



# **Zero Waste Campaign of University of Malaya**

## **Annual Report 2016**

Prepared by,



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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 Clothings 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. Sub-section 1.2: Brief review of ZWC in 2014

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.

At the beginning of 2014, ZWC collaborated with Life Line Clothing (LLC) Sdn Bhd to introduce a used clothes collection program which had expanded rapidly in year 2014 that saw the collection of more than 30 ton of used clothes and waste textile. At the end of the year, ZWC formed partnership with TSP Waste Management to kick off a wood waste separate collection system for energy recovery which is implemented smoothly with about 5-6 ton/month capacity.

In 2014, ZWC actively participated in several road show/exhibition and conference as well as visits to other facilities. In Feb, ZWC participated in an eco-conference in UMS with a paper presentation. In April, ZWC carried out a road show program, while in June, ZWC set up an exhibition booth in one higher education research event in UPM. In Dec, ZWC obtained several awards in conjunction with the UMCARES Summit/exchange conference. In August, ZWC also participated in ASEP 2014 in China. In Sept, ZWC stood at one of the booths under UM in IGEM2014. ZWC appeared in local media such as Harian Metro, Utusan and Astro Awani. All these programs that ZWC participated enable the publicity and promotion of ZWC's activities.

By and large, 2014 marked a significant year for ZWC, especially in internal support and external smart partnership. ZWC is constantly looking for opportunity to overcome the challenge of informal recycling activities and waste data collection to further develop integrated waste management system in the campus of UM. At the moment, almost all the waste arise in UM campus are disposed of properly to sanitary landfills (Jeram and Bukit Tagar) as well as recycled or treated. Construction and demolition waste remains the single most challenging waste stream that disposal destination is unknown.

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. ZWC forms collaboration with Climb Optima, provider of RimbaKU, a home rotary in-vessel composter. One unit of RimbaKU was placed at ZWC for testing and showcase. In March, ZWC was invited by Dr. Nizam to UMT for presentation and assistance on development of composting facility at UMT on 25<sup>th</sup> March.

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 28<sup>th</sup> 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 18<sup>th</sup> August 2015. ZWC also collaborated with AIESEC to carry out some activities such as waste audit and technical visit to Jeram sanitary landfill on 28<sup>th</sup> July.

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 22<sup>nd</sup> March.

ZWC had carried out various capacity building program and exhibitions such as exhibition of UM ZWC in Tangkak on 5th Sept, exhibition of UM ZWC in conjunction with National Recycling Day on 12th Dec., capacity building program on composting to the staffs of MPS at pusat pengkomposan Bukit Lagong on 2nd Oct., awareness talk on food waste management to Rawang Bandar Country Homes community organized by Majlis Perbandaran Selayang, and exhibition of UM ZWC in conjunction with Karnival Mini Alam Sekitar by Majlis Perbandaran Kajang. The objective of these programs and exhibitions is to create awareness and spread the message on recycling and composting to the public. A briefing and training program on food waste segregation at source to all the care operators in UM was carried out in March.

ZWC visited to MPSJ biomass center on 12<sup>th</sup> Oct. for knowledge sharing and experience exchange after MPSJ visited ZWC in June 2015. Toward the end of 2015, ZWC received various visits from MQA, SIRIM, Iran municipalities, UMT, SWCorp, YTL sustainability group, UTM, RCOMM and Joto Okayama School.

In 2015, ZWC has composted and digested 54.14 ton of food waste and green waste at ZWC composting center, divert 63.68 ton of wood waste for energy recovery in a paper mill and recycle and reuse 39.92 ton of recyclable materials that include used clothes. ZWC also prepared/published 4 journal papers and 4 proceedings. The media appearance by ZWC was 14 times in year 2015 and over 50 major visits were happened in the year.

Year 2016 will be 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. The current UM waste transfer station beside the UM ZWC center will also be upgraded and extended. The intelligent recycle center is anticipated as the cornerstone to develop a formal recycling separate collection in the campus of UM.

*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 2016**

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

Sub-section 2.1: UM ZWC Center

Sub-section 2.2: UM ZWC intelligent recycle center

Sub-section 2.3: Baja Organik UM ZWC

Sub-section 2.4: Potential collaboration project

Sub-section 2.5: Media interview/appearance

Sub-section 2.6: Various visits to ZWC center

Sub-section 2.7: Knowledge sharing with local authorities and communities

Sub-section 2.8: Code of practice on food waste segregation at source

# Successful stories of Zero Waste Campaign (ZWC)

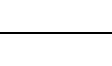
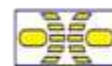
*“Sustainable & Integrated Waste Management Model”*



## Our Partners:



**JPPHB**



### Takakura Composting (2011)

- Research 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”



2010

2011

2012

2013

2014

2015

2016



### VeeCYCLE (2010)

- VeeCYCLE was initiated in 2009 to develop recycling collection with “PRO Bin”
- “Green Bag Scheme” was introduced in 2010 to encourage food waste segregation at source
- Launching of ZWC 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 ISEM2014 & UPM

### Intelligent Recycle Center (2016)

- Introduction of “Baja Organik UM ZWC”
- Establishment of UM ZWC Intelligent Recycle Center in the campus of UM
- UM ZWC center is on GoogleMap and Waze
- Set-up rainwater harvesting system at UM ZWC center

# UM Zero Waste Campaign: Year 2016



**Technology transfer: 2**



**Article /proceeding:**

1. Sumiani Yusoff. (2016) Lecture presented on Theory of composting, SWCorp, 23 March 2016.
2. Sumiani Yusoff (2016). "UM Zero Waste Campaign: Integrated waste management model development in UM campus", proceeding on 22 April 2016 in conjunction with UM#111 Earth Day
3. Sumiani Yusoff. (2016). Keynote lecture about Environmental WAQF: From Theories to Practices, Faculty of Economic and Administration UM, 24 May 2016.
4. Sumiani Yusoff (2016) – "Toward sustainable development and promoting integrated waste management", training program (TCTP) by INPUMA for Sudan officials
5. Sumiani Yusoff. (2016) "Dont Waste It, Just Taste It" Awareness lecture and capacity building, Mayabank International Corporate Responsibility Day, Maybank Tower, 20 August 2016.

