INTRODUCTION

1.1 Background of ZWC

Zero Waste Campaign (ZWC) aims to spearhead the development of an integrated and sustainable waste management model in UM. The history of ZWC rooted from a students' group, "VeeCYCLE" which developed a recycling project in Faculty of Engineering with "PRO bin" to promote the best practice of waste segregation at source. The inception of Green Bag Scheme in 2010 was inspired by the fact that food waste is the major problem in Malaysia.

Subsequently, a composting center was developed with funding from CIMB Foundation, support from UM top management especially DVC (Development) and JPPHB as well as technical assistance by IGES in 2011. In 2013, UMCares continued the funding to ZWC. ZWC signed a MOU with CH Green Sdn. Bhd. in 2013 for research collaboration on COWTEC anaerobic digester.

In 2013, there were various visitors from different parties such as academic institutions, government agencies, private sectors and NGOS. The visit also resulted in research collaboration such as with UMT on compost microbiology research. A recycling collection day was carried out by ZWC in Oct, from several sites in UM campus. About 1 ton of recyclables were collected in that particular day. For e-waste "bring" drop-off collection point at ZWC site, there were two collections by e-waste recycling company, with total weight of about 800kg.

In term of facilities and equipment, ZWC had bought a 1-ton weighing scale for the more convenient and effective weighing of food waste and green waste collected for composting and anaerobic digestion. ZWC also bought an open top Ro-Ro bin for the storage of wood waste that is collected separately. Several recycle bins were put in several places in UM campus to facilitate recycling collection as well. In May, all the compost piles under the canopies were moved to a vacant site under the TNB transmission line right behind the existing ZWC facility. With the new site, the composting capacity is expected to be increased gradually with larger piles and longer composting duration to enhance compost quality by longer maturation period.

In 2014, ZWC cooperates with Life Line Clothing Sdn. Bhd. to introduce a used clothes collection and recycling program and TSP Waste Management Sdn. Bhd. for separate collection of wood waste for energy recovery. In 2015, ZWC initiated the collaboration between SWCorp (National Solid Waste Management

Corporation) and UM on ZWC model and projects by signing a MOU. JPPHB established a ZWC center with container-reuse concept, installed a weighbridge station and green waste chipper. A recycling drop-off center is established the ZWC center for collection of paper, plastic, metal, Tetra Pak UBC and e-waste. ZWC also collaborates with Climb Optima for a research on small-scale in-vessel composter.

Year 2014 is an improvement year for Zero Waste Campaign (ZWC) with more collaboration with industries to establish separate collection of various waste streams, collaboration with academic institutions for research, more appearance in environmental conferences, expo and media, and strengthening rapport from UMCARES and JPPHB. The public private partnership (PPP) between ZWC (UM) and several private entities had resulted in successful separate collection of waste streams for recycling/landfill diversion.

The support from UM top management, especially DVC (Development) to ZWC, is very important to ensure the success of the PPP. For instance, the sites approval to LLC to place the used clothes collection bins and cooperation to collect wood waste separately in a dedicated open top Ro-Ro bin for wood waste recycling. The DVC (Development), Prof. Faisal Rafiq had allocated budget for the upgrading of ZWC facilities in year 2015 such as new ZWC building, green waste shredder, a weighbridge station and composting center. Under DVC (Development), JPPHB assists ZWC in the provision of several manual workers, waste and recycling data as well as collection receptacles for food waste such as bins and bags.

Year 2015 was a special and significant year for ZWC. For the first quarter of 2015, ZWC welcomed a number of local and international visitors such as UMT, CETDEM, government officers from Bangladesh, GPNM, etc. The biogas generator had arrived in Feb. 2015. Four ZWC signage boards had been installed at ZWC site for wood waste, composting, Cowtec AD and ZWC center. The installation of UM ZWC Center (container-style office & gallery building) had started in March 2015 and completed in early May 2015 by JPPHB.

A series of planning and meetings were carried out between several stakeholders of UM (JPPHB, OSH, ICR, Bursary, etc) from Feb. until May 2015 for a MOU signing ceremony with SWCorp. After the ZWC center installation, a launching event and MOU Signing ceremony between UM and SWCorp (National Solid Waste Corporation) was carried out on 28th May 2015, witnessed by the Secretary-General of Ministry of Urban Well-Being, Housing and Local Government. After the launching, installation of a weighbridge station at the entrance of UM waste transfer station had kicked off in June and completed in July 2015. Weighing of solid waste and recyclables began in the mid of July. A series of visits to ZWC center were

happened after the event, with the notable one as Prof. Takakura Koji (inventor of Takakura composting method) on 18th August 2015. ZWC was interviewed by various media and press in 2015 such as TheStar, Astro Awani, Berita Harian, Utusan, Oriental Daily, The MalayMail, NSTP, Harian Metro, Sin Chew Press, Nan Yang Press, etc. The principal coordinator of ZWC, Assoc. Prof. Dr. Sumiani Yusoff was invited to receive Green Era Award in Berlin on behalf of UM on 22nd March.

Year 2016 was another important year for ZWC with development of an intelligent recycling center and other facilities as well as awareness program. ZWC is constantly looking for opportunity to sustain itself financially. One of the steps taken in 2015 is selling of Baja Ria (compost) at RM5 per kilogram. More measures will be adopted to increase income of ZWC for economy sustainability. In end of 2016, UM ZWC develops an intelligent recycle center with Coindex Sdn Bhd to promote recycling behavior and inculcate best practice of recyclables drop-off with this innovative automated recycle center located at DK A&B, PASUM. With the new recycling system, UM community can send their source segregated recyclables to the center for conversion into green points which can be used to claim goodies such as compost. Besides, with the larger capacity chipper-shredder machine from JPPHB, the green waste composting scale is expected to be increased from the current 1.5 ton per month to about 5 ton per month. Moreover, with the RMK-11 budget from JPPHB, the current UM ZWC composting site will be upgraded with concrete platform and proper leachate collection and re-use mechanism.

In year 2017, the launching of UM ZWC intelligent recycle center (IRC) by DVC (Development) and DVC (Research & Innovation) happened in April 2017. The IRC begins operation since April 2017 and several steps such as Green Points conversion were taken to promote the IRC but the utilization is very low. UM ZWC is planning to improve the IRC operation and mechanism. In 2017, UM ZWC was interviewed by several media such as RTM, BFM and TheStar. A special fund under UM Bursary for ZWC income management was set-up. In May – Aug 2017, ZWC was involved in providing training on waste segregation at source and recycling to green volunteers of KL2017 SEA Game. A series of capacity building program on integrated waste management was carried out at UM ZWC and other places, for organizations of various backgrounds. The notable organizations are for example Maybank, DRB-HICOM and Jabatan Lanskap Negara. The large green waste shredding machine was in operation since June 2017, with capacity of 2 ton per month. The capacity is currently limited by space constraint at the current composting site. Planning is in progress to move the current composting site under TNB pylon to another larger area (~0.25 acres) in year 2018. Proper infrastructure such as concrete platform, drainage and compost cover will be installed with this new development. In 2017, UM ZWC has form a volunteer team to support and improve

the UM ZWC projects from time to time, with activities such as promotion of food waste segregation, set-up ZWC garden, etc. UM ZWC is looking for strategy to generate income as part of the plan to become self-sustainable in near future.

2018

In year 2018, there was an increase in the number of achievements from economic to environmental perspective. The biggest achievement of UM ZWC in 2018 was that this project has been awarded the best solid waste management in city center set up campus for World UI GreenMetric ranking. With the xx tons of solid waste diversion from landfill, there are plenty of direct and indirect saving take place. Direct savings were shown in the reduction of waste tipping fee and waste collection fee which equals to RM7,881.00 (RM35/ton) and RM87,200.00 (RM400/ton) respectively. Indirect savings from UM Zero Waste Campaign project were shown in the reduction of fossil fuel cost, carbon emission from transportation of solid waste to landfill and the reduction in carbon emission at landfill.

Besides those savings, UM ZWC organic compost, one of this project product has obtained microbial test verification from Forest Research Institute Malaysia (FRIM). From the result of the microbial test, UM ZWC organic compost is 98% clean from harmful microbes and the presence of *pseudomonas aeruginosa* in UM ZWC compost indicates the availability of the compost to produce more ammonia, the best nutrient for plant growth.

Throughout the 8 years of operation, UM ZWC organic compost were produced in 2 forms which are solid and liquid. The solid compost is produced from aerobic composting method while the liquid fertilizer is produced from anaerobic composting method using Anaerobic Digester (AD) machine. Both composting method give different yield in terms of quantity and duration of the production process. The AD machine is limited to 100kg of food waste per day and only soft food waste like rice and soft vegetables can be processed into liquid fertilizer and biogas compared to open air composting which process almost every kind of food waste. With the increase of food waste loaded at UM ZWC, there was an additional of AD machine at UM ZWC site in year 2018. The addition of new AD machine increases the productivity of liquid compost and biogas at UM ZWC site.

For social interaction, in year 2018, UM ZWC has created a website as it is more environmental friendly when it comes to advertising and marketing. UM ZWC official website can be reached at

https://www.um.edu.my/about-um/umique/sustainability@um/zero-waste. The website introduces UM ZWC as one of the living lab projects in UM campus and it attracts people to know more about this project. UM ZWC organic compost is also being promoted on the website, this helps UM ZWC to gain more compost buyers and increase the compost sale for University of Malaya (current amount of compost sale: RM22,000.00).

