

Waste, Climate and Sustainable Development Convergence: AIT's Contribution Toward Sustainable Waste Management in Asia

International Symposium on Sustainable Future in Asia " Converting Aspirations to Actions"

1st NIES International Symposium

27-28 Jan 2015

C. Visvanathan

Environmental Engineering and Management
Asian Institute of Technology
Thailand

Email: visu@ait.asia

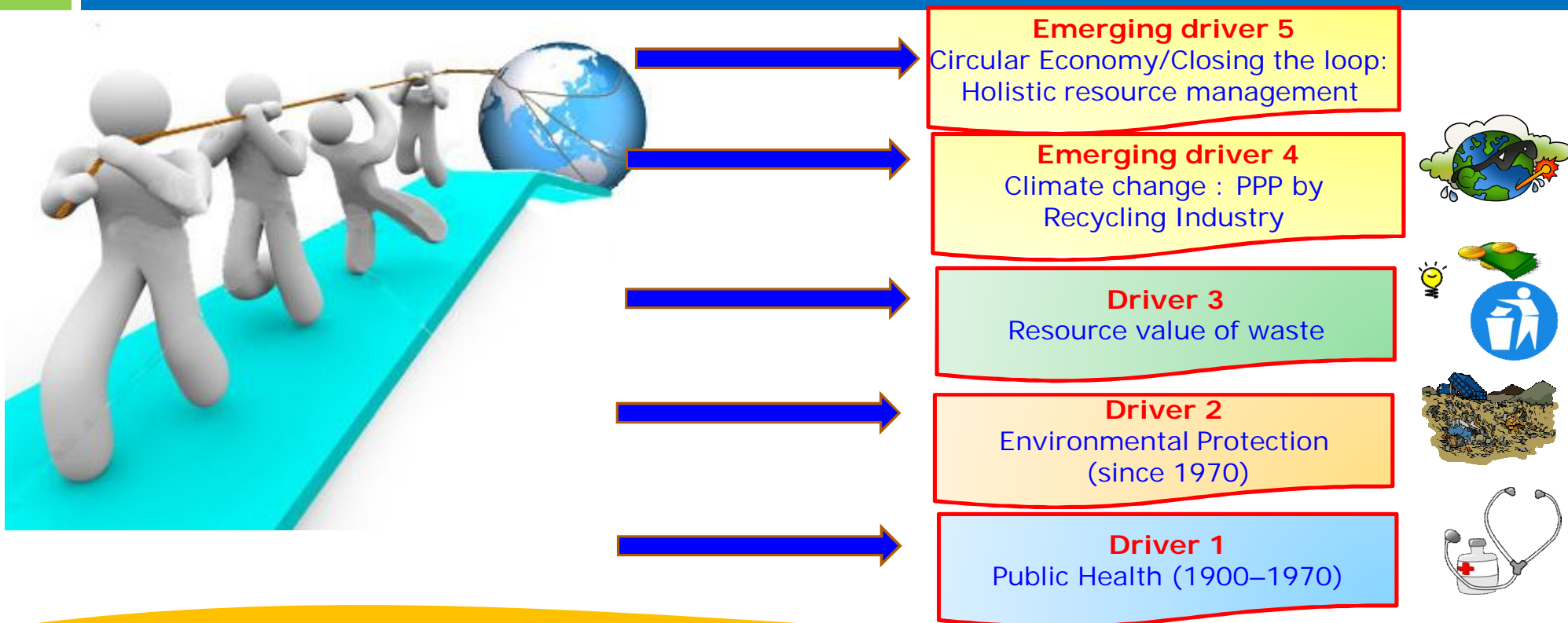
Webpage: <http://www.faculty.ait.ac.th/visu/>



Outline of the Presentation

- Waste, Sustainable Development Goals and Climate Change
- Waste and 3R Initiatives in Asia: Role of Private Sector; **Green Jobs & Co-benefits**
- Role of Regional Academic Institution like AIT in promoting Sustainable Waste Management in Asia
 - Waste Management and 3Rs in AIT's Curriculum and Research
 - AIT's research competency: external funded projects on waste management and 3R
 - AIT's future research direction

Drivers for Solid Waste Modernization



Moving from **Waste Management** to **Resources Management**

SDGs, Climate and Waste Connection

Waste and SDG

The SDGs also known as the Global Goals, build on the Millennium Development Goals (MDGs), but addresses the broader sustainability agenda

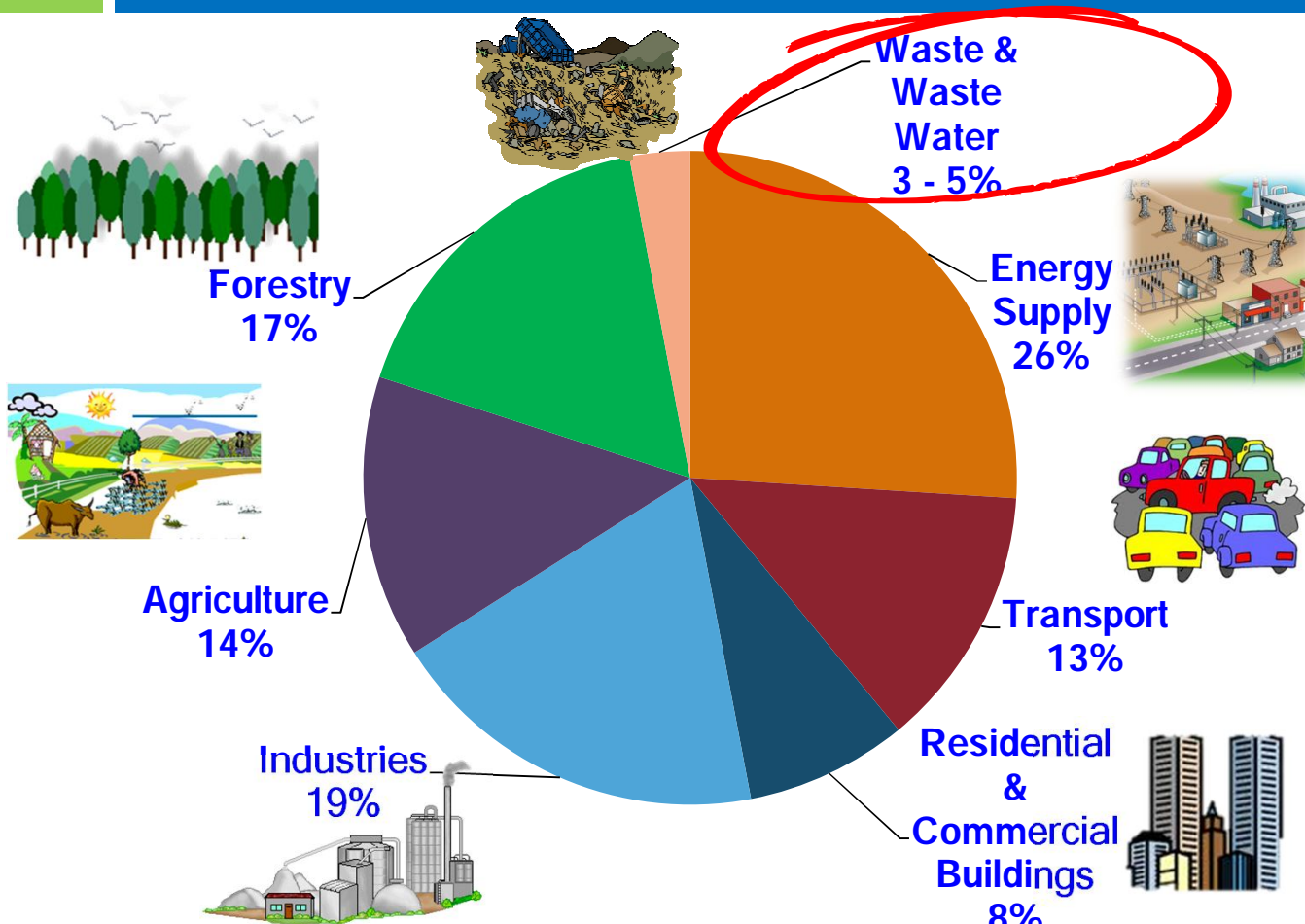
Multiple number of SGDs, especially SDG #12 ('Ensure responsible consumption and production patterns'), goal no. 6 (clean water and sanitation), goal no. 11 (sustainable cities and communities), and goal no. 13 (Climate Action) presents a huge scope for sustainable waste management and resource recovery activities driven co-benefits



