



Zero Waste Campaign of University of Malaya

Annual Report 2017

Prepared by,



Issue date: March 2018

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Section 1: Introduction

Sub-section 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 at 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 RM 5 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 volunteers 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.

Figure 1.0: 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

Section 2: Highlights and Achievements in 2017

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

Sub-section 2.1: Launching of UM ZWC Intelligent Recycle Center

Sub-section 2.2: Interview by RTM, BFM and TheStar

Sub-section 2.3: Tabung UM ZWC

Sub-section 2.4: Training for Green Volunteers KL2017

Sub-section 2.5: Capacity Building Program by UM ZWC

Sub-section 2.6: Maybank CR Day 2017

Sub-section 2.7: Green Waste Shredder Machine

Sub-section 2.8: UM ZWC Volunteers

Sub-section 2.9: Test report of UM ZWC compost

Successful stories of Zero Waste Campaign (ZWC)

“Sustainable & Integrated Waste Management Model”



VeeCYCLE (2010)

- VeeCYCLE was initiated in 2009 to develop recycling collection with “PRO Bin” at Faculty of Engineering
- About 1 ton of recyclable materials were collected per month with cooperation from janitors



Takakura Composting (2011)

- Research & Development in composting of food waste
- Secure of site in UM for composting project
- CIMB Foundation funding for ZWC
- Technical assistance from IGES (Japan)



Anaerobic Digestion (2013)

- MOU Signing with CH Green Sdn Bhd on Cowtec @ AD
- Research on carbon emission avoidance from composting and AD
- E-waste collection



ZWC “IWM” center (2015)

- 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 “Baja Ria”



Intelligent Recycling (2016)

- Development of intelligent automated recycling center
- Community capacity building program
- Code of Practice for food waste segregation at source



2009

2010

2011

2012

2013

2014

2015

2016

2017



Green Bags Scheme (2010)

- “Green Bag Scheme” was introduced in 2010 to encourage food waste segregation at source
- Trainings were carried out for all the residential colleges on best practice of food waste segregation at source
- Obtained CSR funding from CIMB Foundation
- Launching of Zero Waste Campaign in Nov.



Compost & farming (2012)

- Experiment of organic farming using compost
- Developed standard method to produce compost
- Composting capacity increased with green waste as feedstock



Diversify recycling (2014)

- Used clothes collection by Life Line Clothing Sdn Bhd for reuse/recycling
- Wood waste collection by TSP Waste for energy recovery at paper mill
- Biogas shredder in operation
- Exhibition at IGEN2014 & UPM



SEA Game Green Volunteers (2017)

- Training for green volunteers of KL2017 SEA Game
- Interview by radio and newsprint
- Green waste shredder in operation
- Introduction of Baja Organik UM ZWC
- Set-up Tabung UM ZWC



UM Zero Waste Campaign: Year 2017

1.) Sumiani Yusoff. (2017). "Towards a sustainable campus: UM Zero Waste Campaign at University of Malaya." *Asia Research Network (ARN)*. 19-21 June 2017.

2.) Sumiani Yusoff. (2017). "Science Literacies and Science in Makerspaces: UM Zero Waste Campaign" NIDA Network for Information & Digital Access. Program 'Connect with Science'. Initial discussions centred on defining the different fields in public access to science - from Public Understanding through Citizen Science to Science Literacy (SL) - (Submitted)

3.) Sumiani Yusoff *et al.* UM living lab "UM Zero Waste Campaign: Development of Sustainable and Integrated Waste Management in University of Malaya" (Book Chapter) (Submitted)



Technology transfer: 2



Article /proceeding: 8 presentations/articles + 1 book chapter

Appointment as trainer for Green Volunteers for the first ever National Green Sport initiatives – Sea Games KL2017 (19th – 30th August 2017) and Para Sea Games (September 2017)

Training on environmental issues, sustainable waste management, recycling and separation at source for Green volunteers for KL2017 for 1000 university students from UKM, UPM, UM, Taylor's college, TARUC and Politeknik Vokasional Sepang.

1.) UM low carbon city framework carbon emission calculation system and integration with UM living lab system software (Collaboration with Dr. Sorayya)

2.) Intelligent recycle center project to promote recycling among community in UM campus in collaboration with Coindex Sdn Bhd



Visits/Interviews: > 50 (local & international)



Training program: 1

- 1.) UM ZWC + Majlis Perbandaran Selayang, Community engagement on composting method to residents at Pinggiran Batu Cave
- 2.) UM ZWC + Sarawak's Convention Bureau (SCB) ambassadors to the Land of the Thousand Handshakes, Workshop on capacity building on composting to the local communities in Sarawak
- 3.) Maybank CR (Corporate Responsibility) Day for Maybank staffs and orphanages from Rumah Hope PJ

Community Engagement : 3 sessions

1.) Engagement and networking with JICA (Japan International Cooperation Agency) for a preliminary environmental feasibility study on diaper recycling project in Malaysia

2.) Cooperation and collaboration with Mysavefood™ Network from Malaysian Agricultural Research and Development Institute (MARDI) on food waste minimization (technical inputs)

Network/linkage: 2

- ✓ "Special interview on UM Zero Waste Campaign: Sustainable and integrated waste management development" 2017. Media interview by TheStar on 27th March 2017
- ✓ "Special interview on "Pengenalan kepada UM Zero Waste Campaign Pengurusan Sisa Pepejal Lestari di kampus" 2017. Media interview by RTM (Selamat Pagi Malaysia) on 7th Aug. 2017
- ✓ "Interview on issues regarding polystyrene food packaging in Malaysia" 2017. Media interview by Astro Awani on 6th and
- ✓ "Interview on issues regarding micro-plastics water and ocean pollution in Malaysia" 2017. Media interview by Astro Awani on 26th January 2017.
- ✓ "Interview on UM Zero Waste Campaign and food waste management issues" 2017. <http://www.eco-business.com/> on 5th May 2017
- ✓ "Interview on UM Zero Waste Campaign and waste management issues", 2017. Media interview by radio station BFM89.9 on 6th April 2017



Media apperance: 3 newspapers & 3 on TV & 1 on radio



Sub-section 2.1: Launching of UM ZWC Intelligent Recycle Center

The UM ZWC intelligent recycle center (IRC) was officially launched on 20th April 2017 by both TNC (P) and TNC (P&I). After the launching, the IRC begins to operate in May 2017. Until Dec. 2017, only about 800kg of recyclable materials were collected through the IRC. From the half year of operation, we identified several problems of the IRC, especially in term of its robustness and effectiveness. The supplier, Coindex Sdn Bhd is in the process to retrofit the machine to improve the overall performance.

Figure 2.0: UM ZWC Intelligent Recycle Center

| | |
|---|--------------------------|
|  A photograph showing the front of the UM ZWC Intelligent Recycle Center. The wall is decorated with a large mural featuring a tree, a recycling symbol, and logos for 'UM ZWC CAMPUS', 'UNIVERSITY OF MALAYA', and 'ZERO WASTE'. A small television screen is mounted on the wall, displaying a video. The floor is covered with a green and yellow patterned mat. | View of front of the IRC |
|  A photograph showing the interior of the IRC. The room is empty, with a concrete floor and white walls. In the background, there is a desk with a computer monitor and keyboard. To the right, there are two large blue recycling bins. A chair is visible in the foreground on the left. | Inside the IRC |

Figure 2.1: Launching of UM ZWC IRC (1)



View of the IRC



TNC (P&I) was giving a speech



TNC (P) was giving a speech

Figure 2.2: Launching of UM ZWC IRC (2)



Assoc. Prof. Dr. Sumiani Yusoff was giving a welcoming speech



Launching of the IRC by both TNC (P&I) and TNC (P)



TNC (P) was using the IRC as part of the gimmick

Sub-section 2.2: Interview by RTM, BFM and TheStar

In year 2017, UM ZWC was interviewed by several media of radio, TV and newspaper. In early of 2017, AP Dr. Sumiani was interviewed by Astro Awani on polystyrene food packaging and ocean micro-plastic pollution. In March 2017, TheStar came to UM ZWC center to carry out interview. In April 2017, UM ZWC was invited to BFM for a live interview session on waste management and recycling issue. In Aug 2017, RTM came to UM ZWC for interview and video shooting for Selamat Pagi Malaysia program.