UM ZWC networking linkage was extended as UM Tropical Camp that organized by UMCares approached UM ZWC to have a collaboration. The UM Tropical Camp Program was inaugurated by Tan Sri Prof. Dr. Mohd Amin Jalaludin, the former Vice-Chancellor in March 2016. The UM Tropical Camp program is one of the initiatives of UMCares with the cooperation of ISB and the Faculty of Science to promote and foster the use of the University Malaya Research Centers as well as generate income to the University of Malaya. Through this program, school students and Universities within and outside the country can explore the camping experience while enjoying the beauty of Flora and Fauna found in Malaysia. This collaboration has attracted more visitors to UM ZWC site, making UM ZWC a well-known project not only in UM campus but also outside of the campus.

Apart from being a model in campus, UM ZWC also being chosen and appointed by the Department of National Solid Waste Management (JPSPN) to be a model to other institutions in Malaysia for integrated solid waste management. In year 2018, UM ZWC has reported solid waste data collection in UM campus including the initiatives of UM ZWC in raising awareness of campus community on integrated waste management system. The nomination from JPSPN makes UM ZWC more recognizable in national level.

From the networking linkages and nominations throughout the years of operation, UM ZWC managed to gain more visitors in year 2018 as more people recognize this project. Furthermore, UM ZWC has conducted 40 capacity buildings in year 2018 from the visits which increasing the potential of collaboration and networking linkage with various type of organization that visited UM ZWC site.

Like every other year, in year 2018, UM ZWC has engaged with two communities in Malaysia. In September 2018, UM ZWC has established an engagement with P20 community in Pantai Dalam, Kuala Lumpur. UM ZWC included awareness talk, demonstration and training on integrated waste management especially on food waste in the community program and the project of food waste conversion into organic compost is expected to be sustained as it brings many benefits to the community like clean surrounding area, income generation from the compost sale, reduction of waste management cost and many more. Another community engagement has been established was in Bario, Sarawak. The Bario community was

taught and trained to manage their food waste systematically by separating and composting the food waste. The program acceptance was overwhelming and UM ZWC is monitoring the project via mobile phone after the program ended and UM ZWC staffs flew back to Kuala Lumpur.

One of the biggest highlight of UM ZWC in year 2018 was the networking linkage developed with the Member of Parliament (Lembah Pantai), YB. Fahmi Fadzil. The networking linkage was developed through the community project with P20 in Pantai Dalam. YB. Fahmi has been actively supportive and is in the process to upgrade the initiative of UM ZWC in creating a more sustainable environment by inviting more sustainable projects to be done in Lembah Pantai.

Goals & objectives of ZWC

Goal: To achieve a campus with zero waste to landfill with the development of integrated and sustainable waste management model

Objectives:

1. To develop policy and innovation system to divert solid waste (non-hazardous) from disposal in landfill for resource 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 communities.
4. To form strategic partnership with various stakeholders to develop integrated waste management system.

Significance of ZWC

1. Serve as a long term campaign to achieve integrated waste management model and ultimately a zero waste campus
2. Initiate projects, research projects and schemes such as Green Bag Scheme, in-house composting center, anaerobic digestion project, recycling collection system, waste characterization, composting emission study, etc.
3. A model of system innovation to shift toward sustainable waste management

Success stories of UM ZWC

2010

PRO Bins (VeeCycle project)
- Started from a final year class project

Green Bags scheme
- Introduced to encourage food waste segregation at source

2011

Takakura Composting (CIMB Foundation)

- Research and Development in composting of food waste
- Secure of site in UM for composting project

2012

Compost and farming

- Field test for ZWC organic compost
- Developed standard method to produce compost
- Composting capacity increased with green waste as feedstock

2013

Anaerobic Digestion

- MOU signing with CH Green Sdn. Bhd. on Cowtec machine
- E-waste collection

2014

Diversify recycling

- Used clothes (LifeLine Clothing Sdn. Bhd)
- Wood (TSP Waste)
- Biogas

2015

ZWC "IWM" Centre

- MOU signing with SWCorp on collaboration in ZWC model
- Launching of new ZWC center with recycling drop-off
- Weighbridge in operation
- In vessel composter "Climb Optima"
- Introduction of UM ZWC organic compost

2016

Intelligent Recycling Center

- Development of intelligent automated recycling center to promote recycling for reward among campus community
- Improvement of ZWC Integrated Waste Management center
- Increased the number of community engagement

2017

Trainer for KL2017 Sea Games

- Conducted training for Green Volunteers for KL2017 Sea Games
- Increase in media appearance
- Officially set-up a fund transfer account with UM Bursary for UM ZWC organic compost sale

2018

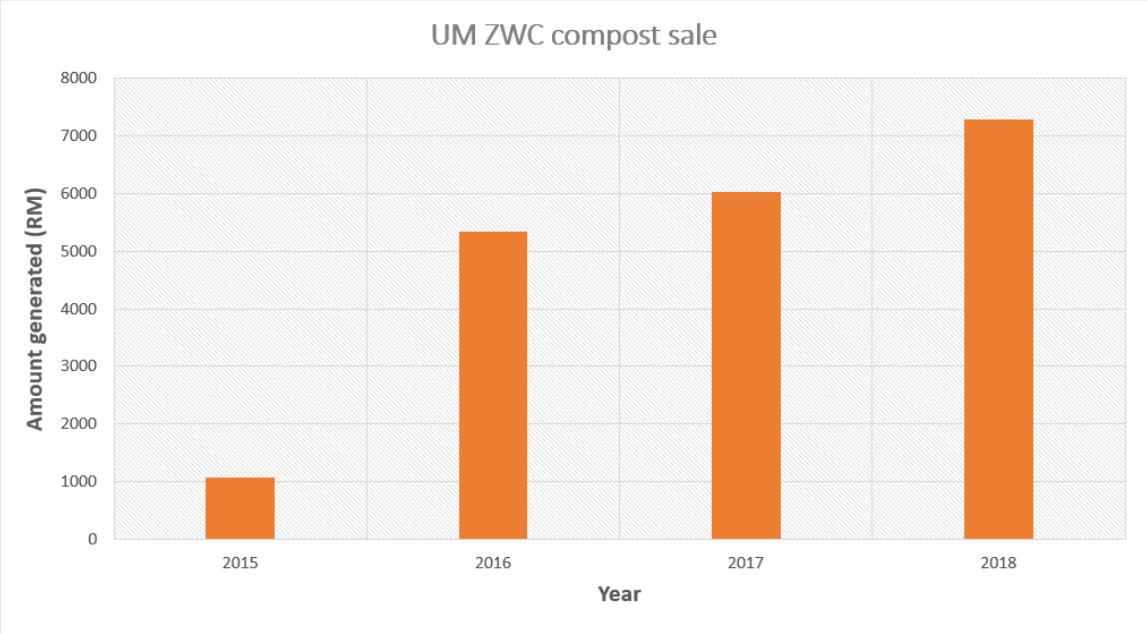
Award: #1 in UI GreenMetric World University Rankings for Solid Waste Management category

- Awarded #1 in UI GreenMetric with score points at 92%
- Collaborated with UMCares in UM Tropical Camp program
- Built a networking linkage with YB. Fahm, the Member of Parliament (Lembah Pantai)

ACHIEVEMENTS OF UM ZWC SINCE INCEPTION

(2009 – now)

INCOME GENERATION FROM UM ZWC ORGANIC COMPOST SALE (YEARLY)



Total of UM ZWC compost sale since 2015 until 2018 = RM22,000.00

2: Highlights and Achievements in 2018

The various highlight of achievement of Zero Waste Campaign are as below:

1. Diverted more than **218,917 kg** of waste from landfill
   There are several direct and indirect cost savings from the waste diversion including:

Direct cost saving	Indirect cost saving
▪ Saved about **RM7,881** of landfill tipping fee ▪ Saved more than **RM70,000** of waste collection fee	▪ Fuel consumption saving: **RM21,600** ▪ Labour cost saving: **RM22,800** (Cost for 1 truck driver per year) ▪ Reduced about **32,270 kg CO_2 eq-**carbon emission from transportation ▪ Reduced about **217,000 kg CO_2 eq-**carbon emission from the breakdown of organic waste in landfill

