Smart Waste Recycling within the Sustainability Framework at Higher Educational Institution – Case of UTM Campuses

Presenter

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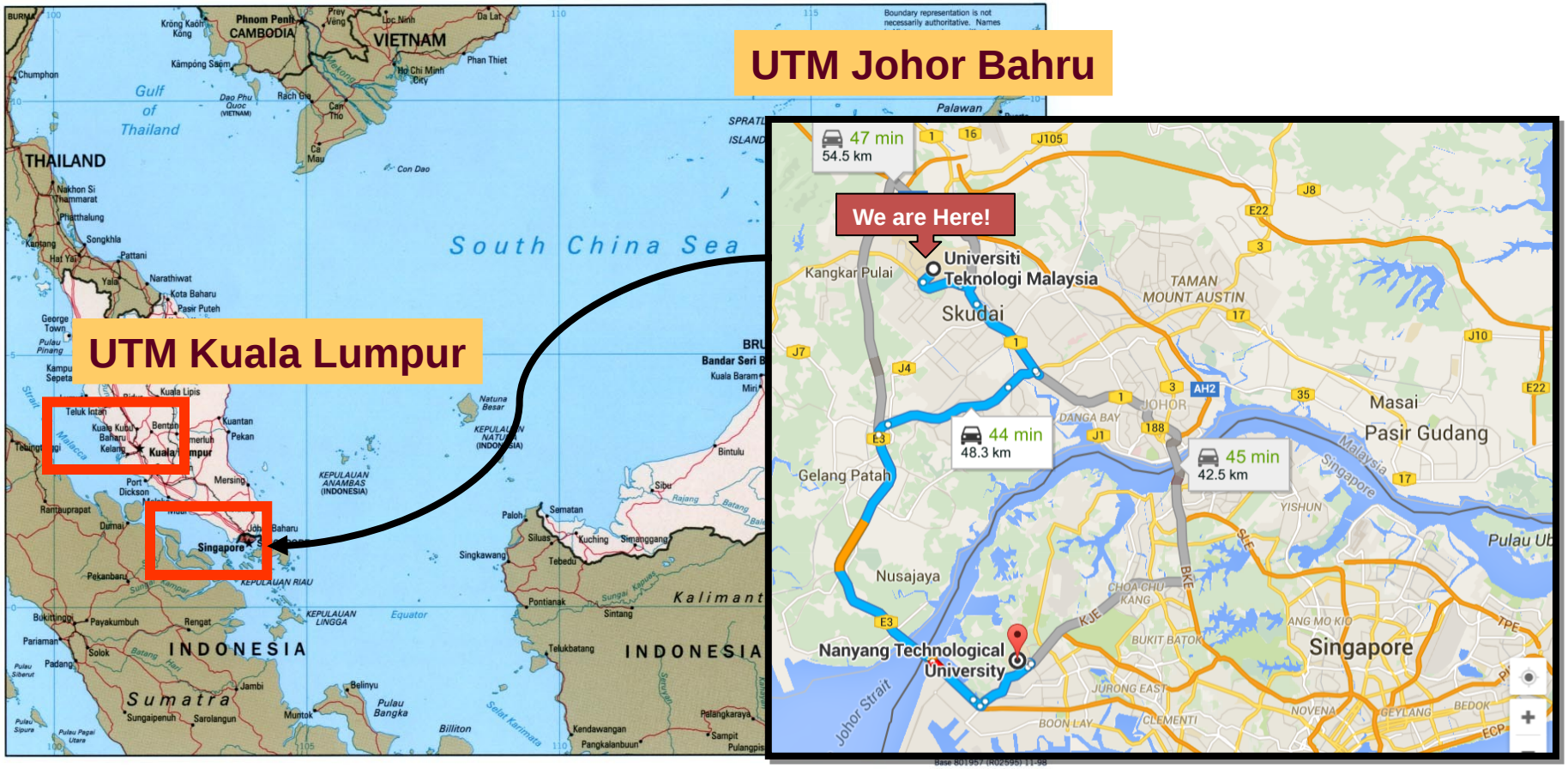
UTM Campuses – at Glance



1-2 hrs flight to main destinations in South East Asia

Enhancement Strategies for Zero Waste Campus in Malaysia 2019 - 2022

Blueprint:
The Zero Waste Policy in Higher Education Institutions

Sample 7

Sub Projects in Program

Co-opetition: synergy among universities

Towards Zero Organic Waste Campus

Improvement in waste management using IOT approach through 4IR, enhances the method and sensitivity of the people to separate waste so that further treatment is effective.