- 1.) Food waste disposer contribution to UM ZWC center for trial and research in food waste size reduction prior to feeding to Cowtec AD
- 2.) Intelligent recycle center project to promote recycling among community in UM campus in collaboration with Coindex Sdn Bhd



**visits/interviews: > 50 (local & international)**



**policy paper/guideline: 2**

Proposed policy  
- Implementation of food waste segregation practice with introduction of clause related to food waste segregation in the contract agreement between UM and café operators

Proposed guideline (in collaboration with JPPHB and OSH UM)  
- Food waste segregation and collection in UM campus



**Network/linkage: 5**

- 1.) Collaboration program with Maybank International Dept for Maybank CSR Day on 20 Aug. 2016
- 2.) Collaboration with Food Aid Foundation on composting of food waste from food surplus
- 3.) Potential collaboration with FAM (Forum Air Malaysia) on food minimization policy formulation
- 4.) UM -UEM meeting and discussion on potential research and consultancy collaboration related to ZWC

- ✓ Interview by Harian Metro on 14 March 2016
- ✓ Interview by Oriental Daily (newspaper) on 28 March 2016
- ✓ Interview by TheMalayMail on 20 March 2016
- ✓ Media appearance (interview) by Astro Awani about issue of polystyrene packaging with AP. Dr. Sumiani Yusoff on 6th Jan. 2017
- ✓ Media appearance (interview) by Astro Awani about issue of biodegradable plastic packaging with AP. Dr. Sumiani Yusoff on 26th Jan. 2017
- ✓ Media appearance on TV1 on SWCorp food waste composting launching event at Fraser Hill on 1st Nov. 2016



**Media apperance: 3 newspapers & 3 on television**

- 1.) Seminar and demonstration on composting project at UM ZWC center to RCOMM and DBKL LA21
- 2.) Training and capacity building program on Takakura composting to community at Sunway SPK Damansara
- 3.) Training and capacity building program on Takakura composting to community at Eco Melawati
- 4.) Training on Takakura composting to Keepable cancer club

**Community engagement: 5  
5 sessions**





## Sub-section 2.1: UM ZWC Center

UM ZWC center has gained a new facelift in year 2016 with the new containers-style office set up in year 2015, new signboard, a new rainwater harvesting system, food waste grinder system and the soon to be ready intelligent recycle center. With the RMK-11 budget, there will be upgrading works for the UM ZWC center in year 2017 for concrete platform and structure for the composting site and extension of the waste storage area at the UM waste transfer station beside the UM ZWC center.

*Figure 2.0: UM ZWC center*

	UM ZWC center in 2016
	Composting site

Figure 2.1: Features at UM ZWC



Rainwater harvesting system



COWTEC anaerobic digestion system



Compost drying



Figure 2.2: Other features of UM ZWC

 A stainless steel food waste grinder mounted on a metal stand. It has a blue plastic collection bin underneath. The brand name 'OMIGA' is visible on the front of the unit. It is located outdoors near a green wall.	<p>Food waste grinder</p>
 A large, dark-colored metal dumpster or storage container. It has a red banner across the front that reads 'TSP WASTE'. Above the banner, the word 'RECYCLE' is partially visible. Two people are standing on top of the container, and there is a pile of wood waste on top.	<p>Wood waste storage</p>
 A large pile of brown, fibrous material, likely compost or mulch, in an outdoor setting. There are some blue and orange plastic bags and other debris scattered around the base of the pile. A person is visible in the background near the pile.	<p>Compost pile</p>

## Sub-section 2.2: UM ZWC intelligent recycle center

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. This intelligent recycle center is anticipated as the cornerstone to develop a formal recycling separate collection in the campus of UM.

*Figure 2.3: Proposed location for the IRC*

	<p>The location of UM ZWC IRC, at dewan kuliah A&amp;B, PASUM</p>
	<p>Meeting about UM ZWC IRC</p>



*Figure 2.4: Site visit and survey on the proposed IRC center location*

	<p>Discussion about the IRC location</p>
	<p>Measuring of the site</p>
	<p>Fabrication of the IRC in progress</p>

Figure 2.5: Completion of the IRC center



Completion of the IRC center  
at dewan kuliah A&B PASUM



UM ZWC IRC






Group photo in front of the  
IRC

### Sub-section 2.3: Baja Organik UM ZWC

The principal coordinator of UM ZWC, Assoc. Prof. Dr. Sumiani Yusoff was invited to Received “Green Era Award” on behalf of UM in conjunction with the Green Economy Forum in Berlin, Germany on 22-Mar 2015.

Figure 2.6: Baja Organik UM ZWC

	<p>Baja Organik UM ZWC sell for RM5/kg</p>
	<p>The matured raw compost, to be grinded into finished compost</p>
	<p>The finished compost</p>



#### Sub-section 2.4: Potential collaboration project

In 2016, UM ZWC was engaged by Maybank International department for collaboration for their Global CR Day in August 2016. With the collaboration, Maybank bought about RM2,000 worth of compost from UM ZWC, and funded the operation cost for ZWC for the CR Day event. The compost is used for their roof top urban farm at Menara Maybank. Besides Maybank, several organizations such as FAM (Forum Air Malaysia), Food Aid Foundation and RCOMM Lestari had visited UM ZWC for potential collaboration projects.