Looking at SDGs from Wastes and Chemicals Perspective

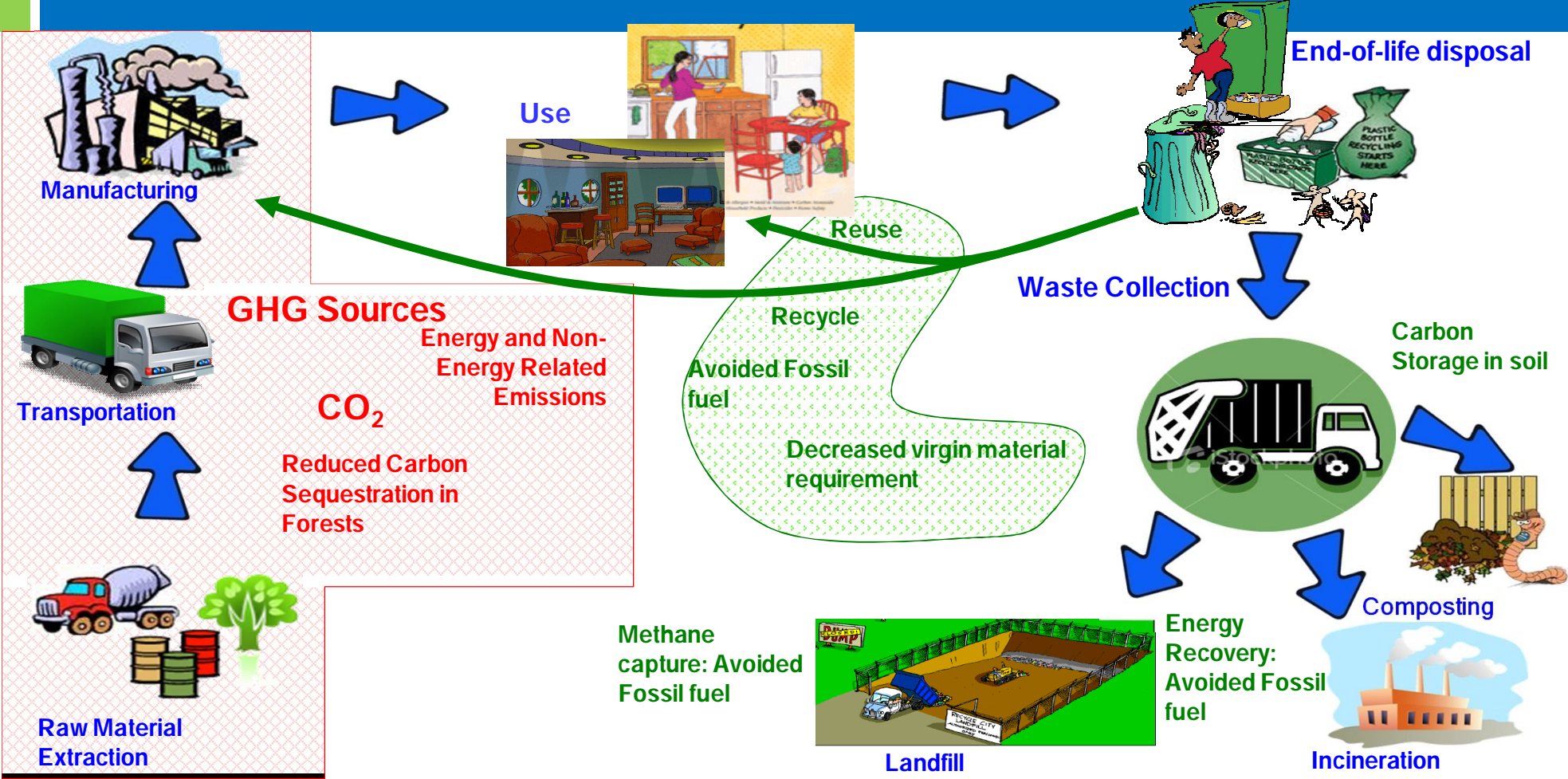


Waste and Climate Change

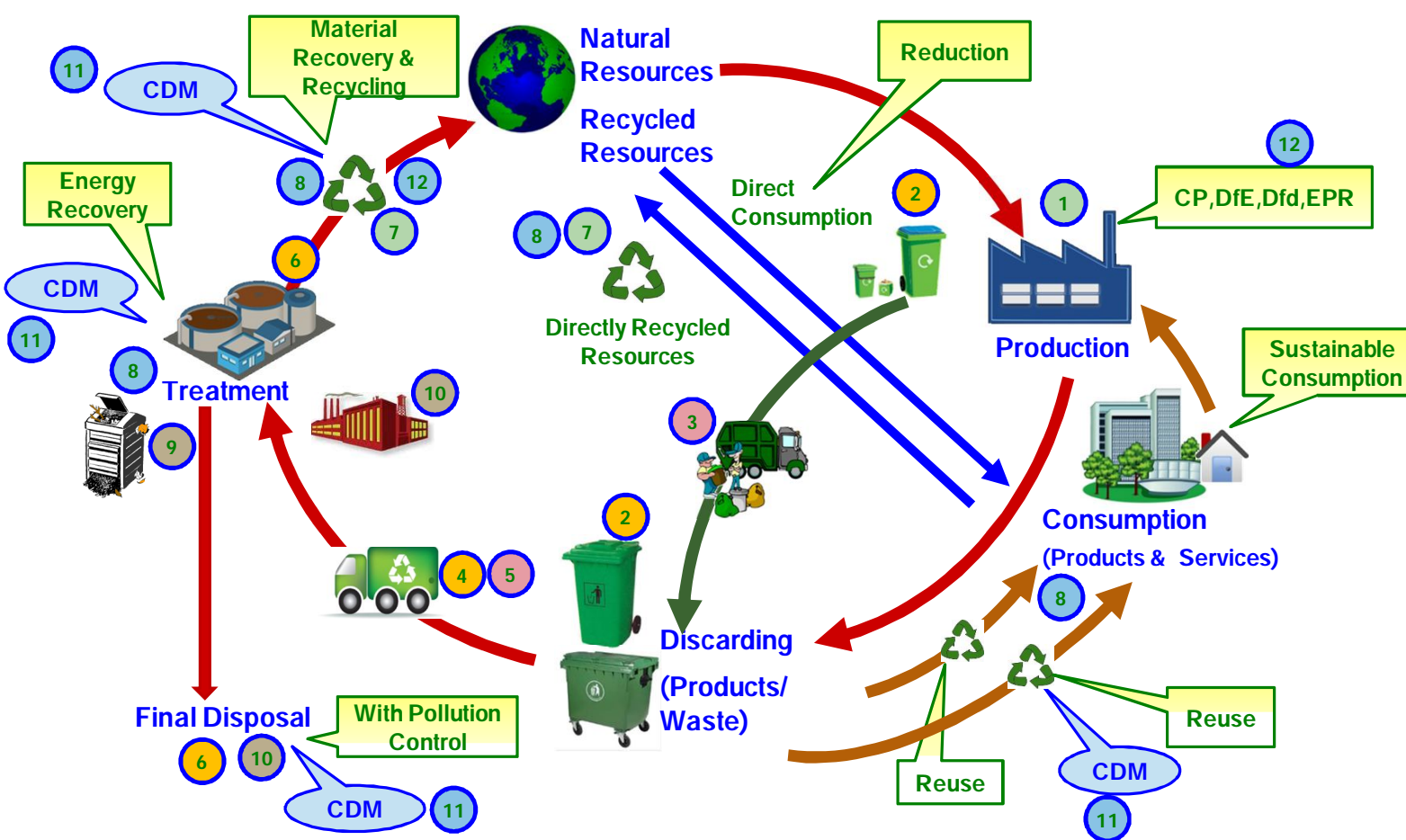


- GHG emissions from overall waste handling/management activities :
- Direct contributor:
 - Release of methane from fermentation of waste in landfill and open dumps
 - CO₂ release by waste transporting vehicles, incineration activities
- On an indirect level:
 - Material and energy use for extraction of virgin resources
 - Energy use and pollutants release in industrial production process

Sources of GHG Emission and Avoidance during Waste Handling & Management



Waste Management Business Opportunities



| No. | Opportunity |
|-----|-----------------------------------------------------|
| A | Machinery & Equipment Supplies |
| 2 | Bin & Container suppliers |
| 4 | Automotive suppliers |
| 6 | Equipment suppliers |
| B | Waste Collection Services |
| 3 | Waste collection services |
| 5 | Waste transportation services |
| C | Others |
| 1 | Waste Mgmt & Consulting |
| 7 | NGOs and CBOs formalizing rag pickers |
| D | Recycling Business |
| 9 | Operating Composting Units |
| 10 | Operating Biogas, Incineration, landfill facilities |
| E | Economic Co benefits |
| 8 | Opportunities arising from 3R activities |
| 11 | Revenue from Carbon Credits |
| 12 | Innovative Product Designers & Resource Managers. |

Waste Management Market

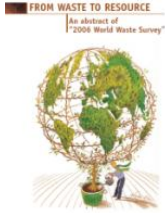


Waste to landfill to reduce from 22% to 5% by 2050

Average yearly US\$ 83 to US\$141 billion of investment to green waste sector

2 -2.84 million additional jobs by 2050 in formal sector

- Global e-waste management market to reach \$21billion in 2020
- Waste-to-energy (WTE) market will see global revenue of \$13.6 billion in 2016 .



Recycling market : US\$ 160 bn
MSW market : US\$ 125 bn
Non-hz Industrial waste : US\$ 147 bn

World's waste market is worth US\$ 410 bn

Waste Management Market is Growing

Co-benefits of Climate Action

- ❑ Creation of green jobs
- ❑ Improving social well-being
- ❑ Reducing health risks
- ❑ Enhancing economic development
- ❑ Saving landfill space
- ❑ Minimizing environmental loads from landfill of fresh waste or incineration
- ❑ Energy Security



Recycling and Job Creation Cont.



Dumping 10,000 tons of waste in a **landfill**

6 Jobs



**10,000 tons of waste
if recycling**

36 Jobs

Recycling generates more jobs (at higher income levels) than other forms of waste management

Co-Benefit Example from Organic Waste Composting

- Co-benefits of recycling one ton of organic waste in decentralized pro-poor manner
 - ❑ Creates two new jobs
 - ❑ Produce 0.20-0.25 tons of good quality compost
 - ❑ Reduce 0.5 tons of GHG emissions
 - ❑ Produces 40-80 m³ of biogas/clean energy source
 - ❑ Saves 1.1 m³ of landfill area
 - ❑ 2000 to 3000 people benefits from improved waste collection
 - ❑ Avoid the production of 0.2-0.3 m³ of polluting waste water
