



Asian Regional Research Programme on Sustainable Solid Waste Landfill Management in Asia



C. Visvanathan, J. Tränkler, P. Kuruparan, B.F.A. Basnayake,
C. Chiemchaisri, K. Joseph, and Z. Gongming

Asian Institute of Technology, Thailand
University of Peradeniya, Kandy, Sri Lanka
Kasetsart University, Bangkok, Thailand
Anna University, Chennai, India
Tongji University, Shanghai, PR China



Presentation Overview

- ✓ Significance of SWLF Management
- ✓ Network of Research Team
- ✓ Phase-I Outcome
- ✓ Phase-II Focus
- ✓ Conclusion





Common Features in Asia: Solid Waste

- ✓ Open dumping / open burning is very common practice
- ✓ No proper cover / liner system used
- ✓ No leachate collection or gas collection system available
- ✓ Inadequate experience in Engineered landfill applications
- ✓ Poor in technical performance and economically not viable solutions



Failures of Sanitary/Engineered Landfill in Thailand?



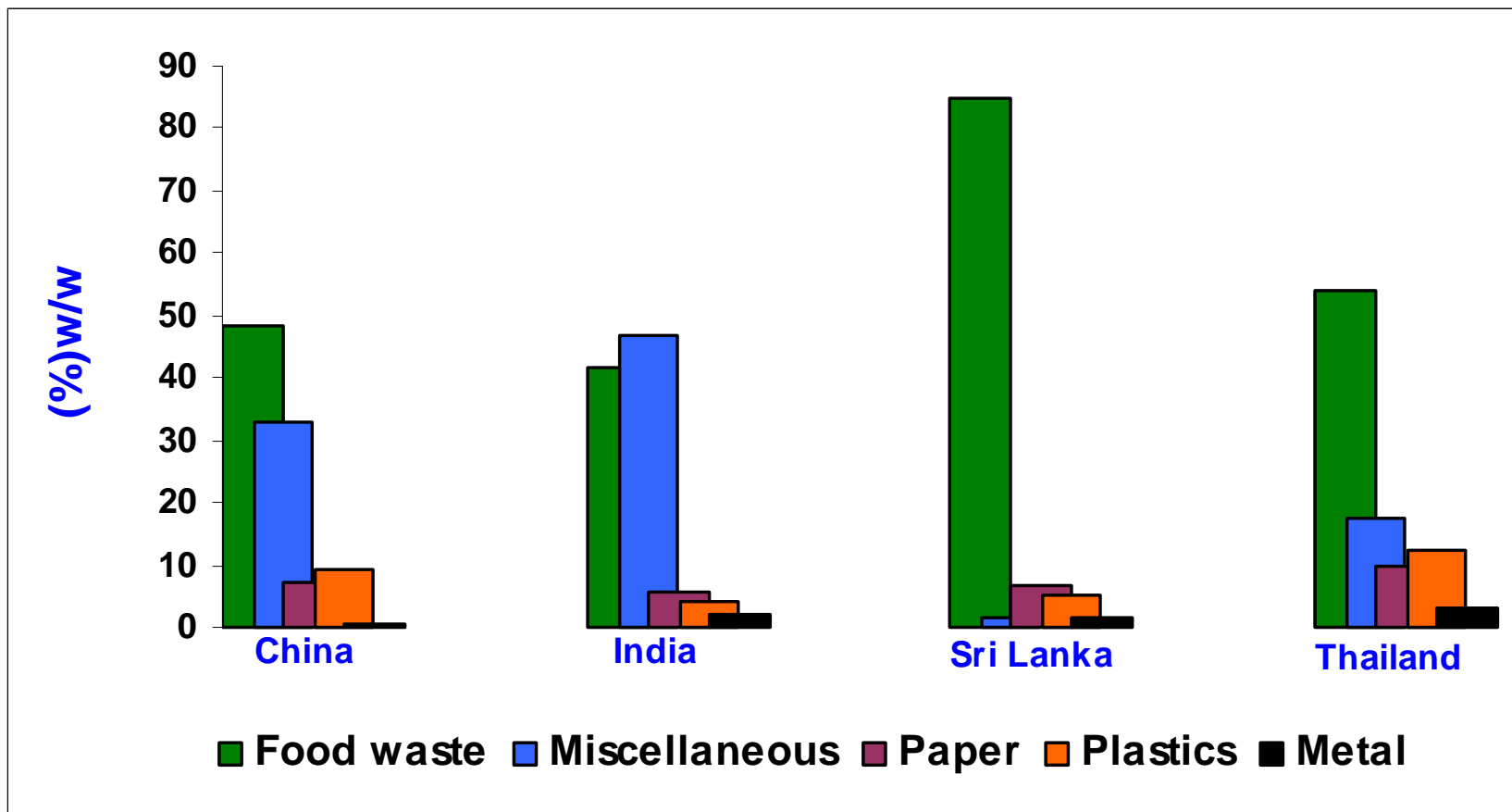


Common Practices in Asia

- ❖ Similar climatic influences
 - ✓ tropical climate
- ❖ Same social/cultural practices
 - ✓ More than 50% food waste
 - ✓ Moisture content is very high
 - ✓ More waste is recycled internally
- ❖ Lack of fund source for MSW landfill management
- ❖ Lack of technical solution for proper care
- ❖ Lack of political willingness



Waste Composition



Comparison of organic and inorganic components in the MSW from the study countries

