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

Prepared in consultation with:
Asia Resource Circulation Policy Research Group, IGES Japan.

Prof. C. Visvanathan
Environmental Engineering and Management Program
Asian Institute of Technology
Thailand
email: visu@ait.ac.th
Web: http://www.faculty.ait.ac.th/visu/

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 form **Waste Management** to **Resources Management**

Waste Economy-Global Market

$1370 Billion **$2740 Billion**

2008 2020

Global Market Volume for Environmental Technologies

$41 Billion **$63 Billion**

2008 2020

Share of Waste Management and Recycling

Source: http://www.rolandberger.com/

Waste Economy-Untapped Market-What a Waste?!

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

Policy-Institutional Financing-Technology GAP

Recycling – Industry Initiatives

Tetra Pak

Tetrapak- Leading beverage carton manufacturer

New line of business

Recycling beverage cartons – enhances profitability and image of company

Apple

+

Li Tong Group

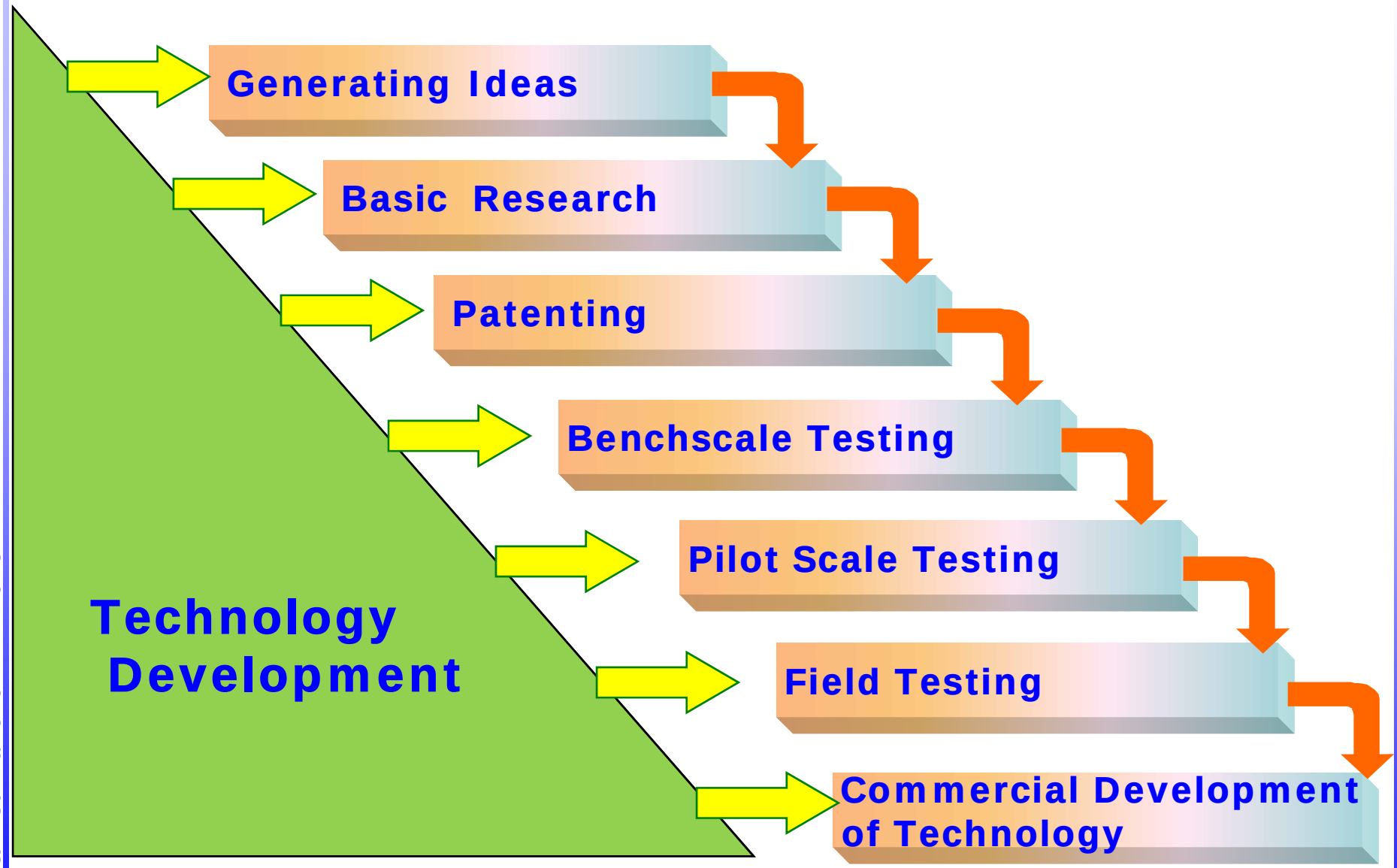
Take-back program for end-of-life products

