

Inaugural Meeting of the Regional 3R Forum in Asia  
Meguro Gajoen, Tokyo, Japan  
UNCRD and Ministry of Environment-Japan,  
11, Nov. 2009 (Wednesday)

# **Strategic Improvement of Municipal Solid Waste Management in Asia Region**

**田中 勝**

**Masaru Tanaka, Ph.D.**

**Director, Sustainability Research Institute  
*Tottori University of Environmental Studies, Japan***

# Municipal Solid Waste Management in Asia Region

# (1) China



Efficient Collection  
and Transportation





Energy Recovery  
from Solid Waste



## (2) Singapore

## Recognition for Supporters





Siting Disposal Site in Ocean





Landfill Disposal  
Facility in Ocean



# (3) Republic of Korea

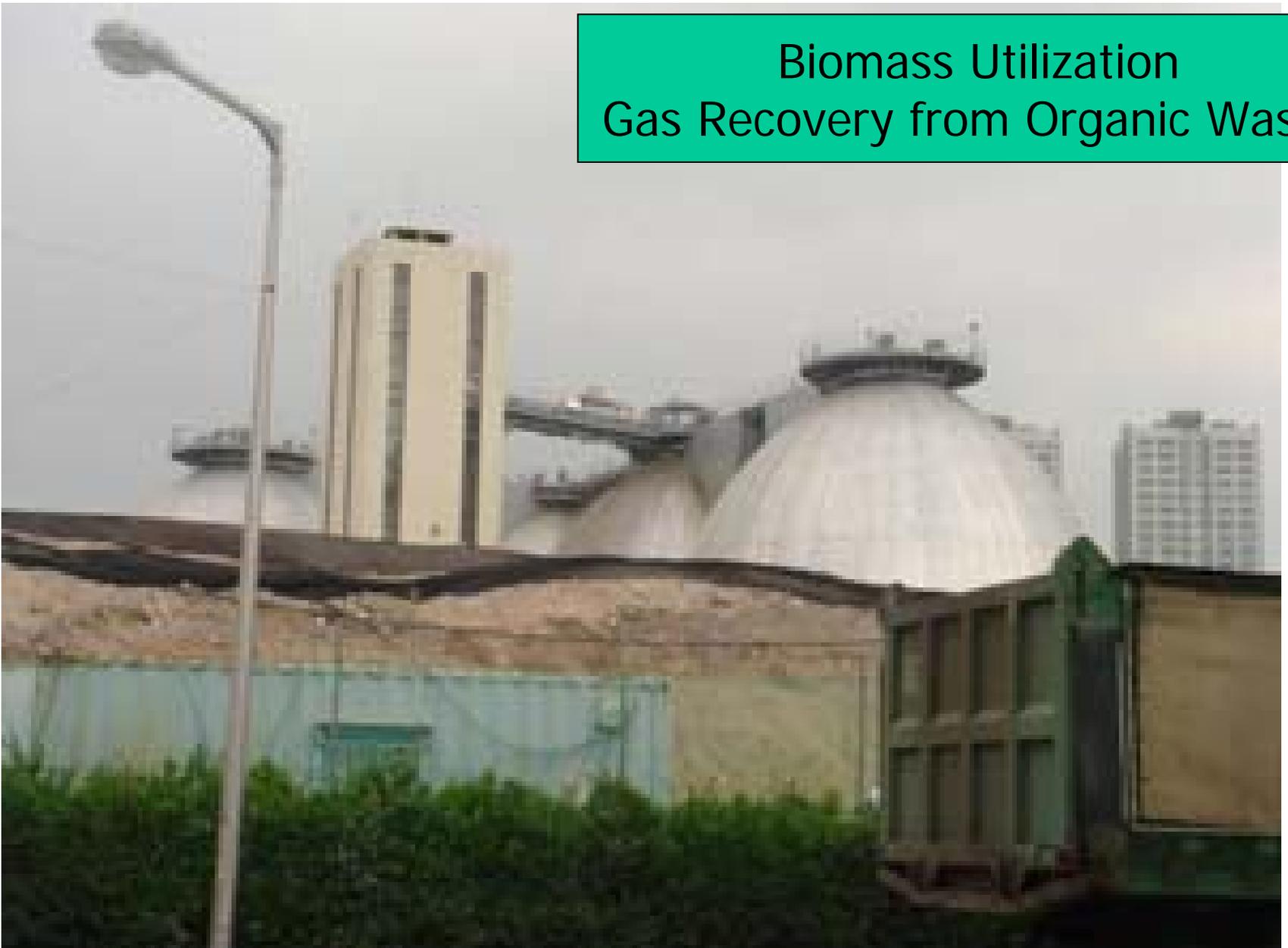
## Landfill Disposal in Coastal Area and Gas Recovery



# Landfill Disposal Site Utilization



## Biomass Utilization Gas Recovery from Organic Waste



ごみ、下水汚泥からメタンガスを回収する資源化施設 (韓国プサン市)

# Recycling by Informal Sector



(4) Philippines



# CDM Program for Low Carbon Society





(5) Thailand



EPR (Extended Producer's Responsibility):  
Take Back Program by Producer



Modern Industrial Solid Waste Management in Thailand



BPEC in Thailand Operates High Tech Incineration Plant



ESBEC Operates Advanced Landfill Disposal Facilities



(6) Indonesia



Safe Equipments for Collection and Transportation

NOMOR

DJ 0000525



**DOKUMEN LIMBAH B3  
(HAZARDOUS WASTE MANIFEST)**

Surat Keputusan  
Kepala Badan  
Dampak Lingkungan  
No. Kep. 02  
Tanggal 5 S

Diisi dengan huruf cetak dan jelas

BAGIAN YANG HARUS DILENGKAPI OLEH PENGHASIL/PENGGUMPUL LIMBAH B3 (THIS SECTION MUST BE COMPLETED BY THE GENERATOR)

Manifest for Secure Management

2. Lokasi pemuatan bila berbeda dari alamat perusahaan  
*(different from mailing address):* PT NAT...  
SUNANDA

Telp./Fax:

3. Nomor penghasil (*Generator registration No.*):

4. Data pengiriman limbah B3 (*Shipping Description*):

A. Jenis Limbah B3  
*(Physical state):*  
SOLID

B. Nama Teknik, bila ada  
*(Technical name if applicable):*  
1131 Packaging

C. karakteristik limbah  
*(Hazard class):*  
9

D. Kode limbah B3  
*(Hazardous waste code):*  
M-11

E. Kelompok kemasan  
*(Packing group):*  
Bag

G. Satuan Ukuran (*Unit of*):  
Berat (*Weight*):  
Isi (*Volume*): 13

Ton  
Drum  
M3

H. Jumlah kemasan  
*(Quantity of packages):*  
13

I. Kemasan (*C*)  
Nomor (*No*)  
Jenis (*Type*)

5. Keterangan tambahan untuk limbah B3 yang tersebut diatas  
*(Additional descriptions for material listed above):*

# Facility for Storage and Sorting

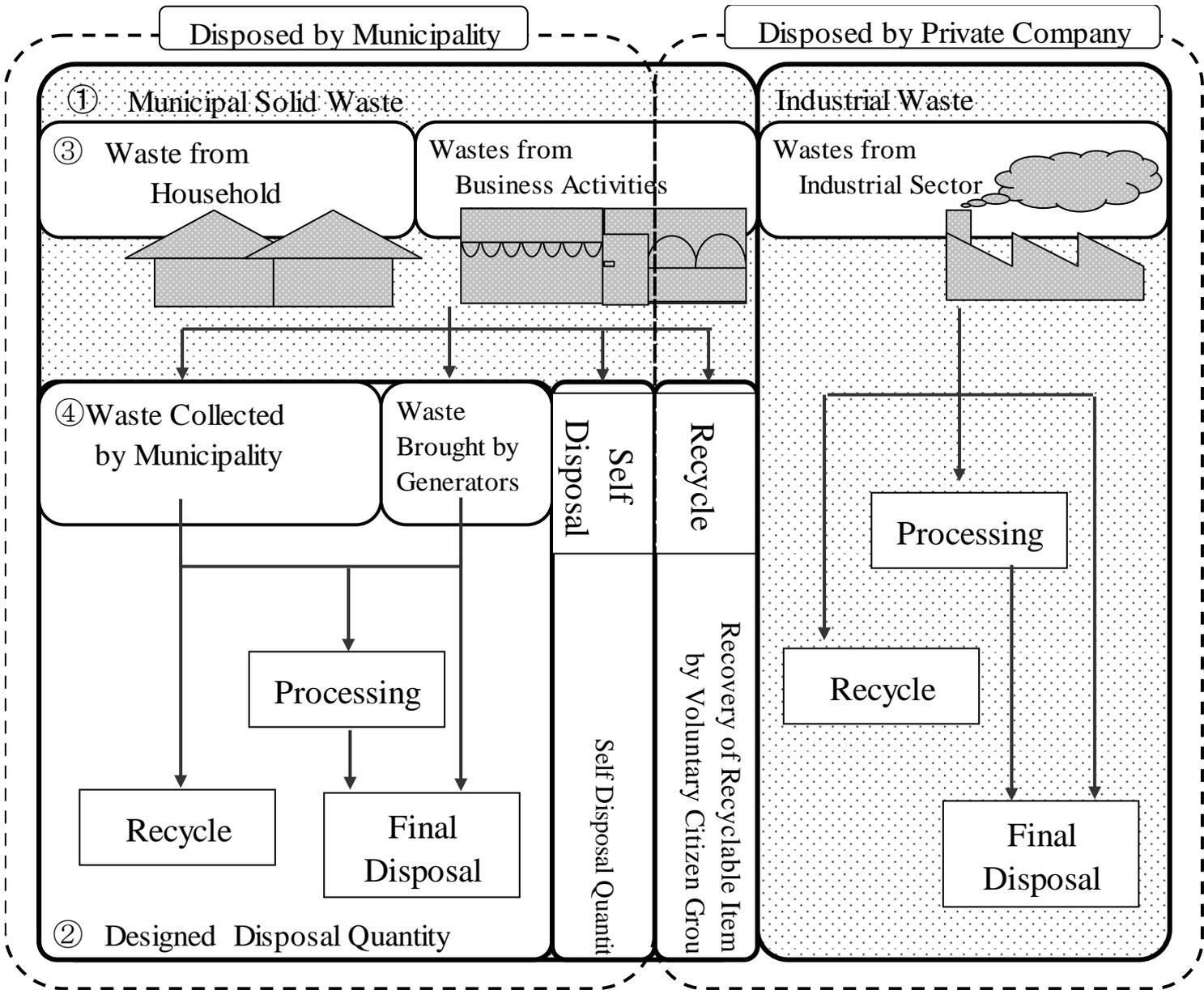




