



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

**Annual Report 2015**

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.



*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

# Successful stories of Zero Waste Campaign (ZWC)

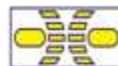
*"Sustainable & Integrated Waste Management Model"*



## 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"
- Introduction of "Baja Ria"



## 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 IGEM2014 & UPM



*"UM is the first university I've seen that has implemented Takakura composting for its food waste and develops an integrated waste management model in campus. In Japan, no university has embark on similar effort yet. Well done!"*  
 Prof. Koji Takakura (18/8/2015)

## **Section 2: Highlights and Achievements in 2015**

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

Sub-section 2.1: UM ZWC new cabin-concept office

Sub-section 2.2: MOU Signing with SWCorp on development of IWM in campus

Sub-section 2.3: Received Green Era Award on behalf of UM VC

Sub-section 2.4: Installation of weighbridge station at ZWC center

Sub-section 2.5: Media interview/appearance on TV and newspaper

Sub-section 2.6: Various official visits to ZWC center

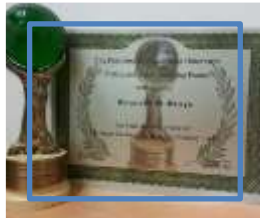
Sub-section 2.7: Collaboration with Climb Optima on in-vessel composter

Sub-section 2.8: Knowledge sharing with local authorities and communities

Sub-section 2.9: Policy on food waste segregation at source

Sub-section 3.0: Wood waste separate collection

# UM Zero Waste Campaign: Year 2015



**Award: 1**

Received "Green Era Award" on behalf of UM in conjunction with the Green Economy Forum in Berlin, Germany on 22-Mar 2015

- 1.) SWCorp: ZWC model development
- 2.) Climb Optima: In-vessel composter
- 3.) Nuinfra Mutiara/UMT: Feed mill research



**Network/MOU: 3**



**visits/interviews: > 40 (local & international)**

## 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



**policy paper/guideline: 2**

- CETDEM (Centre for Environment, Technology and Development Malaysia)
- NGO Kenanga Waja (environment and charity NGO)
- Chow Kit kids
- Food waste awareness to Rawang communities
- Composting training to MPS (Majlis Perbandaran Selayang)

**Community engagement : 5 sessions**



**Published article /proceeding paper: 2 ISI journal & 4 proceedings**

- 1.) Chee Guan Ng & Sumiani Yusoff, 2015. Assessment of GHG emission reduction potential from source-separated organic waste (SOW) management: Case Study in a higher educational institution in Malaysia. Sains Malaysiana 44(2)(2015): 193-201 (**ISI-indexed**)
- 2.) Chee Guan Ng & Sumiani Yusoff, 2015. Life cycle inventory of institutional medium-scaled co-composting of food waste and yard waste in tropical country. Sains Malaysiana 44(4)(2015): 517-527 (**ISI-indexed**)

- ✓ TheStar, 2<sup>nd</sup> March 2015 : Star2, Waste Watch: Universiti Malaya maximizes recycling to minimize its waste
- ✓ Oriental Daily, 24<sup>th</sup> July 2015 : Promote composting from food waste
- ✓ Utusan, 29<sup>th</sup> May 2015 : Pengasingan sisa di rumah mulai 1 Sept
- ✓ NSTP, 29<sup>th</sup> May 2015 : UM signs MoU for a greener campus
- ✓ Harian Metro, 29<sup>th</sup> May 2015 : Perkasa aktiviti kampus hijau
- ✓ Berita Harian, 29<sup>th</sup> May 2015 : Perhebat kesedaran kitar semula
- ✓ SinChew, 29<sup>th</sup> May 2015 : Launching of Zero waste campaign in UM
- ✓ Interview by Astro Awani on food waste segregation program (TV) on 17<sup>th</sup> April 2015
- ✓ Interview by Astro Awani on home composting (TV) 23<sup>rd</sup> June 2015
- ✓ theStar: Zero waste prog in Rawang: 12<sup>th</sup> Oct. 2015
- ✓ Sinar Harian: Prog asing sisa makanan jadi baja: 17<sup>th</sup> Oct. 2015
- ✓ Nan Yang Press on waste issues: 6 – 9 Nov. 2015
- ✓ Berita Harian: ZWC Pelihara Alam Sekitar: 6<sup>th</sup> Nov
- ✓ Interview by SWCorp on ZWC on 13<sup>th</sup> Nov. 2015



**Media apperance: 11 newspapers & 3 interviews**

### Sub-section 2.1: UM ZWC New Cabin-Concept Office & Gallery

The Deputy Vice Chancellor (Development) Office had allocated funding to build a cabin/container-concept office for ZWC at the existing site of ZWC. Since early 2015, a few meetings were carried out with JPPHB to discuss about the office building and a contractor was appointed. Three containers were sent to ZWC in March for the construction. Three (3) units of used containers were used to construct the ZWC center. Therefore, the entire building is based on a reuse concept.

*Figure 2.0: Installation of the used containers into the ZWC center*




	One of the containers
	Installation of the containers
	Retrofitting of the containers into ZWC center



Figure 2.1: Several views of ZWC center

 A photograph showing the front view of a green, single-story building with a grey roof. The building has several windows and a small entrance. In front of the building, there are several large, colorful plastic drums (orange, blue, and green) and some smaller containers. The background shows lush green trees under a blue sky with scattered clouds.	<p>Front view of the ZWC center</p>
 A photograph showing a side view of the green building. A prominent feature is a glass-enclosed structure, possibly a staircase or an entrance, with a grey roof. To the right, there are more colorful plastic drums and a white tent. A tall utility pole is visible in the background against a clear sky.	<p>Side view of the ZWC center</p>
 A photograph showing a green industrial machine, identified as a COWTEC anaerobic digestion unit, located at the corner of the building. The machine is surrounded by several large, colorful plastic drums (blue, yellow, and white). A sign on a stand in front of the machine reads "UM Cowtec Anaerobic Digestion" and features logos for UM, JPM, and BIC. A white tent is partially visible on the right side of the image.	<p>COWTEC anaerobic digestion unit at the corner of the building</p>