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 Development



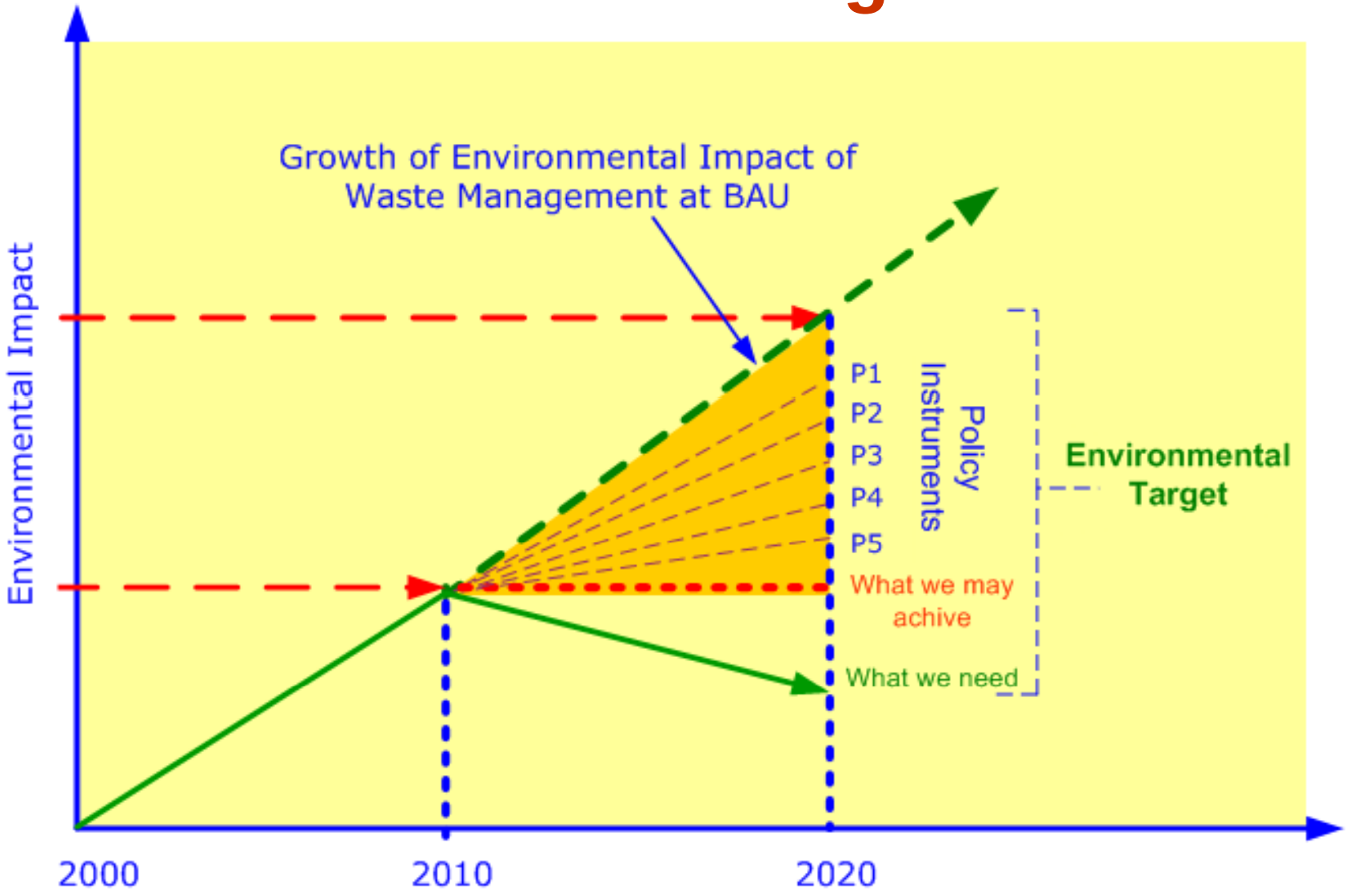
Technology Leapfrogging

Commercially Developed Technologies

Adapted / Modified and Transferred

Implemented and Established in Host Countries

Identification of Policy Instruments for Waste Management



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

Poor Working Conditions

Livelihood Support & Poverty Alleviation

Tags Recycling as "Polluting Industry"

Social Capital Building

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**

Sri Lanka

Thailand

Vietnam

3R Technologies

- Composting
- Anaerobic Digestion
- Plastic Recycling
- Plastic Pelletizer
- Plastic to Oil
- Non-infectious Waste Incineration
- Infectious Waste Incineration
- Flourescent 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**

TT Facilities – Composting 1

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

TT Facilities – Composting 2

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.

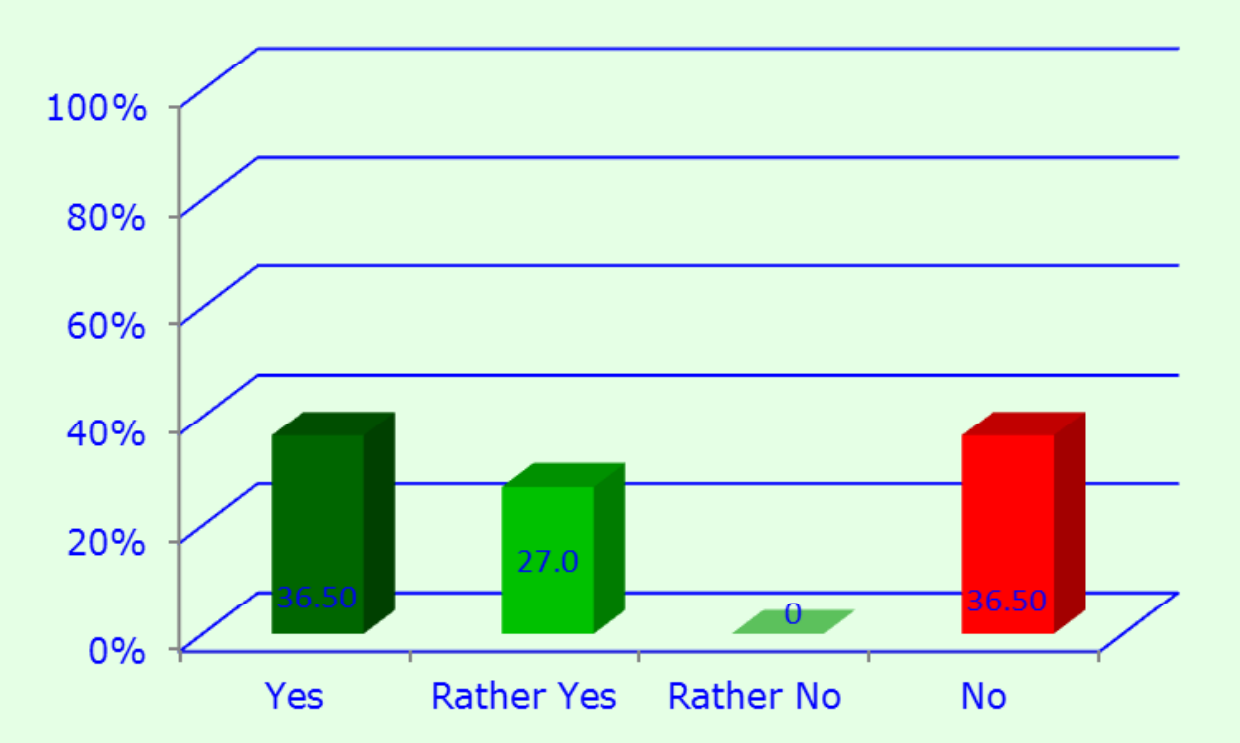
National policies of Vietnam is favorable for FDI. It also has a strong policy on promotion of 3R and is set to achieve a recycling rate of 70% from the total municipal solid wastes by the year 2015.