 - ❑ Reduce risk of disease linked with unmanaged solid waste in urban area
 - ❑ Use of composts → Increase crop yield (increase food security) & decreases chemical fertilizer use (improves public and environment health)



Waste, SDG and COP21 Paris Climate Agreement

- Sustainable Development Goals (SDGs) cannot not be achieved without tackling climate change
- Addressing climate change and fostering sustainable development should be pursued in a holistic manner
- Waste management and recycling are key drivers of sustainable development, and reduction in greenhouse gas (GHG) emissions
- Many of the SDGs guide action on the core drivers of climate change



Take urgent action to combat climate change and its impacts*



Capturing SDG and Climate Funds for Financing Waste Management Activities

- Climate Adaptation Fund



- Carbon Market

- Kyoto Protocol's Clean Development Mechanism (CDM) for the accrediting of emission reduction projects
- Waste-related Nationally Appropriate Mitigation Actions (NAMAs) proposals in developing countries

Carbon Offsets

Offsets represent emission reductions that have been achieved outside of the capped sector.

1 Company A needs to meet its emissions cap

2 Company A invests in an emission reduction project that produces carbon offsets

3 Company A receives carbon credits for its investment

One carbon credit = One tonne of greenhouse gas emission reductions

Carbon offsets programs can include:

- Reforestation
- Renewable energy
- Methane capture/combustion

CARBON CREDIT CERTIFICATE

Eighty tonnes carbon dioxide equivalent (CO₂e)

Retired on behalf of
Your Company

Eighty tonnes of carbon dioxide is hereby registered in biodiverse plantings at
Newtown, SA.

Lat=35°10'22.59"S Long=139° 3'58.90"E



CEO

1st July 2012

Glennide, Adelaide, SA 5065 www.eccoarbonoffsets.com.au



Waste Management Initiatives in Asia

Waste Generation -Facing the Facts

- Worldwide MSW : 5.2 Mt/day,
Developing Countries : 3.8 Mt/day
- 2012, world cities 1.3 bn t of waste/yr.
By 2025, projected to 2.2 bn t/yr.
- MSW generation Urban Asia to reach
1.8 Mt /d in 2025



Mt = Million tonnes
bn= Billion tonnes

Waste Growth in Asia is Inevitable

Solid Waste Generation, Composition, Collection in Asia

- The annual waste generation in East Asia (including the Pacific Region in the report) is approximately 270 million tonnes per year.
 - This quantity is mainly influenced by waste generation in China, which makes up 70% of the regional total. Per capita waste generation ranges from 0.44 to 4.3 kg per person per day for the region, with an average of 0.95 kg/capita/day
- In Eastern and Central Asia, the waste generated per year is at least 93 million tonnes.
 - The per capita waste generation ranges from 0.29 to 2.1 kg per person per day, with an average of 1.1 kg/capita/day.
- In South Asia, approximately 70 million tonnes of waste is generated per year, with per capita values ranging from 0.12 to 5.1 kg per person per day and an average of 0.45 kg/capita/day.

