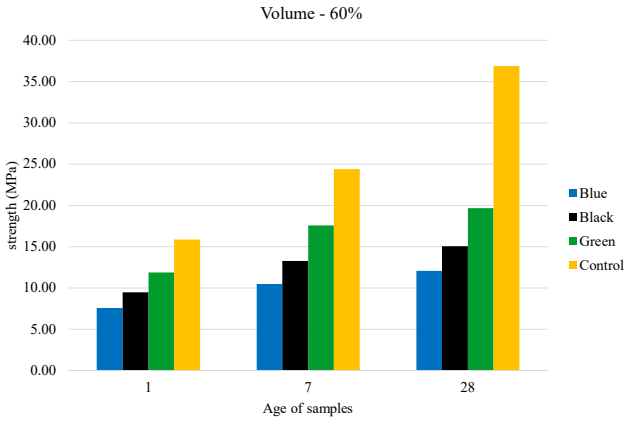
Volume replacement

25%



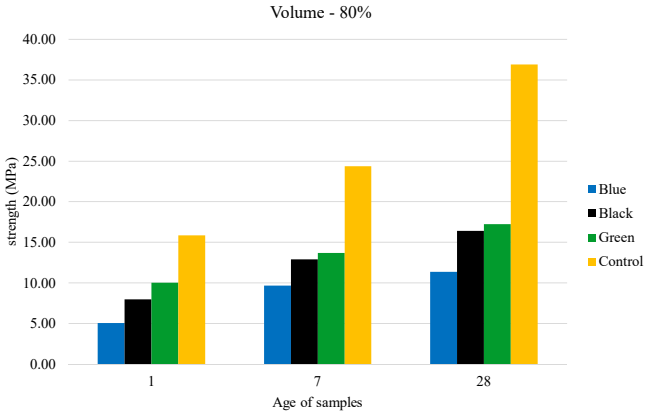
Volume replacement

60%

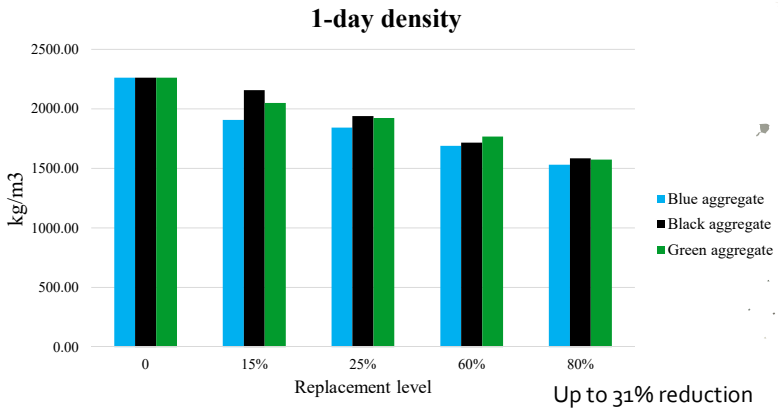


Volume replacement

80%



SSD Density



Up to 31% reduction

Summary of the results

Green plastic aggregate

Replacement of aggregate	Compressive strength (MPa)	Reduction in the strength
15 %	35.84	2.8 %
25 %	30.66	16.8 %
60 %	19.65	46.7 %
80 %	17.22	53.3 %

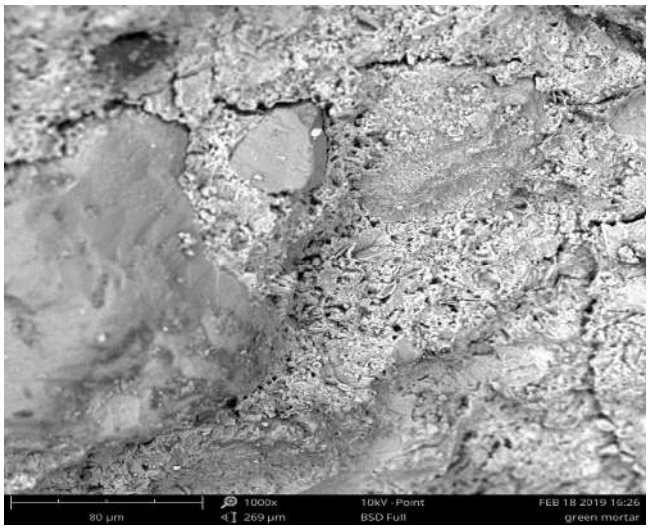
Scanning Electron Microscopy (SEM)

Green plastic aggregate

SEM image on the plastic aggregate with a 1000 magnification demonstrates the smooth surface of the aggregate

Scanning Electron Microscopy (SEM)