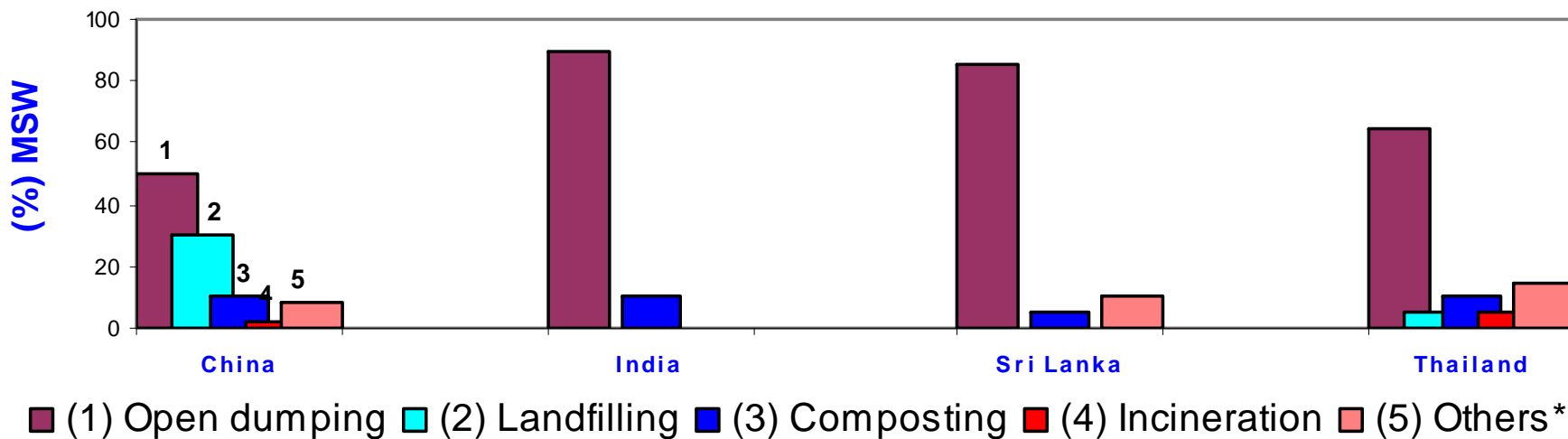


Disposal

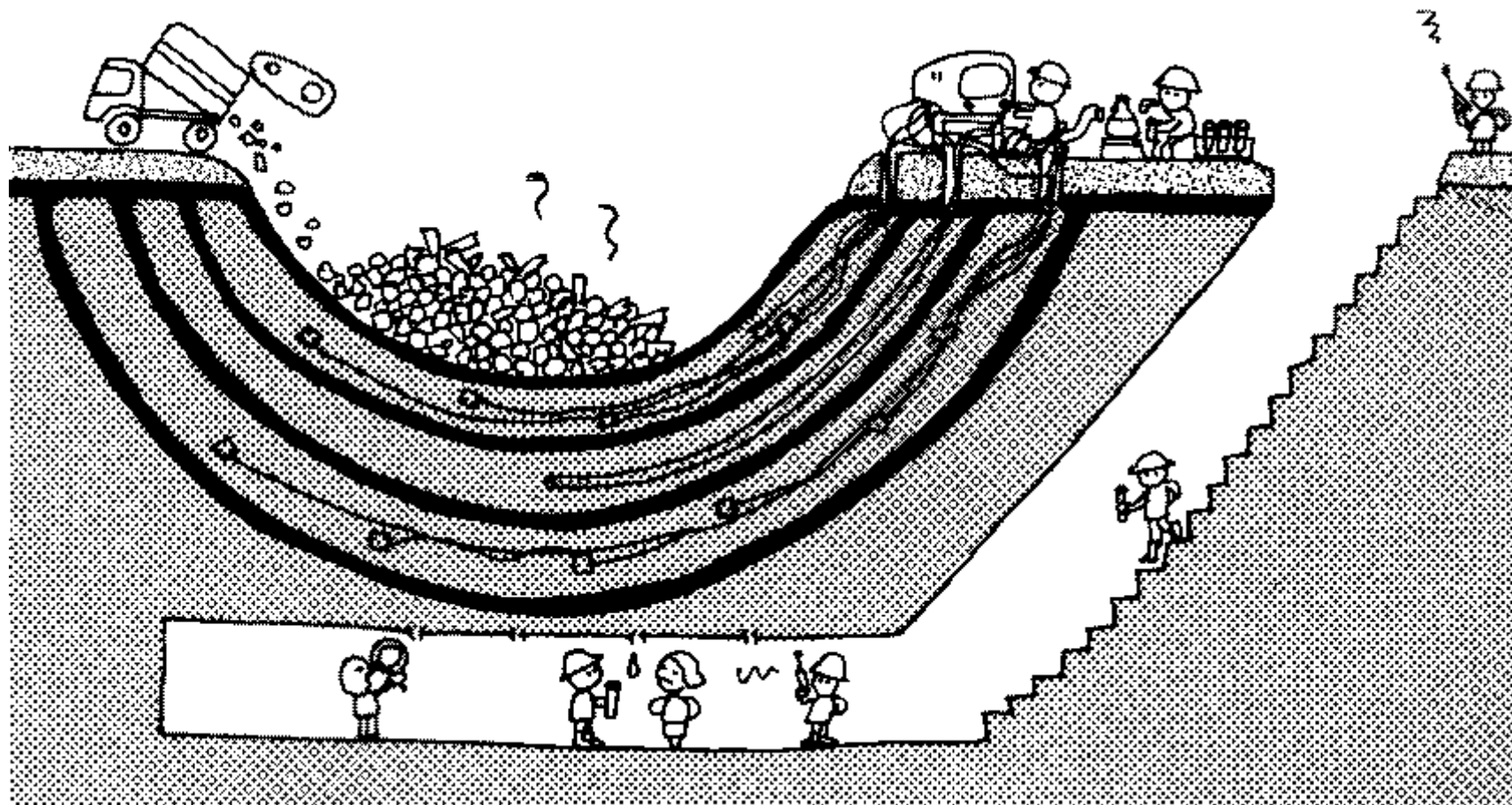
Open dumping: most prevalent mode of disposal

China-50%; India-90%; Sri Lanka-85% and Thailand-65%

MSW disposal methods practised in Study Countries



Why Landfill Research?





Why Regional Research Networks

"...regionally focused environmental research and assessments are developed to complement global scale research and transform its advances into usable information for decision making at spatial scales. This will require building the necessary resource base, as well as new partnerships between the relevant sciences and the public and private sectors."

The Science of Regional and Global Change: Putting Knowledge to Work (NRC, 2001)

- ✓ Integrates researchers from a variety of disciplines to fully understand the selected research theme
- ✓ Possible South-South cooperation
- ✓ Stimulate creativity and innovative solutions
- ✓ Feasible locally adoptable and economically feasible solution
- ✓ Better understanding of the local problems and utilization of representative from National Institutes in the region



Research Group

Coordination:

AIT

NRI's

Swedish Expert

Prof. William Hogland
Environmental Engineering
Department of Technology
University of Kalmar
Sweden



India

Anna University

Sri Lanka

**University of
Peradeniya**

China

Tongji University

Thailand

**Kasetsart
University**



Project Mission

- ✓ Enhancement of solid waste disposal practices and landfill technology for efficient and effective solid waste landfill management in the Asian region.

Research Objectives

Technology Aspects

- ✓ Identification and development of sustainable, environmentally sound and cost effective solid waste treatment and disposal technologies.