*Figure 2.7: Collaboration with Maybank for Global CR Day*

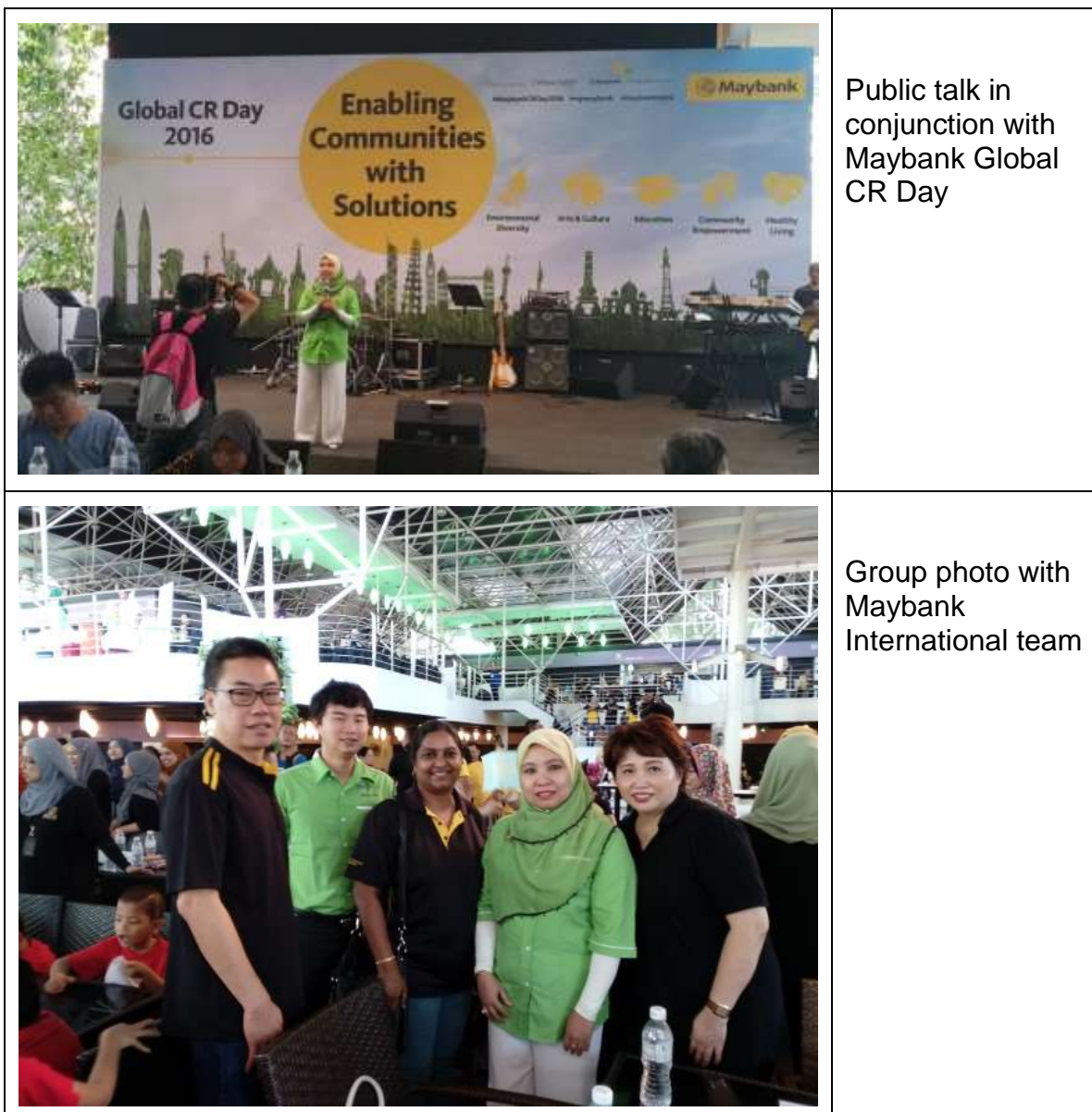


Figure 2.8: Meeting with potential collaborators

 A group of five people standing in a hallway. From left to right: a woman in a green hijab and purple top, a woman in a light purple hijab and patterned dress, a woman in a dark purple blazer, a man in a dark blue polo shirt, and a man in a white button-down shirt. They are all smiling at the camera.	<p>Meeting with FAM (Forum Air Malaysia)</p>
 A group of four people standing in a hallway. From left to right: a woman in an orange hijab and colorful patterned top, a woman in a blue hijab and striped top, a woman in a pink hijab and orange patterned dress, and a man in a light blue striped shirt. They are all smiling at the camera.	<p>Meeting with Food Aid Foundation</p>
 Three people sitting around a small table in a meeting room. A woman in a yellow hijab is on the left, a man in a maroon shirt is in the middle, and a woman in a blue hijab is on the right. There is a laptop, papers, and a plate of food on the table.	<p>Meeting with RCOMM Lestari</p>

### **Sub-section 2.5: Media interview/appearance**

There were a total of six (6) interviews to UM ZWC by media and media appearance in year 2016:

1. Interview by Harian Metro on 14 March 2016
2. Interview by Oriental Daily (newspaper) on 28 March 2016
3. Interview by TheMalayMail on 20 March 2016
4. Media appearance (interview) by Astro Awani about issue of polystyrene packaging with AP. Dr. Sumiani Yusoff on 6th Jan. 2017
5. Media appearance (interview) by Astro Awani about issue of biodegradable plastic packaging with AP. Dr. Sumiani Yusoff on 26th Jan. 2017
6. Media appearance on TV1 on SWCorp food waste composting launching event at Fraser Hill on 1st Nov. 2016

The interviews are about various environmental issues especially in waste management and recycling.

Figure 2.9: Interview by various media (1)







	<p>Media interview by Harian Metro</p>
	<p>Live interview by Astro Awani about biodegradable plastic</p>
	<p>Live broadcasting of interview about waste separation at source</p>



Figure 2.10: Interview by various media (2)

	<p>Photographer was taking picture</p>
	<p>Interview by Astro Awani again</p>
	<p>Interview by Oriental Daily</p>



### Sub-section 2.6: Various visits to ZWC center

There are various visitors to ZWC facilities in the year of 2016 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 ZWC in 2016*

No.	Visits/interviews	Date
1.	Visit by University of Nottingham students	4 <sup>th</sup> March
2.	Visit by UMCares on 2 <sup>nd</sup> April	2 <sup>nd</sup> April
3.	Visit by UM students on 23 <sup>rd</sup> April (UM ZWC open day)	23 <sup>rd</sup> April
4.	Media interview by Harian Metro on 14 <sup>th</sup> March	14 <sup>th</sup> March
5.	Visit by UIA students on 18 <sup>th</sup> March	18 <sup>th</sup> March
6.	Visit by SWCorp and local authorities on 23 <sup>rd</sup> March and 4 <sup>th</sup> May	23 <sup>rd</sup> March
7.	Visit by API lecturer on 17 <sup>th</sup> June	17 <sup>th</sup> June
8.	Visit by Dr. Norbani from Faculty Economy on 18 <sup>th</sup> July	18 <sup>th</sup> July
9.	Visit by UNMC campus services on 22 <sup>nd</sup> July	22 <sup>nd</sup> July
10.	Visit by official from Sudan on 23 <sup>rd</sup> May	23 <sup>rd</sup> May
11.	Visit DBKL LA21 and local communities on 1 <sup>st</sup> June	1 <sup>st</sup> June
12.	Visit by Politeknik Shah Alam on 19 <sup>th</sup> Feb.	19 <sup>th</sup> Feb.
13.	Visit by Taiwan students on 8 <sup>th</sup> Sept	8 <sup>th</sup> Sept
14.	Visit by UM environmental engineering students on 1 <sup>st</sup> Aug and 20 <sup>th</sup> Sept	1 <sup>st</sup> Aug
15.	Visit by UKM on 21 <sup>st</sup> Sept.	21 <sup>st</sup> Sept.

16.	Media interview by Oriental Daily on 28 <sup>th</sup> March	28 <sup>th</sup> March
17.	Visit by MUST students on 17 <sup>th</sup> May	17 <sup>th</sup> May
18.	Visit by Maybank on 29 <sup>th</sup> April	29 <sup>th</sup> April
19.	Visit by ISB students on 4 <sup>th</sup> May	4 <sup>th</sup> May
20.	Visit by De Kompos KK12 on 13th May	13th May
21.	Visit by students from HELPS University on 8th Sept.	8th Sept.
22.	Visit by students from Shibata School on 14th Sept.	14th Sept.
23.	Visit by CMEC reps. on 8th Dec. 2016	8th Dec
24.	Visit by COWTEC ® technical team on 27th Dec. 2016	27th Dec.
25.	Visit by students from API for recycling project on 3rd March 2017	3rd Mar.
26.	Visit by students from UIA (International Islamic University)	3rd Mar.
27.	Visit by CMEC on potential collaboration on 23rd Feb. 2017	23rd Feb.
28.	Visit by CMEC reps. on 8th Dec. 2016	8th Dec.
29.	Visit by COWTEC ® technical team on 27th Dec. 2016	27th Dec.