TTF – Fluorescent Tube Recycling 3

Fluorescent Tube Recycling
Philips Electronics (Thailand) Ltd.
Address: 515 Moo.4 8D, Pattana 3 Road, Bangpoo Industrial Estate, Preakasa, Maung, Samutprakarn, 10280, Thailand
Technology Provider: Royal Philips Electronics, The Netherlands

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

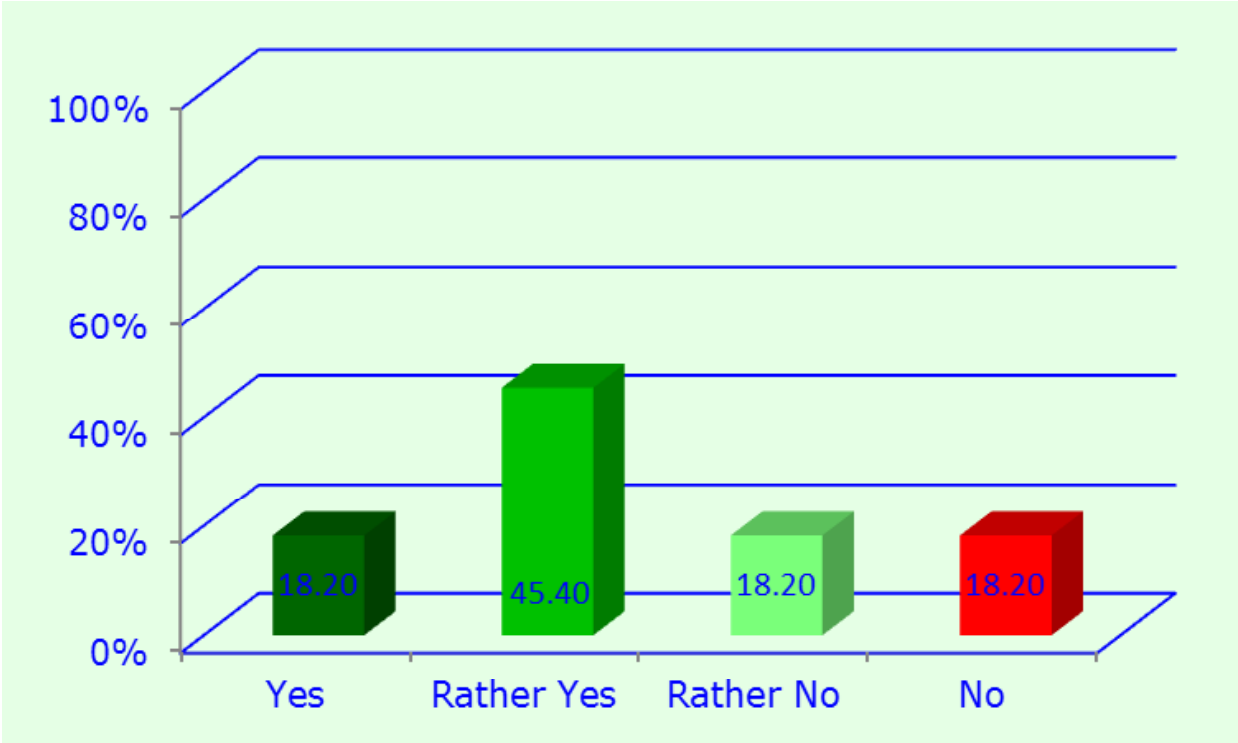
Technology User: Technological Performance- Real Vs Designed Capacity