Hoorweg, Daniel; Bhada-Tata, Perinaz. 2012. What a Waste : A Global Review of Solid Waste Management. World Bank, Washington, DC. © World Bank.

3R Initiative in Asia

- The 3R Initiative aims to promote the "3Rs" (reduce, reuse and recycle) globally so as to build a sound-material-cycle society through the effective use of resources and materials
- It was agreed upon at the G8 Sea Island Summit in June 2004 as a new G8 initiative.
- The Ministerial Conference on the 3R initiative was held in Tokyo on 28-30 April 2005 to formally launch the 3R Initiative agreed upon at the G8 Sea Island Summit in June 2004
- The conference recognized it necessary to promote:
 - a) formulation and implementation of visions and/or strategies leading to a sound material-cycle society;
 - b) reduction of barriers to the international flow of goods and materials;
 - c) cooperation between developed and developing countries;
 - d) cooperation among stakeholders; and
 - e) science and technology suitable for the 3Rs.
- Regional 3R Forum in Asia, 3R scientific conference, etc.



Regional 3R Forums



1st Regional 3R Forum
11-12 Nov 2009, Tokyo, Japan
Outcome: "Tokyo 3R Statement concerning Establishment of Regional 3R Forum in Asia"



2nd Regional 3R Forum
4-6 Oct 2010, Kuala Lumpur, Malaysia
Theme: "3Rs toward Achieving Green Economy, Resource Efficiency and Sound Material-Cycle Society"



3rd Regional 3R Forum
5-7 Oct 2011, Singapore
Theme: "Technology Transfer for promoting the 3Rs - Adapting, implementing, and scaling up appropriate technologies"



4th Regional 3R Forum
18-20 Mar 2013, Ha Noi, Viet Nam
Theme: 3Rs in the Context of Rio+20 Outcome - The Future We Want



5th Regional 3R Forum
25-27 Feb 2014 Surabaya, Indonesia
Outcome: Surabaya Declaration- toward a resource-efficient and zero-waste society



6th Regional 3R Forum
16-19, August, 2015, Male, Maldives
Theme: 3R as an Economic Industry- Next Generation 3R Solutions for a Resource Efficient Society and Sustainable Tourism Development in Asia and the Pacific

Role of Regional Academic Institutions like AIT toward Sustainable Waste Management in the Region

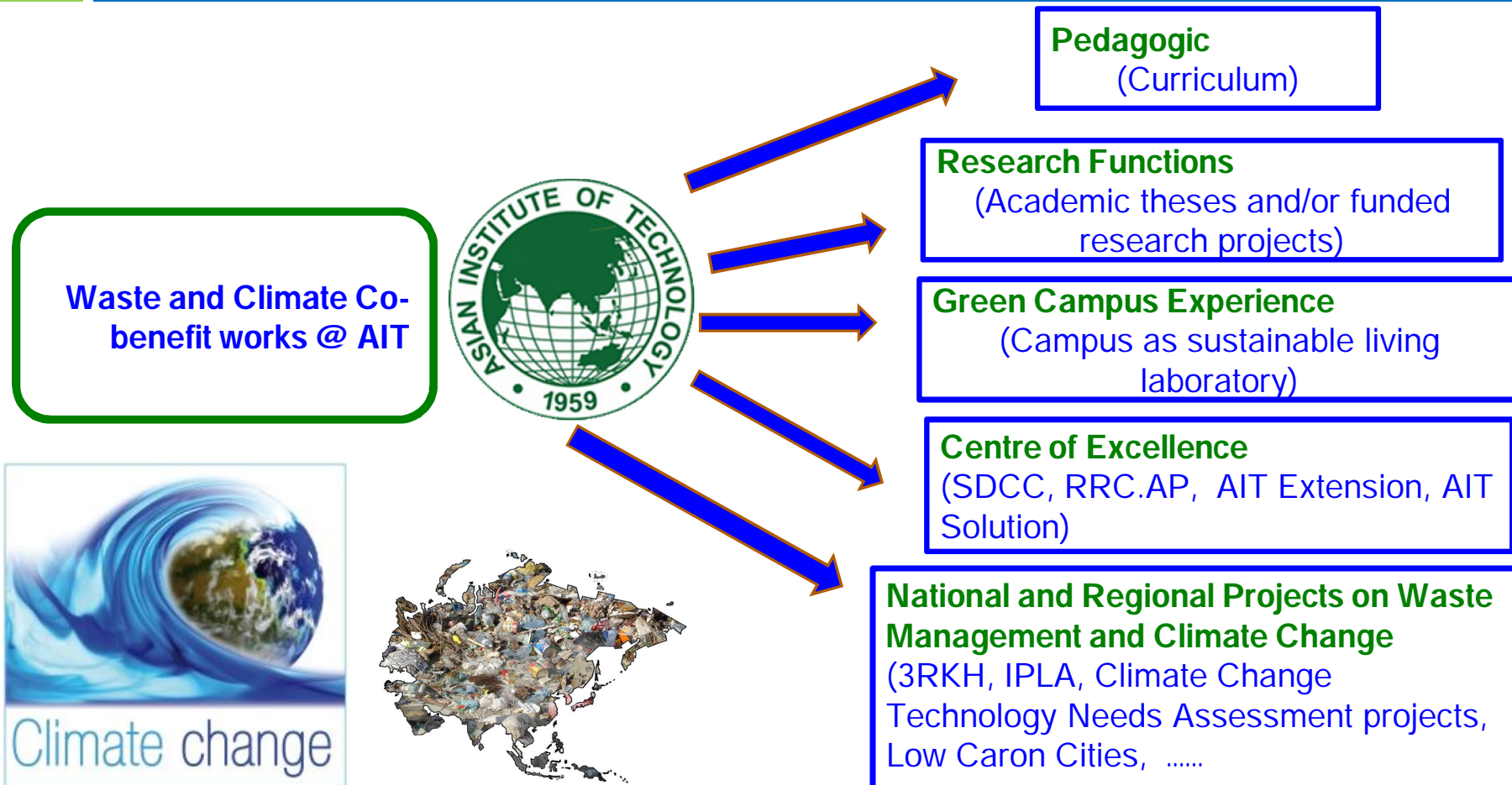
Asian Institute of Technology (AIT)



- Established in 1959
- Promotes technological change and sustainable development in the Asian-Pacific region through
- **Education:** Degree, non-degree, training, consulting, languages and multi-cultural communication
- **Research:** Applied and basic, a balance of both
- **Outreach:** Training, development projects



AIT's Contribution to Waste & Climate Sector



Short Term Trainings and Study Tours

This is for you !