Figure 2.3: Interview by BFM on 6th April 2017



Figure 2.4: Interview by RTM on 7th Aug.



Interview and video recording
by RTM crew



Interview by RTM



Group photo at ZWC

Figure 2.5: Interview by TheStar on 27th March 2017



Interview by TheStar at ZWC office



Photo taking



Group photo

Universiti Malaysia Zero Waste Campaign (ZWC) Centre and UM Waste Transfer Station

- 1. Single edge office
- 2. ZWC Campus Store
- 3. Covered seating area
- 4. Covered garden
- 5. Covered stage
- 6. Covered plaza
- 7. Green water recycling area
- 8. Park garden site adjacent to it
- 9. ZWC garden



Experts say it is not degradable and produces harmful greenhouse gases as well as polluting leachate



From left and in German: incoming computer tracks at the university which are sold for 4000 per hour

"The slightly larger mass of their compound granules led to the more stable or 'harder' shell of some species," says.

"Now, in total, there is also the need to know of how it varies from the rest of the world. It is a very clear and large area."

The following are the species:

point will be questionable. It is important to control waste from sources," he said.

"Some industries do stop comparing their waste when they are faced with problems such as land use, no space or lack of space," he said.

Dr. Theng said many costs for community-based fund-raising failed due to problems with logistics, the technology used, waste management, the economic situation

"There's more community-level computing activity, so it's not just in the country but fairly wide-spread."

"There's also a commitment from managers to expect all the critical bits to be successful," he said.

He's being cautious about 9% of players from the local and knowledge industry who don't have their own digital assets portfolio.

[illegible]



Workers at Universiti Malaysia jettison food and garden waste on top of a compost heap.



The Zero Waste Campaign centre at Universiti Malaysia. It all started as part of a project by Environment Engineering students at UTM.

However, food waste comprises 50% of the waste that is eventually buried in landfills as the rest is recycled for recycling.

"There may be a high percentage return from recycling certain items but it is important to recycle food waste for the sake of the environment," he said.

Food composting at Universiti Malaysia

In 2016, a group of final year student graduates from Universiti Malaysia's Environment Engineering started a food waste composting project called the Zero Waste Campaign.

Since its inception, about 400kg of compost has been produced every month with over 10,000 tonnes of organic food waste compost produced since 2017.

The compost is sold for 100k per 10kg bag.

The bags are then delivered to farms, used for seedling by the students at the composting site.

However, the project also receives donations from other organisations, such as both private and public sectors.

Campaign research officer Jovan Keng said it could be the largest amount of food waste composting programme in the country.

The project has been aligned with green campus from the university.

However, it took awhile for the students and staff to come to



A close-up of food waste mixed with garden waste which will be turned into compost.

trust and receive from others in all categories, including when using the facilities of the project.

"As a new earth-based community we started to put food composting into practice."

"When we first established the project, we didn't have a general idea of how to handle our compost. It took us a while to figure out how to handle our waste effectively," he said.

The campaign also received court orders to be enforced on how the organic waste should be separated.

"The biggest challenge was to coordinate all the stakeholders involved in the food waste composting," he said.

"Now, we have to make sure the waste did not come in just to

such as plastic bottles or bags. We've started the quality, we have high quality compost," said Keng.

Meanwhile, for student and organic food waste composting would likely need government policy involvement.

Under the current food waste management, the landfill is where organic waste is located from other disposal in landfills and mostly managed by the state such as composting, she said.

"The contractor, sometimes, waste separation collection system, separation is not a good government policy in Malaysia. Food waste composting is successful and sustainable," she added.



MBPJ and CH Green Tech staff have been educating SS2 market traders on the do's and don'ts of composting. Food waste is weighed and items not suitable for composting are removed before they are put into the composting bin.

MBPJ in pilot project to turn food waste at SS2 morning market into compost

Both the morning market in Kepong Jaya and the market in the city of Kuala Lumpur are part of a food waste composting project called A Living Lab. Set up by the Kepong Jaya City Council (MBPJ) to tackle the food waste problem, the project aims to turn food waste into a valuable resource with a positive impact.

Green food waste such as vegetable scraps from the market are turned into liquid fertilizer and organic matter. MBPJ and CH Green Tech also have been educating market traders on the do's and don'ts of composting, leading to the composting process.

MBPJ said it was not a public service department, but a local government. It is the first stage of the project to ensure the composting process is not a one-time operation but a continuous process.

"Since the project is a pilot, the council may manage it on its own or outsource the project," said Lee.

"This is to keep the project running so that the public can see and learn about food composting."

"Currently, the results of the project such as compost will be sold to the public."

"The sales of the compost products will be used to cover the operational cost of the project," said Lee.

CH Green Tech also said that the concept is not a one-time project but a long-term project.

"We are using the composting concept to educate the public on food waste management," said Lee.

"We are using the composting concept to educate the public on food waste management," said Lee.

Some challenges are involved in the project.

Ang said that the challenge was to ensure that waste was free from plastic and glass.

The composting process begins with the collection of organic food waste, which is then weighed and sorted into small pieces and put into the composting machine.

It takes between 10 to 15 days for the composting process to complete. The composting process is a continuous process.

Ang said that the composting process is a continuous process.

The long-term goal is for the composting process to be used to generate income for the composting project, said Ang.

A green field will also be set up by the project to show the public the use of the compost in the field.

He said that such a field and by using organic liquid fertilizer, fruits and vegetables can be produced through the project, said Ang.

"A living lab can be replicated in other locations as a demonstration for the public to see the process, Ang said.

The composting process is a continuous process, Ang said.

"The food waste can be converted into compost, which is a valuable resource and it will be used in the field to show the public the use of the compost in the field," said Ang.

"The food waste can be converted into compost, which is a valuable resource and it will be used in the field to show the public the use of the compost in the field," said Ang.



Ang said that composting machine that separates organic and inorganic waste from food waste.

events

Bandar Tun Razak Education Foundation rewards students >8

events

A skateboard park for Kajang folk >13

sport

Karate kids vie for title at international meet >15



Piling it on: A Universiti Malaysia worker turning a compost heap as part of its Zero Waste Campaign. UM gathers food waste together with garden waste to create high-quality composts. —PHOTO BY CHAI THE STAR

Don't let it go to waste

Experts are urging the authorities to stop sending food waste to the country's landfills and convert it to compost, enzymes and biogas instead. >2&3

Intelligent recycling centre among UM's initiatives for Earth Day

By SHERLA SRI PRIYA
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UNIVERSITI Malaysia launched its first Intelligent Recycle Centre, which dispenses coupons that can be redeemed for rewards.

Green Carpark and Community Green Roof Garden were among the other green initiatives launched by the Universiti Malaysia (UM) Sustainability Science Research Cluster in conjunction with International Earth Day. Universiti Malaysia Sustainability Science Research Cluster dean Assoc Prof Dr Sumiani Yusoff said it was important to integrate innovation of technology and green initiatives, as well as execute actual problem-solving plans.

"Recycling has to be appealing and infrastructure development is a crucial aspect," she said.

Dr Sumiani said UM was able to recycle 20% of the waste generated on campus and this was encouraging.

"The national recycling rate is about 11% and we have surpassed the national average within the campus. Our target is for UM to reach a 60% recycling rate, which is the recycling rate in developed countries," she said at the launch of



the UM Intelligent Recycle Centre.

At the Intelligent Recycle Centre, students and university visitors are able to discard newspapers, aluminium cans and plastic bottles and receive reward points.

The centre is located at UM's Pusat Asasi Sains.

The points vary based on the type of recyclable item. Once a certain number of points are accumulated, they can be redeemed for items such as compost, food discounts at selected canteens on campus and T-shirts.

Meanwhile, the Green Carpark

project relies on sunlight coming through the carpark's covered rooftop which generates energy to water plants.

Built Environment Faculty lecturer Dr Noor Sumairi Mohd Zaid said the project aimed to reduce impact of urban heat island in UM

by generating clean renewable energy via the solar system and increase the capacity of campus carbon sequestration through the vertical greenery system.

The Community Green Roof project consists of 70 edible plant species grown on seven different planter boxes.

The idea behind the rooftop garden is to introduce community gardening, including a good design that will benefit from proper use of water and soil.

Besides creating a beautiful atmosphere with healthy plants, the garden will encourage participants to recycle food and garden waste into compost.