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

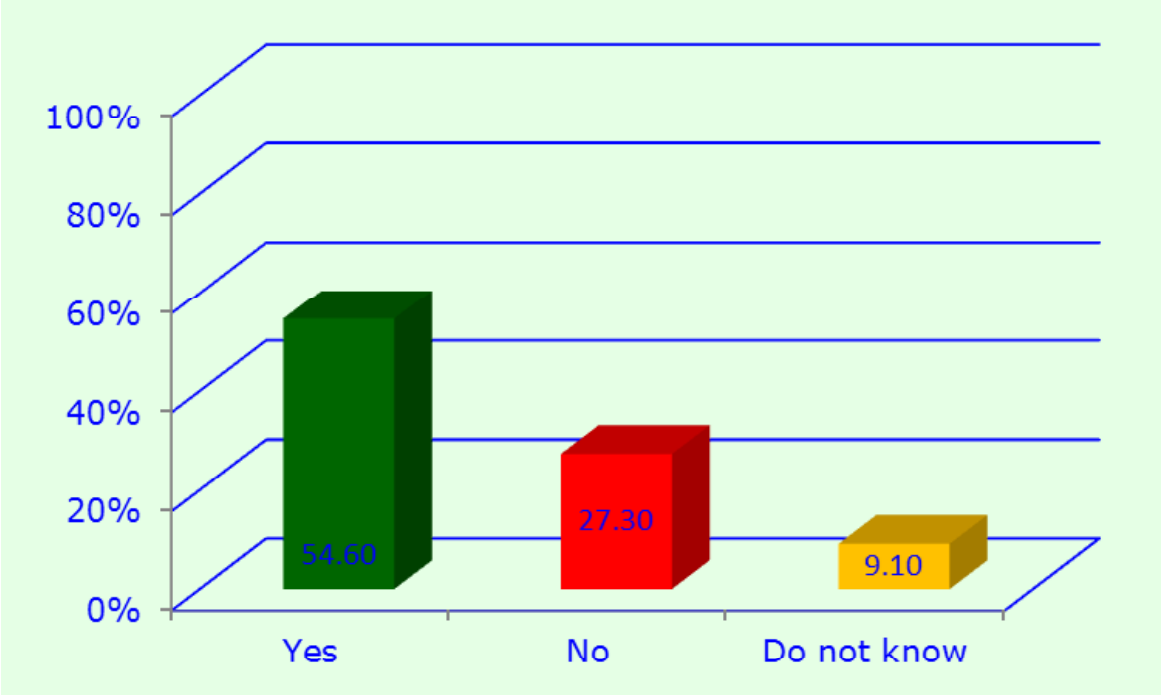


Waste supply- stable and even on the increasing trend

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-infectious 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