The 3R voyage targets technical and managerial staff from local authorities (LA / municipality) with direct work responsibilities on solid waste management activities.

Also, interested individuals from waste management NGOs and private sector can be a part of this program.

Registration Fee

1200 USD/person

* Includes local transportation, meals, night stays, meeting documents, guided tour of the various facilities visited.
* Excludes international airfare and accommodation



About Us

We have long experience of research and capacity building on integrated solid waste management (ISWM) issues in Asia.

We have been coordinating 3R Knowledge Hub (3RKH) project capturing, collecting, creating and disseminating 3R knowledge products under joint initiative of ADB, UNEP, UNESCAP and AIT.

We are the Global Secretariat for International Partnership for Expanding Waste Management Services of Local Authorities (IPLEA).

Through this 3R Voyage, we will introduce you to Thailand's approach towards ISWM as a hands on training way.



www.3rkh.net, www.iplportal.org

Contact Us

C. VISVANATHAN
Environmental Engineering and Management Program
School of Environment, Resources and Development
Asian Institute of Technology
P.O. Box 4, Klong Luang
Pathumthani 12120
THAILAND
Email: vis@ait.ac.th, mih@ait.ac.th
Tel: (66-2) 524 5640
<http://www.faculty.ait.ac.th/visu/>



3R VOYAGE Integrated Solid Waste Management Study Tour — 2013



3R Learning Voyage

The 3R Voyage is a unique "outside the classroom" learning experience that will take you around various waste management facilities in the country. The Voyage is a greater seminar that will give you a chance to learn about sustainable waste management practices through visits made to waste Reduction, Recycling, Recovery, Treatment and Disposal facilities. The 5 day voyage will offer you some useful take home messages on Thailand's urban waste management experience!



Highlight Activities

- Transfer stations and landfill
- Integrated material recovery facility
- Incineration plant
- Waste Management in coastal tourism island
- Community efforts in solid waste management
- 3R Business: Private sector participation
- Plastic to oil plant
- Small scale plastic recycling
- Healthcare waste management



Learning Methods

The learning will be conducted outside the classrooms, with visits to waste treatment facilities. Each visited site will have discussion with operators, managers and local communities.

Going Places

The field visits will be made in different parts/ provinces of Thailand. The sites chosen are so which takes the participants to a whole new experience of waste treatment trail for urban waste management. The tour trail would cover three major places Bangkok and its vicinity; Rayong and Phuket, plus few day hop on off sites on the way.



Major Waste Management Projects

1. ADB's 3R Knowledge Hub (3RKH)

- Collect, create and disseminate 3R relevant knowledge products
- www.3rkh.net

2. ISSOWAMA Project

- Funded by the European Commission under its FP7,
- raised awareness of the Integrated and Sustainable Waste Management
- <http://www.issowama.net/>

3. Sustainable Solid Waste Landfill Management in Asia

- Funded by Swedish International Development Cooperation Agency (SIDA)
- <http://www.swlf.ait.ac.th/>

4. MRI projects

- Creating Waste and 3R related databases
- www.rrrkh.ait.ac.th

5. Sustainable Solid Waste Landfill Management under ARRPET -I & II

- Development of Teaching and Training Modules for Higher Education in the Waste Management Sector
- <http://www.altetrawama.ait.ac.th/>



Solid Waste Related External Funded Projects

Industrial and Research Partners:

Solid Waste Management

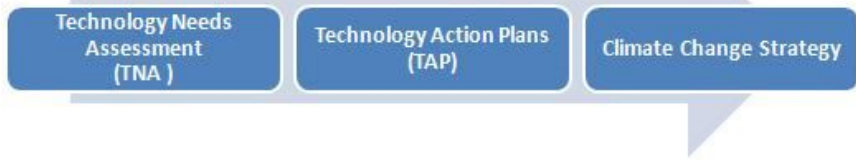
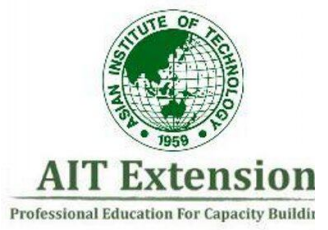
Research Partners:

Logos and portraits of research partners include: Tongji University, IGES, University of Calgary, University of Hawai'i, and various other academic institutions.

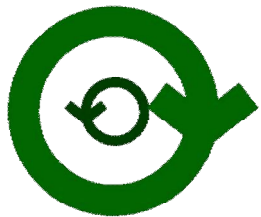
Logos of industrial and research partners include: UNEP, 3RKH, Green Power Systems, Asian Institute of Technology (1959), ADB, TUHH, Asia-Link, EuropeAid Co-operation Office, Peradeniya Sri Lanka, Mitsubishi Research Institute, Inc., UPM, Sida, ISSOWAMA, United Nations ESCAP, and ANKA University.

Below the yellow rectangle are logos for UNIDO, ADBInstitute, and IGES.

Centre of Excellence and Projects on Waste & Climate

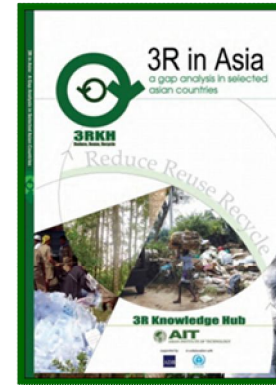
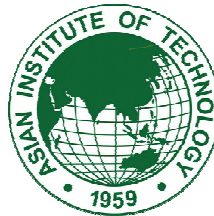


AIT's Presence in Regional Waste Management Outreach Activities: 3R Knowledge Hub

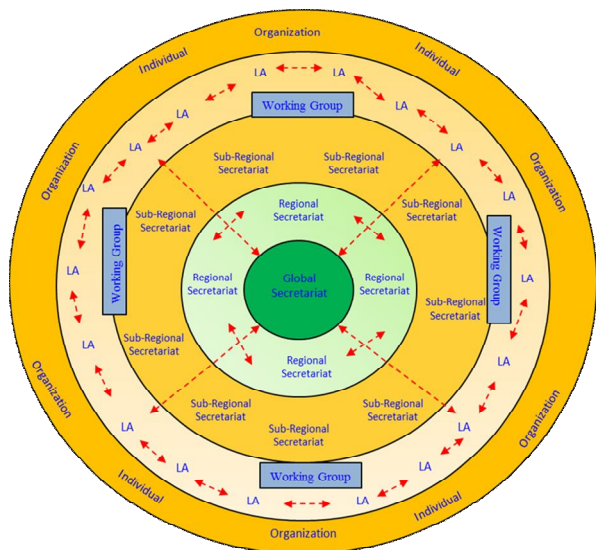


3RKH
Reduce Reuse Recycle

3R Knowledge Hub



AIT's Presence in Regional Waste Management Outreach Activities: IPLA Secretariat



Partners

| | |
|---------------------------------------------|---------------------------------------------------------------|
| Global secretariat | Asian Institute of Technology (AIT) |
| Regional secretariat | UN-HABITAT |
| Sub-Regional secretariat | REC, SWEEP, NET, SPREP, SACEP, Griffith University and UAESP |
| International Organization / Donor Agencies | UNESCAP, UNDP-PPPSD, UNU-IAS, OECD, IDB, GIZ, JICA, and etc.. |
| International Association / NGOs | ISWA, CWG, IWWG and etc. |



[About IPLA](#)
[News](#)
[About The Portal](#)
[Sponsors](#)
[IPLA Members](#)
[Contact](#)



REGISTER. CONTRIBUTE. PARTICIPATE.