2. Obtained microbial test verification of UM ZWC organic compost from Forest Research Institute Malaysia (FRIM)

3. Upgrade of Cowtec AD machine unit to the latest version (4th generation)

4. Development of UM ZWC official website

5. Collaborated with UMCares in UM Tropical Camp program

6. Conducted more than 40 capacity buildings from University of Malaya community and other institutions

7. Appointed by National Solid Waste Management (JPSPN) to assist national waste separation at source program

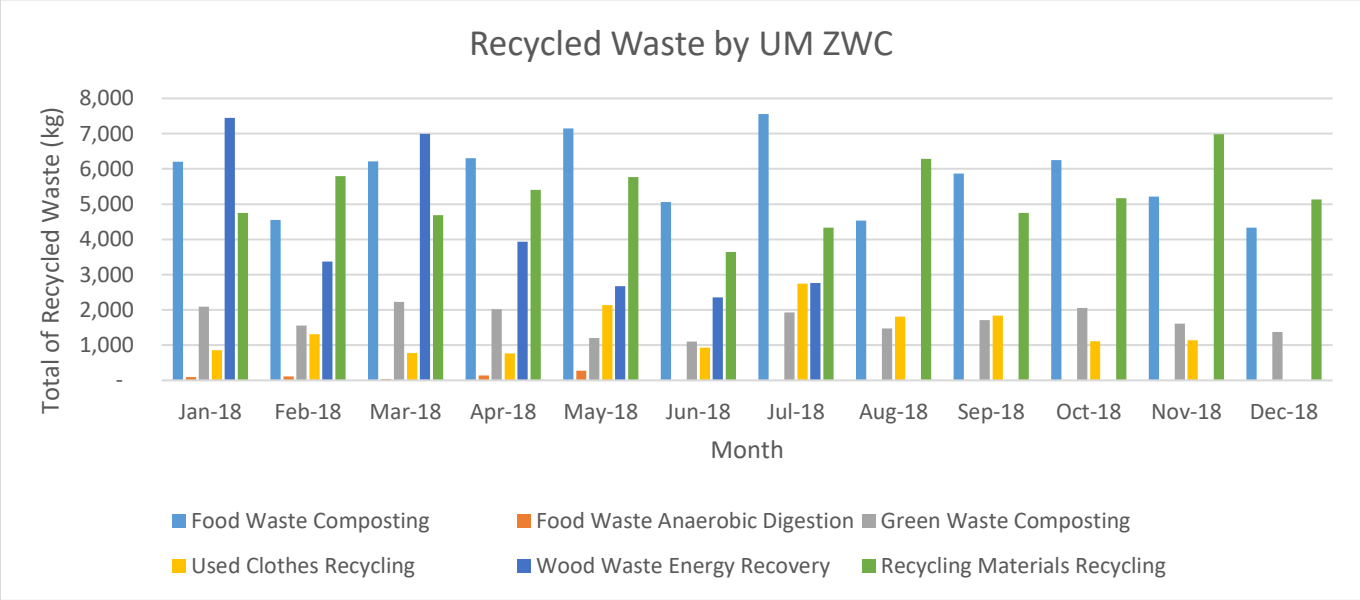
8. Engaged with communities in Pantai Dalam, Kuala Lumpur and Bario, Sarawak

9. Built a networking linkage with YB. Fahmi Fadzil the Member of Parliament (Lembah Pantai)

10. Represented University of Malaya in International Greentech & Eco Products Exhibition and Conference 2018

Sub-section 01: Diverted almost 200,000 kg of waste from landfill (saved about RM7,881.00 of landfill tipping fee)

Month	*Food Waste*		*Green Waste*	*Used Clothes*	*Wood Waste*	*Recycling Materials*	*Total of Recycled waste*
	Composting	*Anaerobic Digestion*	*Composting*	*Recycling*	*Energy Recovery*	*Recycling*	
Jan-18	6,204	90	2,088	859	7,450	4,750	21,440
Feb-18	4,548	115	1,551	1,308	3,370	5,795	16,687
Mar-18	6,209	44	2,231	774	6,990	4,685	20,933
Apr-18	6,301	140	2,020	768	3,930	5,400	18,559
May-18	7,149	278	1,203	2,134	2,670	5,765	19,199
Jun-18	5,058	-	1,100	928	2,350	3,645	13,081
Jul-18	7,554	-	1,924	2,749	2,760	4,330	19,316
Aug-18	4,530	-	1,478	1,807	-	6,284	14,098
Sep-18	5,864	-	1,714	1,838	-	4,751	14,166
Oct-18	6,247	-	2,052	1,115		5,170	14,584
Nov-18	5211.00	0.00	1607.00	1136.10	0.00	6986.00	14,940
Dec-18	4333.50	8.00	1376.00	0.00	0.00	5135.00	10,853
Jumlah	**69,207**	**675**	**20,342**	**15,415.00**	**29,520**	**62,696.00**	197,855



DATA COLLECTION OF WASTE RECYCLING BY UM ZERO WASTE CAMPAIGN

Data collection and analysis is very important in development of integrated waste management plan. The complete /comprehensive data that ZWC fully possesses are as below:

1. Food waste collected for composting or anaerobic digestion
2. Green waste collected for composting
3. Wood waste collected for energy recovery
4. Waste textiles collected for reuse/recycle
5. Recyclable materials sorted at UM ZWC site and UM transfer station
6. Residual waste disposal data

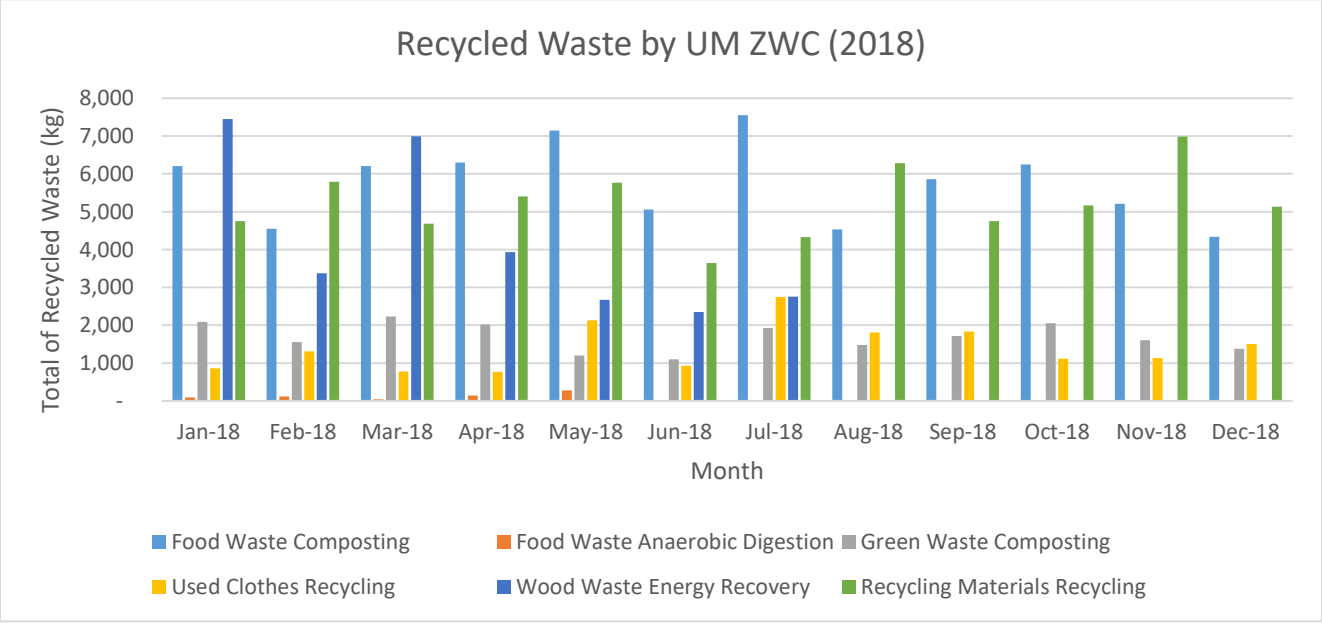
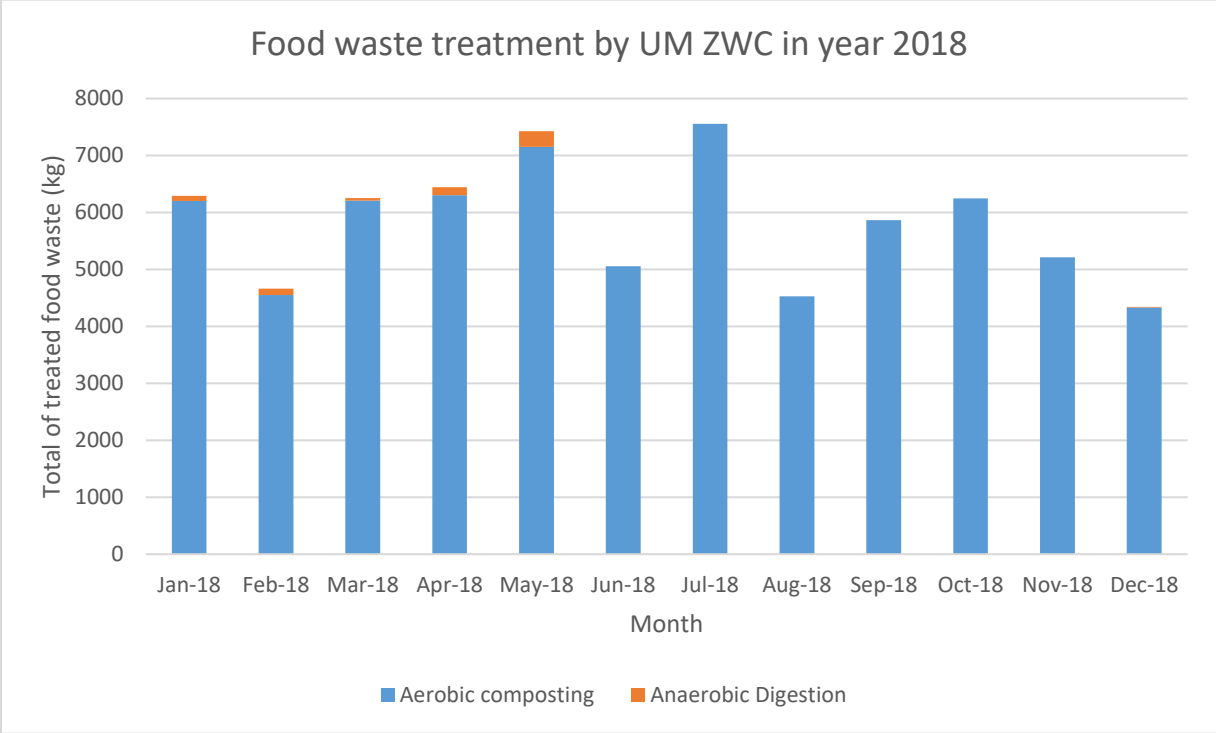
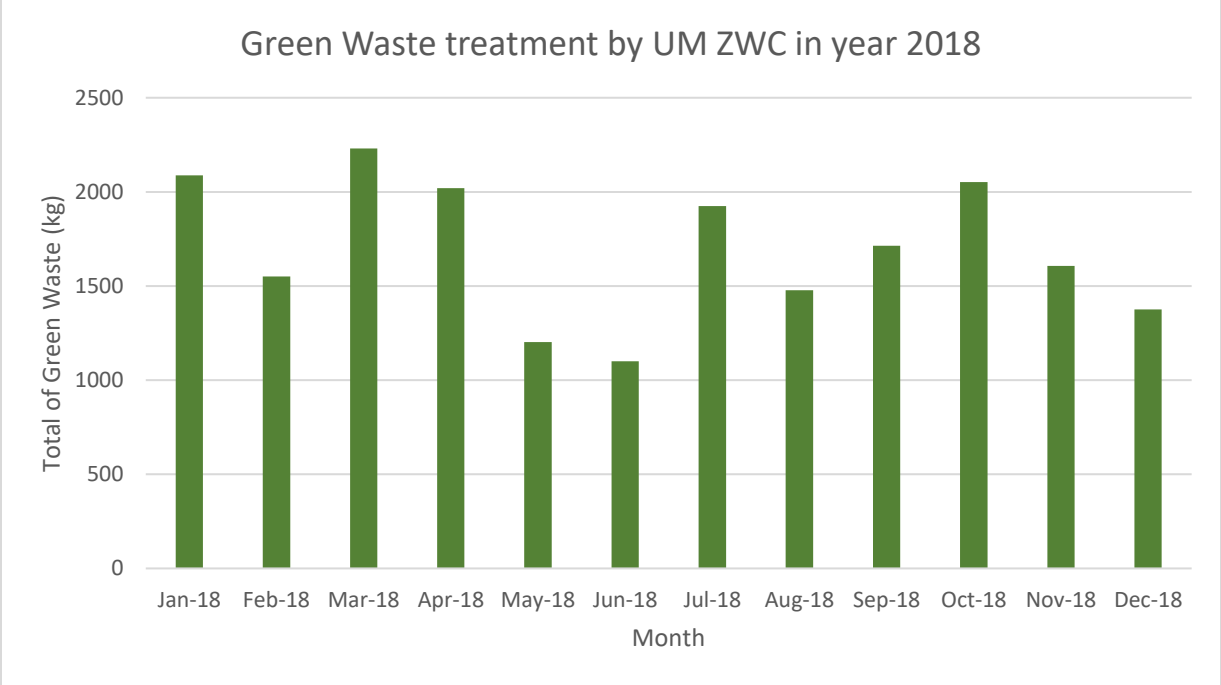