Figure 2.2: Signboards installed at ZWC center

 A green and white signpost stands in a landscaped area with trees and a paved path. The sign reads "University Malaya Zero Waste Campaign" and features logos for UM, JPPMB, and ZWC.	<p>The front signage</p>
 A green and white signpost is located in an open area with a white container and trees in the background. The sign reads "Sisa Kayu / Perabot Kayu Sahaja" and features logos for UM, JPPMB, and ZWC. A timestamp "03/04/2015 10:01" is visible in the bottom right corner.	<p>The signage for wood waste collection and storage</p>
 A green and white signpost stands in a field with large piles of brown compost in the background. The sign reads "UM ZWC Composting Center" and features logos for UM, JPPMB, and ZWC.	<p>The signage for composting site</p>



Figure 2.3: Some machineries and bins at UM ZWC

	<p>Compost grinder</p>
	<p>660L wheelie bins for e-waste collection</p>
	<p>Biogas shredder</p>



## Sub-section 2.2: MOU Signing with SWCorp on development of IWM in UM

UM and SWCorp (Solid Waste Corporation) are embarking on a collaboration on integrated waste management research and development in a campus level. There will be a MOU (memorandum of understanding) signing ceremony between UM and SWCorp, on 28<sup>th</sup> of May 2015. After 6 years of integrated waste management development campaign, a new ZWC building was set up by DVC (Development) to institutionalize the projects under ZWC. The building was completed in May 2015 and the official launching of ZWC was held on 28<sup>th</sup> May 2015. The purpose of the MOU signing is to form collaboration and research in integrated waste management related projects between the two parties.

*Figure 2.4: MOU signing ceremony*



Exchanging of MOU documents by Prof. Dato' Dr. Mohd. Amin Jalaludin, VC of UM and CEO of SWCorp Datuk Ab. Rahim Bin Md. Noor



During the signing of the MOU

Figure 2.5: Official launching of the new ZWC center

	<p>Visit to the ZWC gallery</p>
	<p>Explanation of the Cowtec AD</p>
	<p>The launching of new ZWC center by YBhg. Datuk Haji Mohammad Bin Mentek, Secretary-General of Ministry of Urban Well-Being, Housing and Local Government</p>

Figure 2.6: Visit to ZWC Cowtec AD site

	<p>Explanation of Baja Organik UM ZWC</p>
	<p>Visit to the Cowtec AD</p>
	<p>Visit to the in-vessel composter, RimbaKU</p>



Figure 2.7: Visit to ZWC composting site

	<p>Viewing of the compost mixing and turning</p>
	<p>Wood chipper</p>
	<p>Group photo</p>

### Sub-section 2.3: Received Green Era Award on behalf of UM VC

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 2.8: Received “Green Era Award”

	<p>“Green Era Award”</p>
	<p>Green Era Award photo taking with Dato' VC of UM</p>
	<p>Green Era Award certificate and trophy</p>

#### Sub-section 2.4: Installation of weighbridge station at ZWC center


A 40-ton weighbridge station was installed at the entrance of UM waste transfer station by JPPHB to capture all the net weights of payload of trucks go in and out of the site. A desktop and printer were installed at the ZWC center for the daily weighing operation.

*Figure 2.9: The 40-ton weighbridge station*

	<p>TSP truck passed through the weighbridge station</p>
	<p>Desktop and printer for the weighing</p>



Figure 2.10: Audit and certification by Metrology Department

	<p>Metrology Dept. truck</p>
	<p>Certificate for the weighbridge station</p>
	<p>Weighbridge ticket</p>

## **Sub-section 2.5: Media interview/appearance on TV and newspaper**

There were a total of 14 interviews to UM ZWC by media and media appearance in year 2015:

1. TheStar, 2nd March 2015 : Star2, Waste Watch: Universiti Malaya maximizes recycling to minimizes its waste
2. Oriental Daily, 24th July 2015 : Promote composting from food waste
3. Utusan, 29th May 2015 : Pengasingan sisa di rumah mulai 1 Sept
4. NSTP, 29th May 2015 : UM signs MoU for a greener campus
5. Harian Metro, 29th May 2015 : Perkasa aktiviti kampus hijau
6. Berita Harian, 29th May 2015 : Perhebat kesedaran kitar semula
7. SinChew, 29th May 2015 : Launching of Zero waste campaign in UM
8. Interview by Astro Awani on food waste segregation program (TV) on 17th April 2015
9. Interview by Astro Awani on home composting (TV) 23rd June 2015
10. Oriental Daily, 23rd June 2015: Food waste composting methods
11. TheStar, 12th Oct. 2015: Toward zero waste in Rawang
12. Berita Harian, 6th Nov. 2015: Mahasiswa dituntut memelihara alam sekitar
13. Nan Yang press, 7th Nov. 2015: Waste management issues
14. Interview by SWCorp on UM UM Zero Waste Campaign on 13th Nov. 2015

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



Figure 2.11: Interview by Astro Awani

	<p>Interview about polystyrene issue</p>
	<p>Interview about polystyrene packaging issue</p>
	

Figure 2.12: Interview by TheStar




 A man in a light blue shirt is sitting at a conference table, pointing at a laptop screen. A woman in a yellow hijab is seated across from him, looking at the screen. In the background, a large screen displays a presentation slide. The room has large windows and several other chairs.	<p>Presentation about ZWC</p>
 A group of people are in a kitchen. A man in a white polo shirt and a woman in a blue floral hijab are standing. Another man in a blue shirt is holding a camera. There are red and black trash bins in the foreground. A timestamp "04/02/2018 14:10" is visible in the bottom right corner.	<p>Visit to kitchen</p>
 A group of people are sitting around a table in a restaurant. A man in a dark shirt is talking to a woman in a blue floral hijab. There are drinks and papers on the table. A timestamp "04/02/2018 14:17" is visible in the bottom right corner.	<p>Interview restaurant owner</p>

Figure 2.13: MOU Signing event

	<p>Part of the media activities</p>
	<p>Part of the media activities</p>
	<p>Part of the media activities</p>



Figure 2.14: Other interviews

	<p>Interview on home composting</p>
	<p>Interview by Oriental Daily</p>
	<p>Interview by SWCorp</p>

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

There are various visitors to ZWC facilities in the year of 2015 from academic, government, private sector, media and non-governmental organization. The notable visitors are listed as below:

*Table 2.1: List of notable visitors to ZWC in 2015*

No.	Visitor	Represent
1.	IGES (Institute for Global Environmental Strategies)	IGO
2.	GPNM (Green Purchasing Network Malaysia)	NGO/Association
3.	CETDEM	NGO
4.	Kenanga Waja	NGO
5.	Chow Kit kids	NGO/community
6.	Joto Okayama school, Japan	Academia
7.	USM	Academia
8.	AIESEC international exchanges	Academia
9.	OSH, UMP (Universiti Malaysia Pahang)	Academia
10.	UMT and Nuinfra feedmill	Academia/private
11.	Prof. Koji Takakura	Individual
12.	Jabatan alam sekitar MPSJ (Majlis Perbandaran Subang Jaya)	Local authority
13.	Jabatan penyelenggaraan UTM	Academia
14.	RCOMM	NGO/community
15.	YDP dan ahli majlis dari Iran	Local authority
16.	SIRIM auditor	Government
17.	MQA	Government
18.	YTL Sustainability Group	Private

In 2015, ZWC also organized visit to several places such as:

1. Jeram sanitary landfill
2. MPSJ Biomass Center
3. Universiti Malaysia Terengganu

Figure 2.12: Visitors to ZWC center (1)

	<p>Visit by IGES</p>
	
	<p>Visit by Bangladesh government officers</p>

Figure 2.13: Visitors to ZWC center (2)




	Visit by GPNM
	
	Visit by Kenanga Waja



Figure 2.14: Visitors to ZWC center (3)

	Visit by UMT
	Visit by Cetdem
	Visit by USM students



Figure 2.15: Visitors to ZWC center (4)



Visit by Chow Kit kids



Visit by students from Japan



Visit by UTM lecturers

Figure 2.16: Visitors to ZWC center (5)

	Visit by UMP
	Visit by Aiesec students
	Visit by AECOM



Figure 2.17: Visitors to ZWC center (6)

	<p>Visit by Japanese</p>
	<p>Visit by Prof. Koji Takakura and Prof. Norzulaani, director of UMCares</p>
	<p>Visit by MPSJ</p>

Figure 2.18: Visits to other places

	<p>Visit and exhibition at Tangkak</p>
 <p>28/07/2019 12:10</p>	<p>Visit to Jeram sanitary landfill</p>
	<p>Visit to UMT</p>



Figure 2.19: Visitors to ZWC center (7)

 A group of four people (three men and one woman) standing outdoors on a grassy area. Behind them is a large green and white sign that reads "UM ZWC Composting Center". The sign also features logos for the University of Malaya, JPPHB, and ZWC. To the left, there is a pile of dark compost material covered with a blue tarp.	<p>Visit by RCOMM Lestari</p>
 A group of four people (three men and one woman) standing indoors. Behind them is a poster titled "Organic Waste Composting Project" with the University of Malaya logo. The poster also mentions "umcare". The group is standing in a room with a sofa and other furniture.	<p>Visit by IAC</p>
 A group of about ten people, mostly young men, posing for a photo outdoors. They are standing in front of the same "UM ZWC Composting Center" sign seen in the first photo. They are dressed in casual clothing, and some are holding papers or bags.	<p>Visit by Japanese students</p>

Figure 2.20: Visitors to MPSJ biomass center

 A large group of approximately 30 people, including men and women in professional and casual attire, are posing for a group photo in front of the entrance to the MPSJ Biomass Center. The entrance features a sign that reads "SELAMAT DATANG PUSAT BIOMAS BERSEKAPU MPSJ BANDAR SUNGAI PUCHONG".	<p>Group photo</p>
 A man in a light blue shirt, identified as En. Hafiz, is explaining the biomass process to a group of visitors. He is gesturing towards industrial equipment, including large yellow and white storage tanks, inside a facility. Other visitors, including a woman in a purple hijab, are listening attentively.	<p>Explanation by En. Hafiz</p>
 A group of visitors, including a woman in a purple hijab and a man in a light blue shirt, are standing in front of a building with a large sign that reads "Galeri BIOMAS". They are receiving gifts or certificates from staff members in light blue shirts. The sign also features the MPSJ logo and the text "MAJLIS BANDARAN".	



Figure 2.21: Visitors to ZWC center (8)

	<p>Visit by FKUM students</p>
	<p>Visit by ISB students</p>
	<p>Visit by UTM staffs</p>

Figure 2.22: Visitors to ZWC center (9)

	Visit by SWCorp
	Visit by officers from Iran
	Group photo



Figure 2.23: Visitors to ZWC center (10)

	<p>Visit by SIRIM</p>
	<p>Visit by MQA</p>
	<p>Visit by UMT</p>

Figure 2.24: Visitors to ZWC center (11)

 A group of four people (three men and one woman) standing in front of a green sign that reads "UM ZWC Composting Center". The sign also features logos for UM, JPPH, and ZWC. They are outdoors in a garden-like setting with trees and a blue container in the background.	Visit by YTL
 Two women standing indoors in an office or meeting room. One woman is wearing a white hijab and a patterned vest over a white shirt. The other woman is wearing a white short-sleeved shirt. They are standing next to a table with some items on it and a whiteboard in the background.	Visit by Cetdem
 Two men standing next to a large, silver, cylindrical composting machine. The man on the left is wearing a light blue shirt and dark pants. The man on the right is wearing a white shirt and dark pants. They are outdoors in a grassy area with trees in the background. A green sign for "UM ZWC Composting Center" is visible in the background. A timestamp "14/08/2016 15:12" is visible in the bottom right corner of the photo.	Visit by En. Fauvi of Climb Optima

## Sub-section 2.7: Collaboration with Climb Optima on in-vessel composter

In Feb. 2015, ZWC initiated collaboration with Climb Optima, a local supplier of in-vessel composting machine for food waste. Several models (capacity) are available, and En. Fauvi of Climb Optima had donated one unit of 10kg/day capacity to UM ZWC site as a demonstration unit. Since then, ZWC has begun to use the composting machine and promote it to the visitors as an alternative to the open air composting method that apply at the moment.

*Figure 2.22: Climb Optima in-vessel composter (1)*

	Installation of the in-vessel composter
	En. Fauvi of Climb Optima explained on how to operate the composter



Figure 2.23: Climb Optima in-vessel composter (2)

	<p>The new in-vessel composting machine</p>
	<p>Food waste inside the composter</p>
	<p>Composted food waste inside the composter</p>



## Sub-section 2.8: Knowledge sharing with local authorities and communities

UM ZWC had carried out several sessions of communities' engagement and knowledge transfer program in the year of 2015. Among the notable events are the exhibition at Tangkak, exhibition of booth setup in conjunction with Hari Kitar Semula Kebangsaan and exhibition at a mini environmental program at MPKj. ZWC had received some inquiries and potential collaborators during the exhibition. ZWC also managed to sell some compost during the exhibitions.