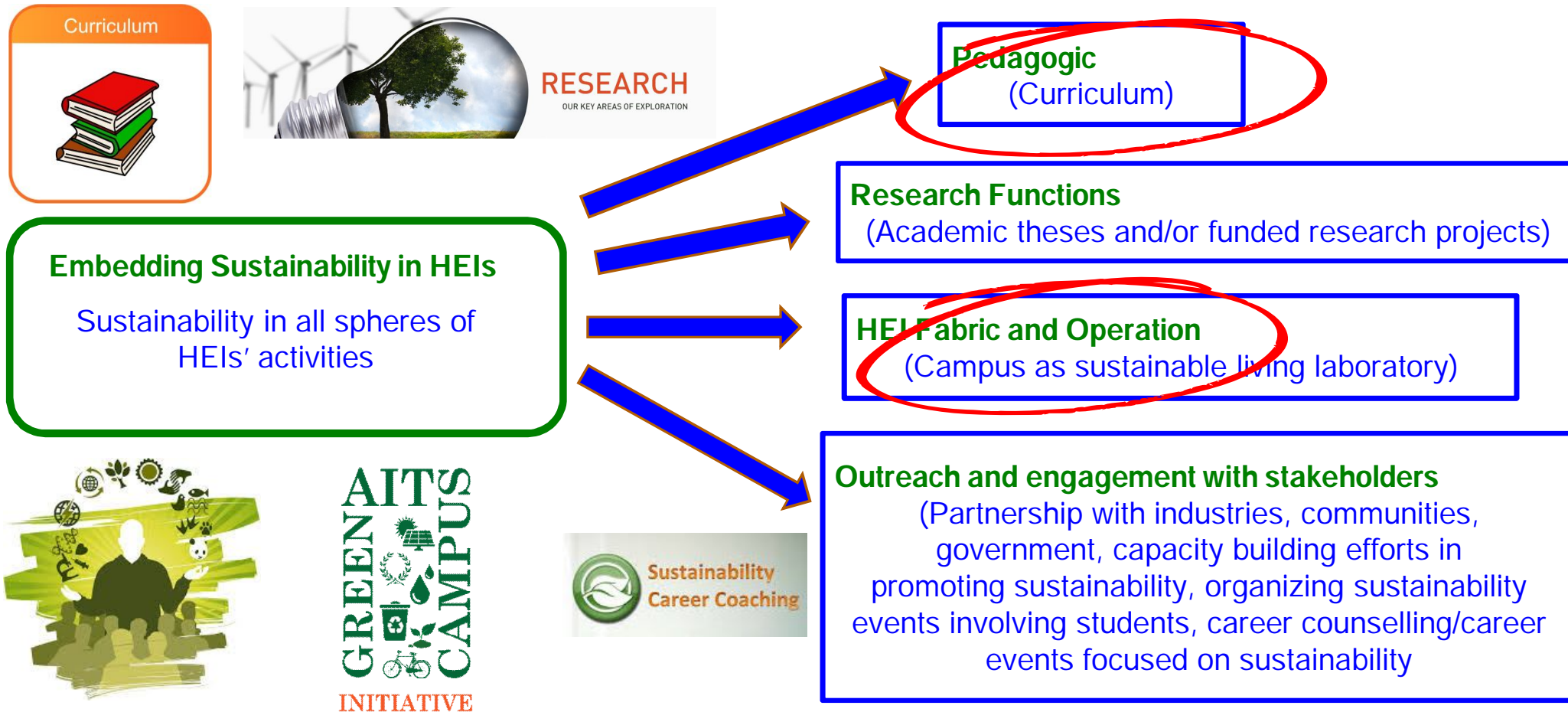
| | | | | |
|-------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|--------------------------------------------------|---------------------------------------------------------------------|-----------------------------------------------------------|
| ASIA & THE PACIFIC South Asia South East Asia Northwest Pacific East Asia Central Asia Oceania (Australia & New Zealand) | AFRICA Northern Africa Western Africa Central Africa Eastern Africa Southern Africa | LATIN AMERICA NORTH AMERICA | EUROPE Western Europe Eastern Europe Central Europe | SIDS South Pacific Indian Ocean Caribbean |
|-------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|--------------------------------------------------|---------------------------------------------------------------------|-----------------------------------------------------------|

Waste for Sustainable Development (WSD) Consortium Secretariat

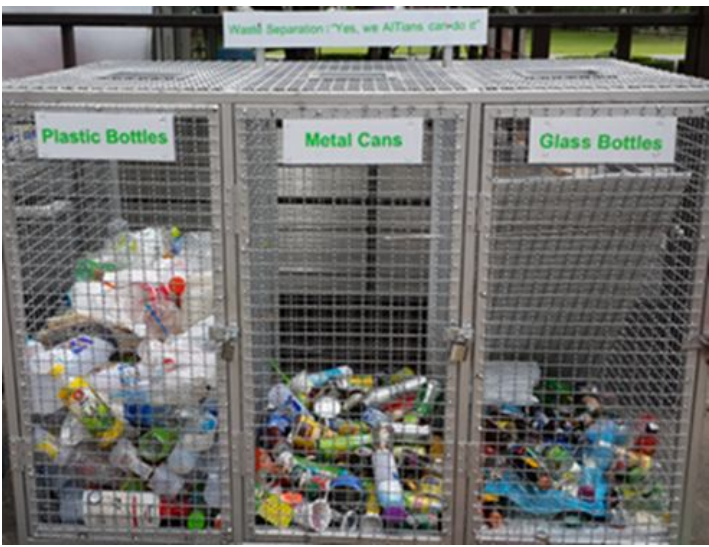


- WSD is a University Consortium promoting holistic waste management education and capacity building
- Convened by the UNEP International Environmental Technology Management (UNEP IETC), a six member University Consortium was established in February 2014
- Holistic approach to waste management puts wastes in life cycle perspective for closing the resource loop, and contribute towards sustainable solutions to all forms of solid, liquid and gaseous wastes and emissions. Holistic system approach to waste management, therefore breaks individual vertical Silos of one stream/form/sector of waste, and handles all possible interlinkages and the resultants multi-media wastes and emissions

AIT Embeds Sustainability Initiatives via...



Green Campus Initiatives: Sustainable Waste Management



Dry Recyclable Waste Segregation Activity in AIT Campus 2 waste collection staff earns 6000 THB (US\$ 200) per month from selling segregated waste, and housemaids also earn additional income from household segregated waste.

Recycling Waste Up-scaling Livelihoods

Thank you for your support to keep AIT green and Clean !

Khun Samreng and Khun Prayaad extend their thanks to AITians for the 50 kg of segregated waste in last 20 days. They say "please give us more segregated wastes."