Fig. 1.3. Summary of waste data collection

1. Food waste collected for composting or anaerobic digestion



2. Green waste collected for composting

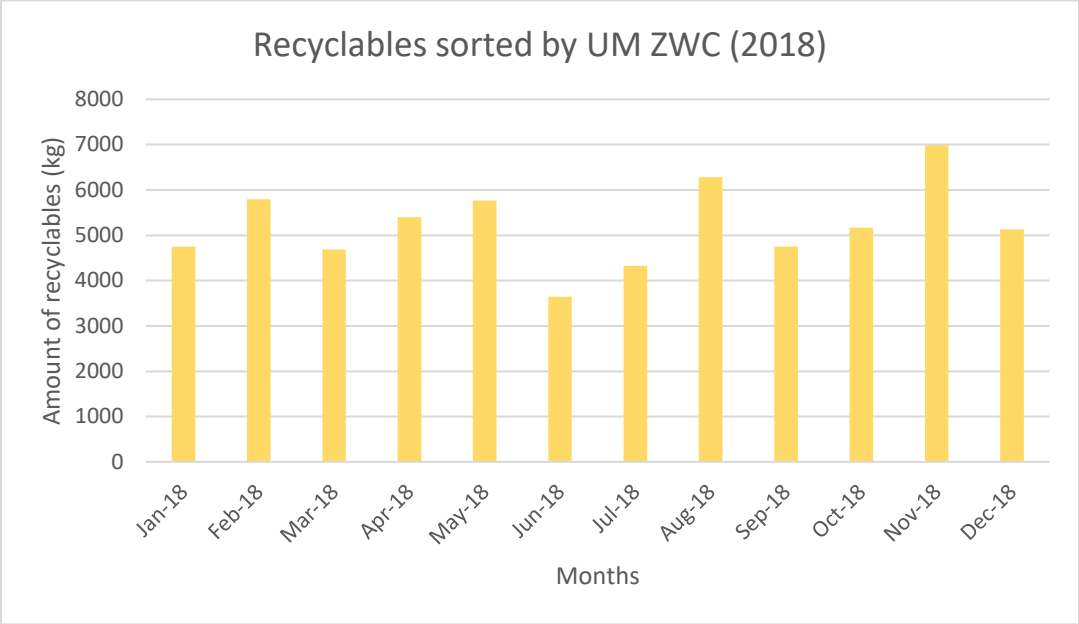


3. Wood waste collected for energy recovery

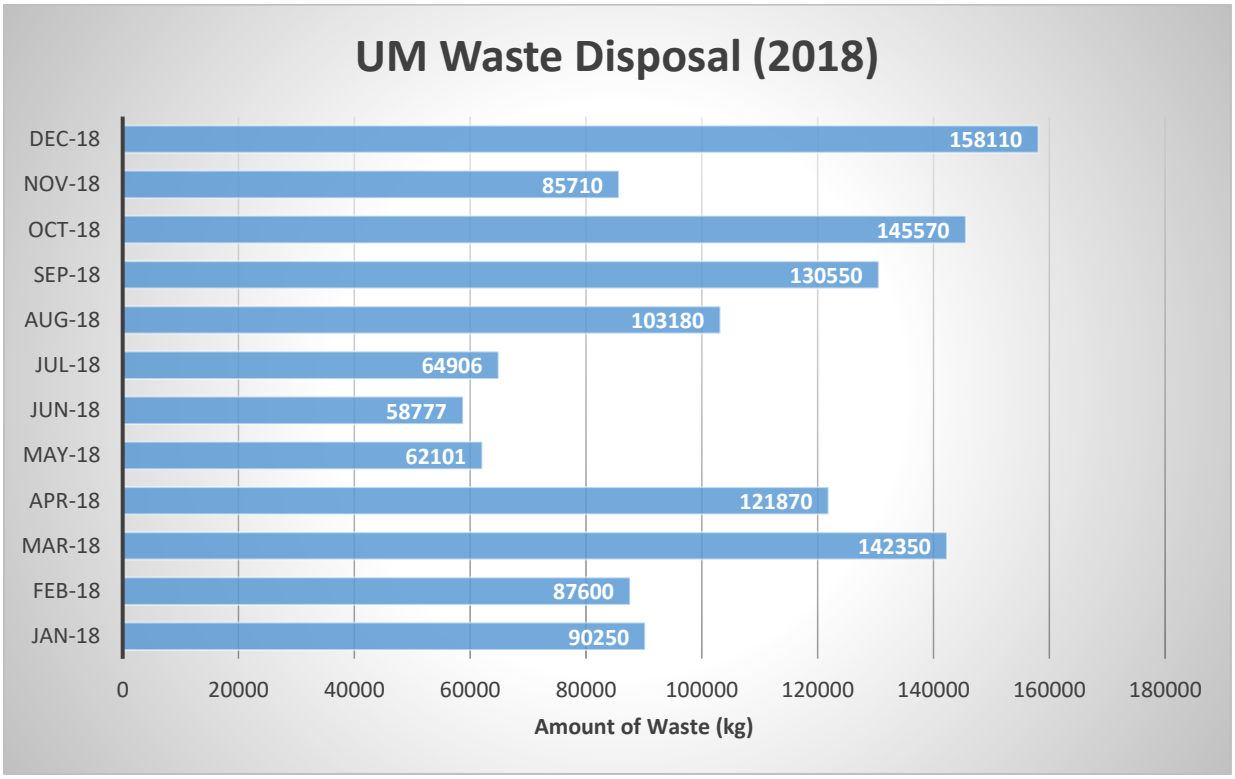
The collection of wood waste by TSP company has been stopped since August 2018 due to the internal conflict management. Currently, UM ZWC is collaborating with JPPHB to find another potential company to collect the wood waste or other alternatives to divert the wood waste from landfill.

