

UNIVERSITY OF MALAYA
Integrated Waste Management Plan

GUIDELINE ON
GREEN WASTE & WOOD WASTE
SEPARATE COLLECTION
AND MANAGEMENT
FOR INSTITUTIONAL AREA



PART 1: Introduction

The Guideline is introduced for the sustainable management of green waste and wood waste in UM campus. Green waste refers to grass clipping, dry leaves, trimmed tree branches and other types of garden / yard waste. Wood waste is referring to unwanted bulky wooden items such as old /damaged furniture as well as chopped tree trunks /branches. Green waste has been separately collected by JPPHB (Jabatan Pembangunan dan Penyelenggaraan Harta Benda) since the establishment of the UM waste transfer station in year____. As municipal biowaste, both green waste and wood waste can be sorted at source for resource recovery i.e. recycling, treatment and energy recovery.

A separate collection of wood waste by JPPHB was recently developed in year 2015 to facilitate the separate storage of wood waste from UM campus in a different open top Ro-Ro bin. The source segregated wood waste is collected by a local company, TSP Waste Management Sdn Bhd to a biomass (wood-fired) power generation plant at Rasa, Selangor. Since inception in Nov. 2014 until Dec. 2017, a total of 166.05 ton of wood waste has been collected separately from UM for energy recovery. With average of 50 ton/year of wood waste being diverted from disposal in landfill, it is a relatively significant waste stream in a university campus in Malaysia. The separation of wood waste at source is not as challenging as food waste segregation at source and is achievable in a brief period as the stakeholders involved in the collection process is much lesser.

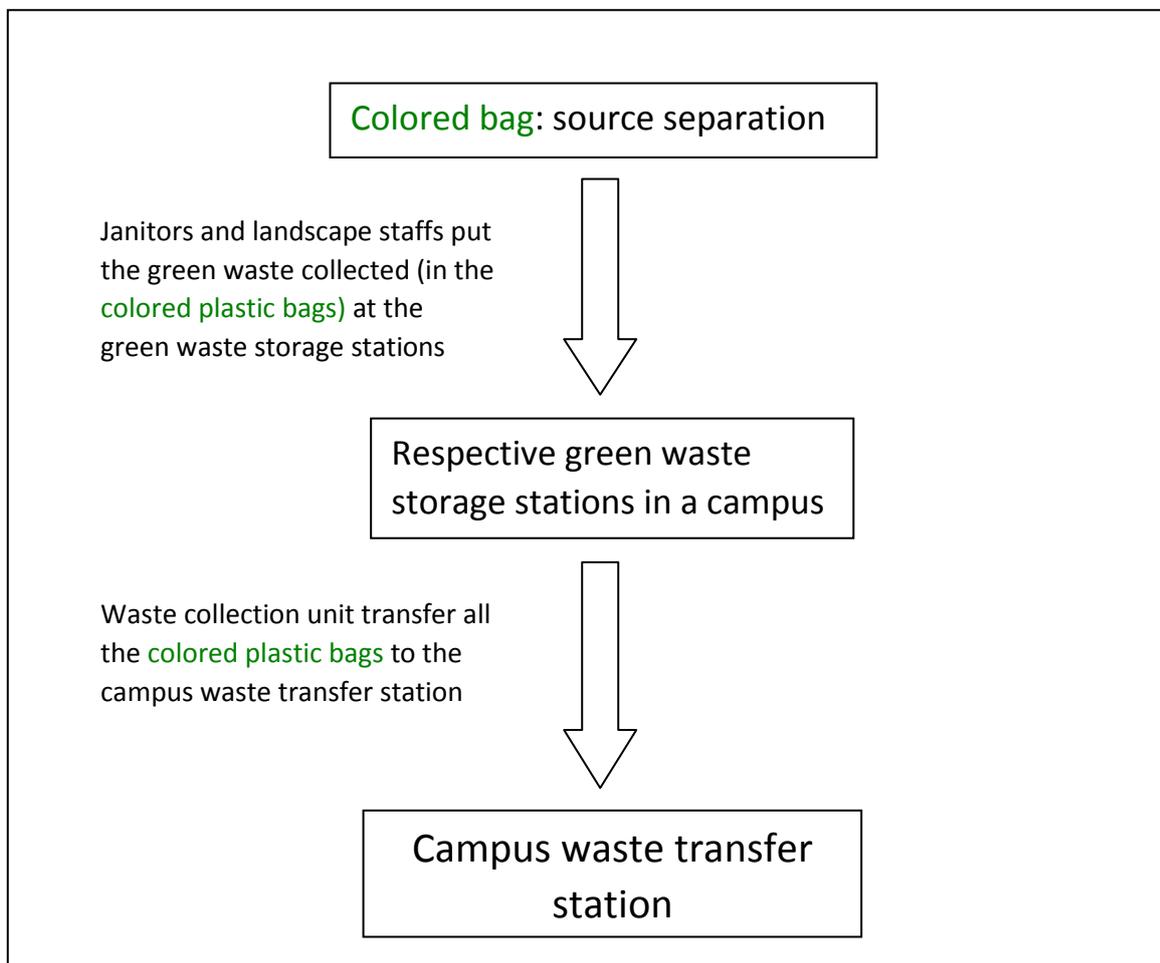
Three important aspects are identified as the enabling factors of successful implementation of wood waste and green waste separate collection in a campus:

1. Organized separated collection method
2. Functional intermediate storage facility (transfer station)
3. Collection for treatment and disposal

Despite different collection methods of green waste and woodw aste are practiced by different campus (depending on needs and available space, resource and facility),

separate collection is able to be achieved with determination from management body. For example, for campus without internal waste collection team or doesn't have sufficient space for intermediate storage, the management can design and issue a tender /RFQ with a separate collection of green waste and wood waste for off-site treatment (i.e. composting) and energy recovery. For campus with internal waste collection team and possesses in-campus transfer station such as UM, an organized separate collection can implemented to achieve the desired recycling goal.

Figure 1.0: Separate collection system for green waste in campus



PART 2: Separate Collection System

In contrary to general waste, green waste and wood waste are often collected separately in Malaysia because of its nature which is bulk /large in size. Therefore, separation at source is often easily achievable for green waste and wood waste. Nonetheless, green waste sometime are mixed together with general waste, especially for campus with limited space for waste storage and without internal collection team (direct collection by appointed waste management contractor). Normally a refuse compactor vehicle (RCV) with rear-end loader is used for direct collection of waste from campus (without transfer station) in Malaysia. Unlike split waste collection vehicle, waste collection with conventional RCV is not able to collect waste separately. Thus without a separate collection scheme with different collection schedule, all the non-hazardous waste such as general waste and green waste are normally collected together in a single trip.



Figure 2.0: Refuse Compactor Vehicle



Figure 2.1: Split Collection Vehicle

Therefore, it is imperative to implement the procurement of waste management service for a campus to enable the separate collection of green waste and wood waste for recycling and treatment, instead of landfill disposal. For campus with internal waste collection team and transfer station, separate collection is easier to achieve. Firstly, all the buildings or areas in the campus. At the transfer station, designated waste storage facility, such as open top Ro-Ro bins are used to store the green waste and wood waste separately in a temporary basis before pick-up by waste collection truck for treatment or disposal. For example, in UM campus, there two open top bins allocated for storage of green waste, three unit of open top bins for general waste and one unit of open top bin allocated for wood waste. The positions of these open top bins are fixed and cannot be mixed up. By having this kind of setting and arrangement, part of the collected green waste can be used for shredding and composting at the back of the transfer station. To ensure wood waste is not mixed in the other bins, regular training and communication with the waste collection team is important.