There are seven beds consisting of plants with different water level needs.

Among them is the medicine bed, which consists of plants with medicinal properties such as arthropod arthritis, which is better known locally as musk-kucing.

The event was launched by the Universiti Malaysia Research and Innovation deputy vice-chancellor Prof Dr Noor Saadah Abd Rahman, who called for more research on the benefits of Community Green Roof.



UM Zeri Waste Campaign centre in Universiti Malaysia. It all started as part of a project by Environment Engineering students in 2004.

However, food waste comprises 70% of the waste that is eventually buried in landfills as the rest is reserved for recycling.

"There may be a high economic return from recycling certain items but it is important to recycle food waste for the sake of the environment," he said.

Food composting at Universiti Malaysia

In 2009, a group of final-year undergraduates from Universiti Malaysia's Environment Engineering started a food waste composting project called the UM Zeri Waste Campaign.

Since its inception, about 600kg of compost has been produced every month with more than 2.5 tonnes



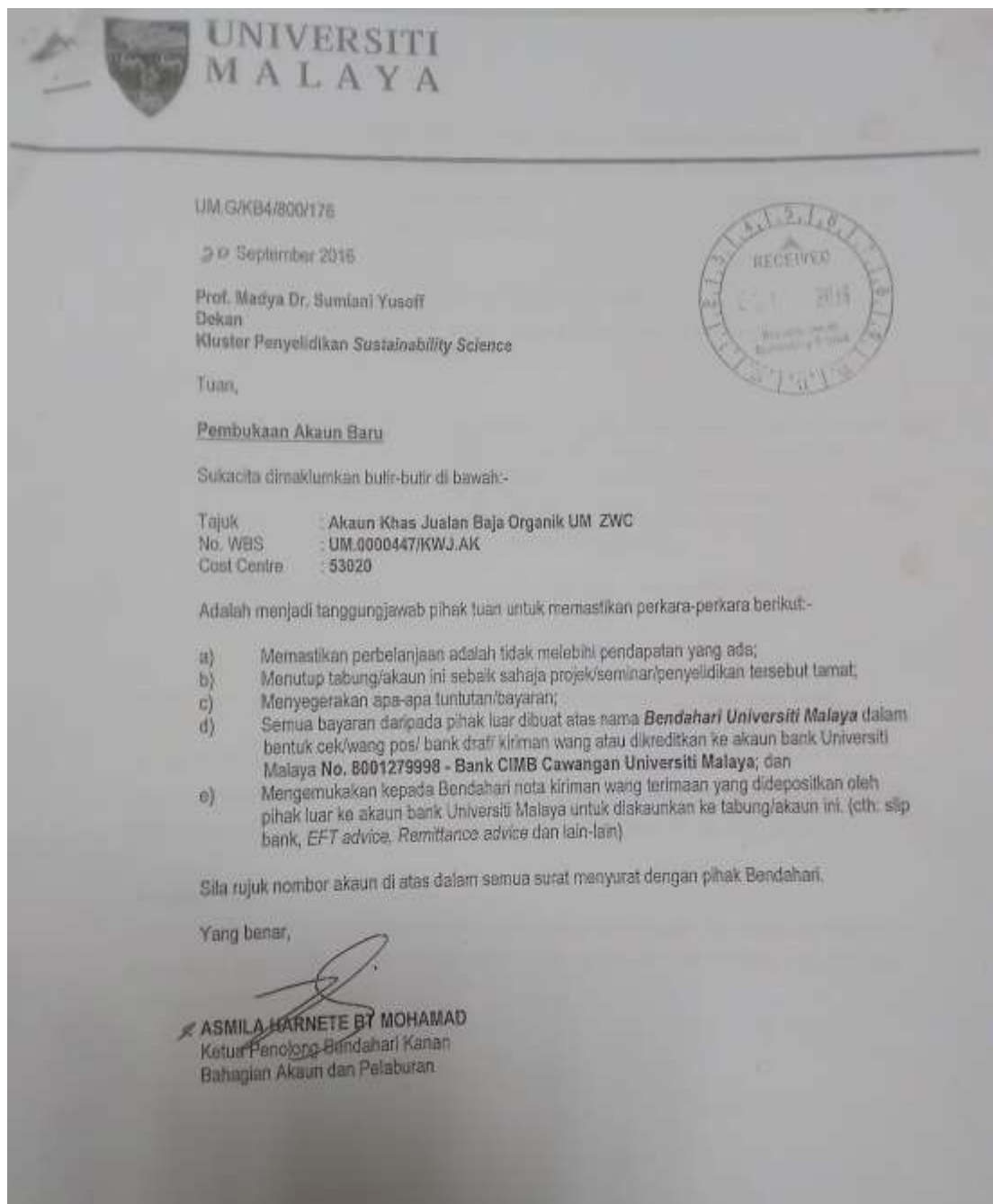
A close-up of food waste mixed with garden waste which will be turned into compost.

Sub-section 2.3: Tabung UM ZWC

A special fund for the management of UM ZWC income collected from sale of UM ZWC organic fertilizer was established under UM Bursary with a TOR (terms of reference). The details of the special fund is shown as below:

Topic : Akaun Khas Jualan Baja Organik UM ZWC
No. WBS : UM.0000447/KWJ.AK
Cost Centre : 53020

Figure 2.6: Letter from UM Bursary about the UM ZWC fund



Sub-section 2.4: Training for Green Volunteers KL2017

In 2016, UM ZWC was engaged under UPUM to involve in a training program for green volunteers of KL2017 SEA Game. UM ZWC had carried out several sessions of training on recycling and waste segregation at source to several universities and colleges that involved in green volunteers for KL2017. A total of about 700 green volunteers had been trained by UM ZWC team on general environmental management knowledge, green technology and 3Rs (Reduce, Reuse and Recycle) as well as waste segregation at source.

Figure 2.7: Training session with green volunteers KL2017



Training at TAR
University College on
22nd July



Training at Taylor
College on 17th June

Figure 2.8: Meeting with potential collaborators



Training at UM on 30th July



Training at Politeknik Sepang on 10th Sept.



Green volunteers with Minister of Sport and Youth

Sub-section 2.5: Capacity Building Program by UM ZWC

UM ZWC had carried out many capacity building program for visitors from academic, government, private sector, media and non-governmental organization. Some of the notable visitors are listed as below:

Table 2.1: List of notable visitors to UM ZWC in 2017

| No. | Program / Visit | Date |
|-----|--|---|
| 1. | Capacity building program on integrated waste management and composting to the UMCares squad from Kolej kediaman ke-4 | 20th Feb. / 11th March |
| 2. | Capacity building program on integrated waste management, recycling, waste treatment technology, AD and composting to Association internationale des étudiants en sciences économiques et commerciales (AIESEC) international students | 24th Jan., 10th June, 29th June, 10th Aug. |
| 3. | Capacity building program on integrated waste management and composting to the UMCares squad from Kolej kediaman ke-2 | 15th April |
| 4. | Capacity building program on integrated waste management, recycling, biological waste sorting and treatment, anaerobic digestion (AD) and composting to representatives from Forum Air Malaysia | 14th & 22th March |
| 5. | Capacity building program on integrated waste management, energy recovery from waste, mechanical-biological treatment, thermal treatment technology, recycling and composting to UM environmental engineering students | 22nd Feb., 21st March |
| 6. | Capacity building program on integrated waste management and recycling projects to students from Faculty of Social Science | 21st March |
| 7. | Capacity building program on integrated waste management and general issues on institutional waste management in a campus level to students of staffs of UM during Earth Day event | 21st April |
| 8. | Capacity building program on integrated waste management and recycling to students from Persatuan Mahasiswa Islam Universiti Malaya (PMIUM) | 3rd March & 14th April |
| 9. | Capacity building program on integrated waste management and recycling to students from Universiti Islam Antarabangsa (UIA) | 3rd March |
| 10. | Capacity building program on integrated waste management, AD and recycling and best practice best of institutional waste management in a campus level to lecturers and staffs from UIA | 16th May |