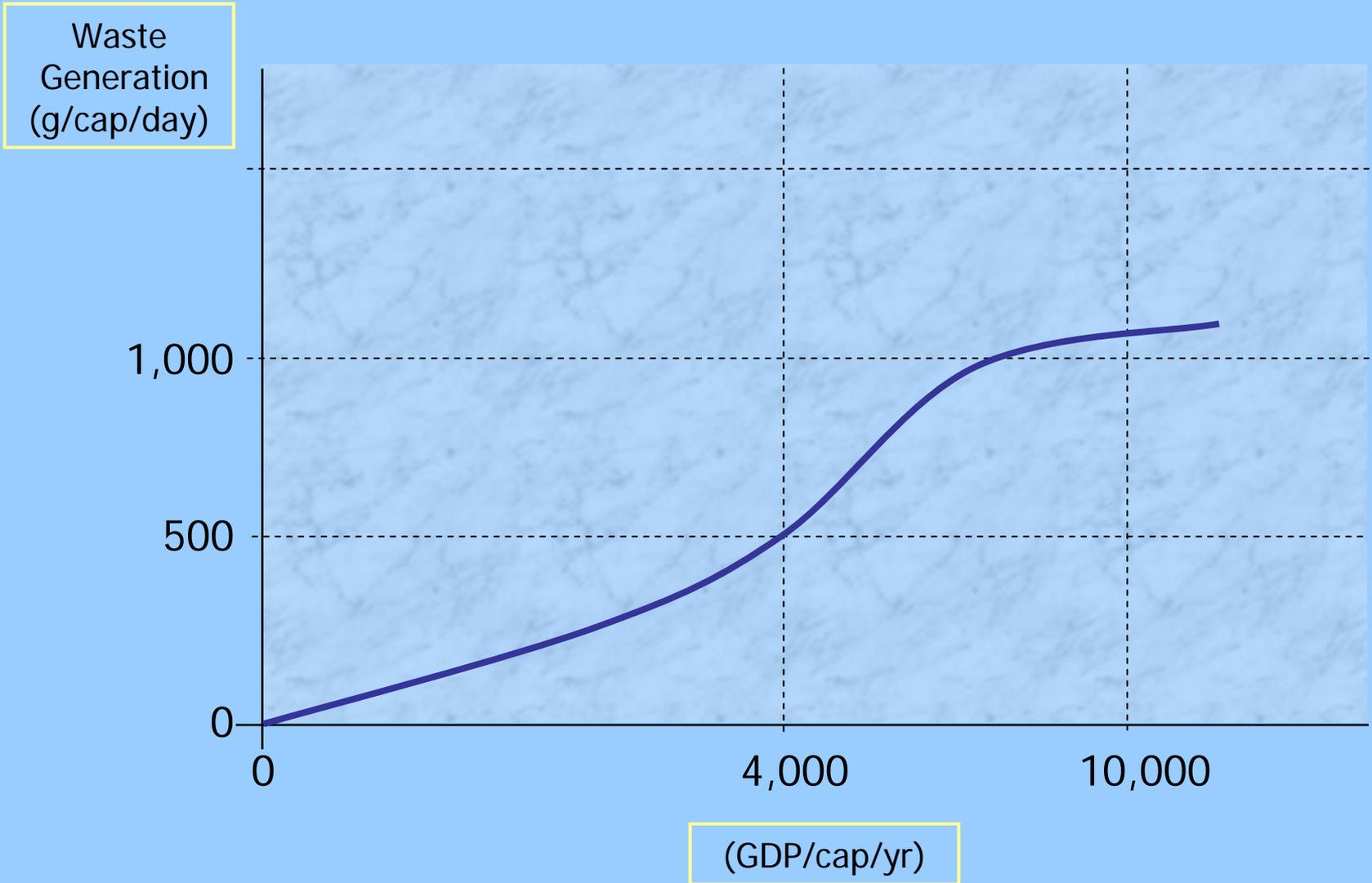
Leachate Control by Capping

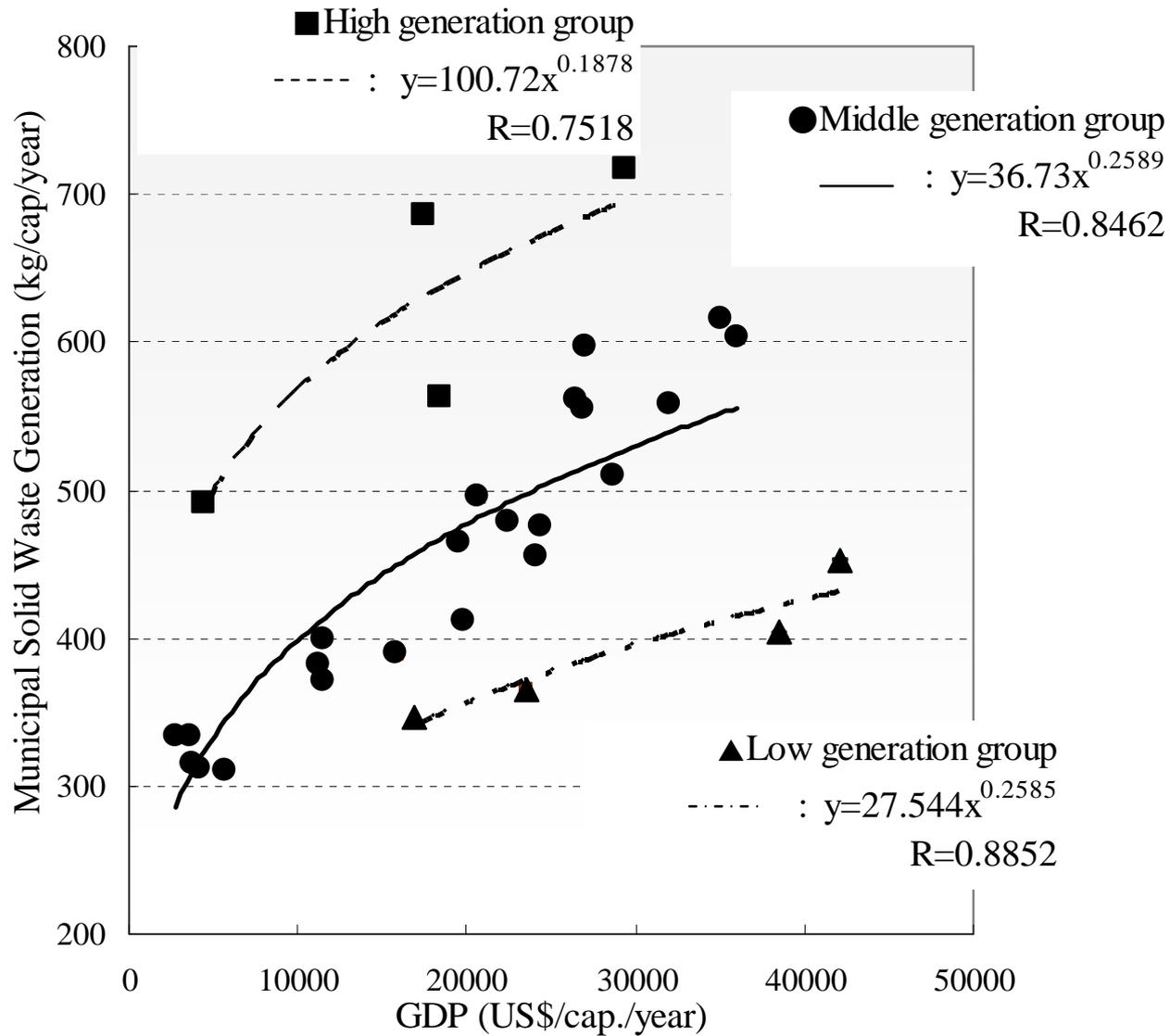
# Waste Management in Asia Region

- Waste Quantity is less but increasing dramatically
- Still many people is not receiving waste management services
- Most of waste is disposed of by open dumping
- Disposal cost is so cheap and modern technology like incineration is not adapted
- Regulation is not likely enforced.
- Not enough experts.
- Recycling is done by informal sectors.



# Waste Generation Increases as GDP Increases



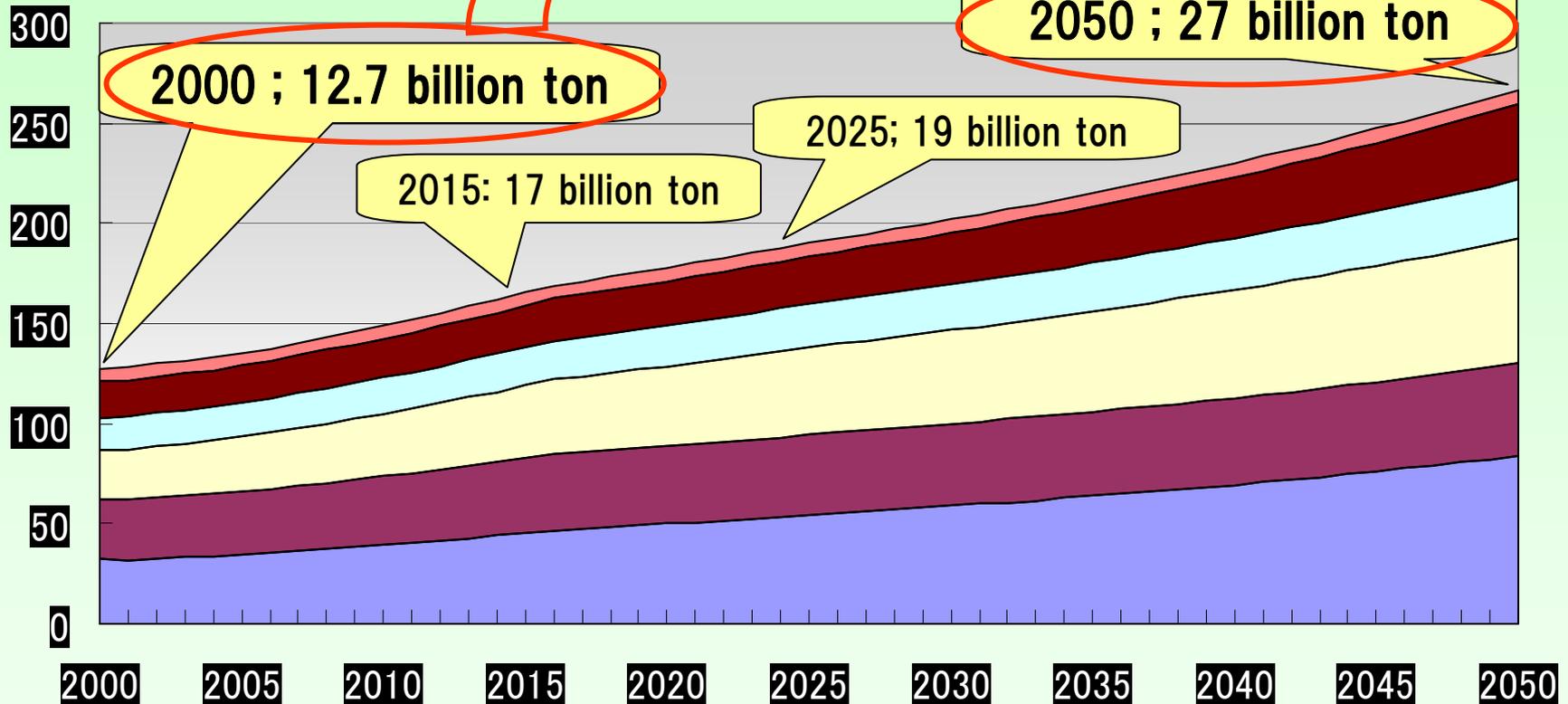


# Solid Waste Generation in the World until 2050

billion ton/ year

億/年

Solid Waste Generation in the World 2000-2050 (t/year)