*Figure 2.24: ZWC exhibition booth at Tangkak*

 A group of five people (three men and two women) standing behind a table at an exhibition booth. The booth has a green banner that reads "ZERO WASTE CAMPAIGN" and "UM (ZWC)". There are also logos for "JPPHD" and "UM ZWC". The people are dressed in casual attire, with some wearing orange shirts.	Group photo at Tangkak
 A group of five people (three men and two women) standing in front of a display stand. The stand has a sign that reads "UNIVERSITY OF MALAYA" and "Organic Waste". There are also logos for "UM ZWC" and "JPPHD". The people are dressed in casual attire, with some wearing orange shirts.	Exhibition at Tangkak

Figure 2.25: ZWC exhibition in conjunction with Hari Kitar Semula Kebangsaan

	<p>Photo with En. Azrul of SWCorp</p>
	<p>Visitors to ZWC</p>
	<p>ZWC booth</p>

Figure 2.26: ZWC exhibition at Kajang environmental event

	<p>Visit to ZWC booth by YDP of MPKj</p>
	<p>ZWC booth</p>
	<p>Training on how to do Takakura composting (DIY)</p>



## Sub-section 2.9: 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 2.27: Food waste segregation by kitchen staffs*

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



Figure 2.28: Capacity building on food waste segregation at source

 A woman in a yellow hijab and a colorful patterned dress stands at a wooden podium on a stage, presenting to an audience seated in a tiered lecture hall. A timestamp '23/04/2015 15:14' is visible in the bottom right corner of the photo.	<p>Dr. Sumiani was giving the presentation</p>
 A man with a backpack is leaning over a registration desk, signing documents. Other people are standing in the background. A timestamp '23/04/2015 14:41' is visible in the bottom right corner of the photo.	<p>Registration</p>
 A woman in a white hijab and a brown patterned dress stands at a wooden podium on a stage, giving a speech. A large screen behind her displays a presentation slide. A timestamp '23/04/2015 10:01' is visible in the bottom right corner of the photo.	<p>Prof. Norzulaani was giving an opening speech</p>

Figure 2.29: Distribution of food waste plastic bags and bins

	<p>Distribution of the bags and bins to KK8</p>
	<p>Distribution of the bags and bins to café operators</p>
	<p>Distribution of the bags and bins to café operators</p>

## Sub-section 2.10: Wood waste separate collection

Wood waste separate collection was carried out with full swing in year 2015. A total of 63.85 ton of wood waste was collected separately for collection by TSP Waste Management for energy recovery. It is estimated that about 60-70% of the total wood waste in UM campus was collected separately in ZWC's open top bin.

*Figure 2.30: Wood waste collection by TSP Waste Management*

	Wood waste collection
	ZWC open top bin for wood waste collection



Figure 2.31: Wood waste separate collection in UM campus

 A photograph of a green and white signboard for wood waste collection. The sign reads 'Sisa Kayu / Perabot Kayu Sahaja' (Wood Waste / Wood Furniture Only) and features logos for UM, JPPH, and ZWC. In the background, there is a pile of wood waste and a white recycling bin with 'RECYCLE' and 'ZWC' written on it.	<p>Wood waste collection signboard</p>
 A photograph of a white open-top recycling bin filled with wood waste. The bin has 'RECYCLE' and 'ZWC' written on it, along with a green leaf logo. It is situated outdoors near a concrete bridge.	<p>ZWC open top bin for wood waste that was painted by Aiesec volunteers</p>
 A photograph of a green TSP Waste truck collecting wood waste. The truck has 'TSP WASTE' and contact information (TEL: 03-60572263, H/P: 010-330-1403) on its side. A large pile of wood waste is visible next to the truck.	<p>Collection by TSP Waste</p>



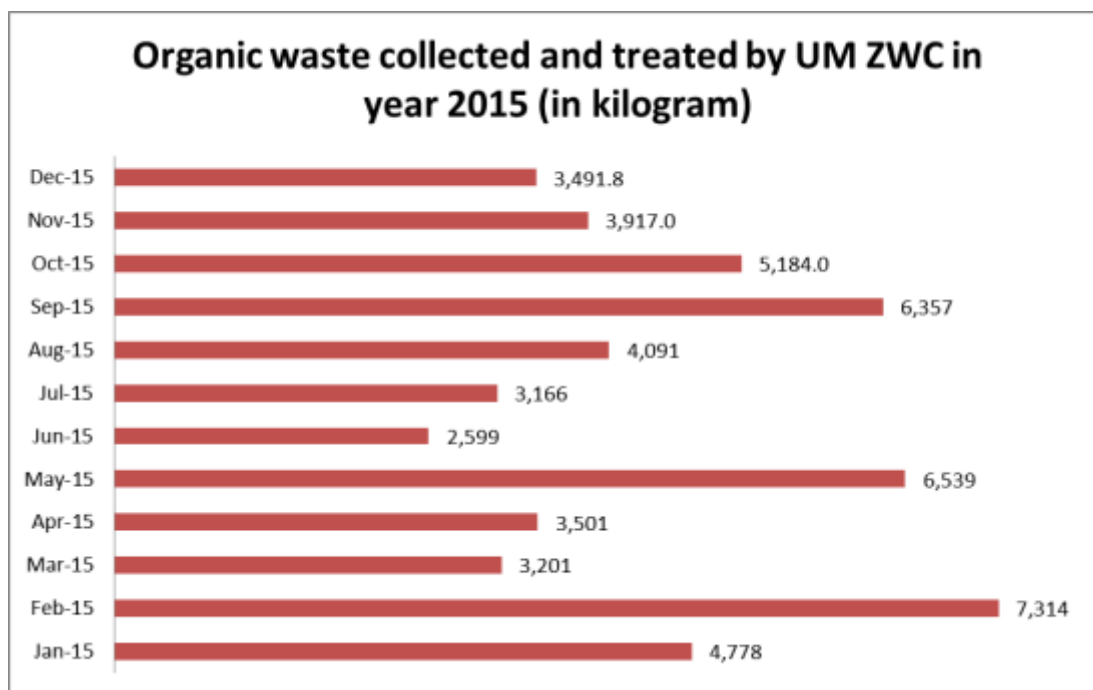
## Section 3: Recycling data and challenges faced

