Effective Policies and Institutional Framework as the Driver for Technology Transfer in the 3Rs

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Development Drivers of SW Modernization

Emerging driver 4
Climate change: PPP by Recycling Industry

Driver 3
Resource value of waste

Driver 2
Environment

Driver 1
Public Health

Moving from Waste Management to Resources Management
Waste Economy - Global Market

Global Market Volume for Environmental Technologies

2008: $1370 Billion
2020: $2740 Billion

Share of Waste Management and Recycling

2008: $41 Billion
2020: $63 Billion

Source: http://www.rolandberger.com/
Waste Economy—Untapped Market—What a Waste?!

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Overabundance of 3R business Opportunities
BUT
Why are the businesses not Capitalizing it?

Policy-
Institutional
Financing-
Technology GAP

Share of Waste Management and Recycling
Recycling – Industry Initiatives

Tetrapak - Leading beverage carton manufacturer

New line of business

Recycling beverage cartons – enhances profitability and image of company

Apple + Li Tong Group

Take-back program for end-of-life products

Recycling activities to generate secondary raw materials
Need for Appropriate 3R Technologies

- Having the right set of 3R technologies to utilize Asian waste economy is the step forward.

- Technology transfer includes both software (skills, knowledge, experience) and hardware (equipment) transfer.
Technology Leapfrogging

Commerially Developed Technologies

Adapted/Modified and Transferred

Implemented and Established in Host Countries
Identification of Policy Instruments for Waste Management

Growth of Environmental Impact of Waste Management at BAU

Source: Adapted from Hwong & Wen Ma, NTU, ARCR workshop
TT and 3R

Inadequate Policies + Lack of Suitable Technologies → Increasing Magnitude of Waste Management Problem in Developing Asian Countries → Appropriate 3R Technology Transfers

Challenging Issues
- Cultural Differences
- Socio-Political Structure
- Financing Mechanisms
- Institutional Setup
- Policy Framework
Critical Issues of Recycling

Social Vs Environmental Issue

Small-Scale Informal Recycling

Generate Revenue

Livelihood Support & Poverty Alleviation

Social Capital Building

Poor Working Conditions

Tags Recycling as “Polluting Industry”
E-Waste Recycling?
Lead recycling...DC

How is this lead kept in the cycle?

How environmentally safe and efficient is this operation?

Level of technology use...!!!
Critical Issues of Recycling

Social Vs Environmental Issue

Formal Recycling

Revenue Generation

Pollution Control Mechanisms

Financing Difficulties: Venture Capital

Technology Gap

Conflict with Informal Recyclers
Analysis of 3R TT Facilities in Asia

Waste Streams

- Municipal Solid Waste
- Healthcare Waste
- Hazardous Waste

3R Technologies

- Composting
- Anaerobic Digestion
- Plastic Recycling
- Plastic Pelletizer
- Plastic to Oil
- Non-infectious Waste Incineration
- Infectious Waste Incineration
- Fluorescent Tube Recycling
- Solvent Recycling

- Field observations and structured interviews with stakeholders in the recycling chain
- Assessment: Social, Economic, Environmental impacts and technology performance
- Identification of barriers and policy needs for technology transfer
Box System Composting Matale Enriched Compost Pvt. Ltd.
Address: No 2, Dole Road, Matale, Sri Lanka
Technology Provider: Waste Concern, Bangladesh

Law and Acts at National Level: Sri Lanka Standard for Compost from Municipal Solid Waste (MSW) and Agricultural Waste (SLSI 1246:2003) – supportive for technology transfer. However, no regulations & standards are developed to address the aspects of MSW management.
National policies of Vietnam is favorable for FDI. It also has a strong policy on promotion of 3R and is set to achieve a recycling rate of 70% from the total municipal solid wastes by the year 2015.