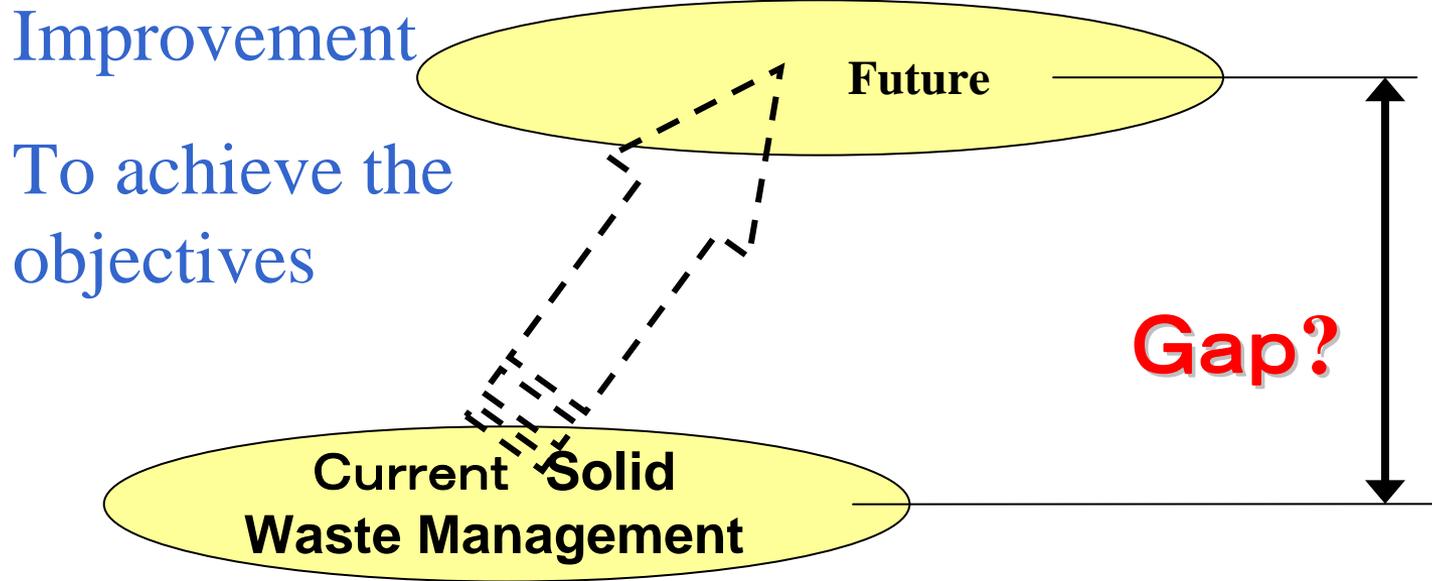


ASIA Europe Northern America Latin America and the Caribbean Africa Oceania

# Quantity and Disposal Level of MSW

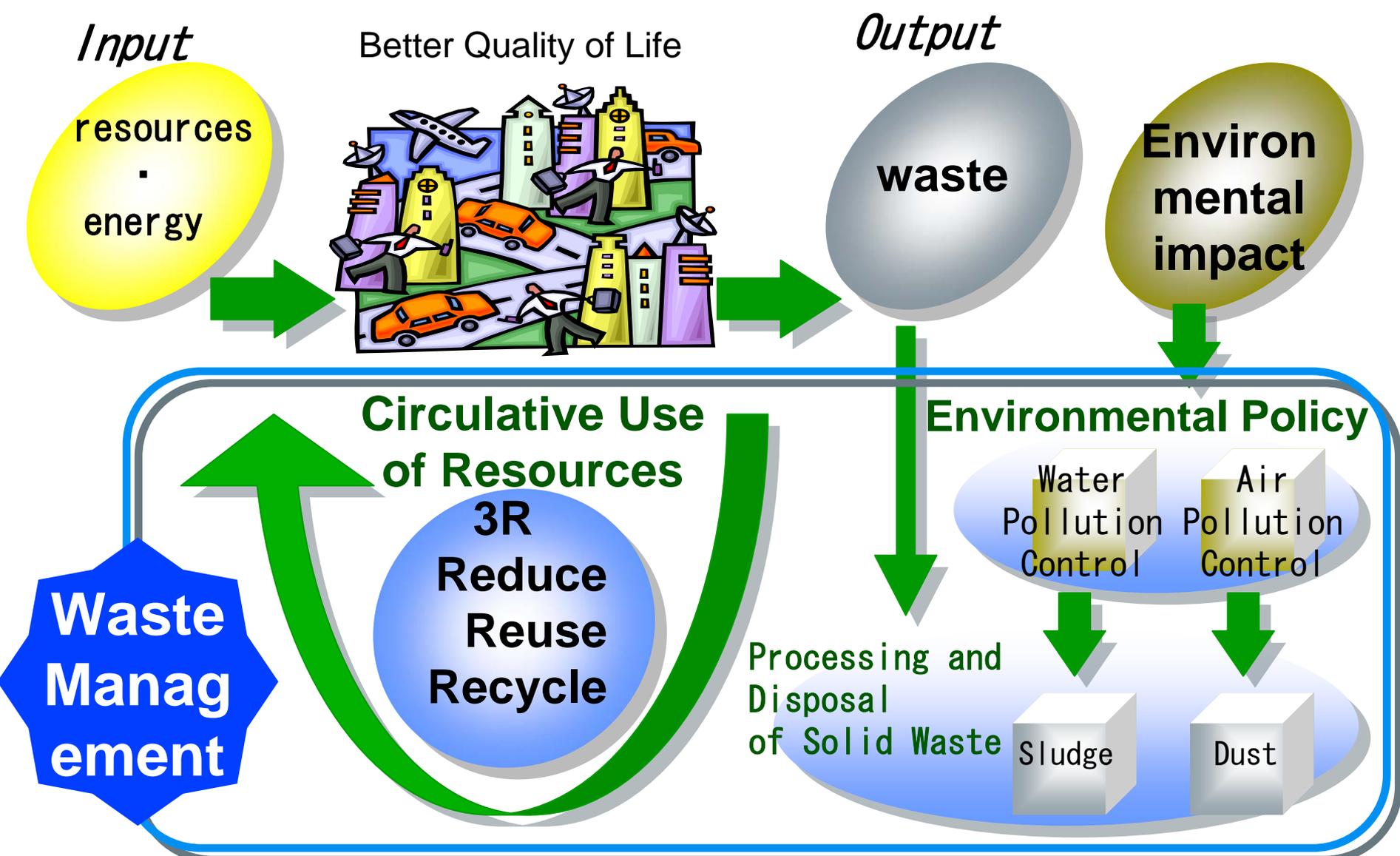
- 2000  
1600million tons in world  
(980million tons(60%) in level 1)  
790million tons (49%)in Asia  
(680million tons(86%) in level 1)
- 2050  
3200million tons in world  
(1400million tons(44%) in level 1)  
1700million(53%) tons in Asia  
(890million(64%) tons in level 1)

# Strategic Improvement of Municipal Solid Waste Management



Unsanitary Condition, Low public Health Level  
By Open Dumping, Open Burning and Scattered Waste

# Sustainable Society and Waste Management



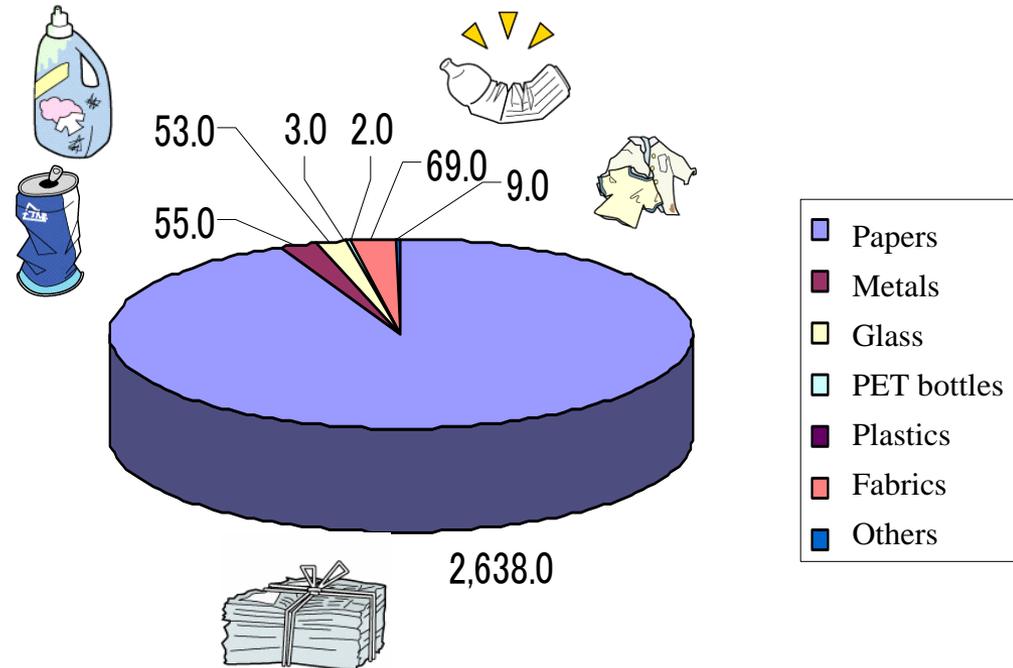
# Promotion of a regional 3RSociety in collaboration of the local governments and NGOs/NPOs