Sub Project 1 4IR and Green Indicators for Effective Management	Sub Project 2 Shaping Pro-environment Behaviours	Sub Project 3 Zero Organic Waste to Landfill	Sub Project 4 The Zero Waste Economy	Sub Project 5 Zero Waste Policy in Campus Operation
1. Communication Apps 2. Green Indicators	1. Awareness Apps 2. Education Modules	**AD Food Waste** 1. Feed Preparation + Biogas Product 2. BSF Technology	1. Marketing of Zero waste Products 2. LCA	1. Assessment Policy for Living Lab – into action in

Transforming The Waste Industry

RMK 11

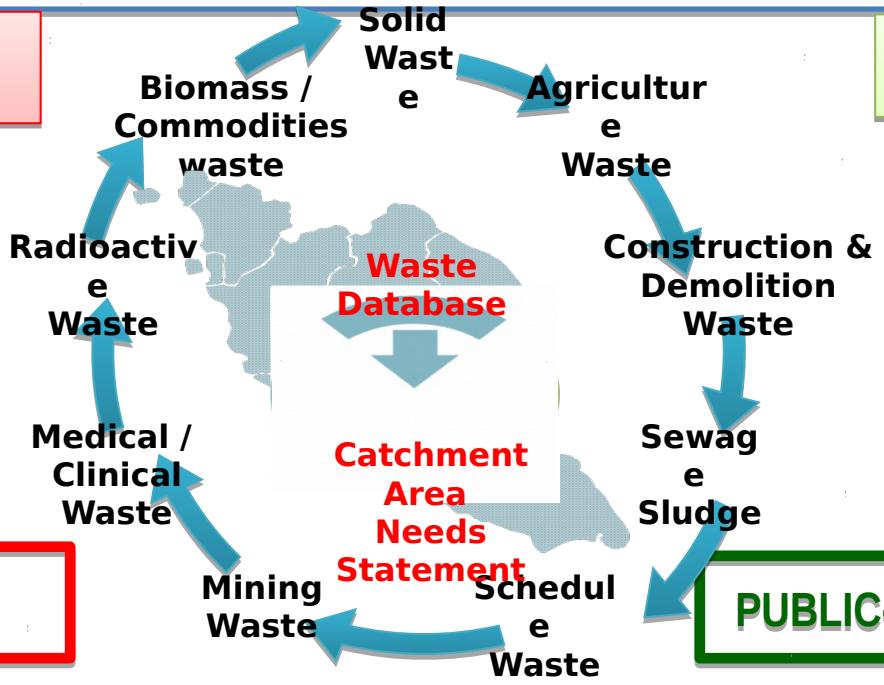
Circular Economy / Sustainable Consumption and Production