4. Waste textiles collected for reuse/recycle

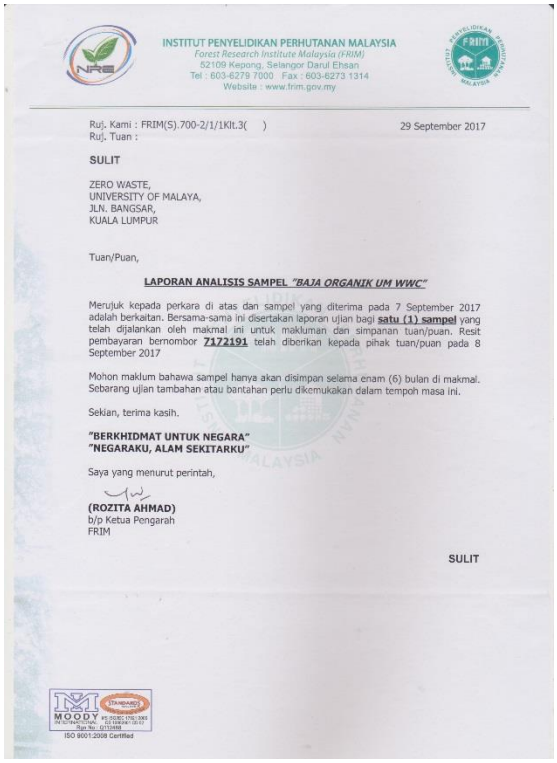
5. Recyclable materials sorted at UM ZWC site and UM transfer station



6. Residual waste disposal data



Sub-section 02: Obtained microbial test verification of UM ZWC organic compost from Forest Research Institute Malaysia (FRIM)



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Tel : 603-6279 7000 Fax : 603-6273 1314
Website : www.frim.gov.my

Ruj. Kami : FRIM(S).700-2/1/1Klt.3( )
Ruj. Tuan :

29 September 2017

SULIT

ZERO WASTE,
UNIVERSITY OF MALAYA,
JLN. BANGSAR,
KUALA LUMPUR

Tuan/Puan,

LAPORAN ANALISIS SAMPEL *"BAJA ORGANIK UM WWC"*

Merujuk kepada perkara di atas dan sampel yang diterima pada 7 September 2017 adalah berkaitan. Bersama-sama ini disertakan laporan ujian bagi **satu (1) sampel** yang telah dijalankan oleh makmal ini untuk makluman dan simpanan tuan/puan. Resit pembayaran bernombor **7172191** telah diberikan kepada pihak tuan/puan pada 8 September 2017

Mohon maklum bahawa sampel hanya akan disimpan selama enam (6) bulan di makmal. Sebarang ujian tambahan atau bantahan perlu dikemukakan dalam tempoh masa ini.

Sekian, terima kasih.

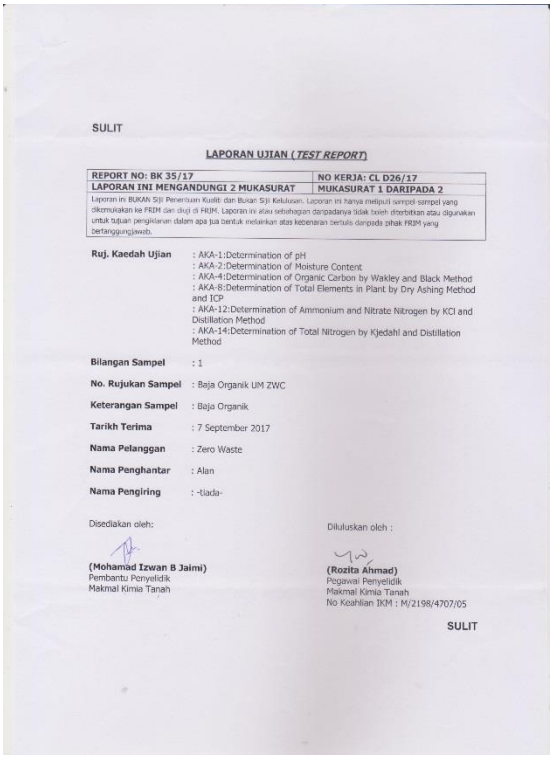
"BERKHIDMAT UNTUK NEGARA"
"NEGARAKU, ALAM SEKITARKU"

Saya yang menurut perintah,

(ROZITA AHMAD)
b/p Ketua Pengarah
FRIM

SULIT

MOODY INTERNATIONAL
ISO 9001:2008 Certified



SULIT

LAPORAN UJIAN (*TEST REPORT*)

REPORT NO: BK 35/17	NO KERJA: CL D26/17
LAPORAN INI MENGANDUNGI 2 MUKASURAT	MUKASURAT 1 DARIPADA 2

Laporan ini BUKAN Sijil Penerimaan Kualiti dan Bukan Sijil Kelulusan. Laporan ini hanya meliputi sampel-sampel yang dikemukakan ke FRIM dan diuji di FRIM. Laporan ini atau sebahagian daripadanya tidak boleh diterbitkan atau digunakan untuk tujuan pengiklanan dalam apa jua bentuk melainkan atas kebenaran bertulis daripada pihak FRIM yang bertanggungjawab.

Ruj. Kaedah Ujian : AKA-1:Determination of pH
: AKA-2:Determination of Moisture Content
: AKA-4:Determination of Organic Carbon by Wakley and Black Method
: AKA-8:Determination of Total Elements in Plant by Dry Ashing Method and ICP
: AKA-12:Determination of Ammonium and Nitrate Nitrogen by KCl and Distillation Method
: AKA-14:Determination of Total Nitrogen by Kjedahl and Distillation Method

Bilangan Sampel : 1

No. Rujukan Sampel : Baja Organik UM ZWC

Keterangan Sampel : Baja Organik

Tarikh Terima : 7 September 2017

Nama Pelanggan : Zero Waste

Nama Penghantar : Alan

Nama Pengiring : -tiada-

Disediakan oleh:

(Mohamad Izwan B Jaimi)
Pembantu Penyelidik
Makmal Kimia Tanah

Diluluskan oleh :

(Rozita Ahmad)
Pegawai Penyelidik
Makmal Kimia Tanah
No Keahlian IKM : M/2198/4707/05

SULIT

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Portal Rasmi : www.frim.gov.my

Ruj. Kami/Our Ref: FRIM(S).700-2/3/14Klt.4(17)
Ruj. Tuan/Your Ref:-

Tarikh/Date: 21 Sep 2017

SULIT

University of Malaya (UM),
Zero Waste Campaign (ZWC),
Lembah Pantai, 50603 Kuala Lumpur

Dr./Tuan/Puan,

Laporan Ujian Makmal Kawalan Kualiti Hasilan Semula Jadi (NPQC)

Adalah saya merujuk kepada perkara di atas, permohonan Dr./Tuan/Puan bertarikh 7 Sep 2017 serta 1 sampel; Baja Organik dalam bentuk pepejal telah diterima pada 7 Sep 2017 dengan nombor permohonan P2017/27. Bersama-sama ini disertakan keputusan ujian yang mana kerja-kerja Ujian pencemaran mikroorganisma (*microbial contamination test*) telah dijalankan oleh institut ini.

Sayugia dimaklumkan bahawa keputusan analisis ini tertakluk ke atas sampel yang tertera di atas sahaja. Pihak FRIM tidak akan terbabit dengan apa-apa jua prosiding undang-undang yang berkaitan dengan hasil analisis yang dijalankan. Untuk makluman pihak Dr./Tuan/Puan, pembayaran telah diterima secara tunai. Bersama-sama ini disertakan borang maklumbalas pelanggan, untuk dilengkapkan dan dikembalikan semula dalam masa 2 minggu daripada tarikh laporan ini.

Sekian, terima kasih.

"BERKHIDMAT UNTUK NEGARA"

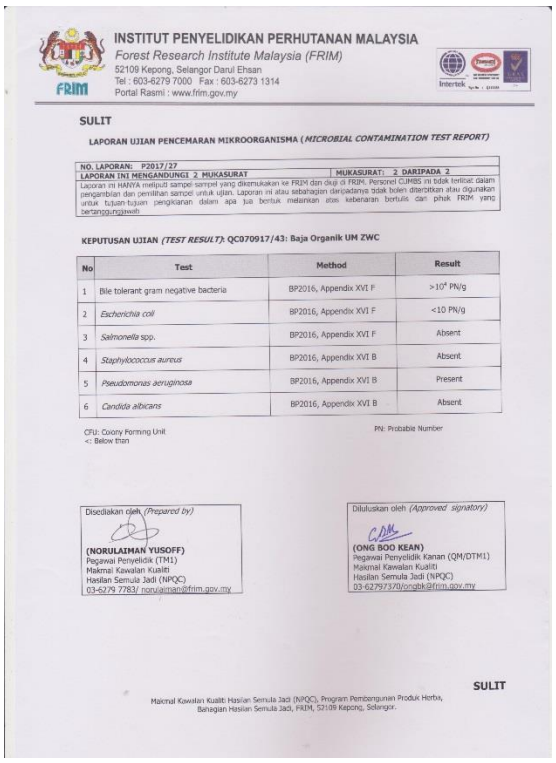
Saya yang menurut perintah,

(ONG BOO KEAN)
b/p Ketua Pengarah
FRIM

No Kotak: No Dokumen: 10214347

SULIT

Makmal Kawalan Kualiti Hasilan Semula Jadi (NPQC), Program Pembangunan Produk Herba,
Bahagian Hasilan Semula Jadi, FRIM, 52109 Kepong, Selangor.



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Portal Rasmi : www.frim.gov.my

SULIT

LAPORAN UJIAN PENCEMARAN MIKROORGANISMA (*MICROBIAL CONTAMINATION TEST REPORT*)

NO. LAPORAN: P2017/27	
LAPORAN INI MENGANDUNGI 2 MUKASURAT	MUKASURAT: 2 DARIPADA 2

Laporan ini HANYA meliputi sampel-sampel yang dikemukakan ke FRIM dan diuji di FRIM. Personel CUMBS ini tidak terlibat dalam pengambilan dan pemilihan sampel untuk ujian. Laporan ini atau sebahagian daripadanya tidak boleh diterbitkan atau digunakan untuk tujuan-tujuan pengiklanan dalam apa jua bentuk melainkan atas kebenaran bertulis dari pihak FRIM yang bertanggungjawab.