Figure 2.2: Example of open top bins arrangement at UM waste transfer station

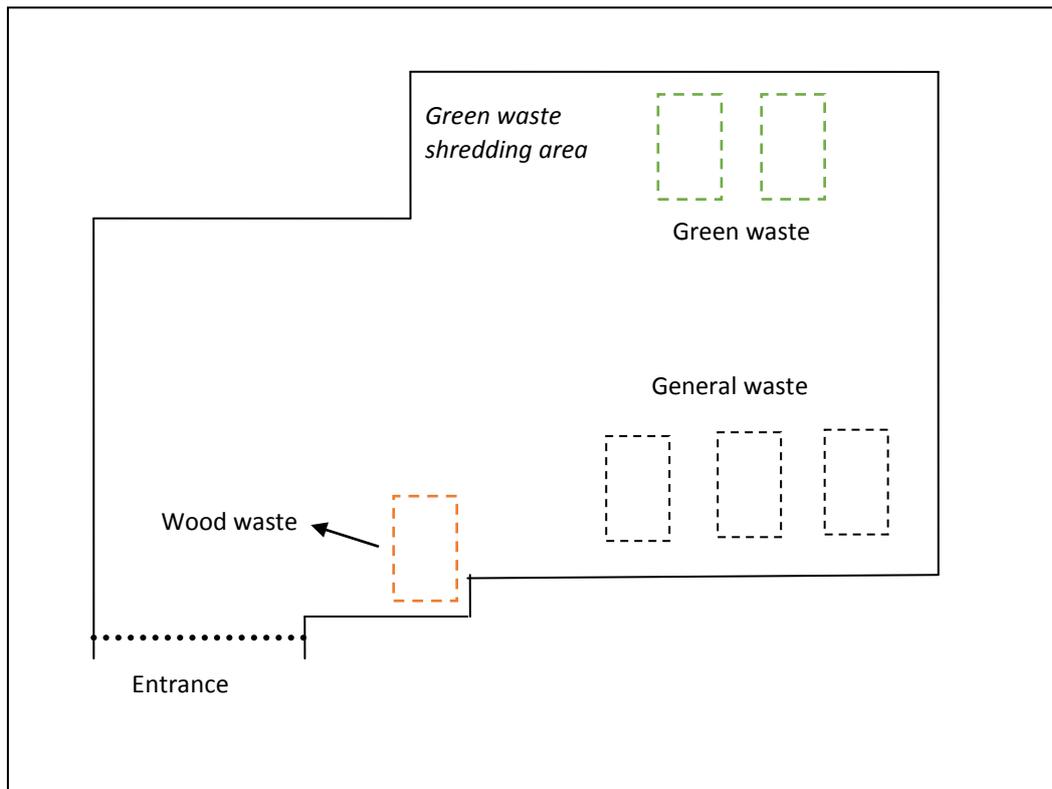


Figure 2.3: Photo of UM waste transfer station



Figure 2.4: Open top bins in UM waste transfer station



Table 2.0: Criteria to enable separate collection of green waste and wood waste

<i>Collection aspects</i>	<i>Direct Collection (kerbside to disposal site)</i>	<i>In-campus collection team (transfer station)</i>
<i>Type of collection vehicle</i>	Split vehicle / open top bin	Open top bin / Lorry
<i>Contract for separate collection</i>	Required	Optional, depend on collector / on-site treatment
<i>Transfer station</i>	No	Yes
<i>Coloured bag for green waste</i>	Yes	Optional

Figure 2.5: Internal waste collection team carry out separate collection of wood waste for separate intermediate storage at UM waste transfer station



PART 3: Waste Conversion (Composting / Energy Recovery)

Separately collected green waste and wood waste is a resource instead of waste. By practicing separate collection of green waste and wood waste for treatment, waste is being diverted from landfill for resource recovery and promote the achievement of circular economy for municipal biowaste. Normally green waste can be shredded as mulch or feedstock for composting. Wood waste can be crushed as feedstock for power plant or boiler for industrial application, or processed wood pellets. In the campus of UM, part of the separately collected green waste is shredded for a composting site located adjacent to the UM waste transfer station. While wood waste is collected separately for intermediate storage in open top bin before collection by a waste management company to a wood-fired biomass power plant located at Rasa, Selangor. The average wood waste collected in a month is about 5.0 ton. Green waste shredded for composting at UM is about 2.0 ton per month.