Windrow Composting
Vietstar Joint Stock Company
Address: Municipal Solid Waste Treatment Complex, Cu Chi District, Ho Chi Minh City, Vietnam
Technology Provider: Lemna International, Inc., U.S.A.
In 2006, the Pollution Control Department (PCD) of Thailand initiated a partnership project with Philips and Toshiba to collect and recycle fluorescent lamp wastes from various establishments. It initiated a household hazardous waste management scheme with large municipalities.
Technological Performance - Real Vs Designed Capacity

Inaccurate estimation/characterization of waste generation

Vietstar Plastic Pelletizer facility - operating at 50% of design capacity, plastic waste from MSW wrongly estimated to be 13%, while only 5% is recovered for recycling in real
Waste Suppliers: Stability of the Waste Supply

- Waste supply- stable and even on the increasing trend
- Competition for waste from informal waste recyclers, and other waste buyers
- Waste providers for Nonthaburi Composting in Thailand selling their waste to animal feeders at better price
End-users: Alternatives to Recycled Products

Recycled products!!
Compost = chemical fertilizers (along with government subsidy)

Recycle process
Plastic pellets = pellets made from Nano technology

BUT, the parent manufacturing company will continue using recycling products as a synergistic benefits
Glimpse of 3R TT Facilities in Asia…

- Most of the 3R technology facilities are operating below the original design capacity

- Lack of transfer of skills and know-how in host countries for high-end technologies

- North-South mode of TT—diffusion either took very long time or never happened due to technical and managerial incapabilities, UNLIKE South-South Mode

- Various mode of financing the TT: FDI (Vietstar Joint Stock Company), Private purchase of the technology (Polydime Plastic recycling, Sri Lanka), Joint-venture (Non-inf ectious waste incineration-GPP between NEDO Japan and Thai govertment)

- Overall need and scope for enabling policy and institutional framework to smoothen the 3R Technology Transfer in Asia
Info needed for Technology Providers

Better project planning for informed choice of technology:

- Size of the local recycling market, and associated local business risks
- Local waste generation and characterization for optimizing the design capacity
- Stakeholders in the vicinity and effective partnership - LAs, NGO/CBOs, local community, waste suppliers, end-users
- Alternative technologies to compare and choose the most suitable one
- Local regulations and institutional arrangements to promote 3R,
  - Who is responsible for what?
  - Is one-stop service provided?
Institutional Setup – Current Status

Centralized approach—one-way, often lacks coordination

- National Government
- Local Government Authorities

Formal Recycling Industry
Informal Recycling Industry
NGOs/CBOs
Community
Need for Decentralized Information and Institutional Setup

High-end expert knowledge network at central level

Infiltration of information

Decentralized Local Authorities

Local government authorities

Local communities

Formal private sectors

Informal sectors

Local businesses

Academia

Build local consortium with stakeholders
Barriers to 3R TT in Asia

- Technology performance constraints: choice of appropriate technology, adoption and diffusion issues, technical capacity
- Trade barriers: IPR/knowledge transfer
- Economic constraints: funding constraint, transaction and operation cost, revenue generation
- Socio-political-environmental constraints
- Policy/regulation constraints
Barriers & Policy Needs

- **Choice of appropriate technology**
  - **Capital intensive technologies**
    - High cost of technology
    - Difficulty in diffusion in local context
    - More complexity in operations
    - Less viability of commercialization
    - Less successful in developing countries
  - Least preferred
  - Least preferred
  - **Labor intensive technologies**
    - Quick diffusion
    - Less complexity in operations
    - More viability
    - Easy to adapt to local conditions
    - More successful in developing countries
  - Most preferred
  - Most preferred

Policy & Inst Framework: TT for 3R
Barriers & Policy Needs (continued)

**IPR and Technology Diffusion:**

- IPR is barely an issue for low-end labor-intensive technologies.
- TT is not only hardware/equipment transfer but the long lasting skills and know-how, organizational and managerial procedures too.