| No. | Program / Visit | Date |
|-----|---|--------------------|
| 11. | Capacity building program on integrated waste management and waste recycling projects in UM by UM ZWC to SWCorp officer | 8th May |
| 12. | Capacity building program on integrated waste management and recycling to resident reps. from Damansara Uptown | 31st March |
| 13. | Capacity building program on integrated waste management to lecturers and students from MUST | 17th May |
| 14. | Officers from Jabatan Landskap Negara and SWCorp | 4th June & 17 July |
| 15. | Capacity building program on integrated waste management, food waste segregation at source and compost to the Pengetua, penyelia and cafe operators of Kolej Kediaman ke-12 | 1st June |
| 16. | Capacity building program on integrated waste management and Takakura composting method to students from Politeknik Port Dickson | 5th July |
| 17. | Capacity building program on integrated waste management and general issues on waste management to students from Abundance Resources | 20th July |
| 18. | Capacity building program on inclusive growth and integrated waste management to Sudanese officials on 9th Aug. 2017 (INPUMA program: Course on economic development planning for equitable and sustainable growth for senior Sudanese officials) | 9th Aug. |
| 19. | Capacity building program on integrated waste management to Dr Odeh Aljayossi and officers from Lebanon | 10th Aug. |
| 20. | Capacity building and training on environmental issues, sustainable waste management, recycling and separation at source for Green volunteers for KL2017 for UKM, UPM, UM, Taylor's college, TARUC and Politeknik Vokasional Sepang. | June – Oct |
| 21. | Capacity building on integrated waste management and demonstration of Takakura composting to students and teachers from Shibata School | 2nd Oct. |
| 22. | Capacity building on operation of anaerobic digestion to representative from safety, health and environment department of Denso Malaysia | 10th Oct. |
| 23. | Capacity building on integrated waste management to UM environmental engineering students | 23rd Oct. |

| No. | Program / Visit | Date |
|-----|---|-----------------------|
| 24. | Capacity building on integrated waste management and composting to safety, health and environment department of DRB-HICOM | 14th Nov. |
| 25. | Capacity building on integrated waste management to international PhD students of UM | 10th Nov. |
| 26. | Capacity building on integrated waste management for students from Faculty Linguistic | 18 th Dec. |
| 27. | Capacity building on composting and biowaste treatment for students from Faculty of Science | 19 th Dec. |
| 28. | Kindergarten kids visited UM ZWC for educational purpose | 10 th Dec. |

In 2017, ZWC also organized visit and training for several places such as:

1. Taman Pinggiran Batu Caves
2. Kolej Kediaman ke-12, UM
3. MyCorps for motivational talk for KBS volunteers
4. MBPJ Cowtec Anaerobic Digestion project at SS2
5. MBPJ Food Bank

Figure 2.9: Interview by various media (1)

| | |
|---|-----------------------|
|  | Visit by UM students |
|  | Visit by UM students |
|  | Visit by UIA students |

Figure 2.10: Interview by various media (2)

| | |
|--|--|
|  <p>A group of four people (three men and one woman) standing in front of a green sign that reads "UM Cowtec Anaerobic Digestion". The sign also features logos for Universitas Malaysia, JPPHB, and ZERO WASTE. They are standing on a paved area next to some large blue and white water jugs.</p> | <p>Visit by reps from Denso</p> |
|  <p>A group of five people (three men and two women) standing in front of a green sign that reads "UM ZWC Composting Center". The sign also features logos for Universitas Malaysia, JPPHB, and ZERO WASTE. They are standing on a dirt path surrounded by lush greenery and plants.</p> | <p>Visit by UM students and staffs</p> |
|  <p>A large group of students posing for a photo in front of a green sign that reads "UM ZWC Composting Center". The sign also features logos for Universitas Malaysia, JPPHB, and ZERO WASTE. The students are arranged in two rows, with some standing and some kneeling in front. They are all wearing white t-shirts with a logo.</p> | <p>Visit by Heriot-Watt students</p> |

Figure 2.11: Visitors to ZWC center (1)



Visit from KK4 environmental club



Visit from UIA staffs



Visit from UM students

Figure 2.12: Visitors to ZWC center (2)



Visit from AIESEC international exchanges



Visit from AIESEC international exchanges



Visit by puan Kamariah, reps from SOWACO

Figure 2.13: Visitors to ZWC center (3)



Visit by UMCares and UM communities during Earth Day



Visit by Prof. Odeh from Lebanon



Visit by DRB-HICOM

Figure 2.14: Visitors to ZWC center (4)

| | |
|---|--|
|  A photograph of three young men standing in front of a green and white sign that reads "UM ZWC Composting Center". The sign also features logos for "UNIVERSITI MALAYSIA JOHORE" and "75% WASTE". The man on the left is wearing a black t-shirt with a white logo, the middle man is wearing a black t-shirt with a white logo, and the man on the right is wearing a blue button-down shirt. They are standing on a grassy area with some plants in the background. | <p>Visit by Aiesec</p> |
|  A photograph of a group of about ten people, including students and staff, standing in front of the same "UM ZWC Composting Center" sign. The group is diverse, with some wearing hijabs and others in casual attire. They are standing on a grassy area with some plants in the background. | <p>Visit by MUST students and staffs</p> |
|  A photograph of a group of about ten people, including staff and students, standing in an office setting. Some are holding folders or documents. The office has large windows and modern furniture. | <p>Visit by UIA</p> |

Figure 2.15: Visitors to ZWC center (5)

| | |
|---|---|
|  | <p>Visit by SWCorp</p> |
|  | <p>Visit by UMP students and staffs</p> |
|  | <p>Visit by Dr. Emenike</p> |

Figure 2.16: Visitors to ZWC center (6)

| | |
|---|--|
|  | <p>Visit by SWCorp and Freund Global</p> |
|  | <p>Visit by students from API</p> |
|  | <p>Visit by students from Shibata School</p> |

Figure 2.17: Visitors to ZWC center (7)

| | |
|---|--|
|  | <p>UM ZWC volunteer</p> |
|  | <p>Visit by Sudan Official</p> |
|  | <p>Visit by AIESEC international exchanges</p> |

Figure 2.18: Visit to other places for capacity building



Training for KK12



Visit to Cowtec AD at SS2



Training at flat pinggiran
Batu Caves

Figure 2.19: Visit to other places for capacity building (2)



Training for volunteers of KBS



Training at Batu Caves



Visit by reps from FAM

Figure 2.20: Training in progress



Training by Dr. Ng



Training by Dr. Sumiani Yusoff



Visit to the composting site

Sub-section 2.6: Maybank CR Day 2017

After the success of Maybank CR Day in year 2016, Maybank again had engaged UM ZWC to carry out another session of Maybank CR Day for year 2017. The theme for year 2017 was urban biodiversity and waste management. The program involves the visit from a group of orphanages from PJ, for a nature walk at UM Rimba Ilmu botanical garden followed by visit to UM ZWC center to learn about food waste composting.

Figure 2.21: Maybank CR Day

| | |
|---|--|
|  | <p>Maybank CR Day at UM</p> |
|  | <p>Assoc. Prof. Dr. Sumiani Yusoff was giving a welcoming speech</p> |

Figure 2.22: Maybank CR Day (2)



Assoc. Prof. Dr. Sumiani Yusoff was giving gifts to the orphans



Group photo



Group photo at ZWC center

Sub-section 2.7: Green Waste Shredder Machine

In May 2017, the larger capacity green waste chipper-shredding machine arrived at UM ZWC. The power is 24hp and the cutting method is a spinning disc. With the machine, large tree branches with leaves can be shredded for composting purpose.

Figure 2.23: Green waste shredder machine (1)



The 24hp shredding machine



Shredding of tree branches

Figure 2.24: Green waste shredder machine (2)



The green waste before shredding



Shredded green waste



Shredded green waste

Sub-section 2.8: UM ZWC Volunteers

A UM ZWC volunteers team was set up in Dec. 2017. Several activities have been identified for the volunteers such as organic farming, UM ZWC garden, decoration items from recyclables, promotion of UM ZWC compost and IRC, awareness on food waste segregation, etc. there are about 15 participants of the first meeting with UM ZWC volunteers.

Figure 2.25: Meeting with UM ZWC volunteers



Meeting with the volunteers



At the composting site

Figure 2.26: Gardening works



Small nursery site



Planting of flowers



Another patch of flower planting

UM ZERO WASTE CAMPAIGN ARE RECRUITING VOLUNTEERS!