Networking among NRIs

- ✓ Compilation of existing practices of solid waste management and basic information about solid waste organization (case Studies), preparation of training materials, lecture notes, workshop and training programs, workshops and policy dissemination

Policy and Institutional Aspects

- ✓ Identification of gaps and recommendation in policy and legislation based on data compilation, technical research and policy dissemination.



Main Research Topics

- ✓ Pre-treatment of solid waste
- ✓ Operation of landfills for controlled and enhanced degradation
- ✓ Management and reduction of landfill gas and leachate emissions
- ✓ Rehabilitation of dumpsites
 - Refuse Derived Fuel
 - Waste Electrical and Electronic Equipment



Sustainable Solid Waste Landfill Management in Asia

AIT:

- MBPT: Anaerobic Dry Fermentation (Major)
- Semi-scale Landfill Lysimeter Studies (Major)
- Landfill Rehabilitation and Toxicity Study (Minor)

Thailand:

- Methane Oxidation and Landfill Gas Emission Study (Major)
- Landfill Lysimeter Study (Major)
- Low-cost Landfill Leachate: Wetland (Minor)

China:

- Low-cost Landfill Leachate Treatment UASB/SBR/ and Wetland (Minor)
- Plastic Recycling from MSW in Landfill and Dumpsite (Major)
- Recycling of Metals in Printed Circuit Board (PCB) (Major)

Sri Lanka:

- MBPT: Aerobic Pre-Treatment (Major)
- MBPT: Anaerobic Pre-treatment (Major)
- Semi scale Landfill Lysimeter Studies (Major)
- Leachate: Constructed Wetland (Minor)
- Landfill Rehabilitation and Landfill Mining (Minor)

India

- Dumpsite Rehabilitation and Mining (Major)
- Semi-scale Landfill Lysimeters (Major)
- Landfill Microbiological Studies (Minor)
- Pre-treatment of MSW by Anaerobic Dry Fermentation (Minor)

Recommendation for policy and legislation based on data compilation, technical research and policy dissemination
Recommendation for the design, operation and maintenance of future solid waste landfill and upgrading of existing dumpsites



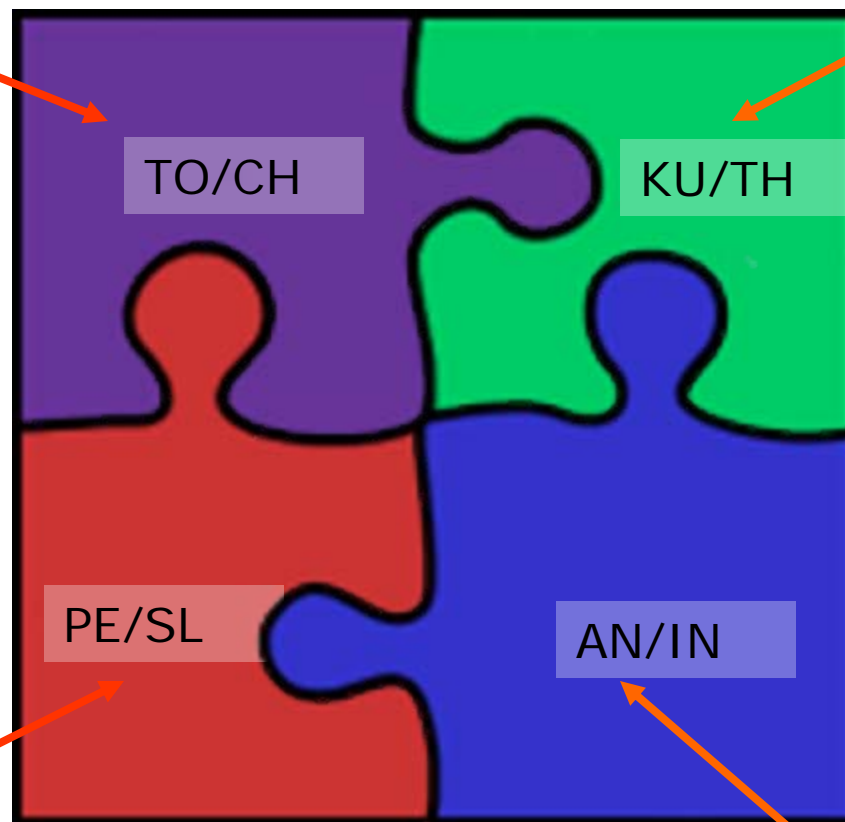
Networking

- ✓ Different NRIs have different competences
- ✓ Integrating such competence for a regional research through networking
- ✓ Allow the NRIs to conduct individual research
- ✓ Share / joint conduction of research on common activities