In 2016, ZWC also organized visit to several places such as:

1. Eco Greater Melawati
2. TSP Waste Management power plant
3. Sunway SPK Damansara
4. Keepable cancer club
5. SWCorp food waste composting launching event at Fraser Hill

Figure 2.11: Visitors to ZWC center (1)



Visit by De Kompos from KK4



Visit by University of Nottingham Malaysia



Visit by UMCares



Figure 2.12: Visitors to ZWC center (2)

	<p>Visit by Maybank International team</p>
	<p>Visit by students from UIA</p>
	<p>Visit by students from JKA</p>



Figure 2.13: Visitors to ZWC center (3)

	<p>Visit by student from Politeknik Shah Alam</p>
	<p>Visit by visitors from Sudan</p>
	<p>Visit by students from Taiwan</p>

Figure 2.14: Visitors to ZWC center (4)



Visit by students from UKM



Visit by students from  
MUST



Visit by UMCares



Figure 2.15: Visitors to ZWC center (5)

	<p>Visit by DBKL LA21</p>
	<p>Visit by students from UM</p>
	<p>Visit by students from HELP University</p>

Figure 2.16: Visitors to ZWC center (6)



Visit by Freund Global for installation of food waste grinder



Visit by students from Heriot-Watt university



Visit by technical team from COWTEC Thailand



Figure 2.17: Visitors to ZWC center (7)

	<p>Visit by AIESEC international exchange</p>
	<p>Visit by students from JKA</p>
	<p>Visit by SWCorp and local authorities</p>

Figure 2.18: Visit to other places



Visit to the Fraser Hill seminar on food waste management



Training to Keepable Cancer club of UM



Visit to Eco Greater Melawati education center



Figure 2.19: Visitors to ZWC center (8)

	<p>Visit by students from FKUM</p>
	<p>Visit by students from Faculty Sains</p>
	<p>Visit by students from Faculty of Built Environment</p>

Figure 2.20: Visitors to ZWC center (9)

 A group of four women are standing in a hallway. The woman on the far left is holding a red folder. They are positioned next to a large poster titled 'Sustainability' and 'SUSTAINABILITY RESEARCH CLUST'. The poster also mentions 'Sustainable for 2030'.	<p>Visit by CMEC</p>
 Three people are standing in front of a green and white sign that reads 'UM Cowtec Anaerobic Digestion'. The sign also features logos for 'UNIVERSITI MALAYSIA JOHORE' and 'JPPHB'. There are some large blue and white containers in the background.	<p>Visit by KK4</p>
 A group of seven people, including students and a staff member, are standing in front of the same 'UM Cowtec Anaerobic Digestion' sign. They are all smiling for the photo.	<p>Visit by students from JKA</p>

## Sub-section 2.7: Knowledge sharing with local authorities and communities

In 2016, UM ZWC had formed collaboration with several communities such as Sunway SPK Damansara and Eco Melawati. With the UMCares KTP grant and in collaboration with RCOMM Lestari, UM ZWC transferred the knowledge of composting to those communities. These communities learnt on how to make compost from food waste and use the compost for their urban farms.

*Figure 2.21: Community training to Sunway SPK Damansara*

	<p>With the community reps</p>
	<p>Dr. Sumiani did a demonstration of composting to Jespal of SPK Damansara</p>



Figure 2.22: Community training to Sunway SPK Damansara (2)



Meeting with the residents from Sunway Damansara



Demonstration of composting method



Demonstration of composting method by Jaron

Figure 2.23: Community training to Sunway SPK Damansara (3)



Jespal was learning about the composting



Outputs from the composting



Crops such as chilli grown from the compost



*Figure 2.24: Community engagement with Eco Greater Melawati*



Group photo with the committees



Discussion at the education center



Inside the education center



## Sub-section 2.8: Policy on food waste segregation at source

A draft food waste segregation at source policy was prepared and incorporated in the tenancy agreement with the café operators of UM. A capacity building and training program with all the café operators of UM had been carried out on 23<sup>rd</sup> March 2016. Distribution of plastic bag and bins for food waste segregation and storage had been carried out in January and February of 2016.

*Figure 2.25: Food waste segregation by kitchen staffs*

	<p><i>Food waste is segregated in food waste bin</i></p>
	<p>Segregated food waste</p>

Figure 2.26: New poster of food waste segregation at source



Figure 2.27: Guideline on food waste segregation for café operators



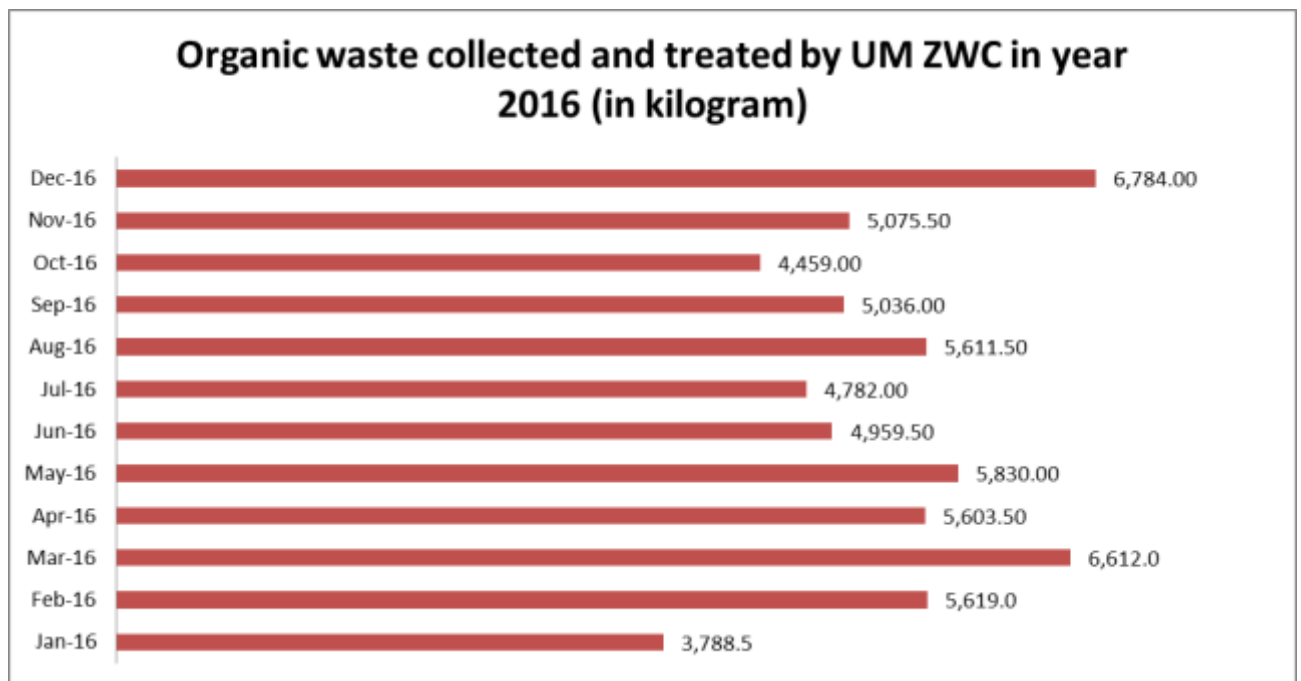
## Section 3: Recycling data and challenges faced