**BE AN
ENVIRONMENTAL
WARRIOR**

TAKE PART. MAKE A DIFFERENCE
**COME JOIN US TO
SAVE THE
ENVIRONMENT!**



zwc.umcares@gmail.com



Zero waste campaign, University of Malaya



Zero Waste Campaign Cabin, UM



EMAIL US TO REGISTER ATTENDANCE



HIGH TEA WILL BE PROVIDED



29 NOVEMBER 2017



4 - 5 PM

Sub-section 2.9: Test report of UM ZWC compost

UM ZWC has carried out a test for the UM ZWC compost based on the common standard test for organic fertilizer. The result and summary of comparison with SIRIM standard (MS1517:2012) is shown as below.



 **INSTITUT PENYELIDIKAN PERHUTANAN MALAYSIA**
Forest Research Institute Malaysia (FRIM)
52109 Kepong, Selangor Darul Ehsan
Tel : 603-6279 7000 Fax : 603-6273 1314
Website : www.frim.gov.my



Ruj. Kami : FRIM(S).700-2/1/1Kit.3() 29 September 2017
Ruj. Tuan :

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



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 Siji Penentuan Kualiti dan Bukan Siji 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 Walkley 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 Kjeldahl 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

SULIT

LAPORAN UJIAN (TEST REPORT)

| | |
|---|------------------------|
| REPORT NO: BK 35/17 | NO KERJA: CL D26/17 |
| LAPORAN INI MENGANDUNGI 2 MUKASURAT | MUKASURAT 2 DARIPADA 2 |
| Laporan ini BUKAN Sijil Perentuan 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. | |

| Bil | No. Sampel | No. Makmal | pH | EC (mS/cm) | MC (%) | OM (%) | Ash (%) | N (%) | OC (%) |
|-----|------------|------------|------|------------|--------|--------|---------|-------|--------|
| 1 | UM ZWC | D239/9/17 | 6.60 | 24.85 | 29.54 | 47.05 | 52.95 | 2.39 | 14.34 |

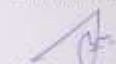
| Bil | No. Sampel | No. Makmal | P ₂ O ₅ (%) | K ₂ O (%) | MgO (%) | Ca (%) | Al (%) | Na (%) | Fe (%) |
|-----|------------|------------|-----------------------------------|----------------------|---------|--------|--------|--------|--------|
| 1 | UM ZWC | D239/9/17 | 2.82 | 0.21 | 0.36 | 0.76 | 0.63 | 0.20 | 0.97 |

| Bil | No. Sampel | No. Makmal | S (%) | Cu (ppm) | Mn (ppm) | Zn (ppm) | B (ppm) | NH ₄ (ppm) | NO ₃ (ppm) |
|-----|------------|------------|-------|----------|----------|----------|---------|-----------------------|-----------------------|
| 1 | UM ZWC | D239/9/17 | 0.37 | 21.49 | 160.27 | 175.36 | 10.70 | 5.58 | 406.82 |

Nota:

ND = Not Detectable

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

Table 2.2: Comparison of UM ZWC compost with SIRIM standard

| Clause | Criteria of Compliance to SIRIM Standard (MS1517:2012) | Compliance of UM ZWC compost |
|--------|---|--|
| 3.1 | Organic fertilizers shall be fertilizers that contain a sizable proportion of biodegradable organic matter and are free of pathogen . | Yes Organic matter: 47.05% Free from pathogen |
| 3.1 | Organic fertilizer shall contain one or more of the major plant nutrients namely nitrogen, phosphorus, potassium and magnesium . | Yes N: 2.39% P: 2.82% K: 0.21% Mg: 0.36% |
| 3.1.1 | The source of organic fertilizer shall be declared and shall only be from animal or plant origin. It shall not contain human and pig waste. | Yes Purely from canteen and kitchen food waste |
| 4.1 | Organic fertilizer when taken from the unopened packages shall be uniformly mixed, free-flowing and free from lumps and extraneous materials. | Yes |
| 4.2 | The particle size of the material shall be such that more than 90% by weight of it shall not be less than the declared particle size | Yes |
| 4.3 | Moisture content shall not be more than 30% (on wet weight basis). The maximum permissible tolerance of declared moisture content shall be 10% of declared value. | Yes Moisture: 29.54% |
| 4.4.1 | The percentage organic matter content declared shall not be less than 50% . When tested, the permissible tolerance shall not differ from declared value by more than 10%. | Yes Organic matter: 47.05% (permissible tolerance is not differ by 10% of declared value) |
| 4.4.2 | The nutrient composition, as percentage of the material, shall be declared. The maximum permissible lower limit of individual nutrient shall not differ by more than 20% of the declared value. The nitrogen (N) content shall not be less than 1.5% . | Yes Nitrogen content: 2.39% |
| 4.4.3 | Carbon: Nitrogen ratio in the fertilizer shall be clearly and indelibly marked on each package. Content of total organic carbon and total nitrogen (as percentage by weight) in the material shall be such that the ratio is not more than 25:1 . The maximum permissible upper limit shall not differ by more than 20% of the declared ratio. | Yes C/N ratio : 6/1 |

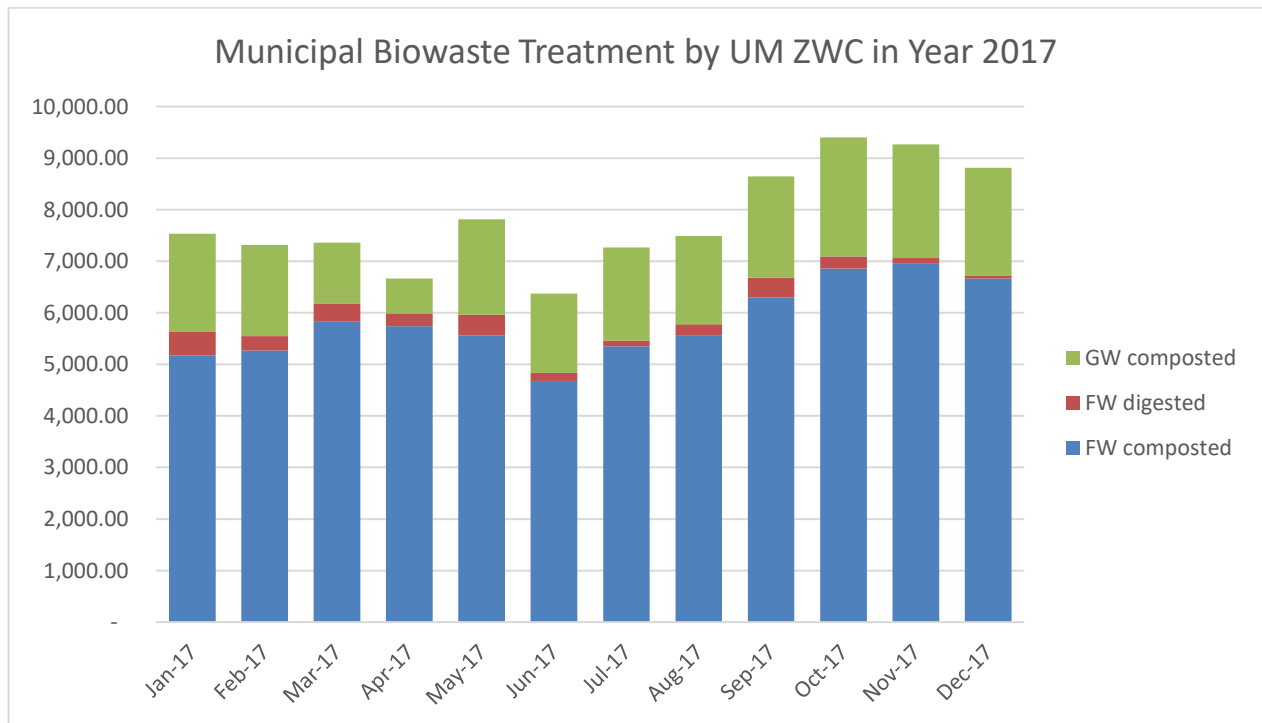
Section 3: Recycling Data and Challenges Ahead

Sub-section 3.1: Waste and recycling data collection

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. E-waste collected at ZWC site for recycling/recovery
6. Recyclable materials sorted at UM ZWC site and UM transfer station
7. Residual waste disposal data

Figure 3.0: Total biowaste (food & green waste) treated in 2017 (in KG)