HOLISTIC WASTE MANAGEMENT

CURRENT

- SINGLE FEEDSTOCK
- SINGLE TECHNOLOGY
- SINGLE PRODUCT

GOVERNMENT BASED SPENDING



FUTURE

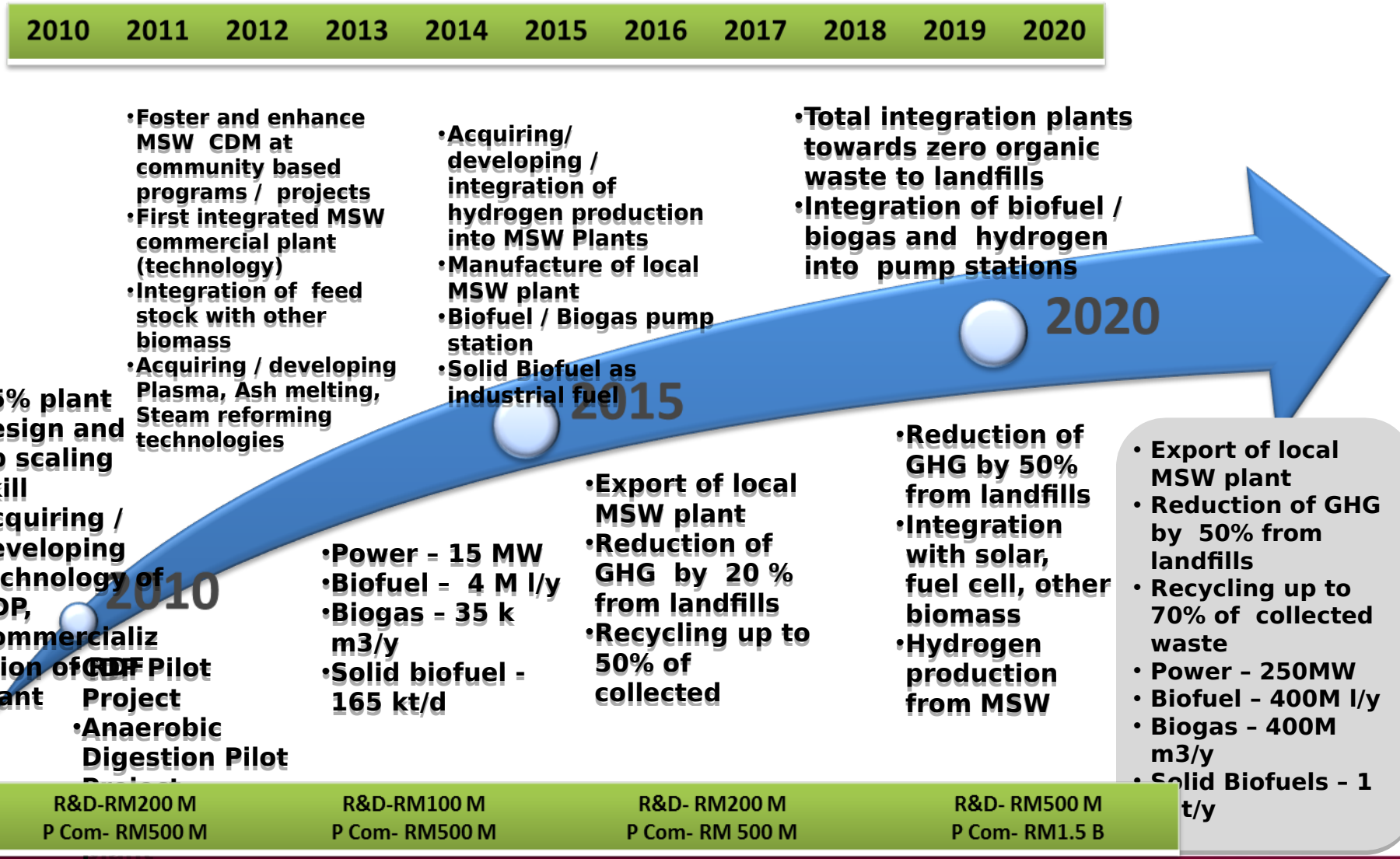
- MULTIPLE FEEDSTOCK
- MULTIPLE TECHNOLOGIES
- MULTIPLE PRODUCTS

PUBLIC-PRIVATE PARTNERSHIP

Holistic Waste Management approach will unlock the vast resources lost daily in transforming Malaysia **Towards A Green Economy** by producing Green Energy and Products with minimal effect on the environment through public and private sector investment.

Current Technology Roadmaps

Municipal Solid Waste (MSW)



UTM Living Laboratory Sustainable Waste Management on Waste-to-Wealth

- With the growing number of universities, **the population of each campus** is significant and generate waste that causes adverse impact to the environment.