You might be thinking, "Oh, wait, who are these people and why are they thanking me for the heap of waste? Yes, you heard them right, these two gentlemen are our Eco heroes, who is supporting the "waste recycling" initiative started by two students Miss Phyoee Thek Khaing (Master's program EEM), and Miss Siwaporn Tangwanichagapong (PhD, UEM). Yes, you certainly deserve the gratitude and so do us the entire AIT community for participating in recyclable waste collection activity. With our effective participation, they have been able to collect **50 kg of recyclable plastic and glass bottles and metal cans** in a mere **20 days** of placing a collection "cage bin" at 108 Lawson premise.

"50 kg of segregated recyclable brings our Eco heroes nearly 400 THB of an extra income in a dignified way than digging the mixed wastes for re-segregating the recyclables"

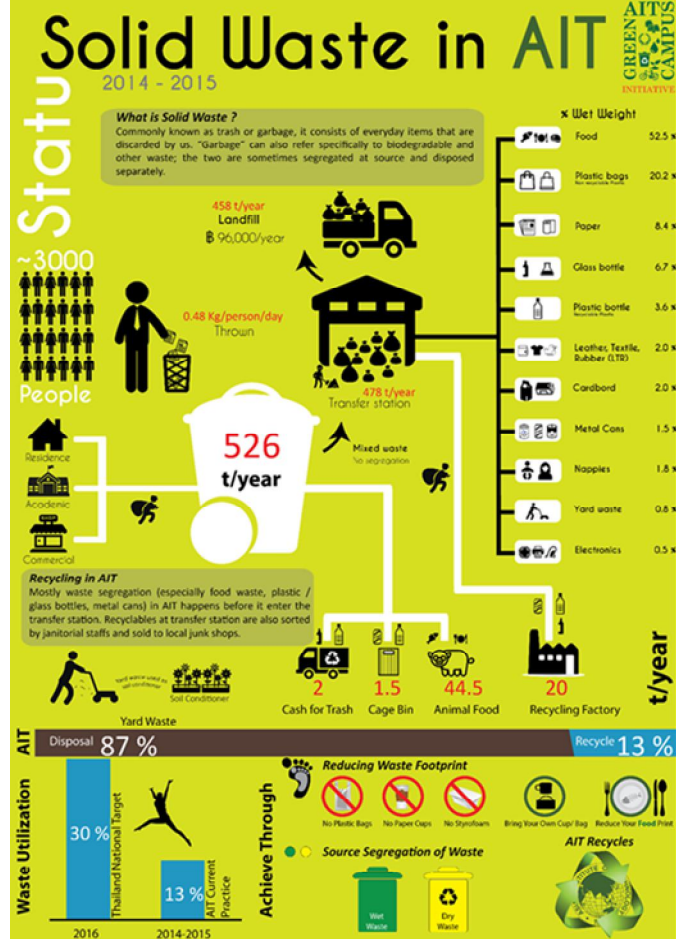
Next time you want to throw a plastic bottle or glass bottle or metal can randomly, think of our Eco Heroes whom you can support the with some extra income just by binning the recyclables in the right bin !

Doing well, but we can do better!

The present collection scale is less than 1% of the total recycle potential of 2 tons of wastes AIT produces every day. Of the 2 tons waste produced, almost one-fourth of the waste accounts for plastic bottles, metal cans and glass bottles. Europe has moved ahead with ambitious target of increasing the municipal solid waste recycling to 70% by 2030, while our host country Thailand also has a 30% waste recovery target by 2016. Let us try to catch up!

Let's be the agent for AIT's Corporate Social Responsibility and extend our helping hands for greater social, economic and environmental well-being.

<http://greencampus.consulting.ait.ac.th/> A Sustainability living laboratory

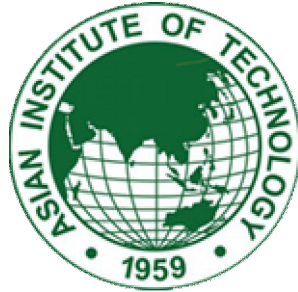


AIT's Future Work on Sustainable Waste Management in Asia

UNEP IETC and RRC.AP/AIT Projects on Waste Management



RRC.AP



UNEP

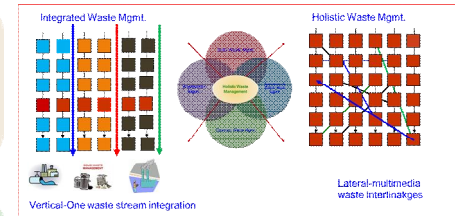
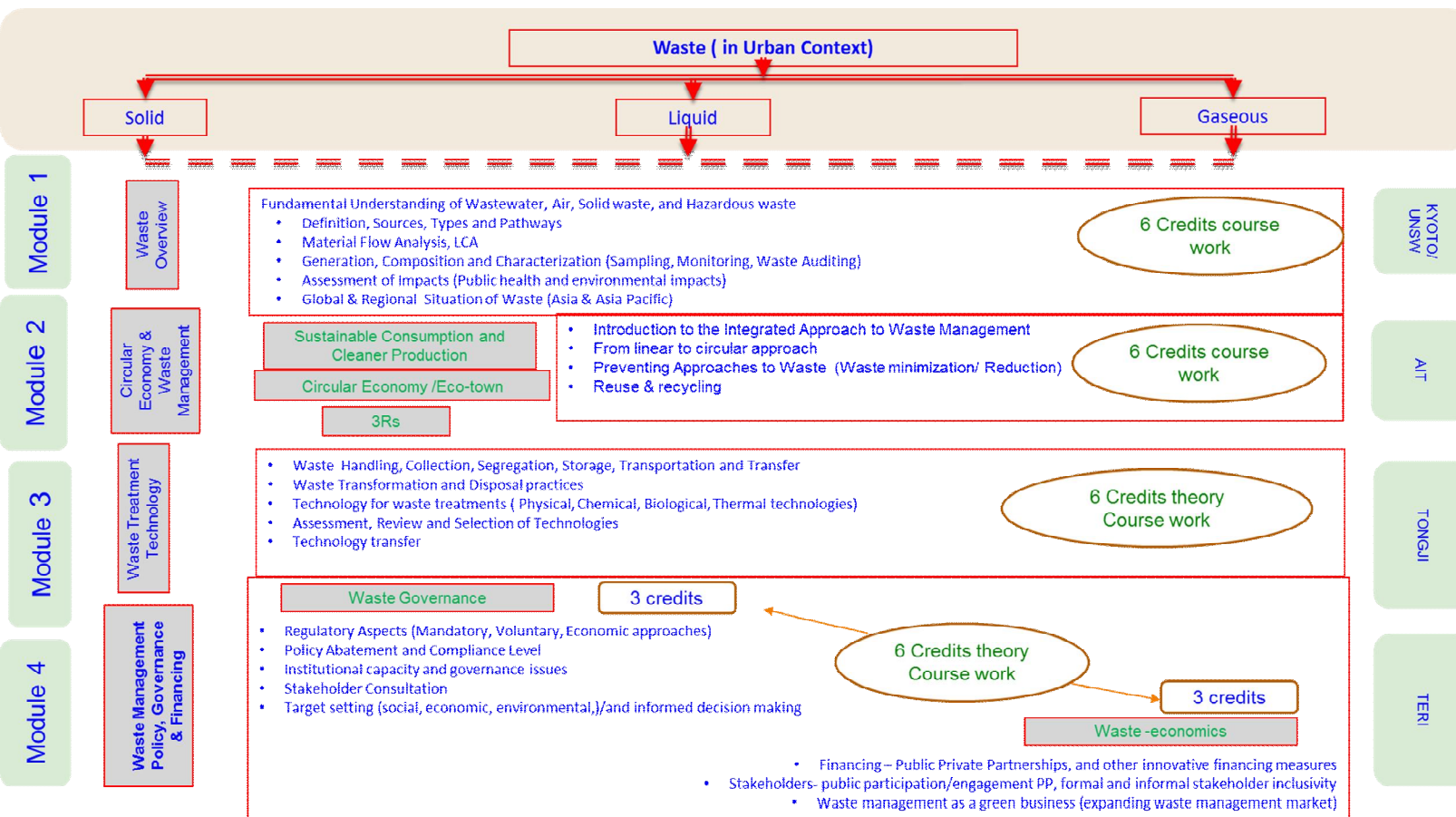
United Nations Environment Programme