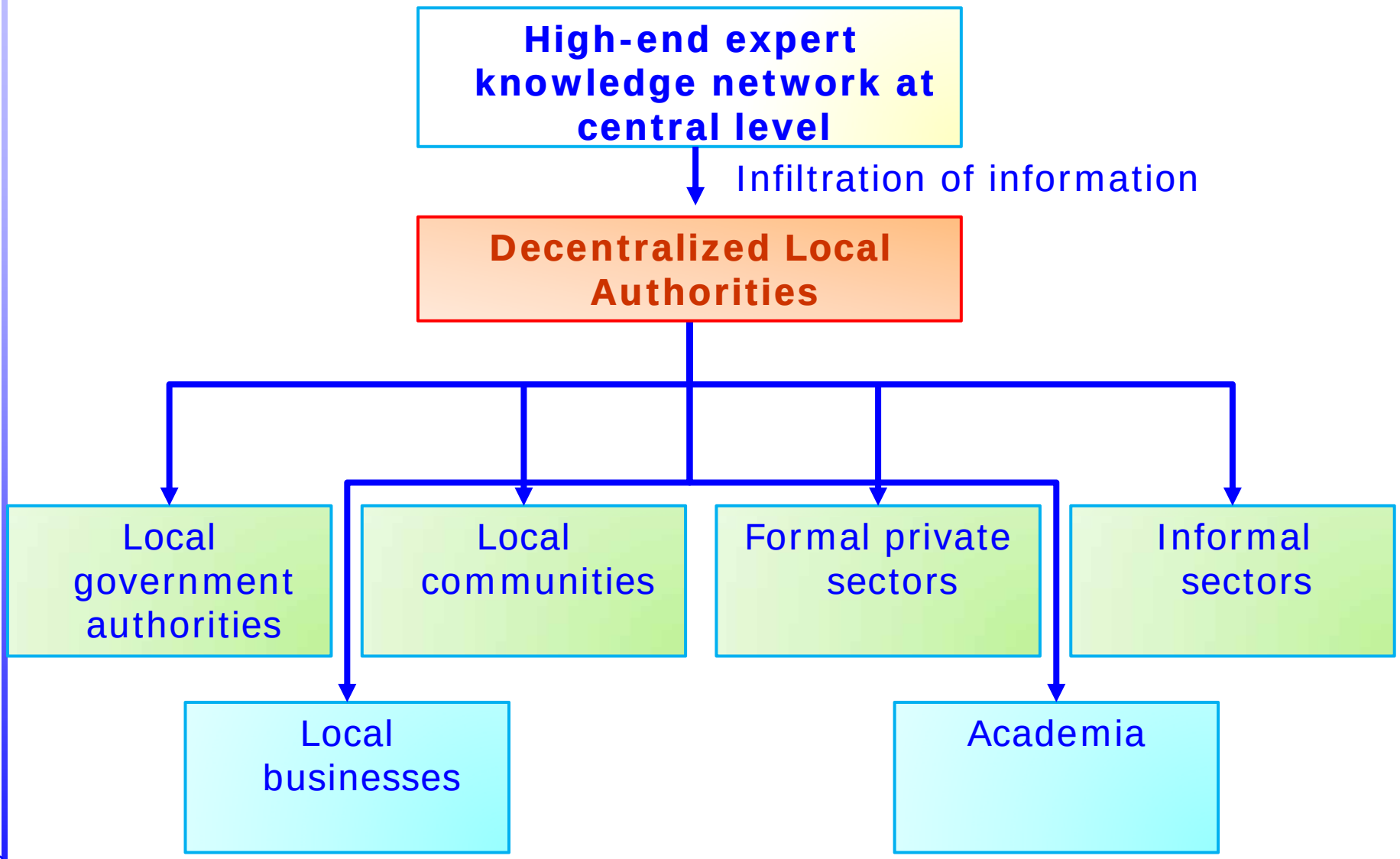
Formal Recycling Industry

Informal Recycling Industry

NGOs/CBOs