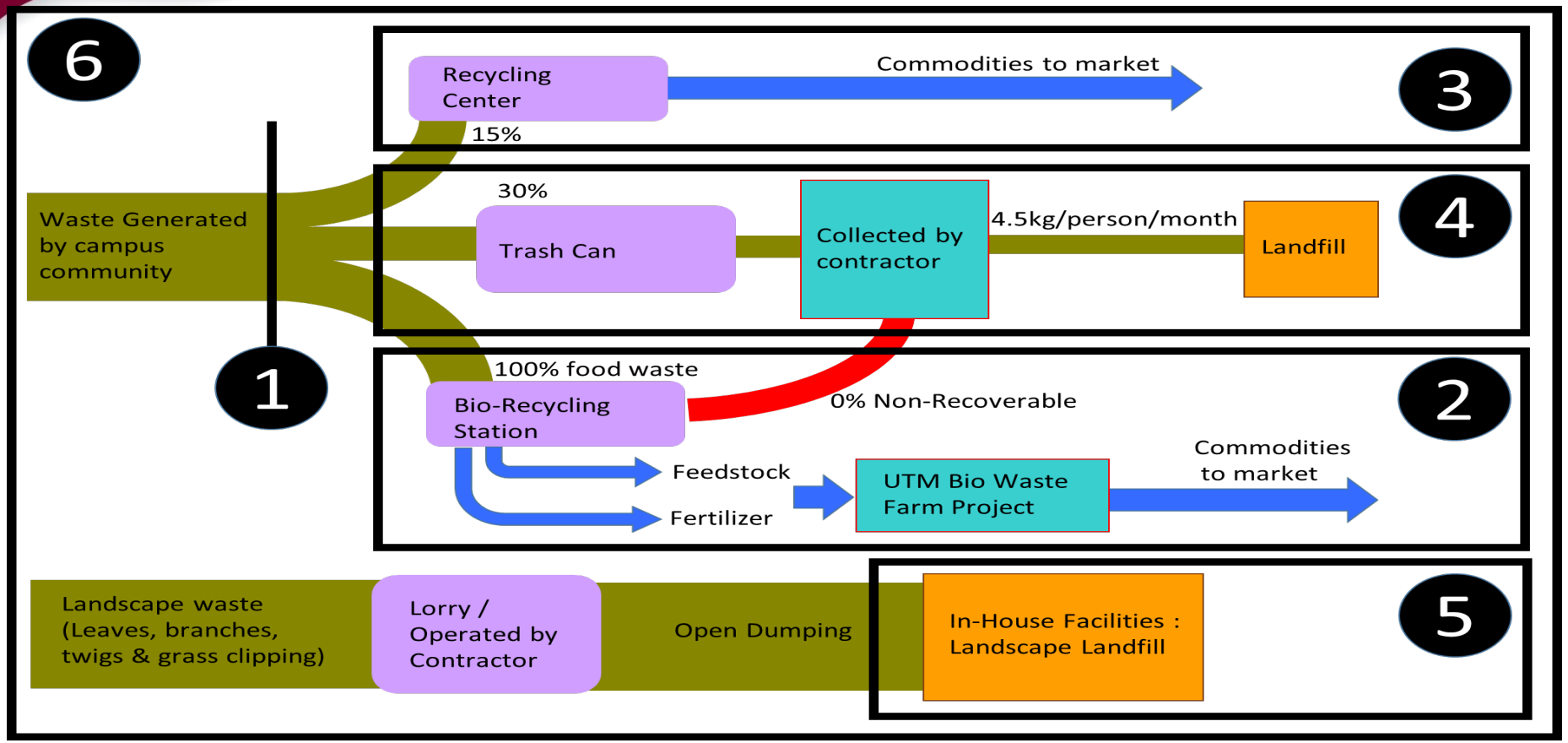
- It is estimated that waste from all academic institutions amounted to approximately 2**1,500 tonnes per day**, which represents **5-10%** of the total waste generated in Malaysia.

- Waste management on UTM campus is a complicated issue dealt by the Office of Asset and Development which deal about **300-400 kg (increased up to 800 kg/day)** of waste per day.

- With the current university budget cuts, the operation need to go on Business as Usual. It is essential to review the current practices and improve by demonstrating **Science2Policy2Action**.

- Apart from the, the project aim to adapt **Living Laboratory concept** in which integrating Operation, Education and Research. Upon completion of the project, it would be a promising commercialization value-added to

Roadmap for Institutional Waste



1	Waste Separation Awareness : Behavioral Changes of Community Participatory on Consensus
2	Food Waste Utilization: Shelf to Shelf Concept for Product
3	Total Recycling on Campus : A multidimensional Approach for Sustainability
4	Waste Minimization Effort on Campus : Translating Science into Action
5	Waste-to-Market : Unlocking New Resources for Commodities
6	Comprehensive Waste Management : Waste HUB

Eco-Park@UTM

Aktiviti rekreasi yang bersesuaian dengan persekitaran semulajadi (perkhemahan, rentas hutan, *canopy walk* dll.). Projek penanaman semula pokok diusahakan di sini.

Edu-Business@UTM

Aktiviti perniagaan, perkhidmatan profesional & perundingan akan tertumpu di kawasan ini. Sebuah pusat konvensyen bertaraf antarabangsa akan dibangunkan. Selain sebuah hospital pakar swasta.

PETUNJUK

- Hutan/zon
- Pusat rekreasi
- Kolej kediaman
- Kediaman staff
- Pusat Akademik & Pentadbiran
- Pusat aktiviti perniagaan
- Pelajar sokongan
- Persimpangan utama
- Persimpangan sekunder
- Jalan utama
- Cadangan jajaran jalan baru
- Jalan bekalan elektrik
- Sempadan UTM

Kolej Kediaman

Kemudahan penginapan kepada pelajar UTM & juga boleh disewa kepada pihak luar yang berminat pada kadar

Eco-Farm@UTM

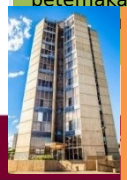
Menempatkan pelbagai jenis pokok buah-buahan & herba. Aktiviti peternakan turut boleh

Sport Hub@UTM

Kemudahan berasaskan aktiviti sukan (kolam/stadium/gym)

Research Farm@UTM

Aktiviti R&D produk dijalankan di sini. Dilengkapi dengan kemudahan makmal & inkubator berteknologi tinggi.