IETC

International Environmental Technology Centre

1. Academic Curriculum on Holistic Waste Management
2. CCAC-Municipal Solid Waste Management Initiative Projects
3. National and City Waste Management Strategy
4. Asian End-of-Life Vehicle Recycling Project

Holistic Waste Management Professional Degree Programme



Expected Outcome

The Consortium will develop a unique Master's degree programme to meet the needs of the industry and academia to address the challenges of waste management in Asia. The programme will be jointly developed and delivered by the Consortium members.

Knowledge Partners

Activities So Far

Workshop on Sustainable Consumption and Production (SCP) in Asia, 2014, Singapore, 12-14 May 2014. Hosted by UNSW, Singapore.

3rd Training Session on Holistic Waste Management, 22-25 Sept 2015, at the University of Tongji, Shanghai, China.

Upcoming Activities

3rd Training Session on Holistic Waste Management, 22-25 Sept 2015, at the University of Tongji, Shanghai, China.

1 Year Professional Master's Degree
Tentative Date: August 2016

WSD Waste for Sustainable Development

University Consortium UNEP

United Nations Environment Programme
International Environmental Technology Centre

Preamble

Waste management has become a global challenge. The world's population is growing rapidly, and with it, the amount of waste generated. This waste is a major source of environmental pollution and a significant barrier to sustainable development. The United Nations Environment Programme (UNEP) and the World Health Organization (WHO) have identified waste management as a key area for action to achieve the Sustainable Development Goals (SDGs).

WSD Consortium

The WSD Consortium is a unique partnership of leading universities and research institutions from Asia and the Pacific region. The Consortium members will collaborate to develop and deliver a world-class Master's degree programme in Waste Management for Sustainable Development. The Consortium will also conduct research and innovation in waste management and provide training and capacity building to the industry and academia.

The Consortium Partners

- Asian Institute of Technology, Thailand
- Chung-Ang University, South Korea
- City University of Hong Kong, Hong Kong
- East China University of Technology, China
- Indian Institute of Technology Bombay, India
- KAIST University, South Korea
- Nanyang Technological University, Singapore
- Shanghai University, China
- UNEP, Geneva

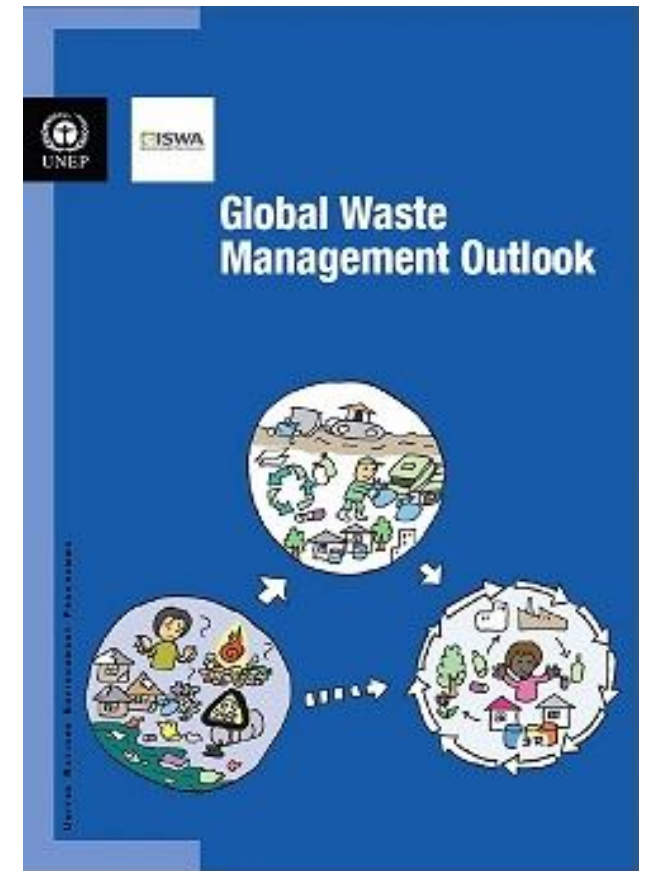
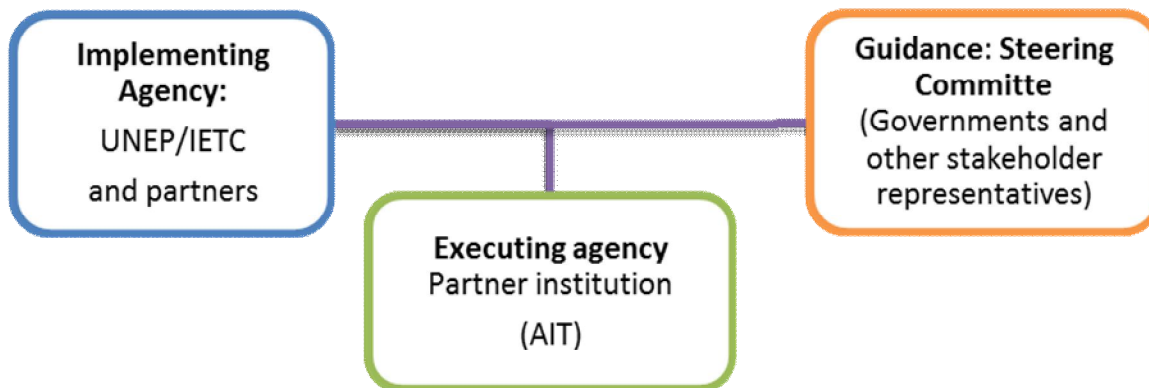
WSD Consortium Arrangement

Objectives

The Consortium aims to develop a unique waste management programme to meet the needs of the industry and academia to address the challenges of waste management in Asia. The programme will be jointly developed and delivered by the Consortium members.

Asian Waste Management Outlook (AWMO)

- To develop the Asia Waste Management Outlook as a follow-up of the Global Waste Management Outlook (GWMO)
- The Outlook will focus on the state of waste management in the region, policies and financing mechanisms used



We Are Open for AIT-NIES Collaboration...



National Institute for
Environmental
Studies

**Regional Focus.....
More than National
Focus.....**





Thank You!