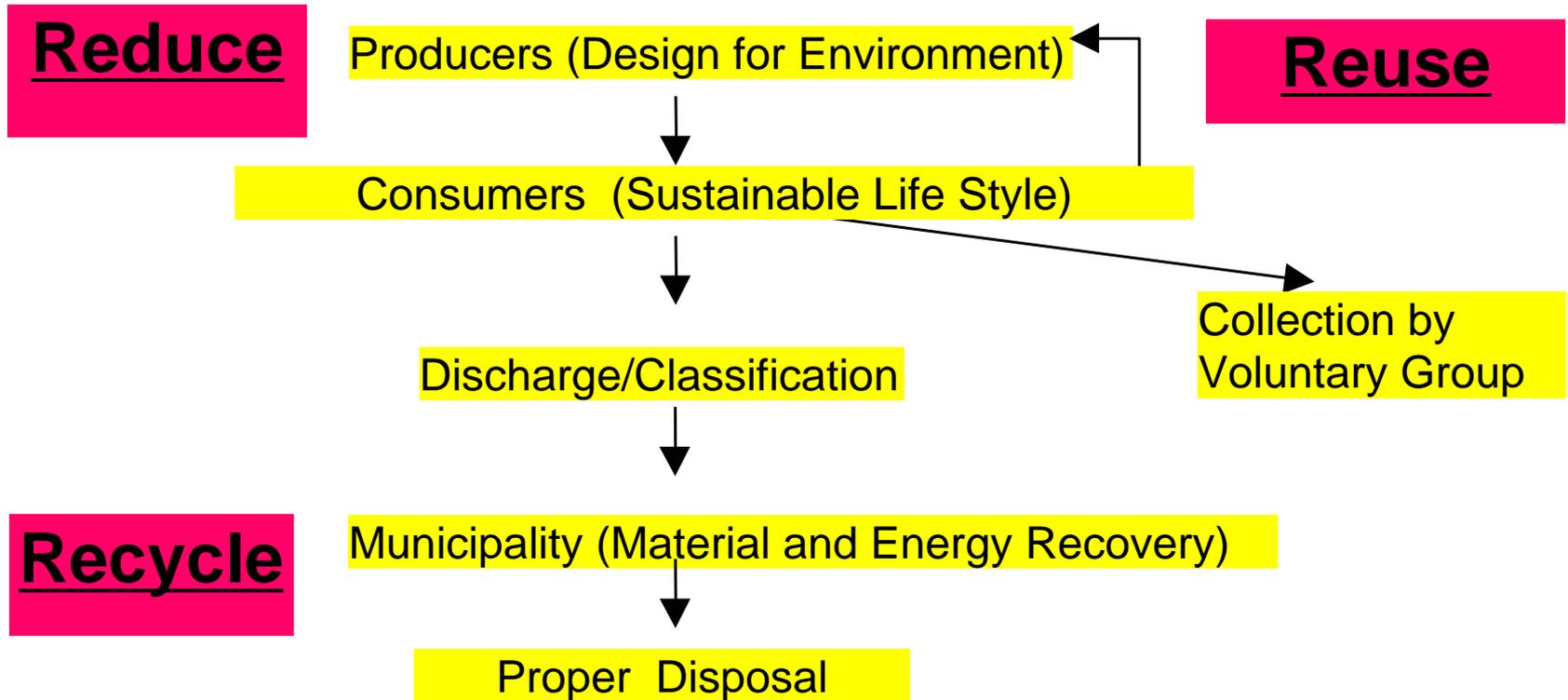
Group collection of recyclable waste

- Local governments support activities to collect used papers, used magazines, used clothing, etc. by citizens' groups, NGOs/NPOs, etc. (group collection )
- ¥1 ~4/kg of collected recyclables are subsidized.
- About 3,000 tons/year of solid waste are recycled through this group collection

[Details of waste by group collection in Japan (thousand tons)]



# Basic Principle of Waste Management (3R Principles)



# Objectives of MSW Management

- Improvement of Public Health Level
- Protection of Living Environment



Benefit provided by waste management should be maximized.

# Improvement of waste management

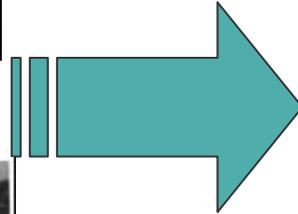
- Introduction of continuous-operational furnaces in waste incineration facilities contributed to reducing gas emission
- Liner sheet and effluent treatment facilities are utilized in sanitary landfill sites