Perumahan Staff

Pembangunan semula unit kediaman sedia ada. Rumah mampu milik bertingkat dicadangkan

Pst. Akademik & Pentadbiran

Kluster ini menempatkan fakulti dan kemudahan sokongan seperti makmal & dewan kuliah. Selain itu, pejabat-pejabat pentadbiran utama

Pembangunan Bercampur

Menempatkan pelbagai jenis pembangunan bercampur (bangunan pejabat, perhotelan, perumahan bertingkat dll.)

Living Lab dan SDGs within Campus

Element of Sustainable Development Goals (SDGs) in Living Laboratory (LL)

Key Initiatives of *Living Lab*:

- **LL1 : Sustainable Arcade**
- LL2 : Green Office
- LL3 : Sustainable Energy Management
- **LL4:Bio-Recycling Centre**
- LL5 : Green School
- LL6 : Green Community

diversity

SEPARATION AT SOURCE AND ACTION PLAN

SEGREGATE YOUR WASTE

SWM ENVIRONMENT

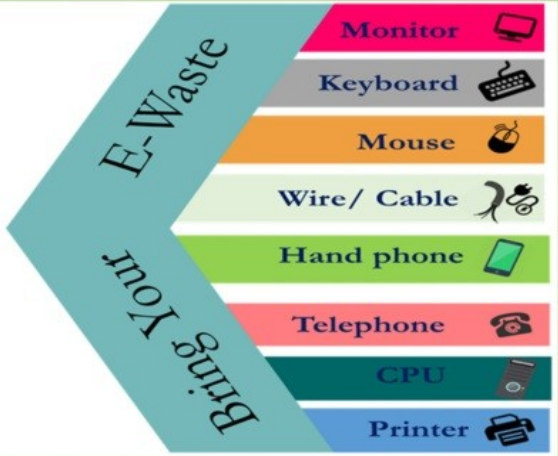
zerO waste

My Waste, My Responsibility

REDUCE REUSE RECYCLE

DROP OF POINT AREA

55% Target by 2021 and **80%** Target by 2025



Help Us To Achieve 10% Of Recycling Rate In UTM

BY:
UNIT LANDSKAP,
BAHAGIAN PENYELENGGARAAN UBAHSUAI DAN PENGURUSAN PERABOT,
PEJABAT HARTA BINA

PROSES SINGLE STREAM RECYCLING

Zero Waste Management Campaign

Single Stream Recycling

My Waste, My Responsibility

REDUCE REUSE RECYCLE

Any enquiries, Please Contact :
Bahagian Landskap dan Pembersihan
Pejabat Harta Bina
Pejabat Harta Bina, Universiti Teknologi Malaysia - UTM
kblp.phb@utm.my