### Sub-section 3.1: Waste and recycling data collection

Data collection and analysis is very important in development of integrated waste management plan. With the weighbridge station installation in July 2015, UM ZWC is able to capture the waste disposal data. 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 2015

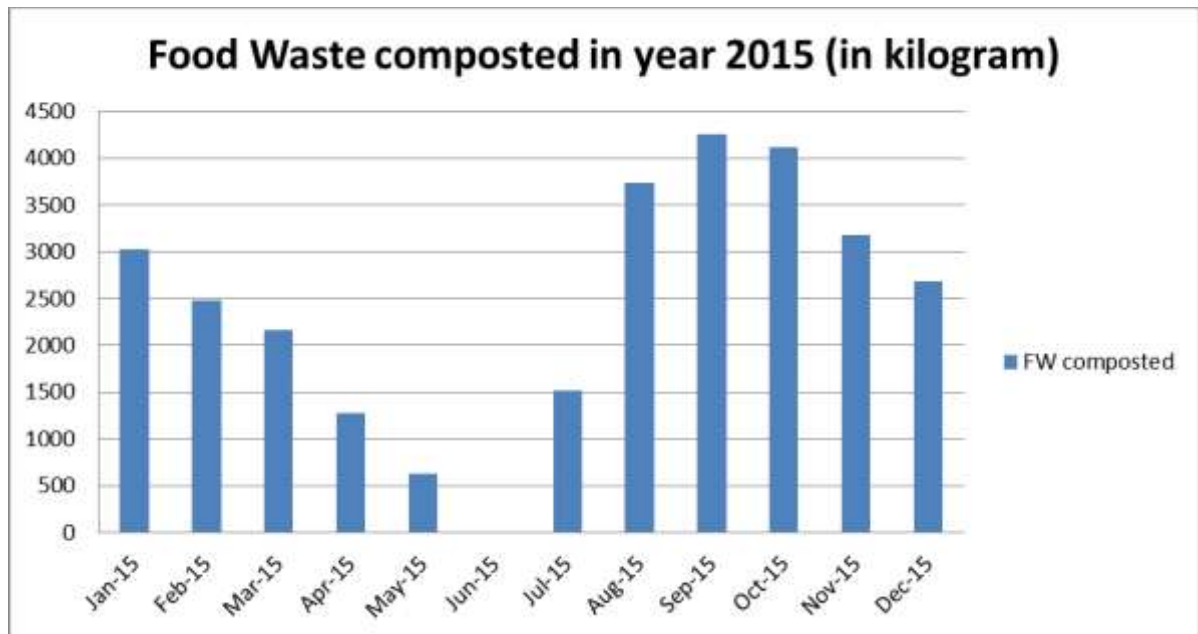


Figure 3.2: Total food waste digested in 2015

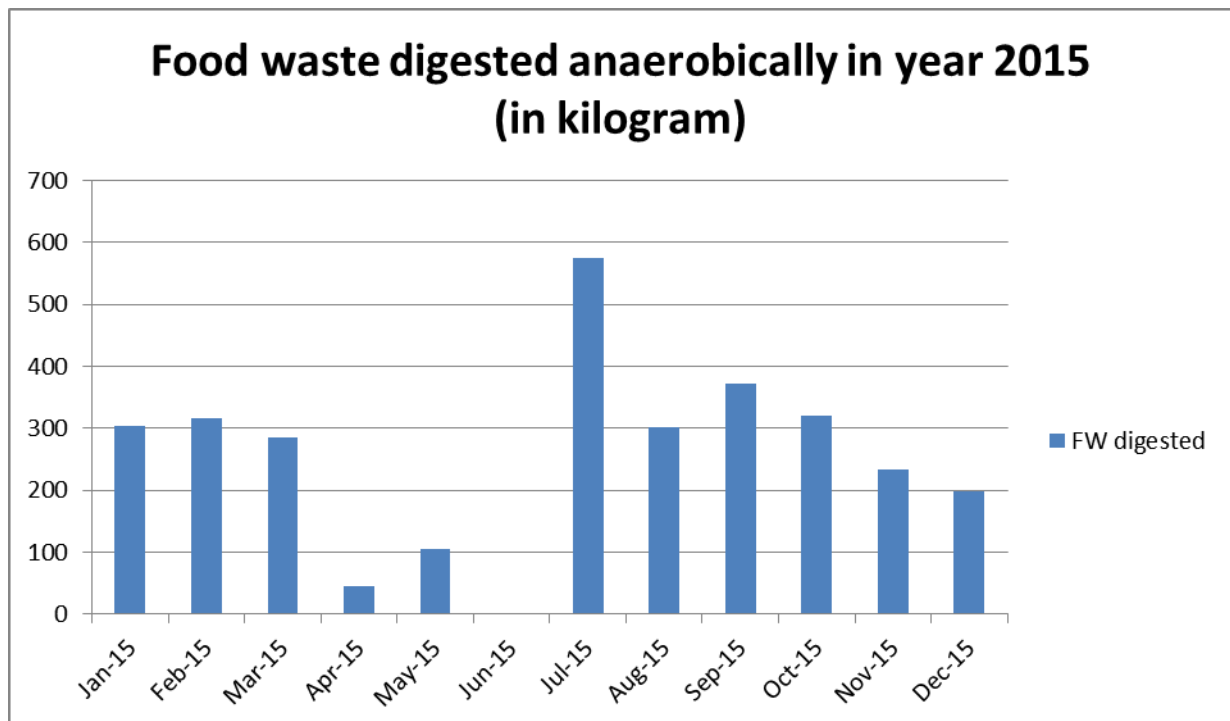


Figure 3.3: Total green waste composted in 2015

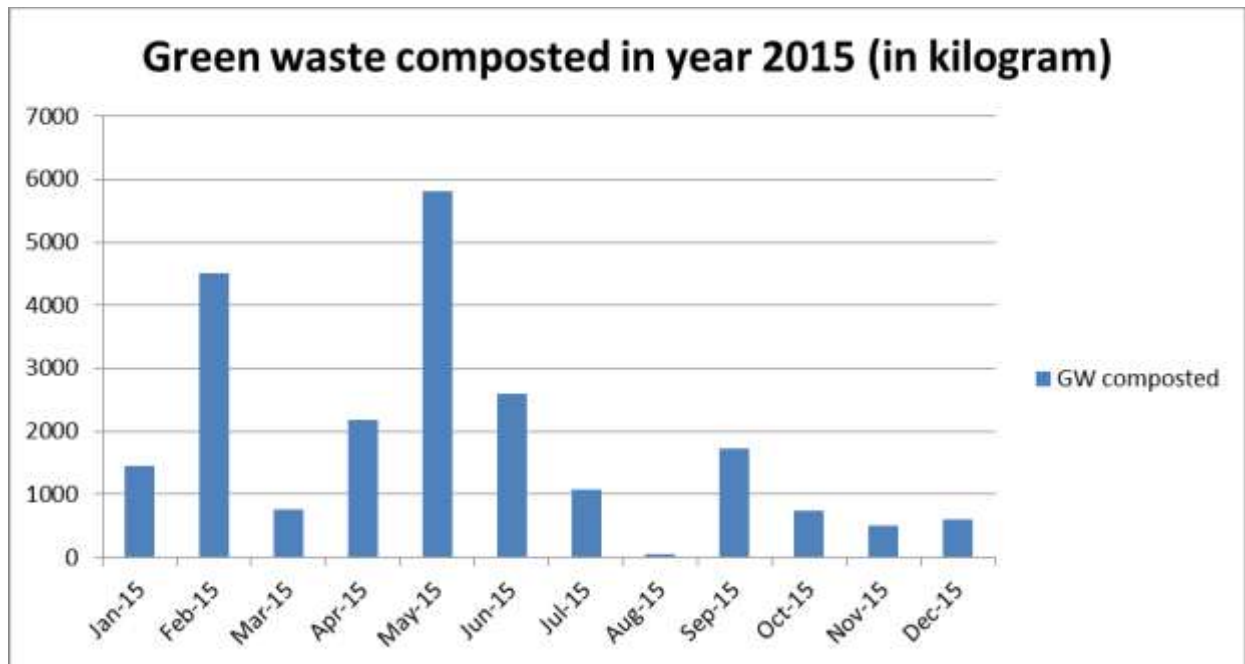


Figure 3.4: Total wood waste collected in 2015



Figure 3.5: Total used clothes collected in 2015

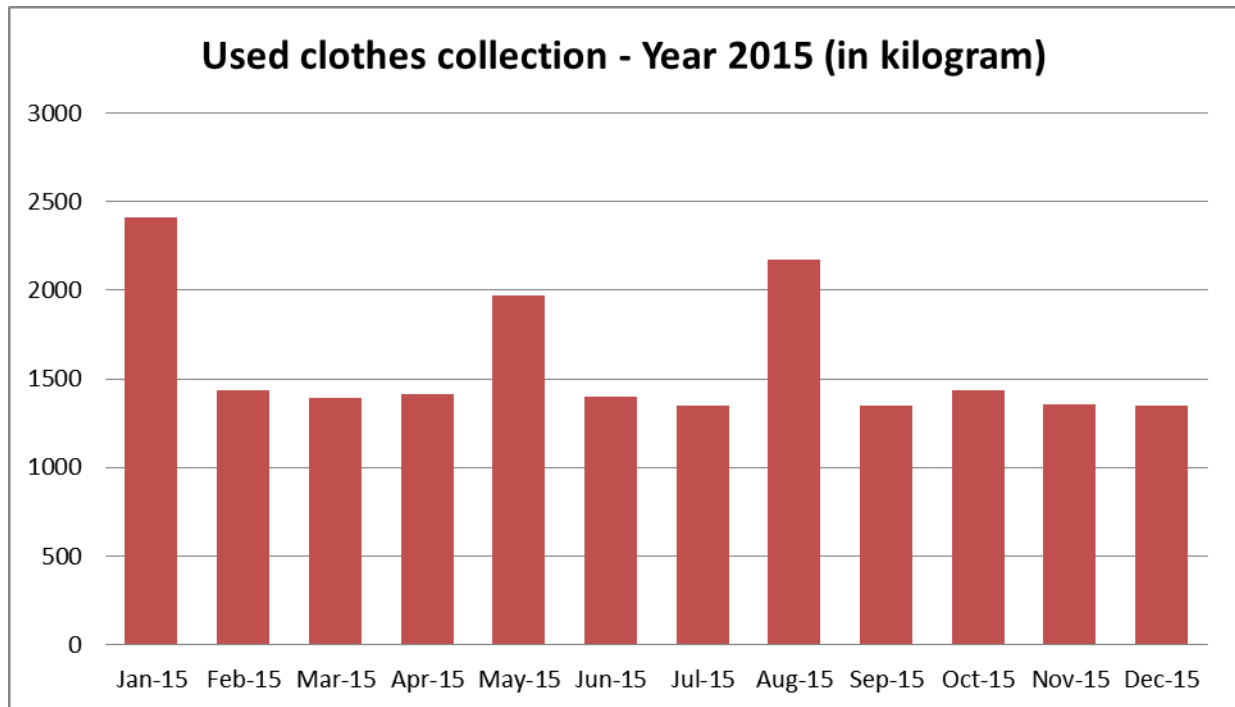


Figure 3.6: Total used clothes collected in 2015 by locations

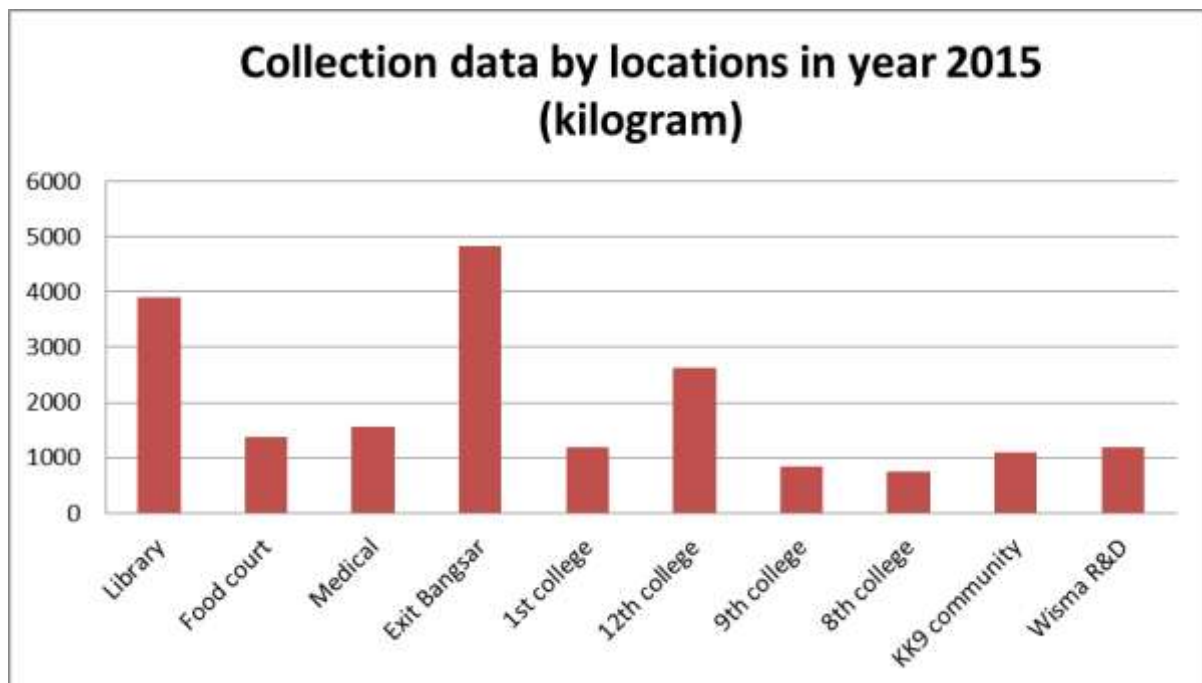




Figure 3.7: Waste recycling and treatment data profile of year 2015

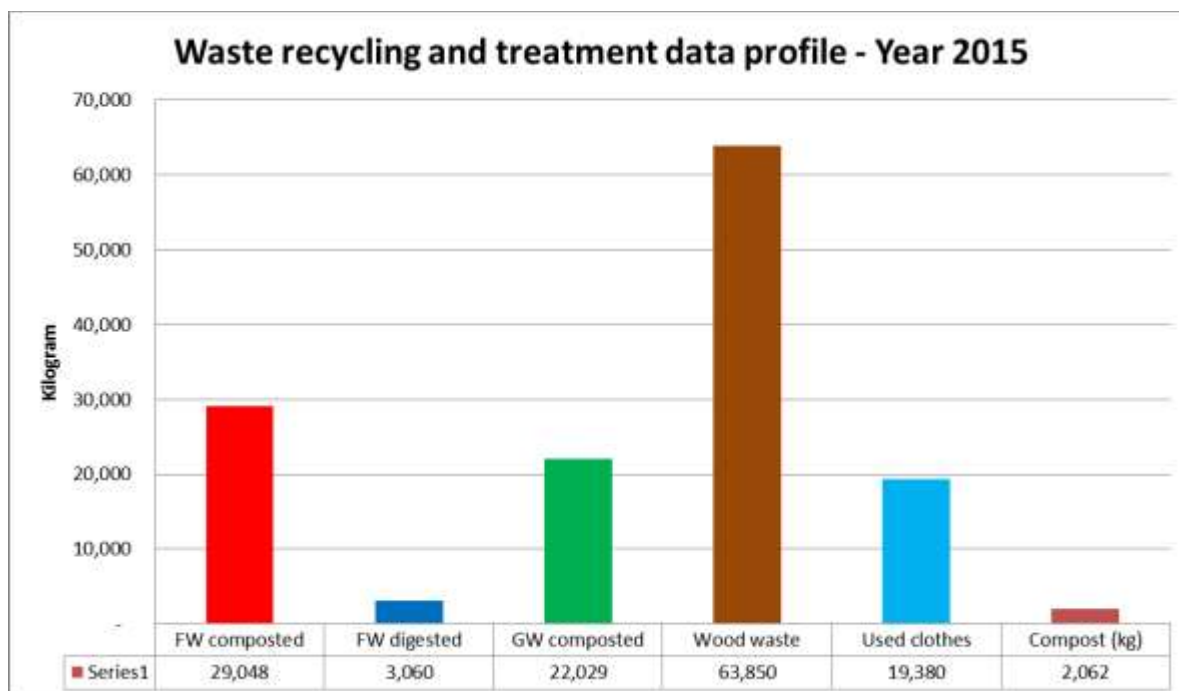


Figure 3.8: Total waste treatment and recycling data from 2011 until 2015

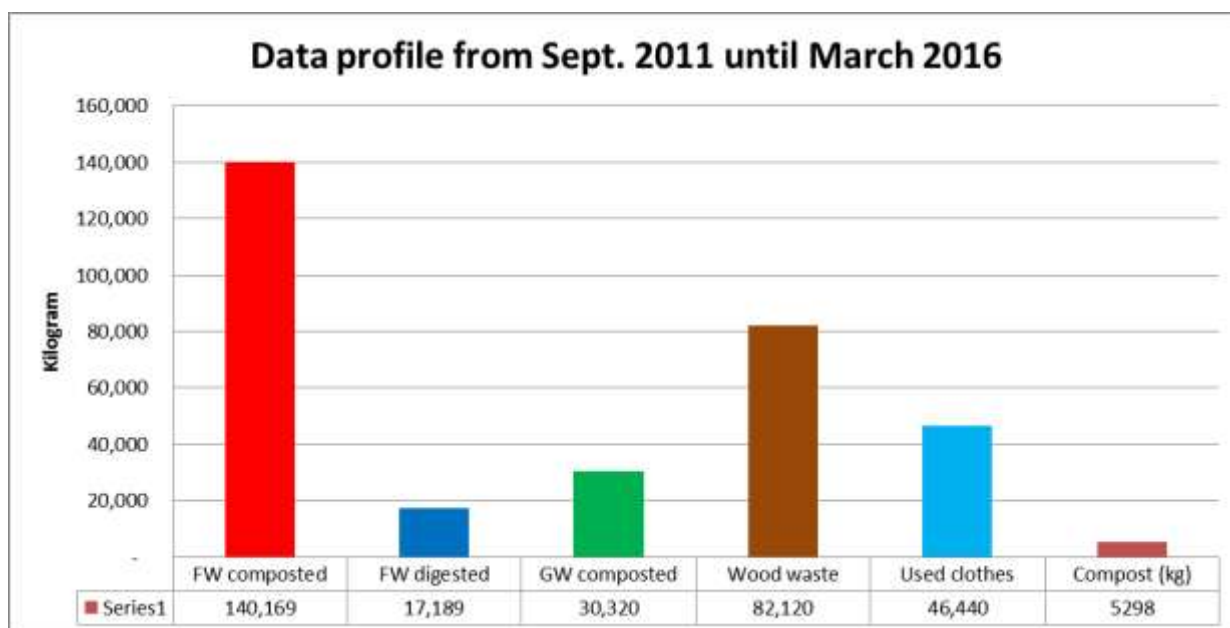