*1960s*



*1970s*

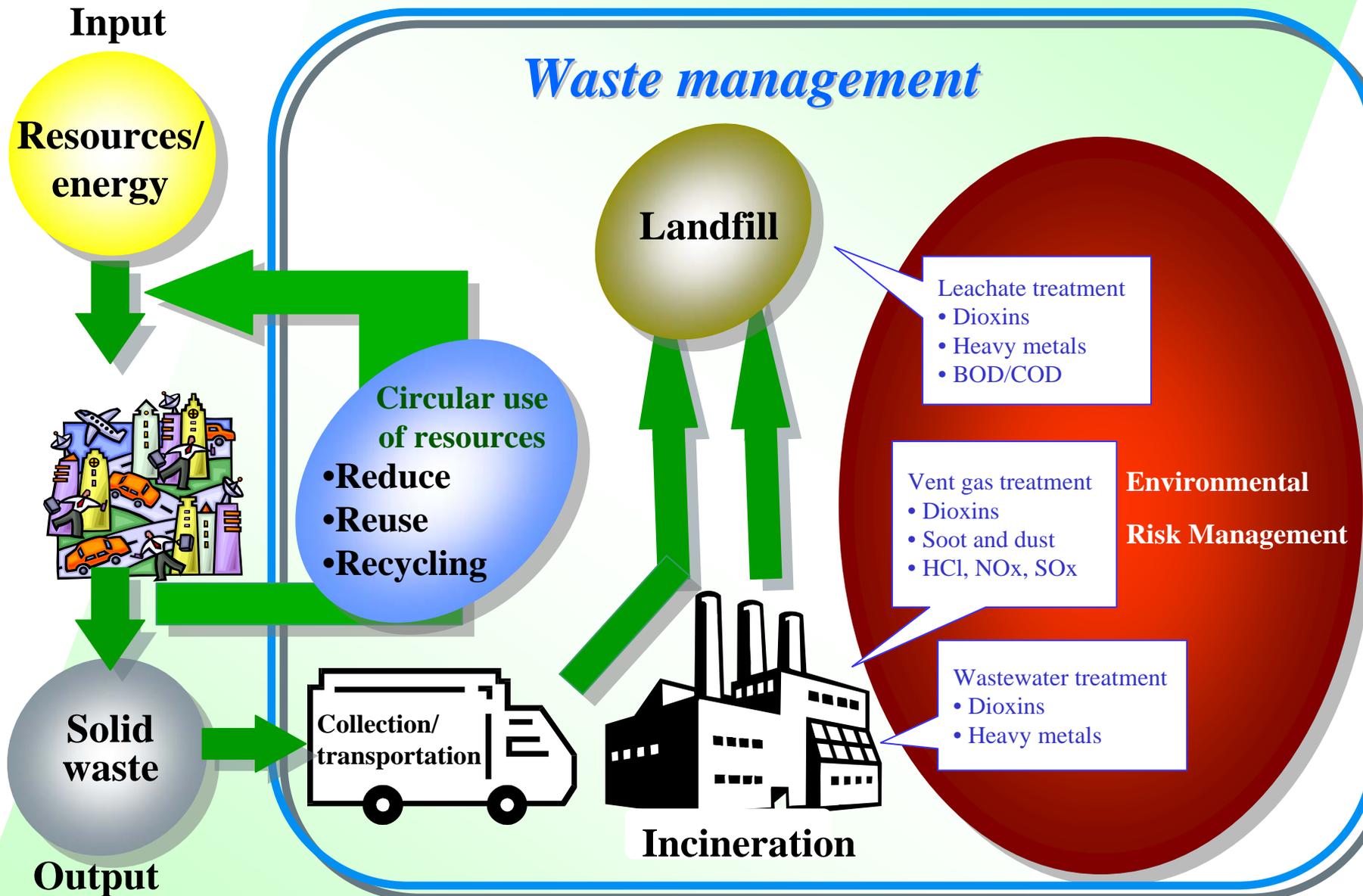


*Present*



*Present*

# Waste Management and Environmental Risk Management



# Improvement toward Better Waste Management

**Refuse Collection Coverage** ↗



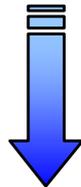
**Open Dumping**



**Sanitary Landfill** ↗



**Incineration Rate for Combustible Waste** ↗



➤ **Landfill Disposal Rate** ↘

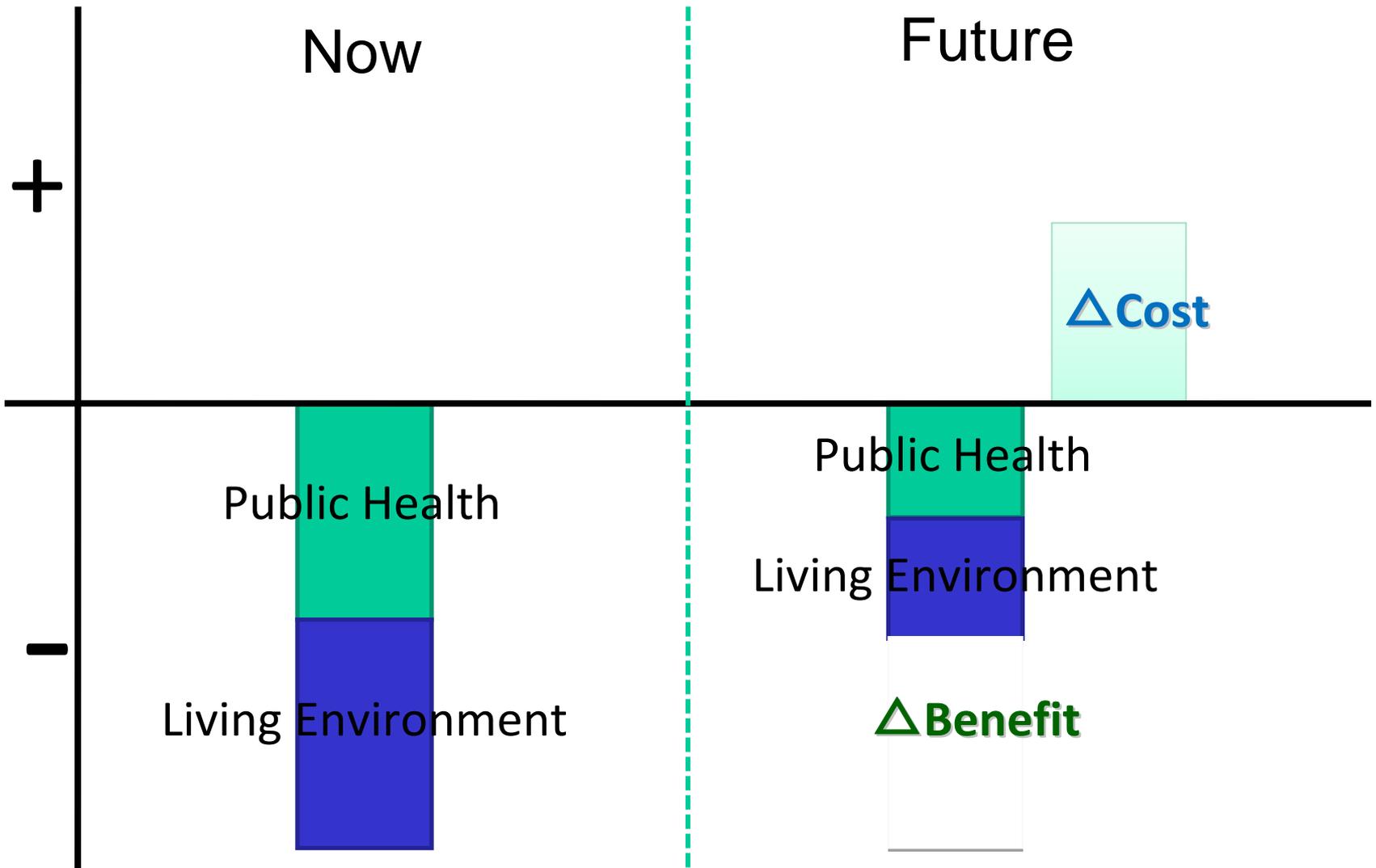
➤ **Recycling Rate** ↗

➤ **Waste Generation Rate** ↘

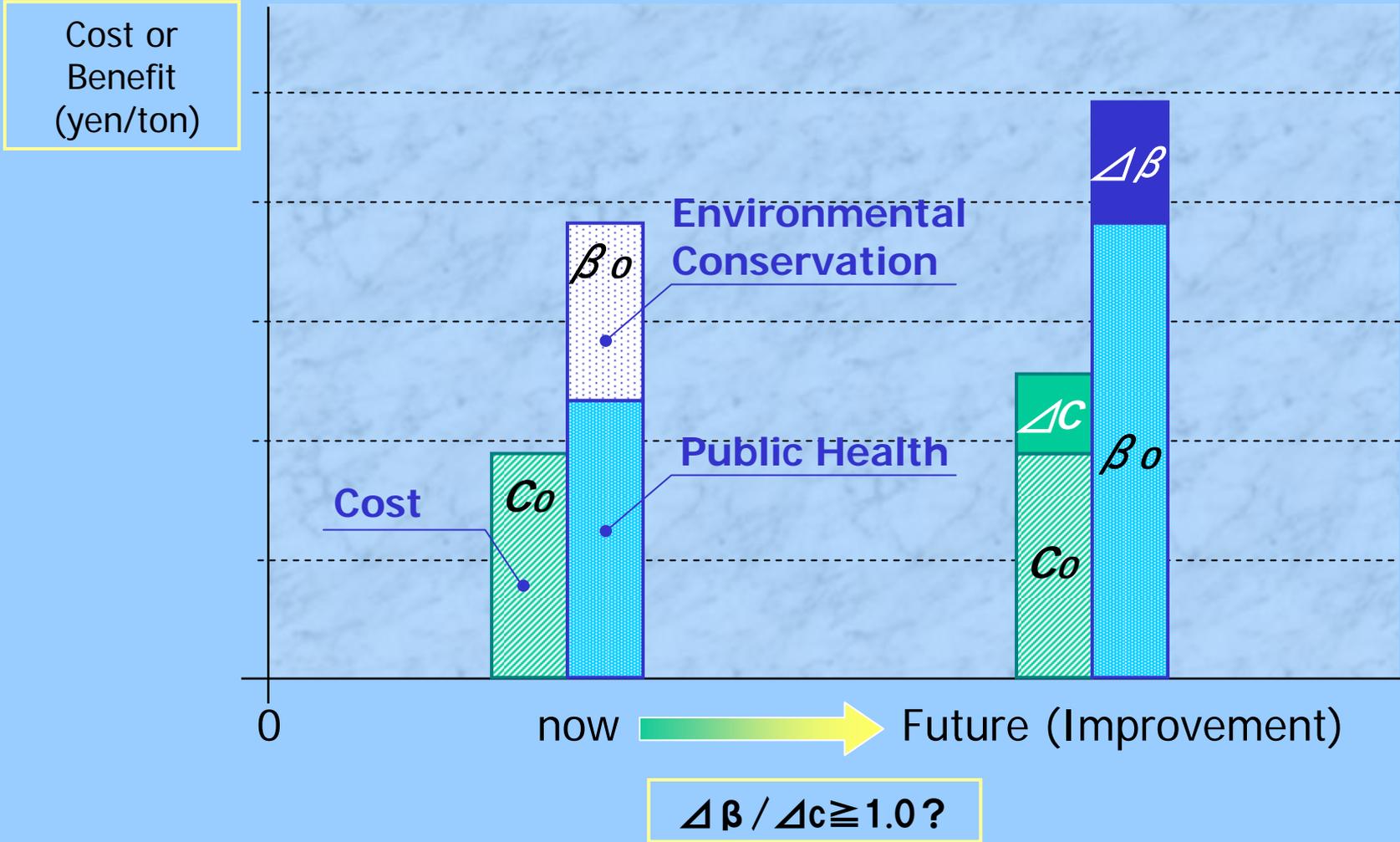
# Constraints

- Limited Budget
  - Limited Man Power
  - Limited Equipment
  - Limited Facilities
  - Limited Landfill Space
  - No Environmental Impact
  - No Health Impact
  - Natural Resource Conservation
- ..... (Efficiency)
- ..... (Volume Reduction)
- ..... (Risk Management)
- ..... (Recycling)
- 
- The diagram consists of a list of eight constraints on the left. On the right, four categories are listed, each preceded by a dotted line. Brackets connect the constraints to these categories: a large right-facing bracket groups the first four constraints (Limited Budget, Limited Man Power, Limited Equipment, Limited Facilities) to the 'Efficiency' category; a dotted line connects 'Limited Landfill Space' to 'Volume Reduction'; a right-facing bracket groups 'No Environmental Impact' and 'No Health Impact' to 'Risk Management'; and a right-facing bracket groups 'Natural Resource Conservation' to 'Recycling'.