Single Stream Recycling

all-in-one

Multi Stream Recycling

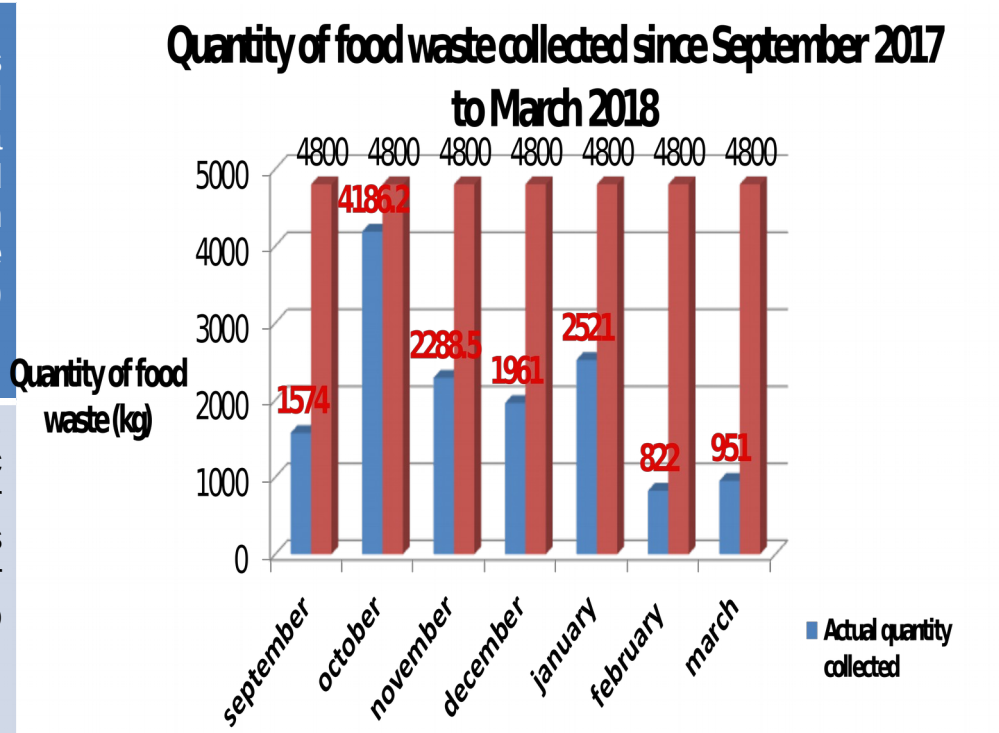
- PLASTIC
- ALUMINIUM
- PAPER
- GLASS
- E WASTE

THANK YOU FOR RECYCLING !

CAMPAIGN AT SUSTAINABLE ARCADE

Food waste Management

Catering waste	All food waste, including used cooking oil, originating in restaurants, catering facilities and kitchens, including central kitchens and household kitchens. (From the Defra guidance on Regulation (EC) 1069/2009 and accompanying implementing Regulation (EC) 142/2011, enforced in England by the Animal By-Products (Enforcement) (England) Regulations 2011.
Former foodstuffs	Foodstuffs originating from retailers, distribution premises, wholesale, etc (products which are no longer intended for human consumption for commercial reasons or due to problems of manufacturing or packaging defects or other defects which do not present any risk to humans or animals).
Food waste	Food waste in this report means food and drink waste. It includes catering waste and former foodstuffs, and may or may not contain products of animal origin.



From **Fork-to-Farm** Initiatives

OUTPUT: LIVING LAB @ DUSUN, UTM

Chicken Farm

Fertilizer and Soil Enhancer

Organic Farming

"From Waste to Green Energy"

Using renewable fuel, we can complete the energy cycle!

Kinki University Bio-coke Project

Introducing A New Environmentally Friendly Energy Source

Hello everyone! Nice to meet you! I am the environmentally friendly solid fuel **-Bio-coke Man!**

Bio-coke does not produce harmful sulfides [SOx] like regular coke does.

No Acid Rain

Reduced Greenhouse Effect

Bio-coke produces 20% less CO than regular coke.

CO_2

Products we use everyday

Cars

Fridges

Forests

Dried Plant Matter / Bio-mass

Used Tea Leaves / Coffee Grinds
Fruit & Vegetable Waste
Logging Refuse & Compost

Used Tea Leaves

Coke is an important energy source in factories.

I am cleaner, greener, and more economical!

What is Coke?

Coke is a solid fuel that burns at very high temperatures.
It is primarily used for smelting iron ore to create steel.
This steel can be used to make things like cars and household appliances.

Previously wasted materials are now a source of Green Energy!

Bio-coke can be substituted for regular coke and used to smelt iron.

Bio-coke

Bio-coke could one-day be a household fuel.

How Bio-coke completes the energy cycle?

Biomass is primarily made up of photosynthetic plant matter. Photosynthesis is the process in which plants absorb water [H2O] and carbon dioxide [CO2] from the environment and, utilizing energy from the sun, release oxygen [O2]. When plants are burned, the same amount of carbon dioxide [CO2] that was absorbed previously is then released. Bio-coke made frombiomass forms a part of this natural cycle.

$CO_2 = CO_2$

Photosynthesis

Combustion

What inspired you to develop Bio-coke?

I developed Bio-coke to help combat the very public environmental issues we are now facing. I thought it was crazy that there was currently no environmentally friendly substitute for coal available so the Kinki University School of Science and Engineering developed a prototype machine able to produce viable Bio-coke, 50mm in diameter. In demonstrations we have already been able to substitute as much as 20% of regular coke with Bio-coke.

School of Science and Engineering / Department of Mechanical Engineering
Professor Tamio Iida

Not only tea or coffee but any plant or vegetable waste can become clean energy!

Where will Bio-coke be used?

Bio-coke is so hard that even when in the furnace it does not fall apart.

Bio-coke is as hard as a frying pan.

I am going to be used in the steel industry instead of coke.