Sustainable Landfilling Technologies

Landfill Leachate Treatment

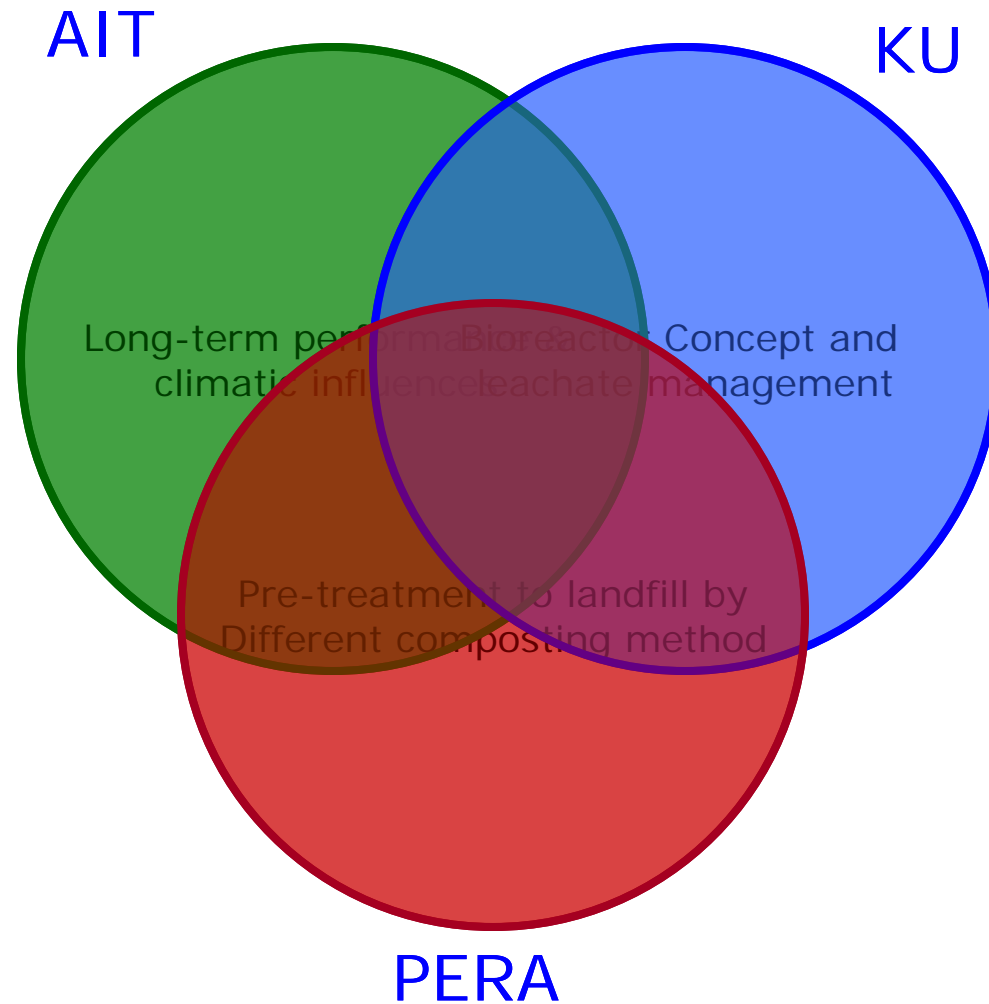
Methane Emission and
Oxidation Studies in
the Cover Soil