# Cost-Benefit Analysis



# Cost and Benefit Before and After



# Cost-Benefit Analysis

## Cost

$$\text{Budget} = C + \Delta C$$

- Waste Management Budget  $\uparrow$

For Human resource development

And to buy Advanced facilities

## Benefit

$$\text{Public Health} = B1 + \Delta B1$$

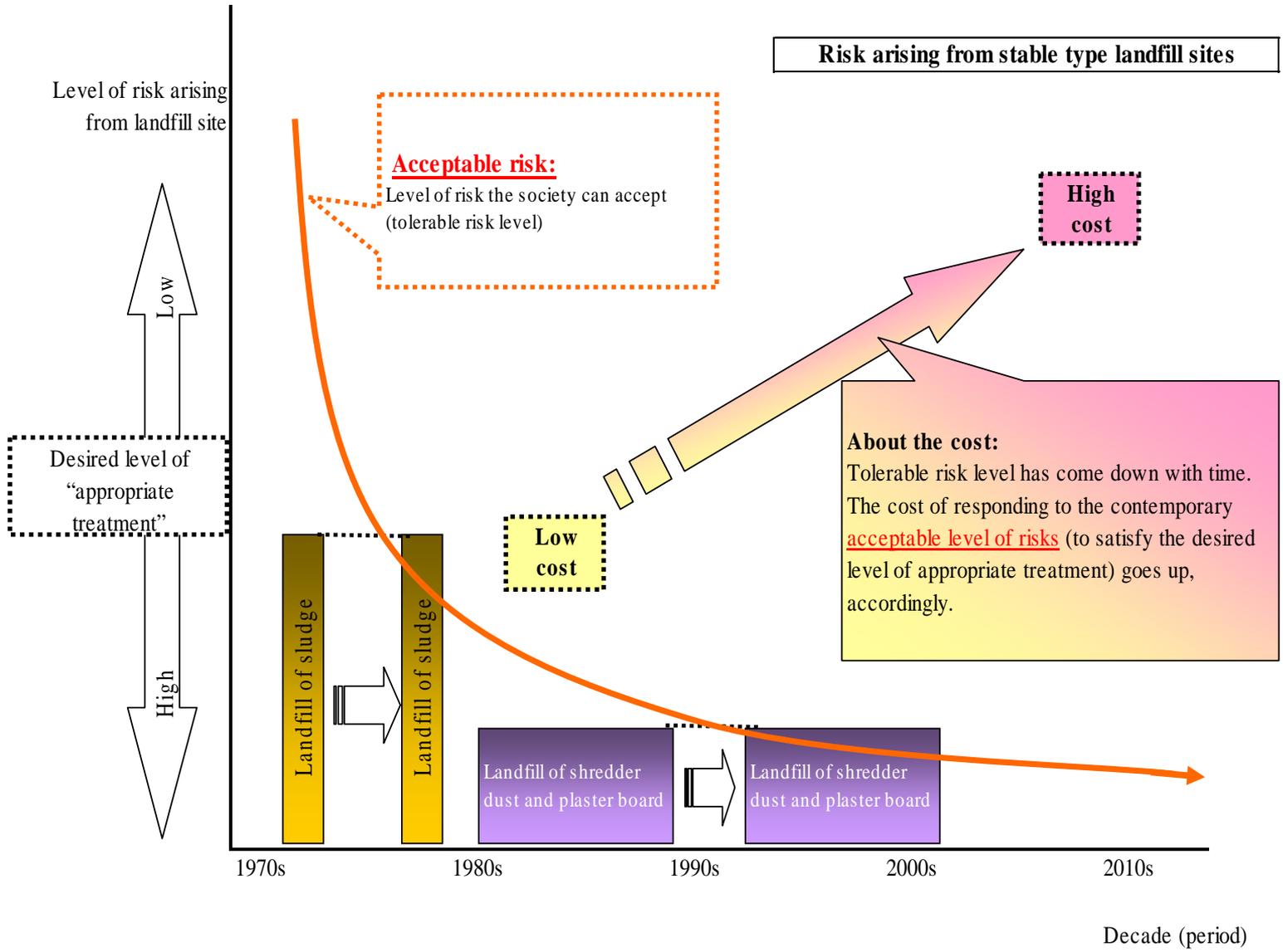
$$\text{Living Environment} = B2 + \Delta B2$$

$$\frac{\Delta B1 + \Delta B2}{\Delta C} \geq 1$$

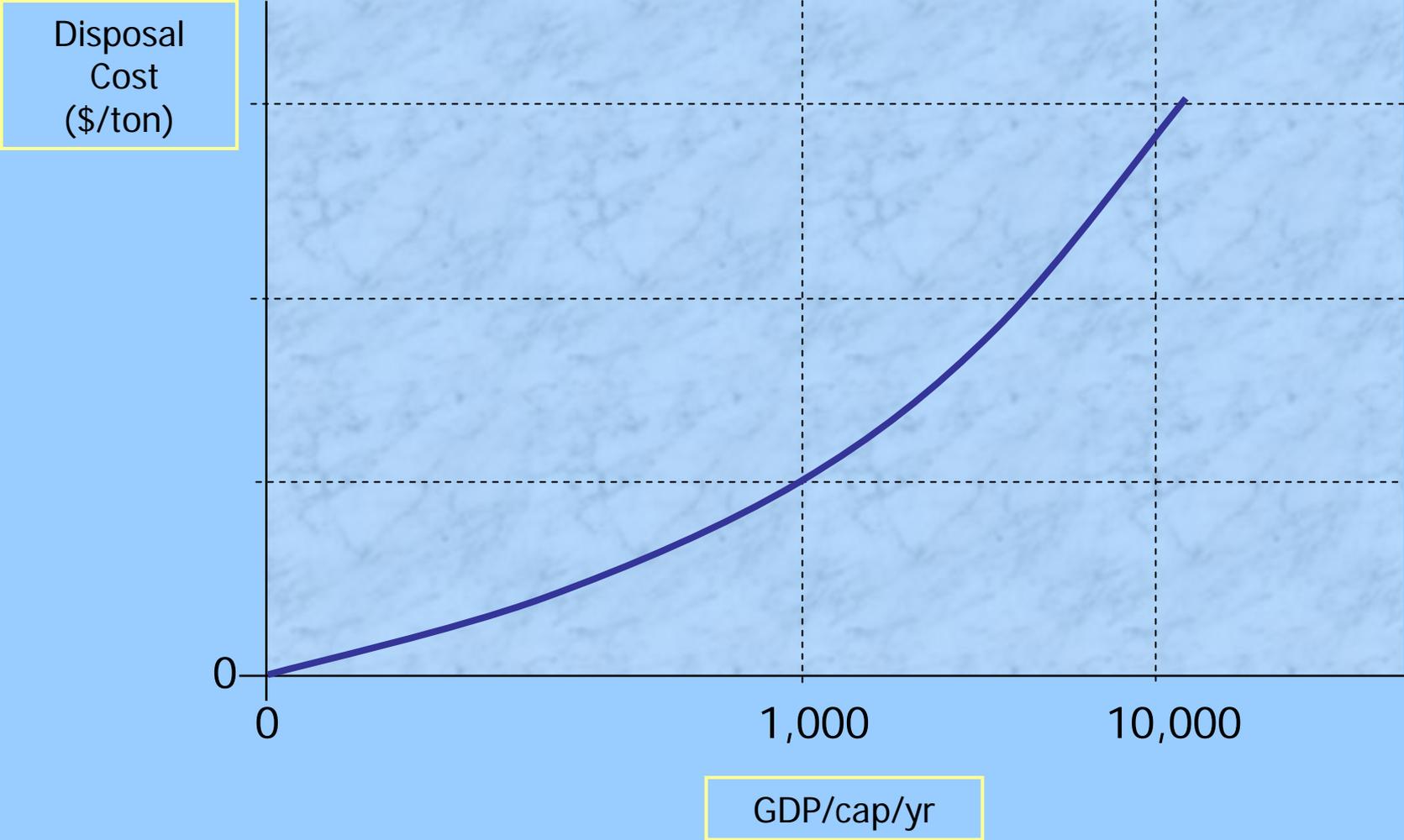
Benefit provided by waste  
service should not be  
underestimated