Bio-coke in action

Used in Foundries to make Cars

Used in blast furnaces to make Steel

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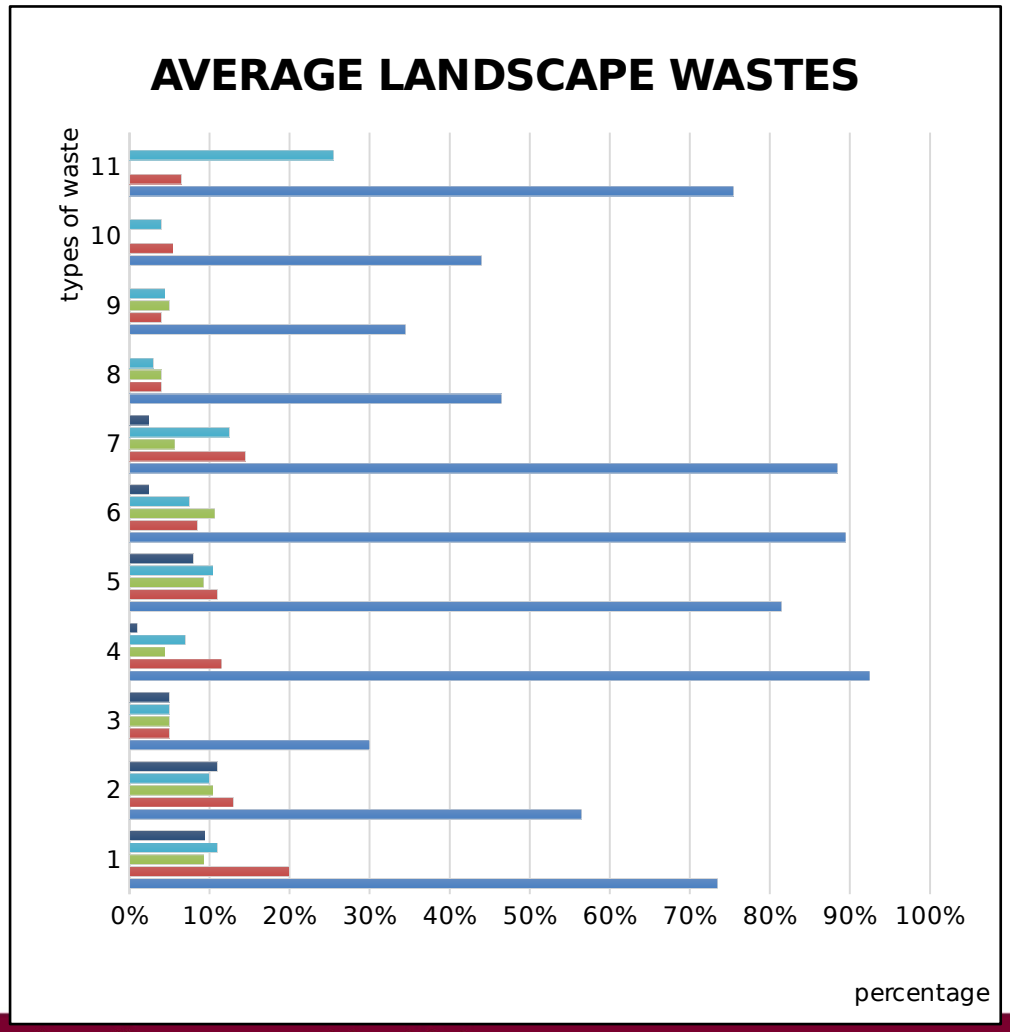
http://www.kindai.ac.jp
Kinki University
Liaison Center / Industry-Academic-Government Partnership Section
Research Promotion Department
Tel: 06-6721-2332
Address: 3-4-1 Kowakae Higashiosaka, Osaka 577-8502 Japan