Note: Organic waste in the above graph doesn't include wood waste

Figure 3.1: Total wood waste collected for energy recovery in 2017 (in KG)

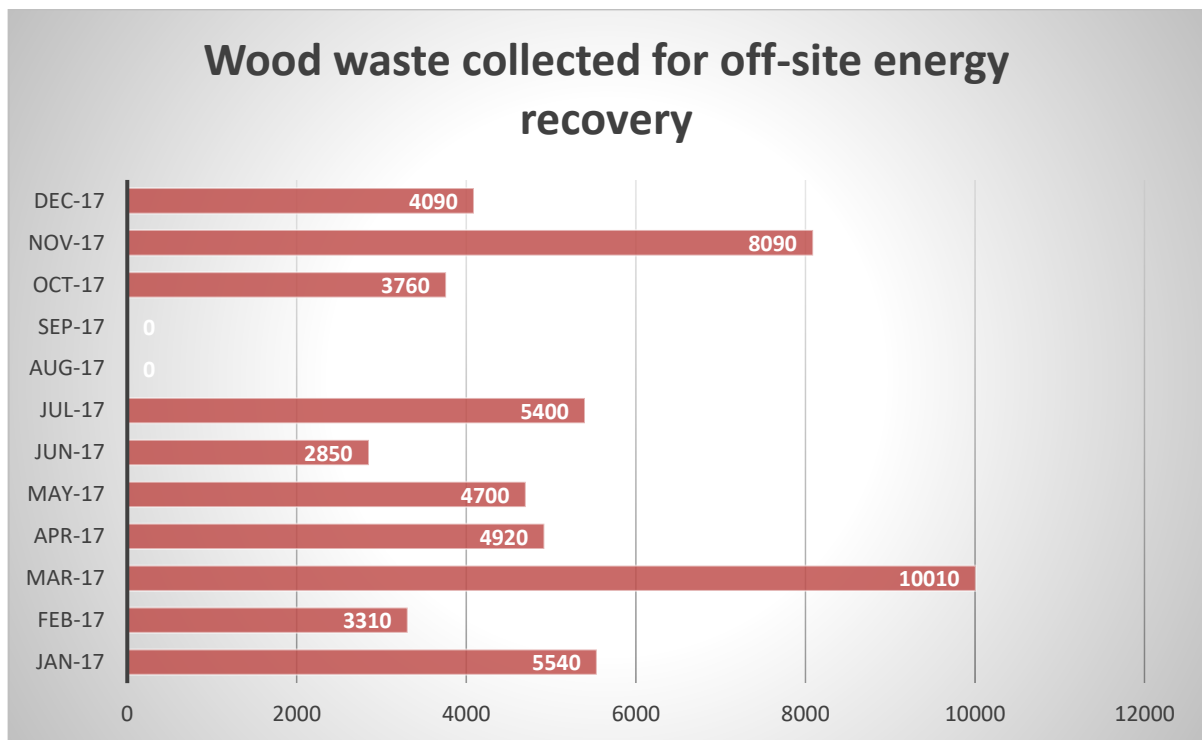


Figure 3.2: Total used clothes collected for reuse/recycle in 2017

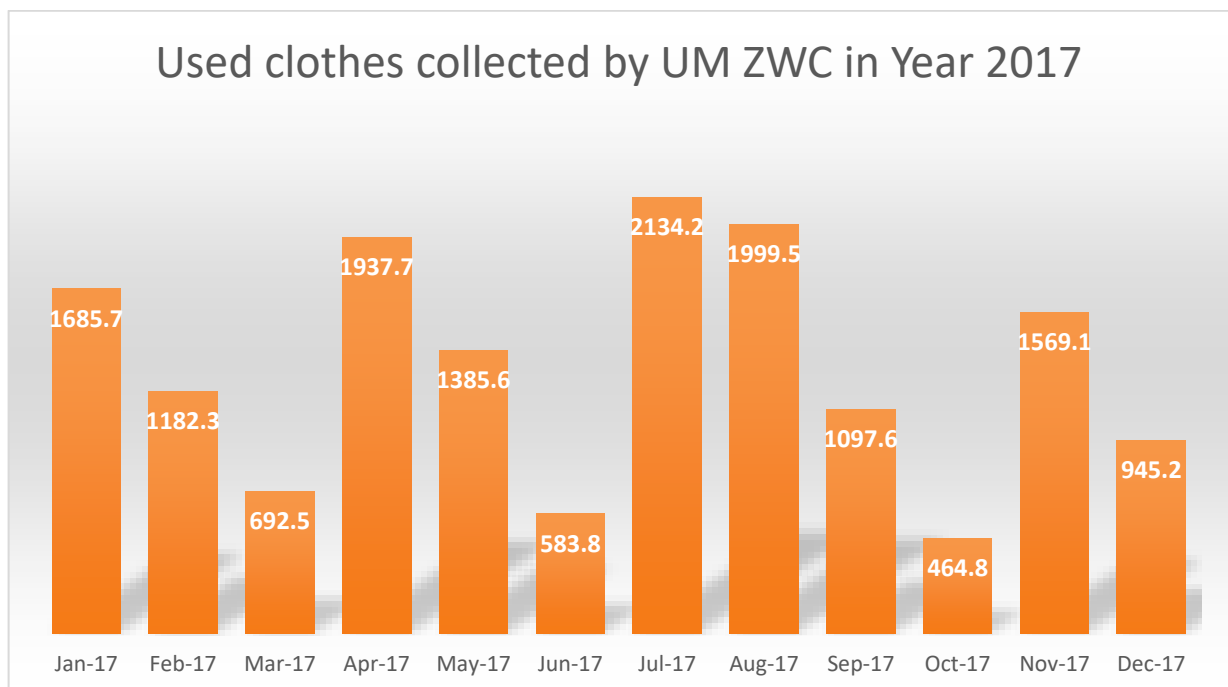


Figure 3.3: Waste recycling and treatment data profile of year 2017

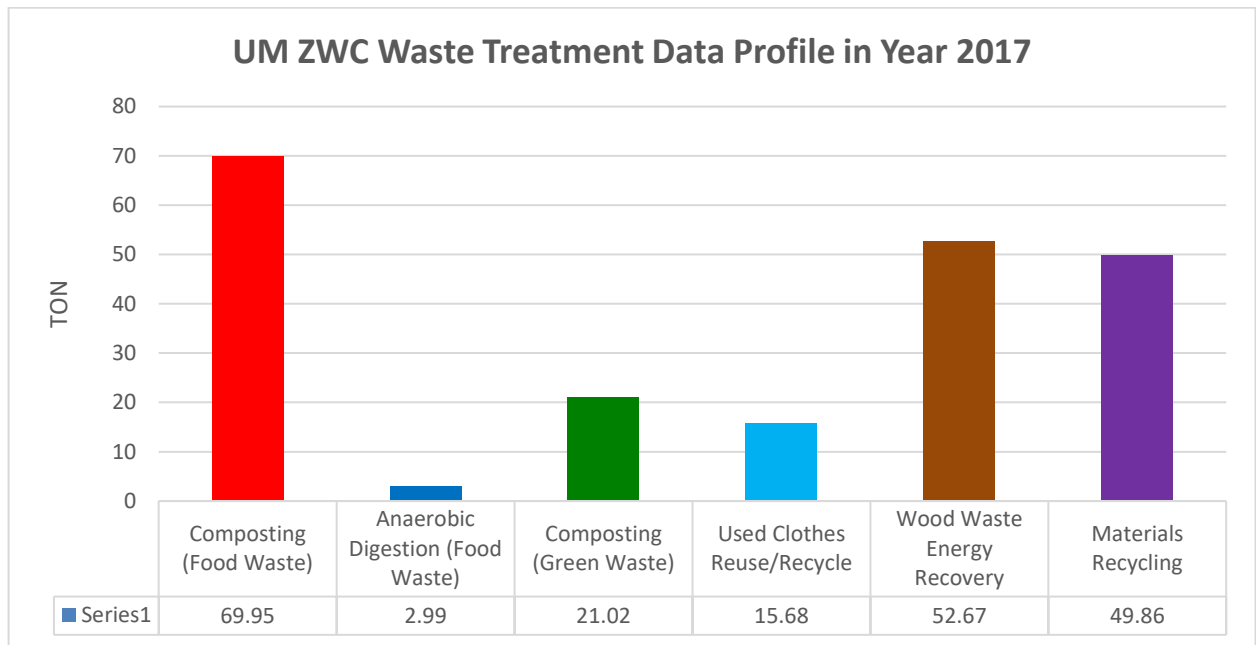


Figure 3.4: Residual waste and green waste disposed to landfill in year 2017