KEPUTUSAN UJIAN (*TEST RESULT*): QC070917/43: Baja Organik UM ZWC

No	Test	Method	Result
1	Bile tolerant gram negative bacteria	BP2016, Appendix XVI F	$>10^4$ PN/g
2	*Escherichia coli*	BP2016, Appendix XVI F	<10 PN/g
3	*Salmonella* spp.	BP2016, Appendix XVI F	Absent
4	*Staphylococcus aureus*	BP2016, Appendix XVI B	Absent
5	*Pseudomonas aeruginosa*	BP2016, Appendix XVI B	Present
6	*Candida albicans*	BP2016, Appendix XVI B	Absent

CFU: Colony Forming Unit
<: Below than

PN: Probable Number

Disediakan oleh *(Prepared by)*

(NORULAIMAN YUSOFF)
Pegawai Penyelidik (TM1)
Makmal Kawalan Kualiti
Hasilan Semula Jadi (NPQC)
03-6279 7783/ norulaiman@frim.gov.my

Diluluskan oleh *(Approved signatory)*

(ONG BOO KEAN)
Pegawai Penyelidik Kanan (QM/DTM1)
Makmal Kawalan Kualiti
Hasilan Semula Jadi (NPQC)
03-62797370/ongbk@frim.gov.my

SULIT

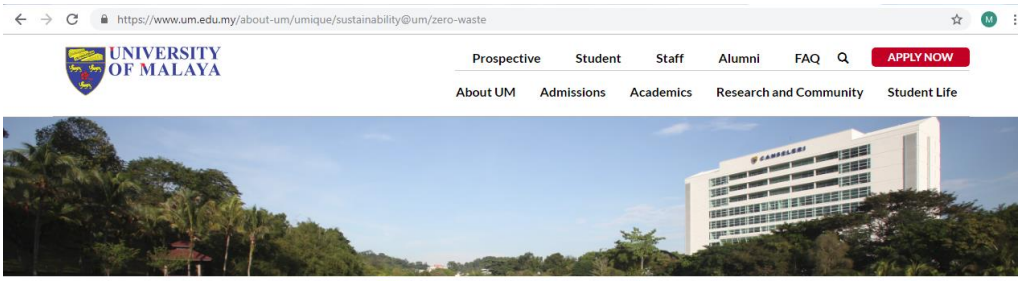
Makmal Kawalan Kualiti Hasilan Semula Jadi (NPQC), Program Pembangunan Produk Herba,
Bahagian Hasilan Semula Jadi, FRIM, 52109 Kepong, Selangor.

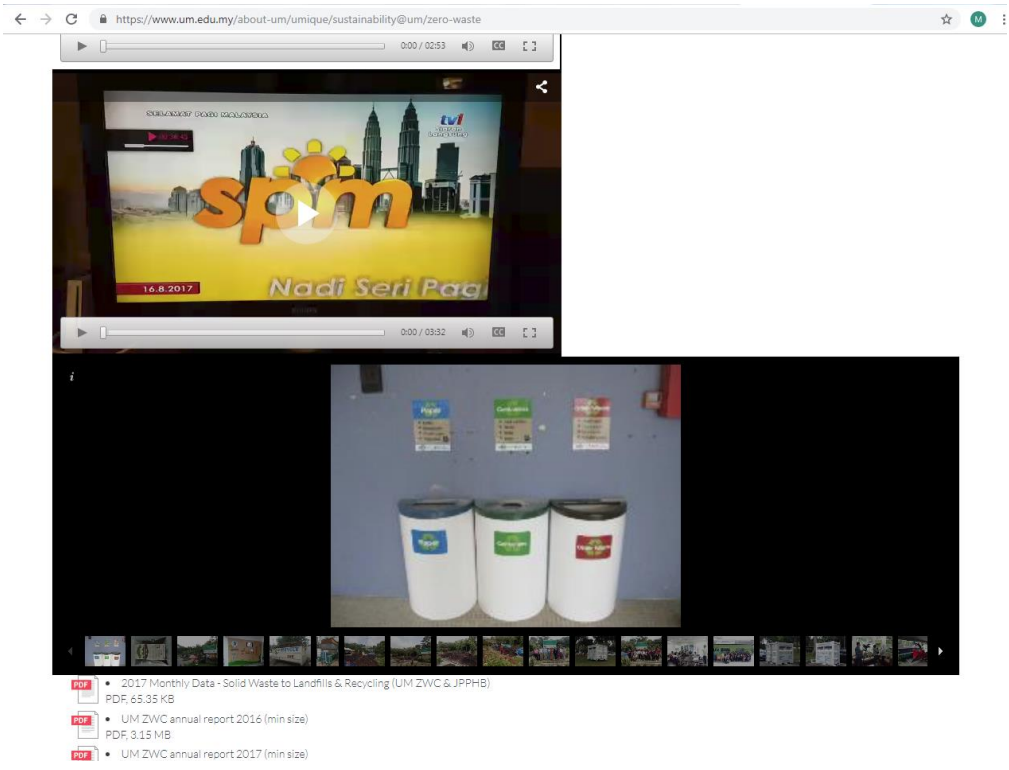
Sub-section 03: Upgrade of Cowtec AD machine unit to the latest version (4th generation)

Old Cowtec AD machine at UM ZWC site

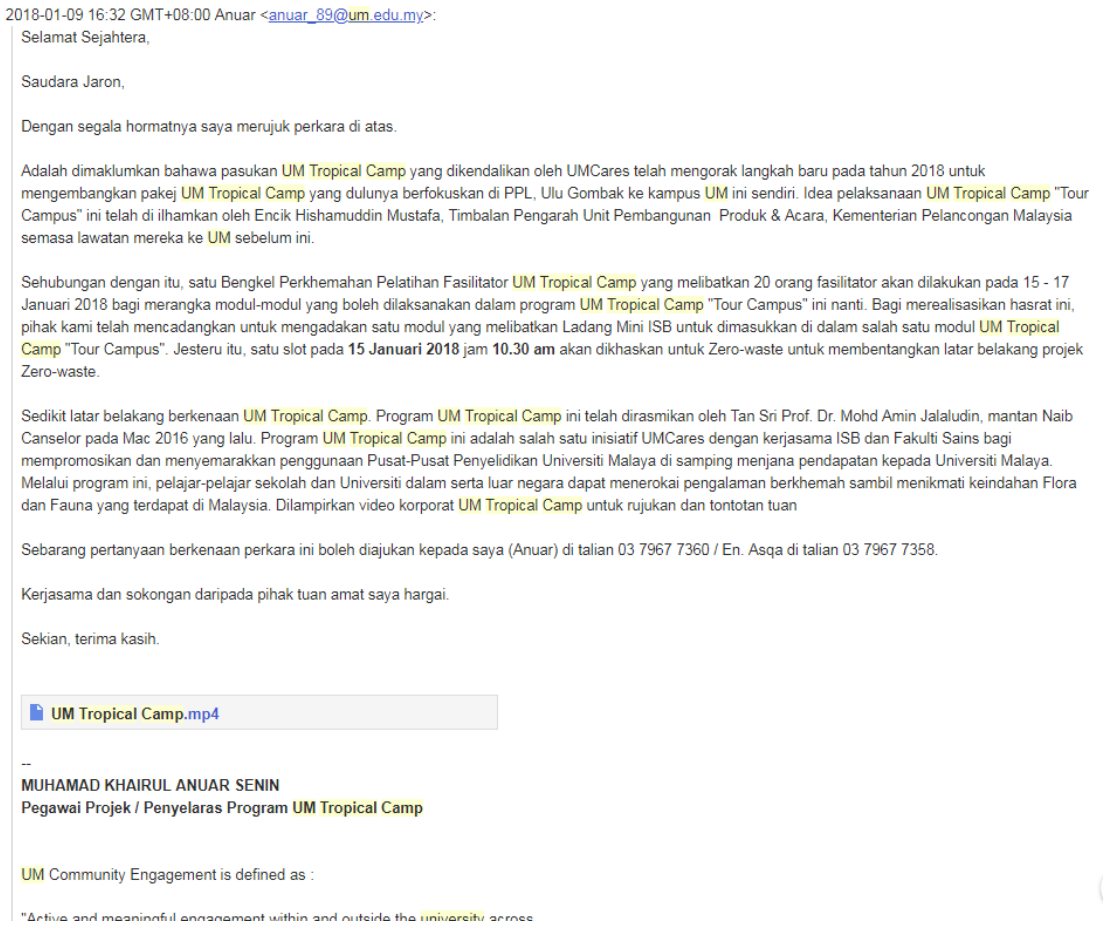
The latest Cowtec Ad machine placed at UM ZWC site

Sub-section 04: Development of UM ZWC official website





Sub-section 05: Collaborated with UMCares in UM Tropical Camp program



2018-01-09 16:32 GMT+08:00 Anuar <anuar_89@um.edu.my>:

Selamat Sejahtera,

Saudara Jaron,

Dengan segala hormatnya saya merujuk perkara di atas.