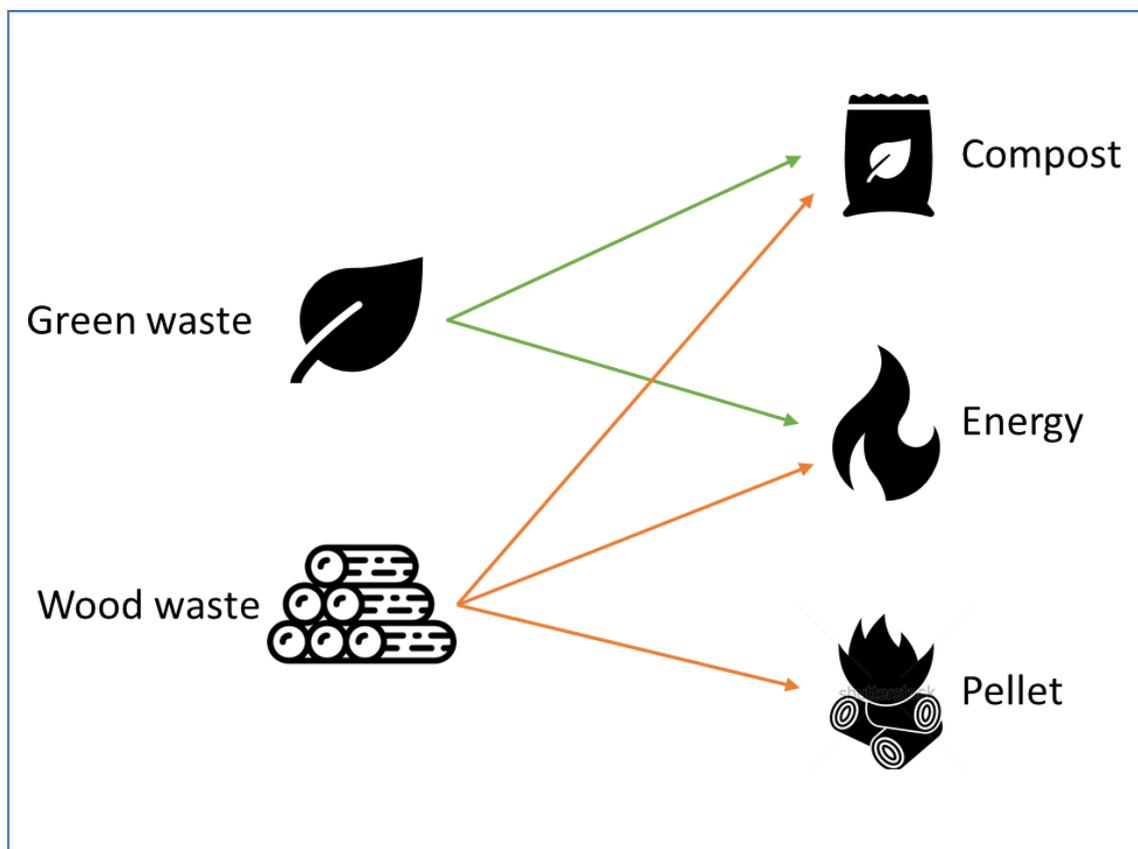


Figure 3.0: Resource recovery of green waste and wood waste

Figure 3.0: Green waste shredding and composting

	<p>Green waste shredding machine</p>
	<p>Open air composting piles</p>
	<p>Shredded green waste as feedstock for composting</p>

Figure 3.1: Wood waste collection for energy recovery

 A photograph showing a large pile of wood waste, including logs and debris, on a dirt road. A white truck is parked nearby, and a person is visible near the back of the truck. The scene is outdoors under a blue sky with clouds.	<p>Wood waste collected to a transfer station</p>
 A photograph of a large industrial facility with a dark roof. The ground is covered with a large pile of crushed wood waste. A person is visible near the pile. The sky is blue with clouds.	<p>Crushed wood waste</p>
 A photograph of a large industrial building with a green facade and yellow railings. A yellow tractor is parked in front of the building, carrying a load of wood waste. The sky is blue with clouds.	<p>Wood-fired power plant at Rasa</p>

Acknowledgement

JPPHB