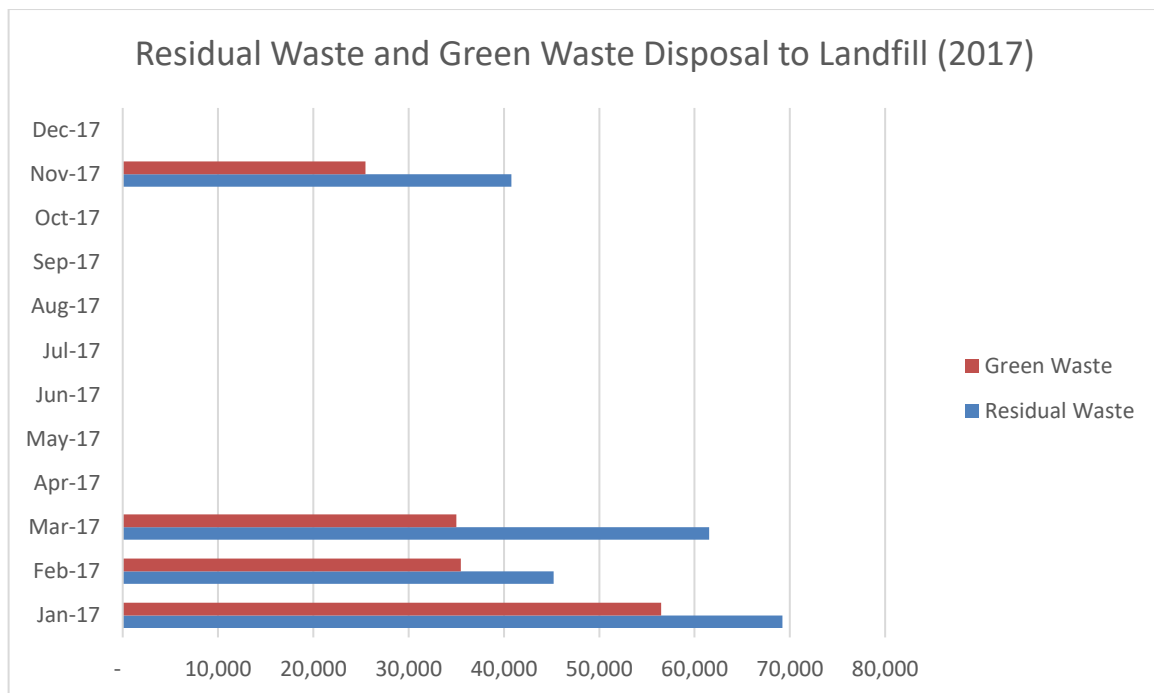


Figure 3.5: Municipal organic waste treatment by UM ZWC (2012-2017)

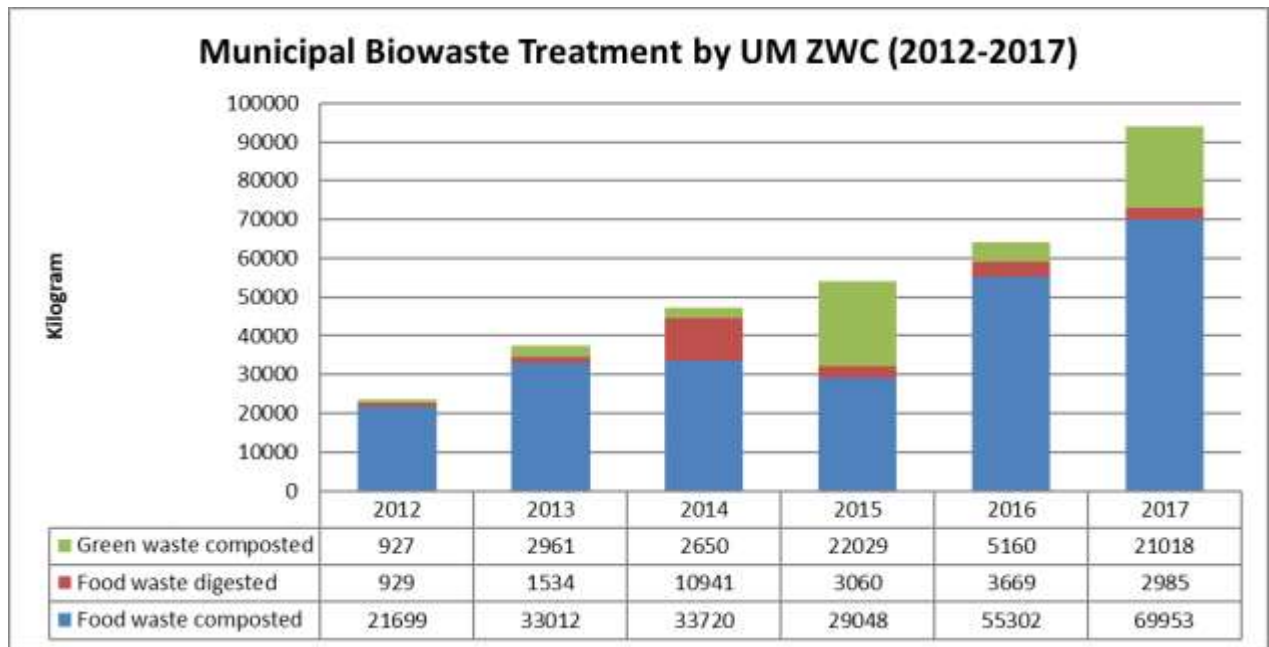
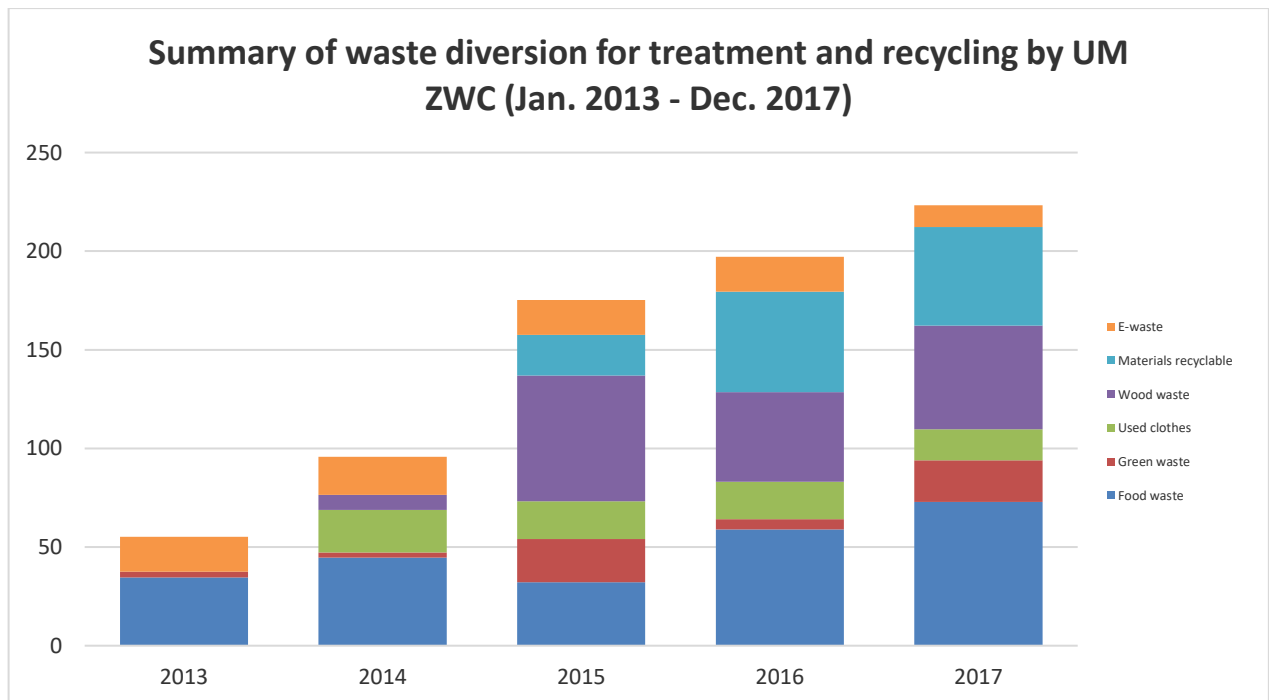


Figure 3.6: Summary of waste diversion for treatment and recycling by UM ZWC (2013-2017)



Sub-section 3.2: 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 2017 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.