Adalah dimaklumkan bahawa pasukan UM Tropical Camp yang dikendalikan oleh UMCares telah mengorak langkah baru pada tahun 2018 untuk mengembangkan pakej UM Tropical Camp yang dulunya berfokuskan di PPL, Ulu Gombak ke kampus UM ini sendiri. Idea pelaksanaan UM Tropical Camp "Tour Campus" ini telah di ilhamkan oleh Encik Hishamuddin Mustafa, Timbalan Pengarah Unit Pembangunan Produk & Acara, Kementerian Pelancongan Malaysia semasa lawatan mereka ke UM sebelum ini.

Sehubungan dengan itu, satu Bengkel Perkhemahan Pelatihan Fasilitator UM Tropical Camp yang melibatkan 20 orang fasilitator akan dilakukan pada 15 - 17 Januari 2018 bagi merangka modul-modul yang boleh dilaksanakan dalam program UM Tropical Camp "Tour Campus" ini nanti. Bagi merealisasikan hasrat ini, pihak kami telah mencadangkan untuk mengadakan satu modul yang melibatkan Ladang Mini ISB untuk dimasukkan di dalam salah satu modul UM Tropical Camp "Tour Campus". Jesteru itu, satu slot pada **15 Januari 2018** jam **10.30 am** akan dikhaskan untuk Zero-waste untuk membentangkan latar belakang projek Zero-waste.

Sedikit latar belakang berkenaan UM Tropical Camp. Program UM Tropical Camp ini telah dirasmikan oleh Tan Sri Prof. Dr. Mohd Amin Jalaludin, mantan Naib Canselor pada Mac 2016 yang lalu. Program UM Tropical Camp ini adalah salah satu inisiatif UMCares dengan kerjasama ISB dan Fakulti Sains bagi mempromosikan dan menyemarakkan penggunaan Pusat-Pusat Penyelidikan Universiti Malaya di samping menjana pendapatan kepada Universiti Malaya. Melalui program ini, pelajar-pelajar sekolah dan Universiti dalam serta luar negara dapat menerokai pengalaman berkhemah sambil menikmati keindahan Flora dan Fauna yang terdapat di Malaysia. Dilampirkan video korporat UM Tropical Camp untuk rujukan dan tontotan tuan

Sebarang pertanyaan berkenaan perkara ini boleh diajukan kepada saya (Anuar) di talian 03 7967 7360 / En. Asqa di talian 03 7967 7358.

Kerjasama dan sokongan daripada pihak tuan amat saya hargai.

Sekian, terima kasih.

UM Tropical Camp.mp4

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MUHAMAD KHAIRUL ANUAR SENIN
Pegawai Projek / Penyelaras Program UM Tropical Camp

UM Community Engagement is defined as :

"Active and meaningful engagement within and outside the university across

Invitation email from UMCares

Sub-section 06: Conducted more than 40 capacity buildings from University of Malaya community and other institutions

1. Capacity building program on integrated waste management Aiesec Heriot-Watt international exchanges on 9th Jan., and 24th Jan. 2018

2. Training on integrated waste management for UMCares facilitators of UM Tropical Camp on 15th Jan. 2018

3. Capacity building program on integrated waste management Aiesec UM international exchanges on 22nd Jan. 2018

4. Capacity building program on integrated waste management to lecturers and staffs from Medan University on 21st Feb. 2018

5. Capacity building program on integrated waste management and municipal organic waste treatment to the councillors of City of Yangon on 28th Feb. 2018

6. Capacity building for lecturers from Politeknik Port Dickson on composting technique, biowaste treatment and recycling projects of UM ZWC on 2nd March 2018

7. Capacity building for UCSI students and lecturer on integrated waste management and municipal biowaste treatment on 6th March 2018

8. Capacity building for officers from KPT on integrated waste management and municipal biowaste treatment on 27th March 2018

9. Capacity building for Intitute of Biological Sciences students on municipal biowaste treatment on 2nd April 2018

10. Capacity building program on integrated waste management for a primary school students on 12th April 2018

11. Capacity building program on integrated waste management and municipal organic waste treatment to TNB Research Sdn Bhd on 13th April 2018

12. Capacity building program on integrated waste management for environmental engineering students on 7th April 2018

13. Capacity building program on integrated waste management for ISB students on 6th April 2018

14. Capacity building program on integrated waste management for AIESEC students on 18th April 2018

15. Capacity building program on integrated waste management for representative and deputy dean of Faculty Bahasa & Lingustic (FBL) on 23th April 2018

16. Capacity building program on integrated waste management and biowaste composting to 40 students from SMK Ketari on 12th May 2018

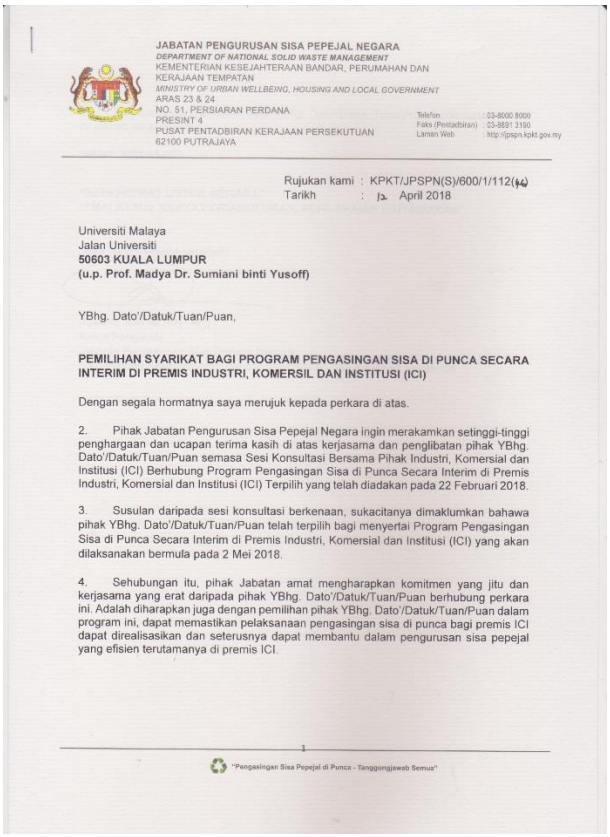
17. Capacity building program on integrated waste management for students from Inpuma on 12th May 2018

18. Training and demonstration to International Islamic University Malaysia (IIUM) students on 14 Sept 2018

19. Training for Idrissi School under UMCares Tropical Camp program on 4 October 2018

20. Demonstration and training for P20 community in Pantai Dalam, KL

Sub-section 07: Appointed by National Solid Waste Management (JPSPN) to assist national waste separation at source program



JABATAN PENGURUSAN SISA PEPEJAL NEGARA
DEPARTMENT OF NATIONAL SOLID WASTE MANAGEMENT
KEMENTERIAN KESEJAHTERAAN BANDAR, PERUMAHAN DAN KERAJAAN TEMPATAN
MINISTRY OF URBAN WELLBEING, HOUSING AND LOCAL GOVERNMENT
ARAS 23 & 24,
NO. 51, PERSIARAN PERDANA,
PRESINT 4
PUSAT PENTADBIRAN KERAJAAN PERSEKUTUAN
62100 PUTRAJAYA

Telefon : 03-8000 8000
Faks (Pentadbiran) : 03-8891 3180
Laman Web : http://jpspn.kpkt.gov.my

Rujukan kami : KPKT/JPSPN(S)/600/1/112(14)
Tarikh : 12 April 2018

Universiti Malaya
Jalan Universiti
50603 KUALA LUMPUR
(u.p. Prof. Madya Dr. Sumiani binti Yusoff)

YBhg. Dato'/Datuk/Tuan/Puan,

PEMILIHAN SYARIKAT BAGI PROGRAM PENGASINGAN SISA DI PUNCA SECARA INTERIM DI PREMIS INDUSTRI, KOMERSIL DAN INSTITUSI (ICI)

Dengan segala hormatnya saya merujuk kepada perkara di atas.

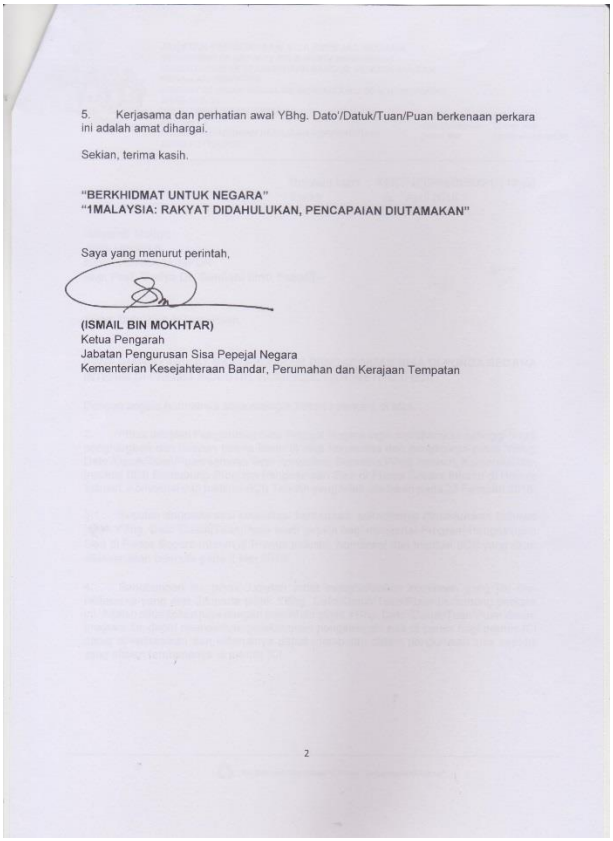
2. Pihak Jabatan Pengurusan Sisa Pepejal Negara ingin merakamkan setinggi-tinggi penghargaan dan ucapan terima kasih di atas kerjasama dan penglibatan pihak YBhg. Dato'/Datuk/Tuan/Puan semasa Sesi Konsultasi Bersama Pihak Industri, Komersial dan Institusi (ICI) Berhubung Program Pengasingan Sisa di Punca Secara Interim di Premis Industri, Komersial dan Institusi (ICI) Terpilih yang telah diadakan pada 22 Februari 2018.