Figure 3.9: Residual and landscape waste disposed to landfill

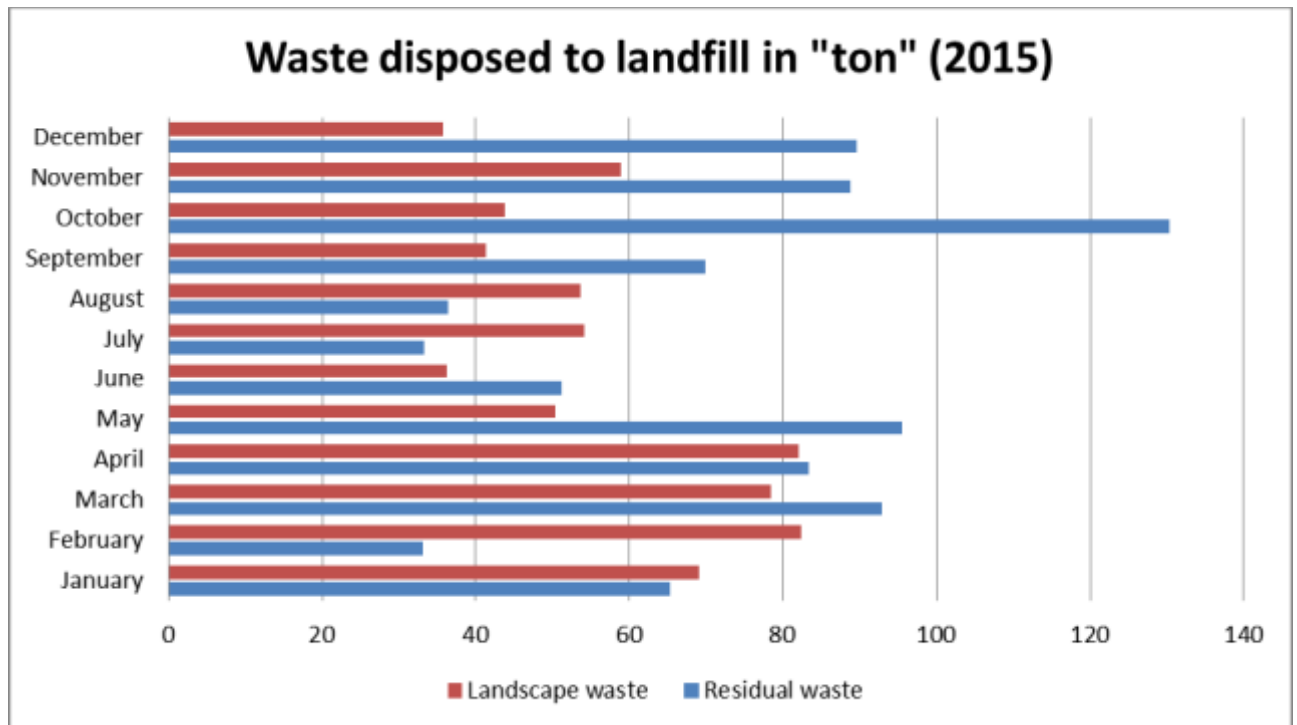


Figure 3.10: Total waste recycled and treated by UM ZWC



*Table 3.0: Target and Achievement of UM ZWC*

<b>Aspect</b>	<b>Target</b>	<b>Achievement</b>
Organic waste diverted for composting & AD	48 ton	50.65
Wood waste diverted for energy recovery	60 ton	63.87
Materials collected for reuse/recycle	30 ton	30.56
Media appearance (TV/newspaper/etc)	6 times	14
Capacity building (community/organization)	6 occasions	5
Network/linkage	3 parties	3
Proceedings/journal papers	5 papers	6
Visits/interviews	30 visits	45

ZWC facility will undergo an upgrading process in 2015 to officially set up a ZWC building to facilitate the green waste shredding, compost grinding, compost packing and storage of recyclables and compost, as well as an office for ZWC. The site office will serve as meeting room for visitors to ZWC facility.

Figure 3.11: Drawing of new ZWC building