# Financial Mechanisms

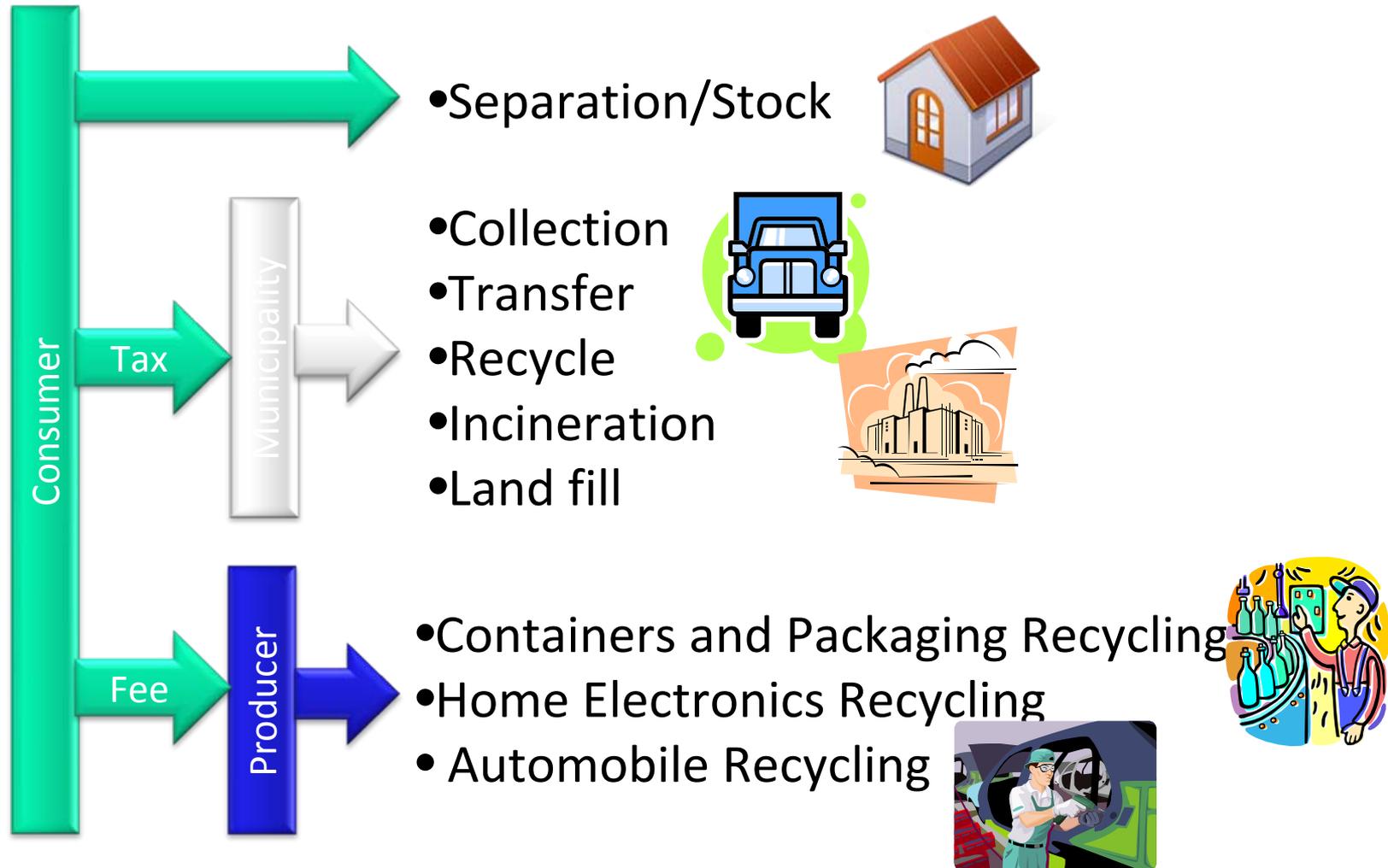
- Solid waste may generate financial resources
- Regional management to recover material and energy and to dispose of solid waste may be better.
- Central government should finance to built essential waste management facilities with the help of international financing banks to improve public health and environmental.
- PPP (Polluter pay principle ) apply for waste management basically.



# Disposal Cost goes up as GDP increases



# Cost payer of MSW Management

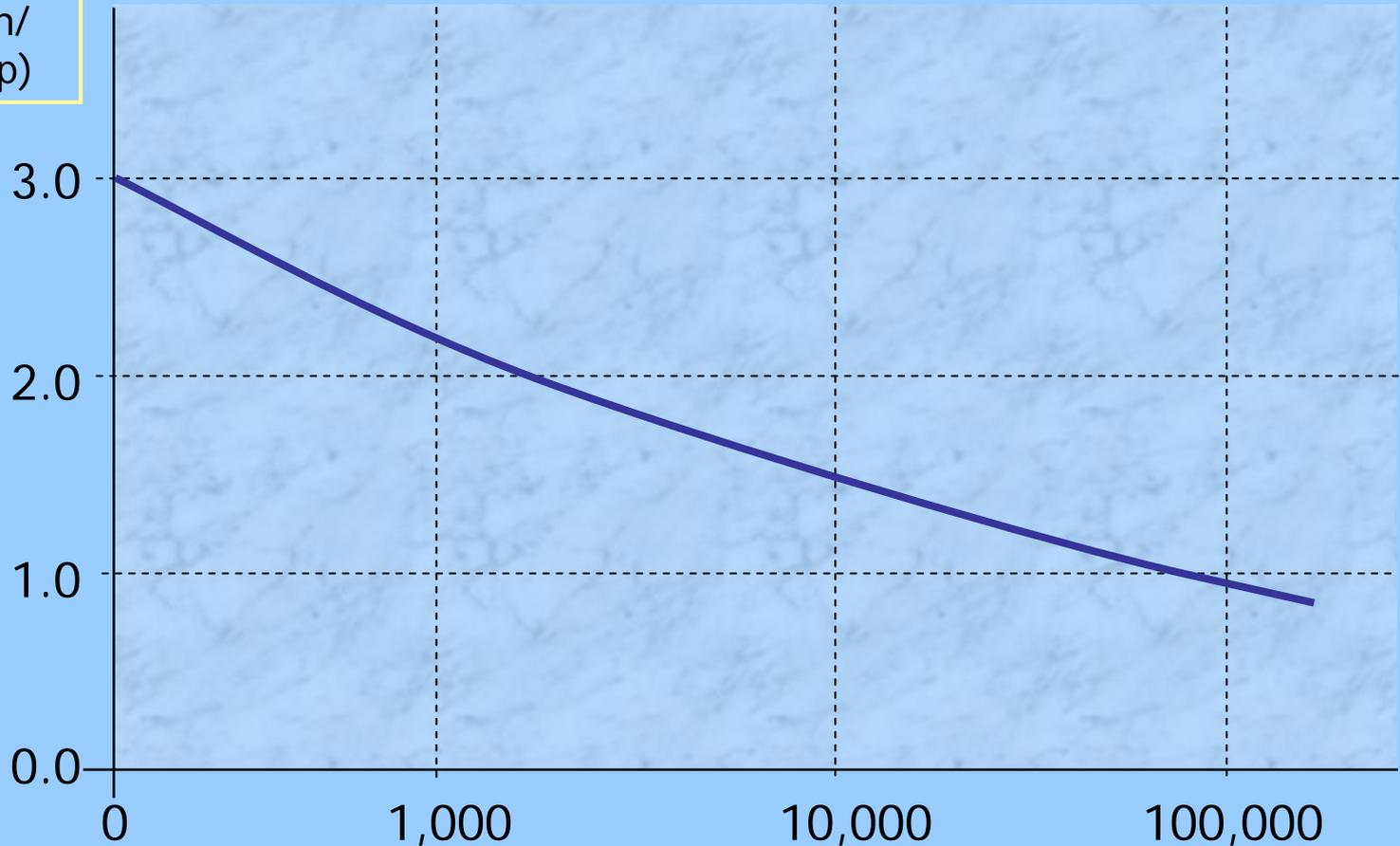


# Capacity Development

- Constant improvement of solid waste management is required.
- Create section of 3Rs and/or solid waste management in local and central governments.
- Workers in MSW should be trained and educated always and respected and treated as professional staffs. Then efficiency of waste management will be improved.
- Experts conducts Cost/Benefit analysis for service of solid waste management.
- Experts can develop capacity of human resources, institutions, and science and technology.

# Man Power for Solid Waste Management

Man Power  
for SWM  
(person/  
1000pop)



GDP (\$/cap/yr)

- Society of Solid Waste Management Experts in Asia & Pacific Islands (SWAPI)