Other last year issues and the status of progress:

| Issues | status |
|---|--|
| 1. The current shredder's capacity is very small (3 HP), resulted in low tonnage of green waste shredding and composting: JPPHB had approved to move the larger chipper to ZWC, but pending to TOR) | A 24 HP chipper shredder has arrived to UM ZWC site since June 2017 and in operation. With the shredder, green waste composting capacity has raised to 2 ton/month but the capacity increment is limited by the current composting area under the TNB pylon. |
| 2. Cleanliness issue at ZWC site, which caused by cleansing activities of waste collection | A layer of ready mix concrete had been laid on the area in front of green waste shredding area to reduce the leachate |

| | |
|---|---|
| trucks: In progress to build an extension of waste bins storage area with RMK-11 budget | accumulation. But the trucks washing area is not yet been moved, as the water pipe is not changed yet. |
| 3. Drainage system and floor trap at ZWC site needs to be upgraded and improved: In progress to repair area with RMK-11 budget | A perimeter/scupper drain to channel leachate to a sump had been built last year. But the discharge from the sump is still linked to the river nearby. Planning is in progress to build a buffer natural mini constructed wetland to treat the wastewater biologically. |
| 4. Ground at corner beside the open top bin for wood waste needs to be leveled to prevent stagnant water which is breeding ground for mosquito: In progress to repair area with RMK-11 budget | A concrete platform for the placement of the open top bin for wood waste storage had been built last year using RMK-11 budget. The area with stagnant water has been filled and not more stagnant leachate now. |
| 5. Separation of food waste at source is not widely practiced by cafe operators in UM campus: Will coordinate with JPPHB canteen committee to improve the monitoring and enforcement | UM ZWC had bought 10,000 pcs of biodegradable bags for food waste separation at source purposes, and it has been gradually distributed to all residential colleges and café operators in UM campus |
| 6. TNB issued notice of dangerous to UM on the utilization of land under TNB pylon for composting | UM ZWC has obtained green light from TNC (P) to use a vacant land beside PAUM as ZWC composting site. RMK-11 budget will be allocated to build a proper composting facility |
| 7. The UM ZWC intelligent recycle center (IRC) was found to be not robust in operation as breakdown often happens. Besides it didn't attract a large group of users last year | The IRC provider, Coindex Sdn Bhd has promised to retrofit the IRC with another recyclables feeding system which is more effective and robust. |
| 8. The current COWTEC 100kg/day AD at ZWC site has problem of leakage since year 2016. It needs a major overhaul to solve the leakage. | Plan is in the pipeline to change the current COWTEC AD to a new unit with latest version of 4 th generation in year 2018. The project will be partially funded by RMK-11 |
| 9. The weighbridge station for UM waste transfer station often broke down last year. It was found that lightning is one of the major causes. | JPPHB is in the process of repairing the weighbridge and install anti-surge and lightning protection device on the weighbridge. |

Proposal for year 2018

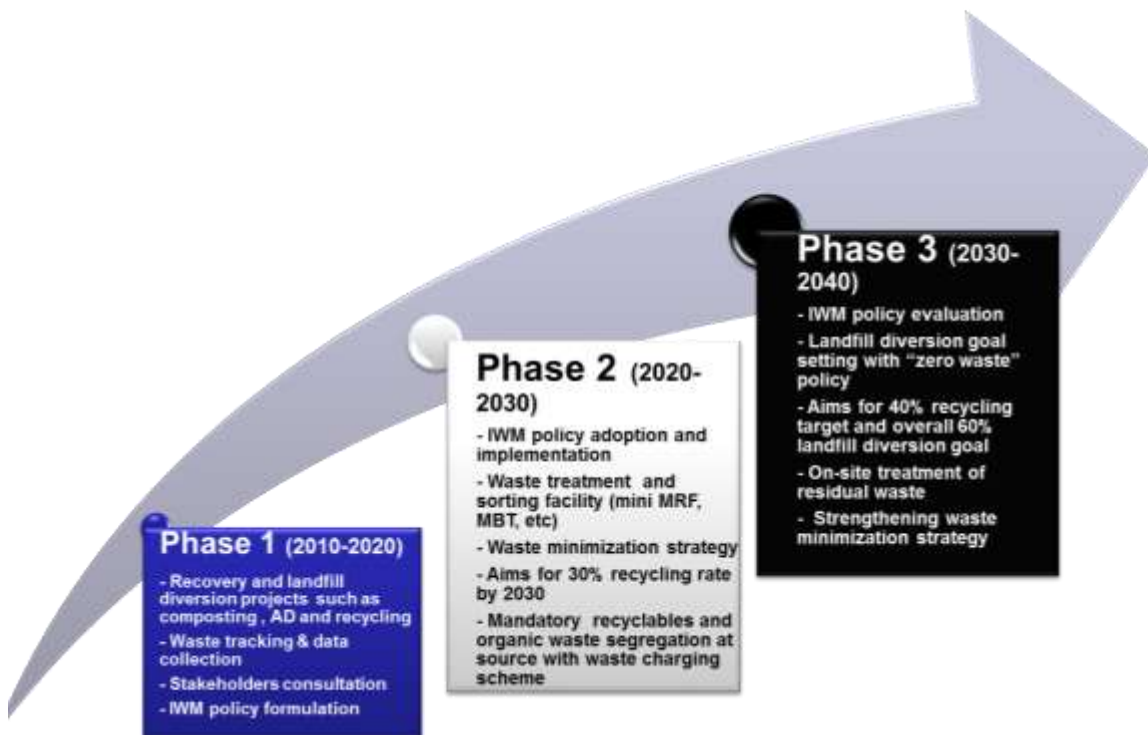
1. Re-locate and upgrade the current UM ZWC composting site to a new area with development of proper composting building and facilities, with an official launching by TNC (P)
2. Change the current COWTEC AD to a new unit with latest version of 4th generation with a new MOU signing program
3. Establish a Food Bank in UM with notion to divert surplus food for the needy (students) in UM campus
4. More active engagement with residential colleges and PTj to promote UM ZWC compost and food waste segregation program
5. Operation and promotion of UM ZWC intelligent recycle center as a central recycling drop-off facility in UM campus
6. Increase the composting capacity for green waste (from the current 2 ton/month) with the 24 HP shredder and new composting site

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, etc



Income generation strategy

1. Increase sale of organic fertilizer (Baja Organik UM ZWC) – Current
2. Recycling revenue from UM ZWC intelligent recycle center – on-going
3. Entrance fee (in the form of training module fee) for educational tour/visit to UM ZWC center (2018)
4. Technical training module on integrated sustainable waste management strategy for campus-level (in progress)

Section 4: Conclusion

Year 2017 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. Green waste shredding machine is an upgrading of shredding 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. KL2017 green volunteers training 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 sale of compost is a step toward ZWC self-sustainability financially. The introduction of UM ZWC volunteers aims to form a team to promote the notion of zero waste in the long run.

In year 2018 and 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.

Appendix A: Photos of ZWC facilities and activities



New wood waste collection bin by TSP, after the construction of the new platform for wood waste collection site



JPPHB staffs put in wood waste into the bin



The wood waste bin before change



Compost packed in
25kg gunny sacks



Compost before and
after crushing



Crushed compost



Food waste collected



Food waste to be fed into
compost piles



Feeding of food waste into
compost piles



Compost piles in year 2017



Turning of compost piles



Feeding of food waste into compost piles



Cenviro is using the UM waste transfer station to transfer the collected scheduled waste into a larger truck



The condition in the ZWC office after re-arrangement and new features



Green waste shredding area



Mobile phone and battery collection bin



Plastics collected at UM ZWC IRC



Compost drying



UM ZWC center new
facelift in year 2017



Another view



The UM waste transfer
station

Appendix B: Letters of visits and collaborations