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<td>• Rigidity in IPR hampers 3R technology transfer. Example: Non-infectious waste incineration facility in Thailand- technical managers/operators from the technology provider country refrain to disclose technical specifications with the fellow colleagues from host countries, even after the IPR period is over!</td>
<td>• IPR issues needs to be considered from both the ends-technology providers and receivers before the actual transfer</td>
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### Barriers & Policy Needs (continued)

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<tr>
<th>Official Development Assistance (ODA)</th>
<th>Foreign Direct Investment (FDI)</th>
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<tr>
<td>▪ Provides large scale budget</td>
<td>▪ Provides medium to large scale budget –capital expenditure</td>
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<tr>
<td>▪ Covers capital expenditure</td>
<td>▪ Creates employment opportunities for locals</td>
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<tr>
<td>▪ Does not secure sustainability of technology</td>
<td>▪ Has more chances of securing sustainability of technology via partnerships- Vietstart MRF, Vietnam</td>
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<tr>
<td>▪ Unable to generate revenue for continual operation of technologies</td>
<td>▪ More potential to generate revenue via operations</td>
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<tr>
<td>▪ Not very much suitable for 3R technology transfers?</td>
<td>▪ Has been suitable and successful for transfer of 3R technologies</td>
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**Needs:** Favorable FDI policies to finance capital intensive 3R technologies
### Barriers & Policy Needs (continued)

#### Revenue Generation for Financial Sustainability

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<td>Very few of the facilities are able to achieve operational cost.</td>
<td>Cost recovery and revenue generation: waste collection and treatment fees, and sale of recycle products</td>
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<td>Example: Non-infectious waste incineration, WMS-DOWA, Thailand (disposal revenue of 3300 baht/ton, and revenue from selling steam (only 20% of steam is captured and sold).</td>
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<td>▪ A regulatory mechanism to levy optimum nominal waste tipping and treatment fee from waste suppliers</td>
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<td>▪ Effective and expanded market for recycled products - Example: WMS-DOWA, Thailand - steam selling is limited only to nearby factories due to the cost of pipeline network</td>
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<td>▪ Synergistic recycling with parent manufacturing organization (Polydime plastic recycling in Sri Lanka, fluorescent tube recycling in Thailand).</td>
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### Barriers & Policy Needs (continued)

**Socio-Environmental Impacts**

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<td>▪ Lack of provision of green jobs to local human resources,</td>
<td>▪ Support green jobs to communities, inclusive informal waste sector</td>
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<td>▪ Conflict with informal waste sector-Vietstar composting facility intake of 900 tons/day MSW, leaving very little waste for the scavengers in the landfill</td>
<td>▪ Measures to avoid nuisance (odor, noise, air and water pollution) in the vicinity</td>
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<td>▪ Green Peace in opposition to infectious waste incineration (dioxin emission)</td>
<td>▪ Need to transfer proven and environment friendly technologies for wider acceptance</td>
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<td>▪ Environmental nuisance</td>
<td>▪ Follow MEAs while transferring the technologies</td>
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<td>Example: Nonthaburi aerobic composting facility could not use food waste for composting- as people complained of excessive odour,</td>
<td></td>
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<td>Noise pollution is common in the vicinity of many technology facilities</td>
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### Barriers & Policy Needs (continued)

**Building Effective Partnerships with Local Stakeholders**

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<td>Disintegrated, uncoordinated and discontinued activities on promoting awareness on recycling and waste segregation to the communities</td>
<td><strong>From Conflict to Cooperation</strong></td>
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<td>Leaving out informal sector, conflicts on share of profits from waste recycling</td>
<td>To delineate roles and responsibilities and act with coordinated efforts.</td>
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<td>Example: Thailand Non-infectious waste incineration- this facility has a conflict with the municipality for obtaining wastes from outside the industrial estate and about who originally takes benefit from treatment of wastes.</td>
<td>Getting informal sector on board through formal or informal contract/agreement for sale and purchase of waste-</td>
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<td>Example: Matale Composting, buys from independent collectors, good price for waste, quality decides the price, also offers credit in advance- promoting livelihood of poor</td>
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<td>Vietstar recycling facility has contracted the HCMC municipality for supply of MSW</td>
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Concluding Remarks

Top three 3R related technologies priority focus for the next 10 years in Asia (identified based on the research findings and panel meetings with the members of Asia Resource Policy Circulation Research Group):

- **Priority 1:** Promotion of waste to energy/resource systems (Organic waste management including food waste)

- **Priority 2:** E-waste

- **Priority 3:** Vehicles – End of Vehicles (ELV)
Thank You For Your Attention..!!