Community

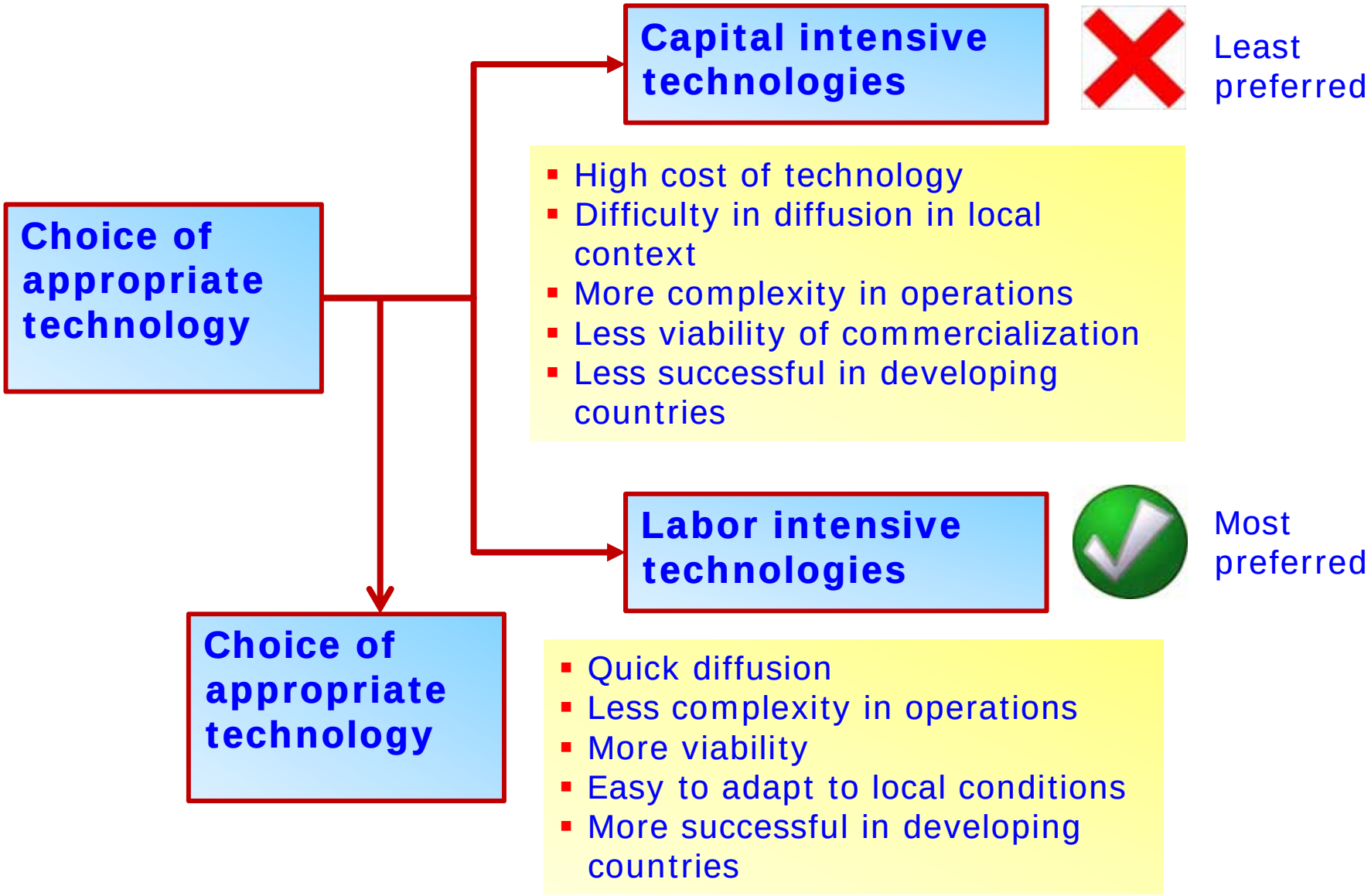
Need for Decentralized Information and Institutional Setup