Landfill Pretreatment Technologies

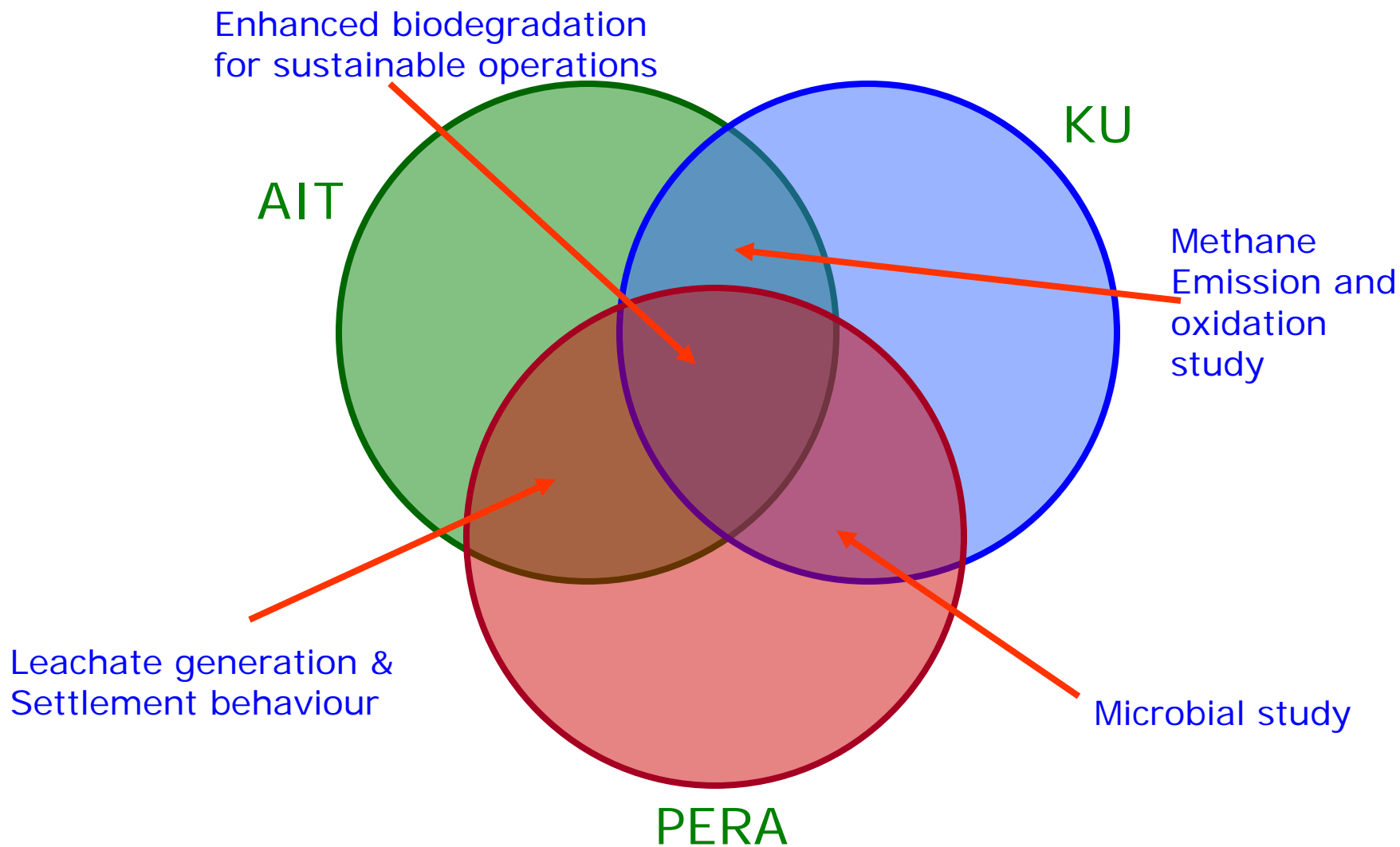
Landfill Rehabilitation and Mining

Landfill Lysimeter Simulation





Landfill Lysimeter Simulation



Research Activities - Phase I



SBR Leachate treatment (China)



Landfill mining & rehabilitation study (India)



Pre-treatment by composting (Sri Lanka)

Research Activities - Phase I



**Dumpsite mining and toxicity study
(Thailand)**



**Combined anaerobic digestion
(Thailand)**



Methane Oxidation study (Thailand)



Publications and Others

NRI India received the best paper award-**Sardinia 2003 "Kirton Curl" award** for Best Waste Management paper in developing countries

NRI Sri Lanka (joint publication with Thailand) Winner of the **Kriton Curi Award** for Waste Management from Developing Countries at the Tenth International Waste Management and Landfill Symposium-**Sardinia 2005**.