### 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:

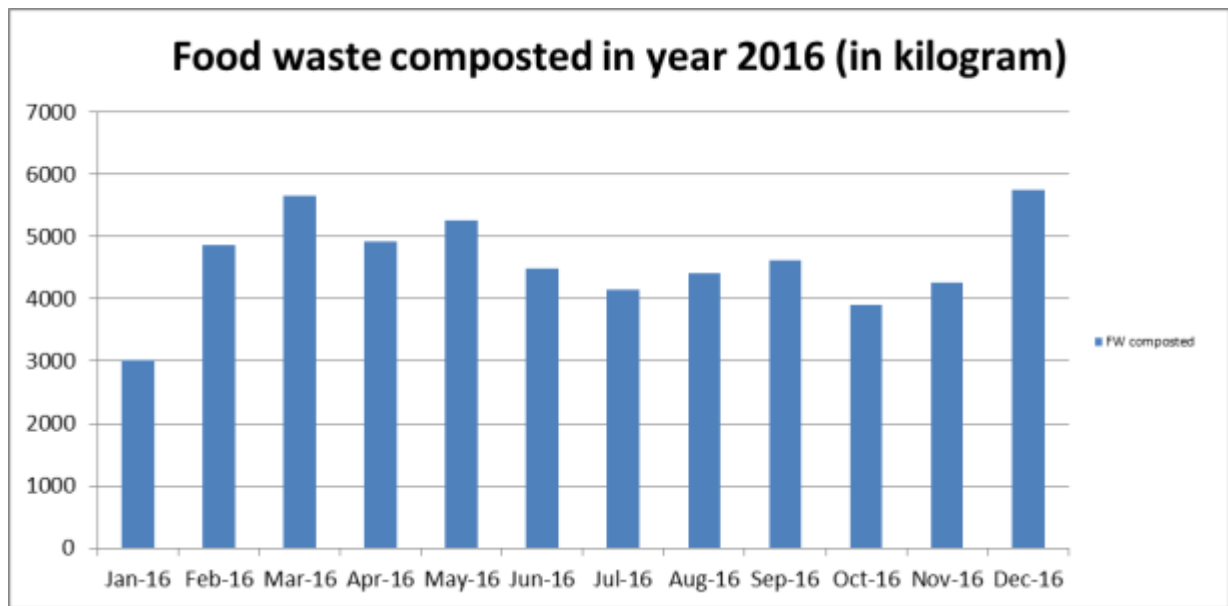
1. Food waste collected for composting or anaerobic digestion
2. Green waste collected for composting
3. Wood waste collected for energy recovery
4. Waste textiles collected for reuse/recycle
5. E-waste collected at ZWC site for recycling/recovery
6. Recyclable materials sorted at UM ZWC site and UM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

*Figure 3.0: Total organic waste (food & green waste) collected in 2015 (in kilogram)*