NEDO 技術開発機構

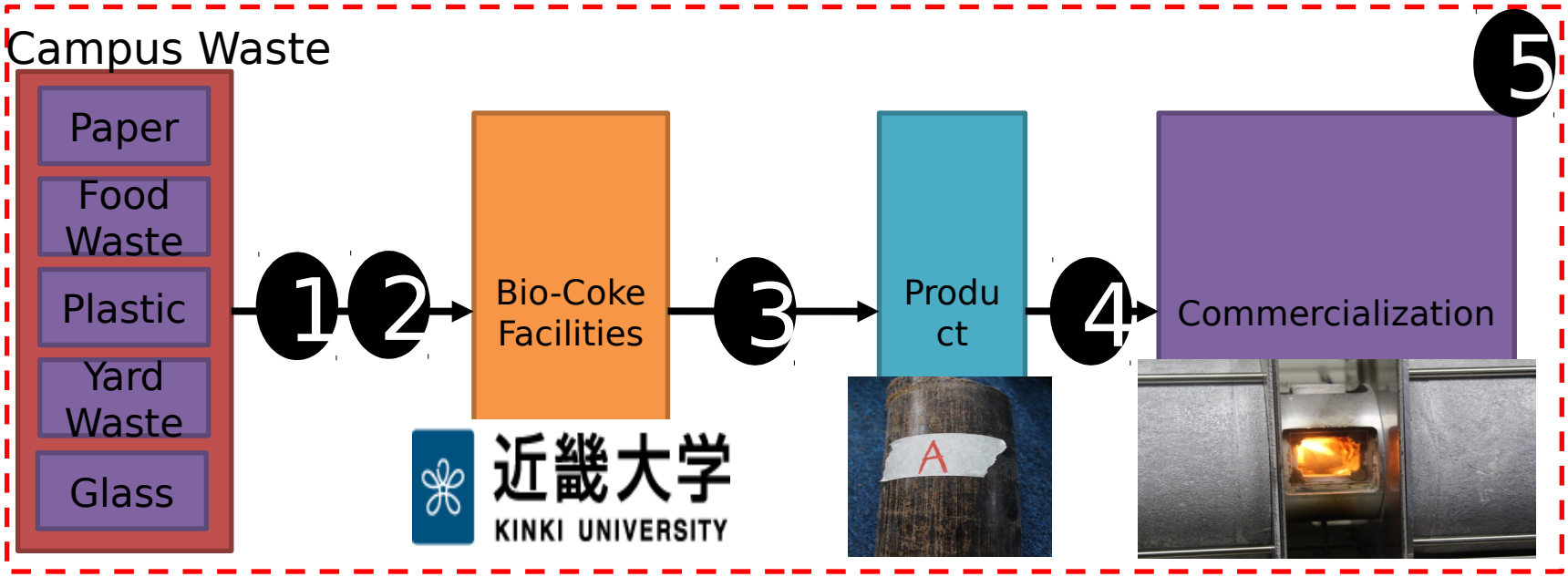
Kinki University School of Science and Engineering is currently researching " Bio-coke mass production, development and demonstration" This research has been selected for funding by The New Energy and Industrial Technology Development Organization (NEDO). This research, together with our partner, Mitsubishi Heavy Industries, is taking place at the Kinki University Institute of Resource Recycling in Eniwa, Hokkaido.

UTM Landscape Waste Management: Collection of 5 types of Landscape Waste



AVERAGE TRIP					
ZONE	DRY LEAVES	TWIGS	BRANCHES	PALM FROND	WOOD
1	74%	20%	9.35%	11%	10%
2	57%	13%	11%	10%	11%
3	30%	5%	5%	5%	5%
4	93%	12%	5%	7%	1%
5	82%	11%	9.30%	11%	8%
6	90%	9%	10.70%	8%	
7	89%	15%	5.70%	13%	3%
8	47%	4%		3%	
9	35%	4%	4%	5%	3%
10	44%	6%	5%	4%	
11	76%	7%		26%	

UTM Landscape Waste Management: Case Study of Collaboration



Process	Potential Research Collaboration
1	Quality and Quantity Analysis of Feedstock Resources
2	Elements of Pre-Processes: Pyrolysis, Gasification and Carbonization
3	Characteristic of Product Output
4	Market Readiness and Acceptance
5	Resource Utilization : Sustainability of Supply Demand Chain

COMMERCIALIZATION

BIO-COMPOST (FOOD WASTE)

ORGANIC FERTILIZER

FEEDSTOCK (FOOD WASTE)

ANIMAL FOOD

CONTENT:

- Moisture content
- Ash
- Crude proteinanalysis using Kjedahl method
- Crude fat
- Crude fiber

GREY OYSTER MUSHROOM

Fresh oyster mushroom (RM3/±200g)

Matured mushroom beds (RM2/±600g)

- EFV
- Sodas
- Pineapple Waste
- Coffee Powder
- Cocoa Powder
- Paddy Straw
- Rice Husk
- Food Waste

❑ Production of mushroom for 100 beds is approximately 200-400g/day.

4BIOPLUS

FLOOR CLEANING/ DISHES/KITCHEN SINK

MULTIPURPOSE CLEANING

INSECT REPELLENT (FLIES)/ PLANT FERTILIZER

UTMCS Institutional Linkages

Website:
http://www.utm.my/sustainable/
Facebook: UTM Sustainable Campus
Instagram: UTMCS

THANK YOU

.....save the next generation by going green.....

UTM
UNIVERSITI TEKNOLOGI MALAYSIA

SUSTAINABLE Campus
Kampus Lestari
UNIVERSITI TEKNOLOGI MALAYSIA