Books/Reports- Joint Publications

Visvanathan, C., Trankler, J., Gongming, Z., Basnayake B.F.A., Joseph, K., and Chiemchaisri, C., (2004), "*Municipal Solid Waste Management in Asia*", Asian Institute of Technology publication, ISBN: 974-417-258-1

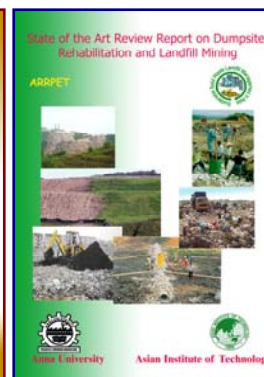
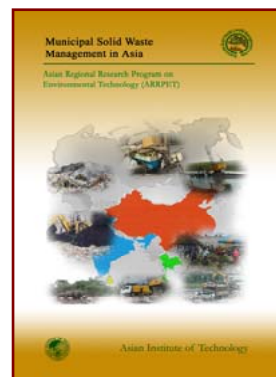
Kurian Joseph, Nagendran, R., Thanasekaran, K., Palanivelu K., and Visvanathan, C., (2004), "*Dumpsite Rehabilitation and Landfill Mining*", Anna University publication, India.

Zhou Gongming, C., Visvanathan & J. Trankler, "*Municipal Solid Waste Landfill Leachate Treatment Technology Achievement*" (2004), Tongji University Press, ISBN: 7-5608-2774-8.

SARDINIA 2003 - "Kriton Curl" award



October 6-10, 2003
About 400 papers
About 900 delegates from 65 countries
5 papers from AIT/NRIs





Major Focus - Phase II

- ✓ Scale up of experimental units: Lab scale → pilot scale
- ✓ New minor research topics
 - WEEE
 - RDF
 - Construction waste
 - Medical waste
- ✓ Networking
 - Text books, development of country specific case studies teaching materials, lab manuals, landfill design and operational manuals
 - Dissemination workshops, national / regional / international conferences
 - Websites, roadmap CD and other public information dissemination

Research Activities - Phase II

AIT



Dry Anaerobic Digestion



Open Cell Lysimeters

INDIA



Stabilisation of Fresh and Mined Waste



Air quality monitoring of Dumpsites

CHINA



Plastic recovery for RDF



Metal recycling from PCB

SRI LANKA



Bio-filter (Odor control) from Composting of MSW



Fabrication and Evaluation of Refuse Polythene-based Landfill Liner

THAILAND - KU



Methane Oxidation Cover Soil Layer

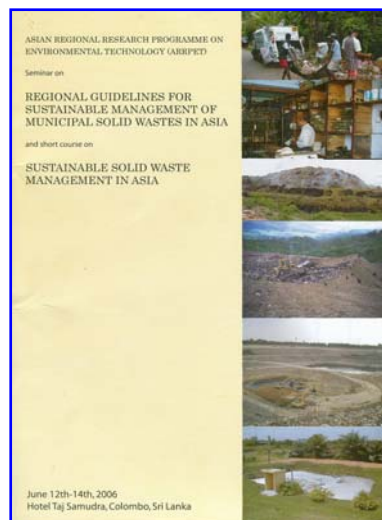


Plastic recovery from dumpsites for RDF



Workshops Conducted

Sri Lanka
(June 12-14, 2006)



Seminar on
Regional Guidelines
for Sustainable
Management of
MSW in Asia

Short Course on
Sustainable Solid
Waste Management
in Asia

Thailand
(August 3-4, 2006)



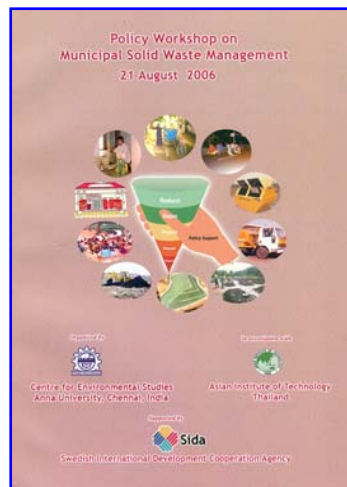
Seminar on
Solid Waste
Landfill
Technology in
Asia



Workshops Conducted

India (August 21-25, 2006)