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



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

Barriers	Needs
▪ 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!	▪ IPR issues needs to be considered from both the ends-technology providers and receivers before the actual transfer

Barriers & Policy Needs (continued)

Official Development Assistance (ODA)	Foreign Direct Investment (FDI)
▪ Provides large scale budget	▪ Provides medium to large scale budget –capital expenditure
▪ Covers capital expenditure	▪ Creates employment opportunities for locals
▪ Does not secure sustainability of technology	▪ Has more chances of securing sustainability of technology via partnerships- Vietstart MRF, Vietnam
▪ Unable to generate revenue for continual operation of technologies	▪ More potential to generate revenue via operations
▪ Not very much suitable for 3R technology transfers ?	▪ Has been suitable and successful for transfer of 3R technologies

Needs: Favorable FDI policies to finance capital intensive 3R technologies

Barriers & Policy Needs (continued)

- **Revenue Generation for Financial Sustainability**

Barriers	Needs
▪ Very few of the facilities are able to achieve operational cost.	Cost recovery and revenue generation: waste collection and treatment fees, and sale of recycle products 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). ▪ A regulatory mechanism to levy optimum nominal waste tipping and treatment fee from waste suppliers ▪ 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 ▪ Synergistic recycling with parent manufacturing organization (Polydime plastic recycling in Sri Lanka, fluorescent tube recycling in Thailand).

Barriers & Policy Needs (continued)

- **Socio-Environmental Impacts**

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

Barriers & Policy Needs (continued)

- **Building Effective Partnerships with Local Stakeholders**

Barriers	Needs
▪ Disintegrated, uncoordinated and discontinued activities on promoting awareness on recycling and waste segregation to the communities ▪ Leaving out informal sector, conflicts on share of profits from waste recycling 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.	**From Conflict to Cooperation** ▪ To delineate roles and responsibilities and act with coordinated efforts. ▪ Getting informal sector on board through formal or informal contract/agreement for sale and purchase of waste- Example: Matale Composting, buys from independent collectors, good price for waste, quality decides the price, also offers credit in advance- promoting livelihood of poor Vietstar recycling facility has contracted the HCMC municipality for supply of MSW

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..!!