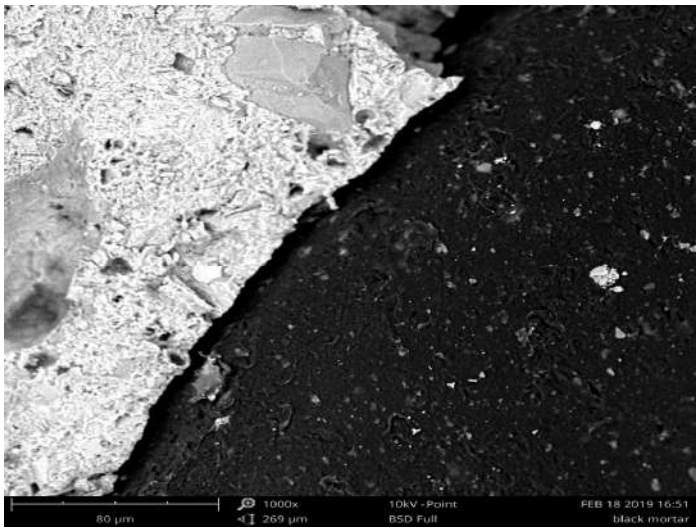
Green plastic aggregate mortar



SEM image on the interaction of the cement paste and green plastic aggregate with a 1000 magnification

Scanning Electron Microscopy (SEM)

Black plastic aggregate mortar



SEM image on the interaction of the cement paste and black plastic aggregate with a 1000 magnification

Key Performance Indicators (KPI)

Category	Description
Project target achievement	Contribution of recycled plastics in the construction: Between 15-80 % of sand can be replaced with plastic aggregates depending on the desired strength.
Capacity building	Seminar was conducted on 22nd of March 2019 with the purpose of sharing the knowledge of the utilization of plastic aggregates and their impact on human's lives.
Innovation/Technology/Knowledge transfer	Incorporating volume based design on replacement of plastics
Community engagement	Plastic aggregate concrete was used as the pavement of a geopolymer (zero-cement) house near the examination hall, next to the bus station / One Undergraduate student was trained, future works on plastic pavements for PPR (6 locations identified); in UM, we wish to work with JPPHB to utilize plastic aggregates for pavements
Networking and linkages	Centre for research & Innovation/ Thiagarajar College of Engineering, Anna University, India
Publications	A book chapter was delivered for UM Living Lab publication One cited indexed journal (scopus) publication is being prepared
Policy papers/guidelines	N.A

Application

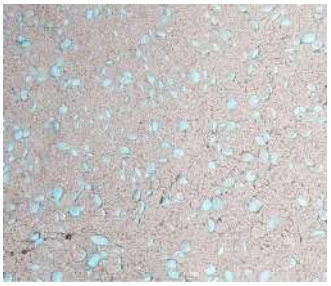
- Plastic aggregate geopolymer concrete was used as the pavement of a zero cement house built next to the bus station (near examination building)
- 30% of the fine aggregate was replaced by plastic aggregates

Application

- Two different plastic aggregates were utilized in the pavement of each side of the house: 1- Green plastic aggregate 2- Black plastic aggregate

Application

- Dry mix of green plastic aggregate GP concrete



- Wet mix of green plastic aggregate GP concrete

Application

•
PPR Batu Muda, Community Centre meeting room
•PPR Desa Rejang,
•PPR Seri Semarak, Tuition and Guidance Center, Block E
•PPR Seri Alam, Community Centre meeting room
•PPR Kerinchi,
•PPR Pantai Ria, Community Centre function hall

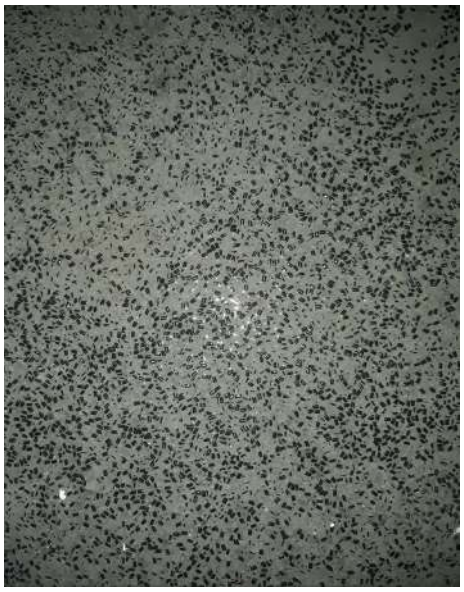
Application

- Mixing and pouring the fresh plastic concrete on the pavement

Application

- Leveling the surface of the pavement

Application



Statistics on Plastics

- ✓ Of the **plastic waste** produced between 1950 and 2015, **only 9%** was recycled
- ✓ Discarding the plastic on land, **makes the soil less fertile** and incinerating it leads to **environmental pollution** due to the release of poisonous chemicals
- ✓ **4820 kg of plastic** is being generated in **University of Malaya each year** (University of Malaya Zero Waste Campaign)
- ✓ Utilizing the plastic in the **pavements** could **lower the costs** of the construction and **make use of the unused plastics** generated.