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

*Figure 3.1: Total food waste composted in 2016*



*Figure 3.2: Total food waste digested in 2016*

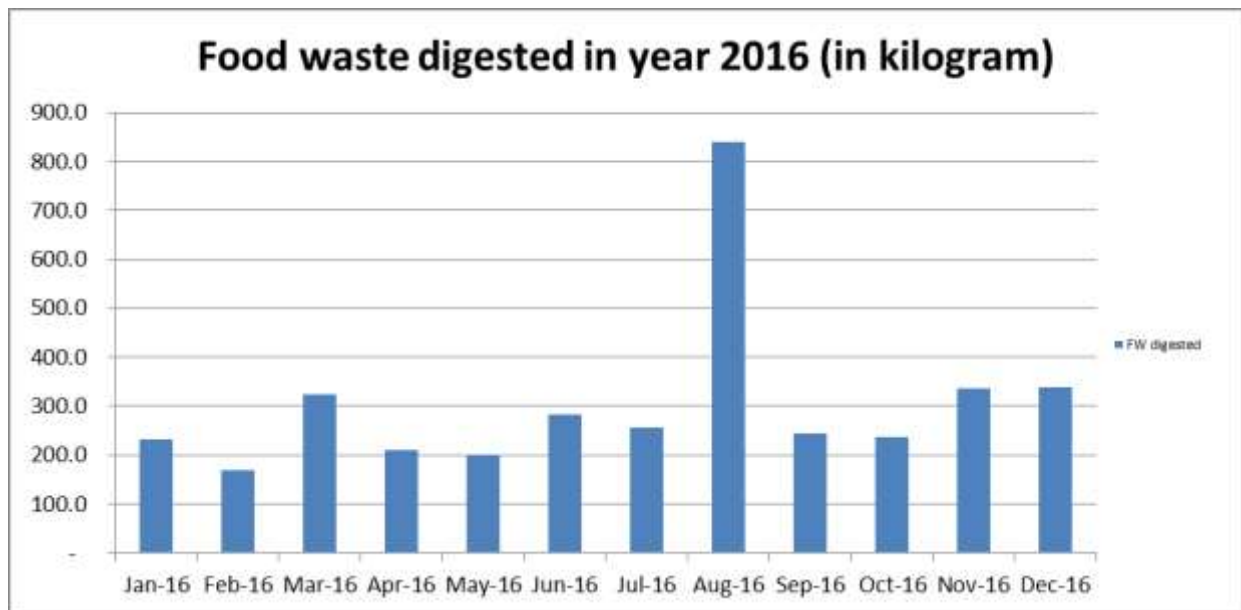




Figure 3.3: Total green waste composted in 2016

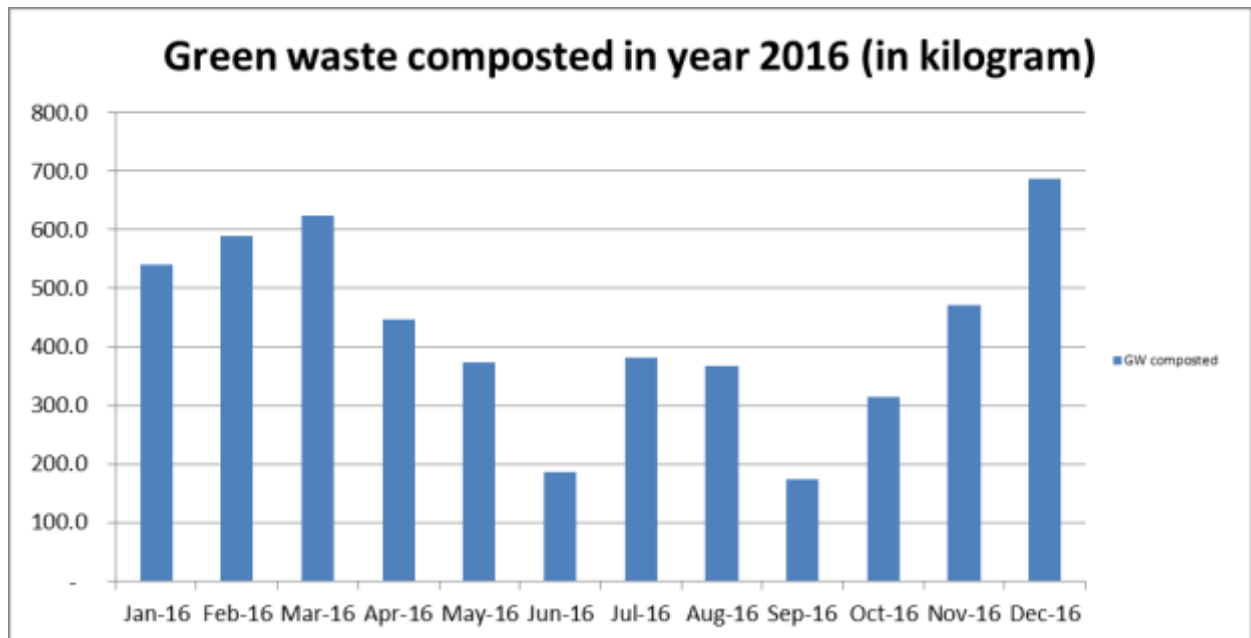


Figure 3.4: Total wood waste collected in 2016



Figure 3.5: Total used clothes collected in 2016



Figure 3.6: Waste recycling and treatment data profile of year 2016

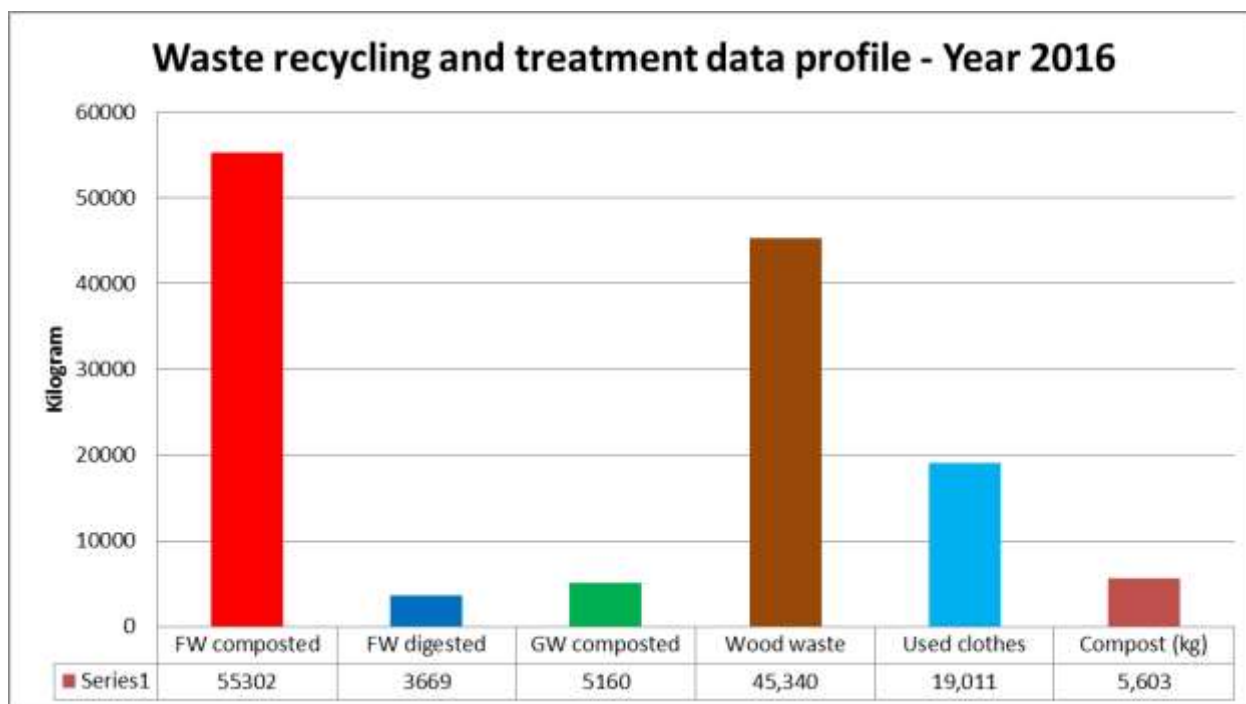


Figure 3.7: Residual and landscape waste disposed to landfill

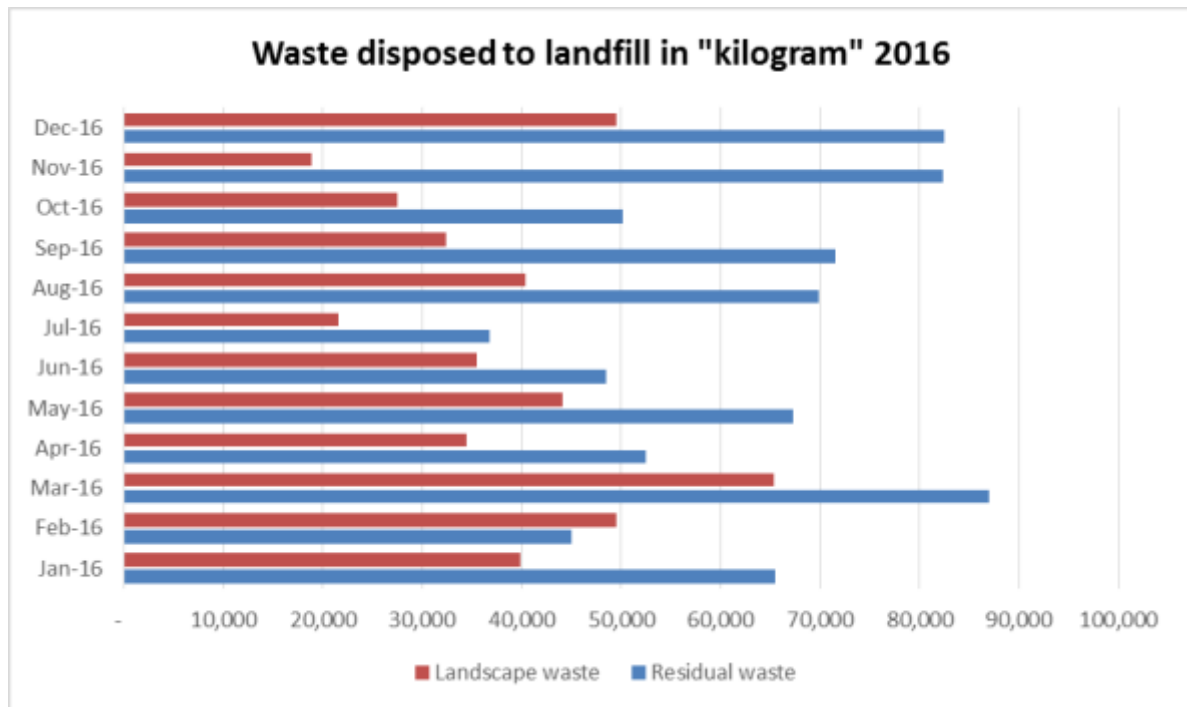


Figure 3.8: Total waste recycled and treated by UM ZWC

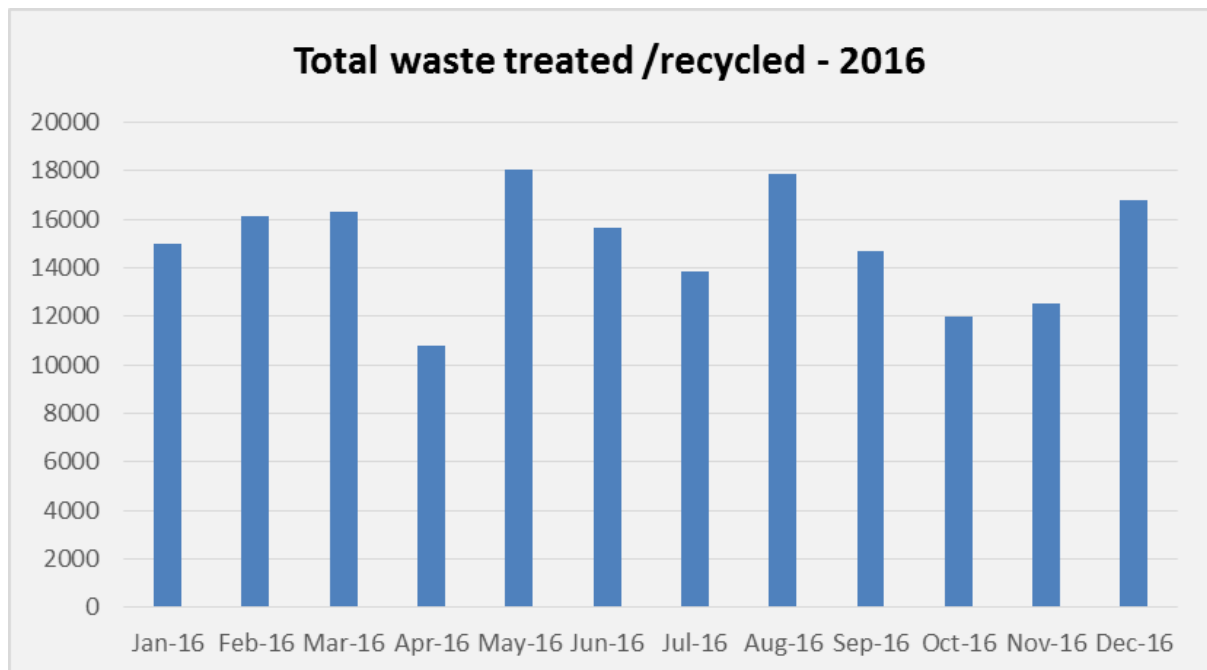