3. Susulan daripada sesi konsultasi berkenaan, sukacitanya dimaklumkan bahawa pihak YBhg. Dato'/Datuk/Tuan/Puan telah terpilih bagi menyertai Program Pengasingan Sisa di Punca Secara Interim di Premis Industri, Komersial dan Institusi (ICI) yang akan dilaksanakan bermula pada 2 Mei 2018.

4. Sehubungan itu, pihak Jabatan amat mengharapkan komitmen yang jitu dan kerjasama yang erat daripada pihak YBhg. Dato'/Datuk/Tuan/Puan berhubung perkara ini. Adalah diharapkan juga dengan pemilihan pihak YBhg. Dato'/Datuk/Tuan/Puan dalam program ini, dapat memastikan pelaksanaan pengasingan sisa di punca bagi premis ICI dapat direalisasikan dan seterusnya dapat membantu dalam pengurusan sisa pepejal yang efisien terutamanya di premis ICI.

1

"Pengasingan Sisa Pepejal di Punca - Tanggungjawab Semua"



5. Kerjasama dan perhatian awal YBhg. Dato'/Datuk/Tuan/Puan berkenaan perkara ini adalah amat dihargai.

Sekian, terima kasih.

"BERKHIDMAT UNTUK NEGARA"
"1MALAYSIA: RAKYAT DIDAHULUKAN, PENCAPAIAN DIUTAMAKAN"

Saya yang menurut perintah,

(ISMAIL BIN MOKHTAR)
Ketua Pengarah
Jabatan Pengurusan Sisa Pepejal Negara
Kementerian Kesejahteraan Bandar, Perumahan dan Kerajaan Tempatan

2

Sub-section 08: Engaged with communities in Pantai Dalam, Kuala Lumpur and Bario, Sarawak

i) Implementation of integrated solid waste management system withP20 community in Pantai Dalam, KL

Phase 1: Introductory session – Introduction to integrated solid waste management system including waste segregation and waste treatment

Phase 2: Program launching by YB. Fahmi the Member of Parliament (Lembah Pantai)

ii) Implementation of integrated food waste management system with Bario community in Sarawak

Involved 4 communities in Bario, Sarawak. This program focuses more on integrated food waste management system including food waste segregation and food waste treatment (composting)

Sub-section 09: Built a networking linkage with YB. Fahmi Fadzil the Member of Parliament (Lembah Pantai)

3: Challenges and Proposed Projects in 2018

The current largest challenge faced by UM ZWC is the financial sustainability of the campaign. As a university funded campaign, UM ZWC has been funded by UM living lab grant since year 2015, workers and maintenance support from JPPHB as well as funding from JPPHB (RMK-11). The current income from sale of compost is too small (about RM500/month) to support the entire campaign (all projects under the campaign). UM ZWC is constantly looking for funding opportunity, as well as income generating methods such as training program. Over the past 3-4 years, UM ZWC has found one of our strength in capacity building. Every year, there are about 50-70 visits to UM ZWC from various organizations, either academic, government, private sectors, media or NGOs. Our media coverage is quite huge with more than 20 appearances in newspaper, radio, TV and magazines.

The second challenge faced by UM ZWC toward the end of year 2018 is the sale of compost. We have plenty of compost which need to be marketed or it will be stockpiled at the composting site. So far, UM ZWC hasn't do any promotion, marketing or advertising of UM ZWC compost yet. The compost is not yet being patented or trademarked as a UM product.

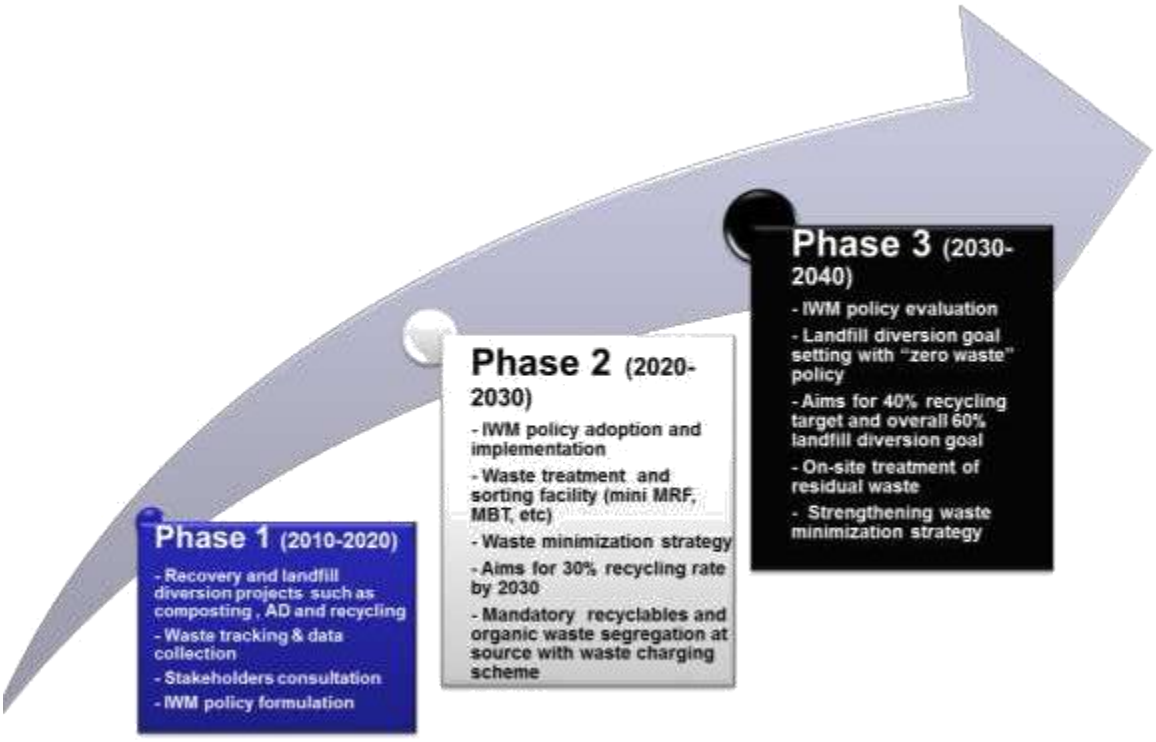
The third challenge that faced by ZWC presently is the informal recycling collection activities which hinder the systematic development of separate collection of recyclables and recycling data collection. Without recycling data, it is not possible to analyze recycling rate and carry out planning for further improvement. Planning is in progress to develop a formal recycling collection system in UM, which requires relatively huge resource and committed participation from all PTj. Besides, the other persistent challenge faced by ZWC is the food waste segregation at source by cafe operators in UM. Source segregated food waste is important for the continuity of ZWC's composting operation which is the key KPI to achieve the organic waste recycling target.

Proposal for 2019 and beyond (short term: 5 years)

1. Brand UM ZWC as a permanent educational /training center (e.g. “unit”) under an existing UM’s department/cluster which can also serve as public education center for integrated/holistic waste management / best practice in recycling/waste treatment in an institutional set-up
2. Get a compost turner machine /wheel loader for semi-mechanization of the composting aeration process
3. Secure patent or trademark for UM ZWC compost as a standard marketable bio-fertilizer
4. Support and enhance research on microbiology of compost, especially in quality of compost and duration of composting to achieve maturation; and to secure patent in near future
5. Obtain formal government approval (JPSPN) for UM ZWC center as a government authorized waste treatment facility (e.g. communal composting)

Proposal for 2019 and beyond (long term: > 10 years)

1. Formalize the separate collection of dry mixed recyclables in UM campus with the collaboration from all PTj and JPPHB; and develop a recycling sorting and storage facility at UM ZWC center
2. Develop a small-scale thermal treatment facility (small incinerator: 0.5-1.0 ton/day) at UM ZWC center to reduce the residual waste from disposal to landfill
3. Advocate the introduction of waste minimization policy such as food packaging related regulations, paper consumption, disposable packaging materials reduction.



4: Conclusion

Year 2018 was a year of project extension and experimenting as well as program strengthening for UM ZWC. The UM ZWC IRC is for example, an experiment of the effectiveness of recycling drop-off in UM campus. Cowtec AD machine is an upgrading of microbial activity capacity for composting project. Research collaboration and research support for microbiological study of composting demonstrates the value of UM ZWC in providing infrastructure for research in UM campus. UMCare Tropical Camp training module is a good start for the development of training module for UM ZWC. While setting up of special fund under UM for management of income from training module is a step toward ZWC self-sustainability financially. The networking linkage built with the Member of Parliament, YB. Fahmi aims to promote the notion of zero waste in the long run not only with University of Malaya community but also with the communities outside.

In year 2019, UM ZWC will adopt a more integrated approach to enhance the current operation and management system. For example, upgrading of the composting facility which will serve as cornerstone to institutionalize the project. The renewal of Cowtec AD proves the sustainable collaboration to continuously improve the biowaste anaerobic digestion project. Research project will generate more findings and new knowledge in natural composting.