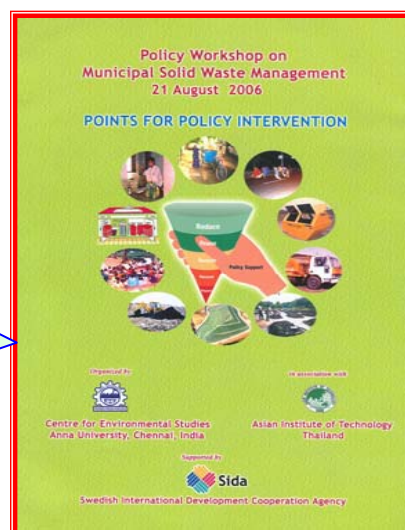
Policy Workshop on MSW Management



Training Programme on MSW Management



POINTS FOR POLICY INTERVENTION:
Several copies distributed to Policy makers and to participants





Impact of the Project

Capacity building: NRIs have not only developed their own research capacity and institution facilities but are also recognized as the national solid waste experts:

- ✓ NRI India: Recognition of the competence on landfill rehabilitation and landfill mining by the cooperation of Chennai and initiation of dumpsite rehabilitation projects;
- ✓ NRI Sri Lanka: PI has been appointed to assist the court on sorting out the solid waste related problems and provide solutions;
- ✓ NRI China: Designed and implemented the landfill leachate treatment plant in Shanghai based on the experimental outcomes.

Public awareness: Apart from the technical publications, NRIs have given interviews and published many popular articles and other public media based on the research findings

The Hindu from India

Rs. 126-CRORE PROJECT / NEW LANDFILL SITE SOUGHT Dump yards' makeover report in six months

By Earth Journalism

CHENNAI, AUG. 29. The Centre for Environmental Studies, Anna University, has been named to prepare a detailed project report for modernisation of the Chennai Corporation's garbage dumpsites in its six months.

Mandatory
Modernisation of dumpsites by municipal bodies in India has been made mandatory under the Municipal Solid Wastes Management and Handling Rules, 2000, following a public interest petition filed by Arundhanii Pandey and others in the Supreme Court in 1996 on the antiquated garbage disposal system. The Rules drafted last down procedures for collection, storage, source segregation, transportation, processing and disposal of waste, and set a deadline of October 31, 2003 for setting up waste processing and disposal facilities.

Corporation were also required to find new sites for sanitary landfills, something that most cities haven't been able to do.

The State Government created a special fund of Rs. 3 crore for the project and asked the

Chennai Corporation officials to prepare a detailed project report after consultation. Anna University is expected to have the report ready in six months.

The city agency has claimed per capita garbage in the city is 1.2 kg per day, which is higher than the national average of 0.8 kg per day.

Improvements
The improvements planned will be in accordance to the Municipal Waste Handling Rules, officials said.

The city agency has started constructing a compost yard at the Indragiri dumping ground, which will prevent rainwater from entering the premises and burning garbage.

Investments in both areas will be heavily depending on the garbage has been an issue that has not been addressed so far.

THE HINDU Workshop advocates better solid waste management

Solution should begin at home with segregation at source

Staff Reporter

CHENNAI: The solution to the problem of municipal solid waste management begins at the source, segregation at source, said a workshop on Municipal Solid Waste Management (MSWM) organised by the Centre for Environmental Studies, Anna University, Chennai, on Monday.

T. Sekar, Member Secretary of the Tamil Nadu Pollution Control Board (TNPCB) said the solution for solid waste management lies in four words—reduce, reuse, recycle and recover.

He said that the city agency has claimed per capita garbage in the city is 1.2 kg per day, which is higher than the national average of 0.8 kg per day.

Minimising waste
Finally, the solution will minimise waste at source. This could be achieved by requiring users of glass, plastic, paper and other materials to use them in a responsible manner.

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STRIKING MESSAGE: Unchecked garbage beneath the Begumpet Bridge on Rajaji Salai.

PHOTO: B. JOTHY RAMALINGAM

garbage on fire, and producing methane gas, which can pollute the ground water. This obligation should be borne by every citizen, he said.

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Corporation of Chennai's initiative to dumpsite rehabilitation
State level Committee for SWM





Conclusion

- ✓ Sustainable solid waste landfill management technologies for Asia
- ✓ Locally adoptable techniques
- ✓ Cost effective and adoptable solutions
- ✓ Capacity mobilization, Policy suggestion and dissemination seminars
- ✓ Academic tools development for Asian context: Books, laboratory & operation manuals, teaching materials, etc.

http://www.faculty.ait.ac.th/visu/main_page.htm

<http://www.swlf.ait.ac.th/>



Thank you...