Figure 3.9: Municipal organic waste treatment by UM ZWC (2012-2016)

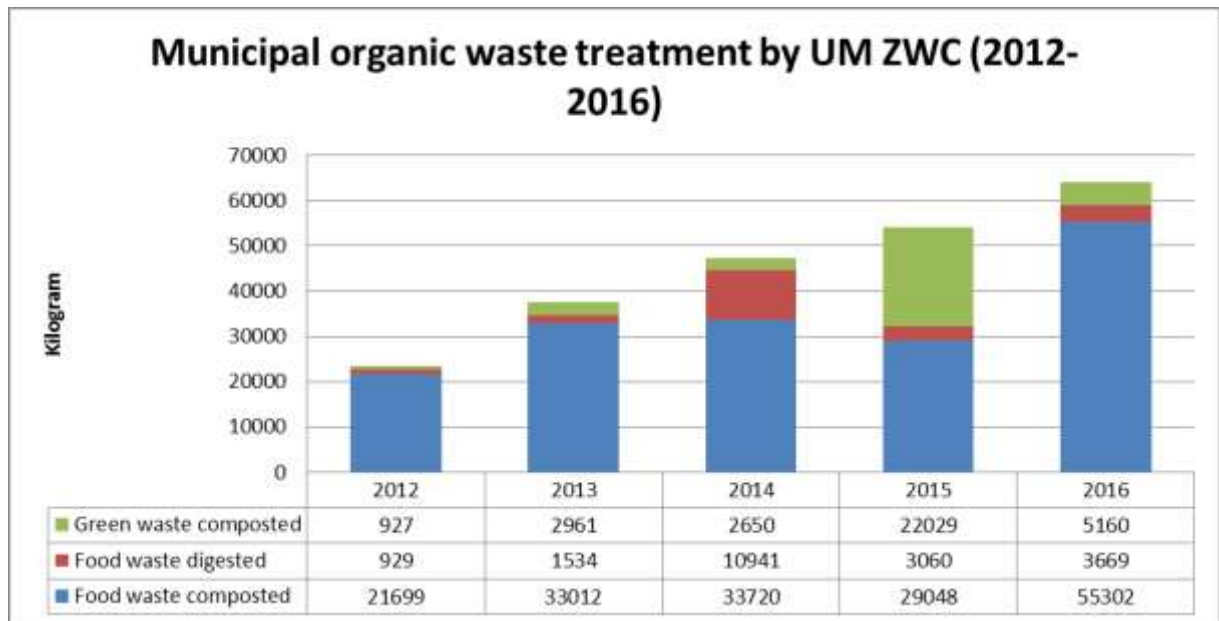
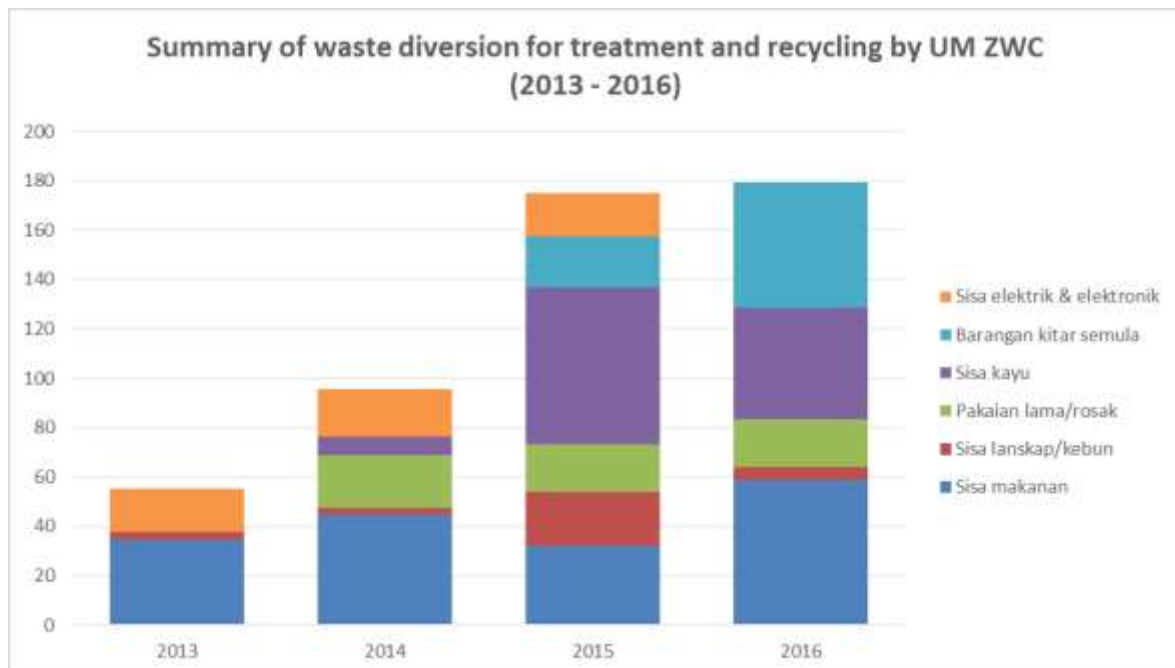


Figure 4.0: Summary of waste diversion for treatment and recycling by UM ZWC (2013-2016)





### **Sub-section 3.2: Challenges and proposed projects in 2016**

The primary problem faced by ZWC at the moment is the challenge to obtain full commitment and cooperation from all cafe operators to segregate food waste for the continuity of ZWC's composting operation which is the key KPI to achieve the organic waste recycling target. Currently, the workers have to sort out food waste (about 100-400kg per day) manually.