### **Sub-section 3.3: Challenges and proposed projects in 2015**

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. Weighbridge station is operated manually, thus if collection happens during off-hours, the data is not recorded (JPPHB will install automated data collection system soon)
2. The green waste chipper of JPPHB (that mounted onto collection truck) is not ready yet, thus green waste for composting is not sufficient with the current shredder
3. Research, patent of product and process, and commercialization of ZWC compost are not commence yet

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.

## **Section 4: Conclusion**

2015 is another significant year for ZWC, with installation of new ZWC office and weighbridge as well as formal collaboration with SWCorp. The overall wastes recycling and treatment by UM ZWC was increased to about 15 ton per month with established separate collection system for used clothes and wood waste. The challenges remain for the segregation of more food waste in the campus. Besides, green waste shredding with larger capacity shredder is another key factor for the increment of composting capacity from the current 5 ton/month to 20 ton/month. Recycling program with innovative recycling center is an important strategy to improve and intensify the recycling collection in the campus. UM ZWC has to obtain JPSPN (National Solid Waste Management Department) approval on waste treatment facility (communal composting) eventually.

## Appendix A: Photos of ZWC facilities and activities



Turning of compost piles



Shredding of green waste



e-waste collection





Loading of food waste into compost pile



Discharge of AD digestate



Source segregated food waste



Aquatic plant from UM lake, *Najas* sp was composted



A huge quantity of the aquatic plant waste





Grinded compost



Grinding  
(crushing) of  
compost



Compost packed  
in 30kg gunny  
sacks



Turning of compost pile



Packing of compost in 1kg pack



The matured compost in dark black color