The second challenge faced is the high nutrient loss (evaporation) of the existing open air composting method which results in 90% of mass loss and thus not effective in compost production. The next challenge is the lack of linkage of ZWC to researchers who are interested to carry out research related to organic waste treatment.

The other 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.

Other issues are:

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)
2. Cleanliness issue at ZWC site, which caused by cleansing activities of waste collection trucks: In progress to build an extension of waste bins storage area with RMK-11 budget
3. Drainage system and floor trap at ZWC site needs to be upgraded and improved: In progress to repair area with RMK-11 budget
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
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

**Separation of food waste at source is not widely practice by cafe operators in UM campus**

**Shredder capacity is very small (3 hp), resulted in low tonnage of green waste shredding and composting**

**ZWC site needs upgrading works**

**Recycling activities in the campus is not integrated and thus no systematic data collection**

The key findings are:

- 1.) Recycling data from all the PTj in UM campus, especially from janitors, is indeed important for accurate and comprehensive recycling rate calculation. If the recycling activities by janitors and other staffs/parties/students can be controlled, the recycling rate of the campus is as high as 15-20%. The intelligent & automated recycle center that going to be introduced soon, will assist to increase the recyclable capture rate to certain extent.
- 2.) Composting of green waste is very minimal at 1-2%, despite the ZWC workers do shredding of green waste every day; because the capacity of ZWC's shredder is very small (2 HP) and only a very small portion of green waste can be shredded for composting. A larger capacity shredder is needed to increase the green waste composting.
- 3.) There is huge room of improvement for food waste separate collection, judging from the fact that only about 10-20% of total food waste in UM is actually segregated for composting. This is a very challenging matter, as requires cooperation from all cafe operators to segregate their food waste, which require constant monitoring and enforcement.

### Proposal for year 2017

1. Operation and promotion of UM ZWC intelligent recycle center as a central recycling drop-off facility in UM campus
2. Increase the composting capacity for green waste (from the current 1.5 ton/month to 5 ton/month) with larger chipper-shredder machine from JPPHB
3. Upgrade the UM ZWC site and UM waste transfer station with RMK-11 budget

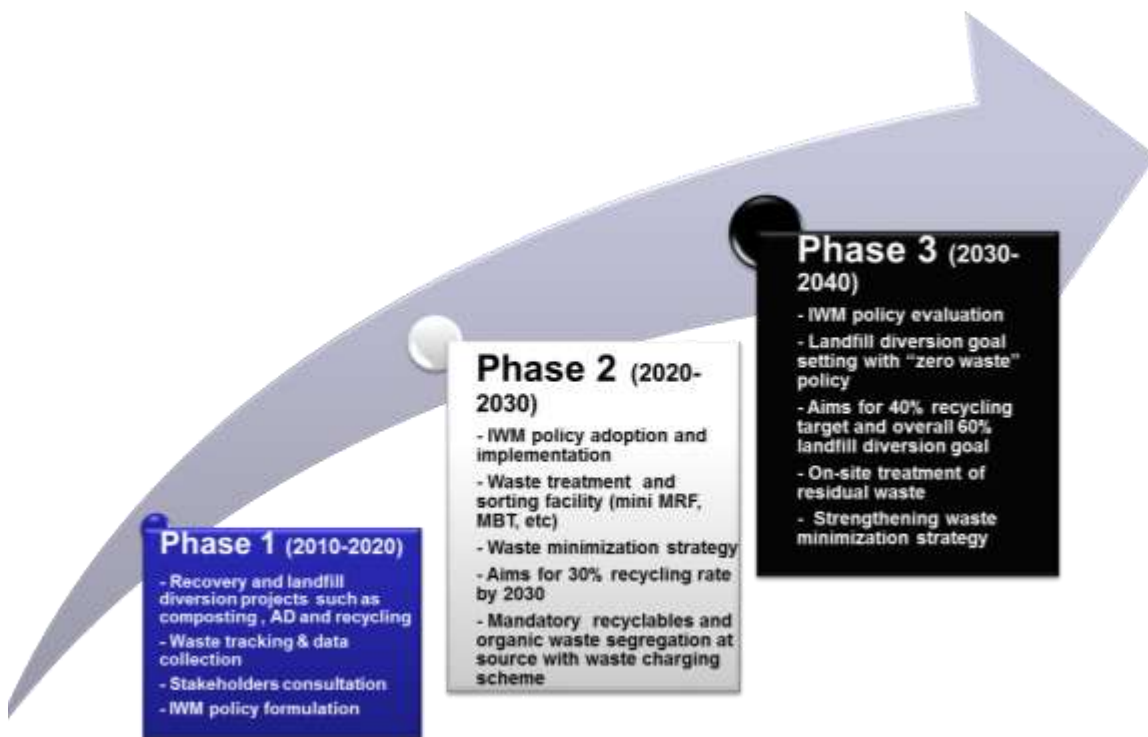
### Proposal for 2018 and beyond (short term: 5 years)

1. Set-up UM ZWC as a permanent educational center (e.g. “unit”) under an existing UM’s department/cluster (such as SuSci) which can also serve as public education center for integrated/holistic waste management / best practice in recycling/waste treatment
2. Identify a larger area nearby for project development for the open air windrow composting with larger capacity (> 10 ton per month); and buy a compost turner machine for semi-mechanization of the composting aeration process
3. Obtain formal government approval (JPSPN) for UM ZWC center as a government authorized waste treatment facility (e.g. communal composting)

### Proposal for 2018 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. Sale of organic fertilizer (Baja Organik UM ZWC) – Current
2. Recycling revenue from UM ZWC intelligent recycle center – This year's plan
3. Entrance fee for educational tour/visit to UM ZWC center (potential)
4. Training course on integrated waste management strategy for campus-level (potential)



## **Section 4: Conclusion**

2016 was a year of transition development for UM ZWC, from projects based level campaign to a campus level campaign with diversified projects of recycling and waste treatment. New features such as weighing station, large capacity shredder, intelligent recycle center, etc, the total waste diverted had increased from year to year since campaign inception in 2011. Besides, with policy and guideline on waste segregation at source and separate collection of certain waste such as wood waste, a larger quantity of wastes have been reduced from disposal in landfill. With extension of land area for composting, a larger composting capacity is expected in year 2017.

Furthermore, UM ZWC center has garnered attention and interest from various parties and organization for educational visits and knowledge sharing. Since year 2015, UM ZWC received more than 70 to 80 visits in a year. UM ZWC has been turned into an educational center for integrated waste management, and constantly exploring alternative technologies for wastes conversion into useful products and energy.

## Appendix A: Photos of ZWC facilities and activities



Compost drying



Compost packing



Compost grinding



Compost piles



Workers in operation



Workers in operation





Turning of compost piles  
(aeration)







Food waste grinder



Food waste before grinding



Grinded food waste



COWTEC anaerobic digester



Food waste for COWTEC AD



Feeding of food waste into the AD



Weighing of food waste



Source segregated food waste



Compost piles





View of the front of UM  
ZWC center



Compost piles



Packing of grinded compost





Wood waste collection by TSP



Green waste shredding



Shredded green waste



Wood waste transferring



Feeding of food waste into compost pile

## **Appendix B: Letters of visits and collaborations**