

Utilization of waste biomass in urban-rural context - Japanese perspectives -

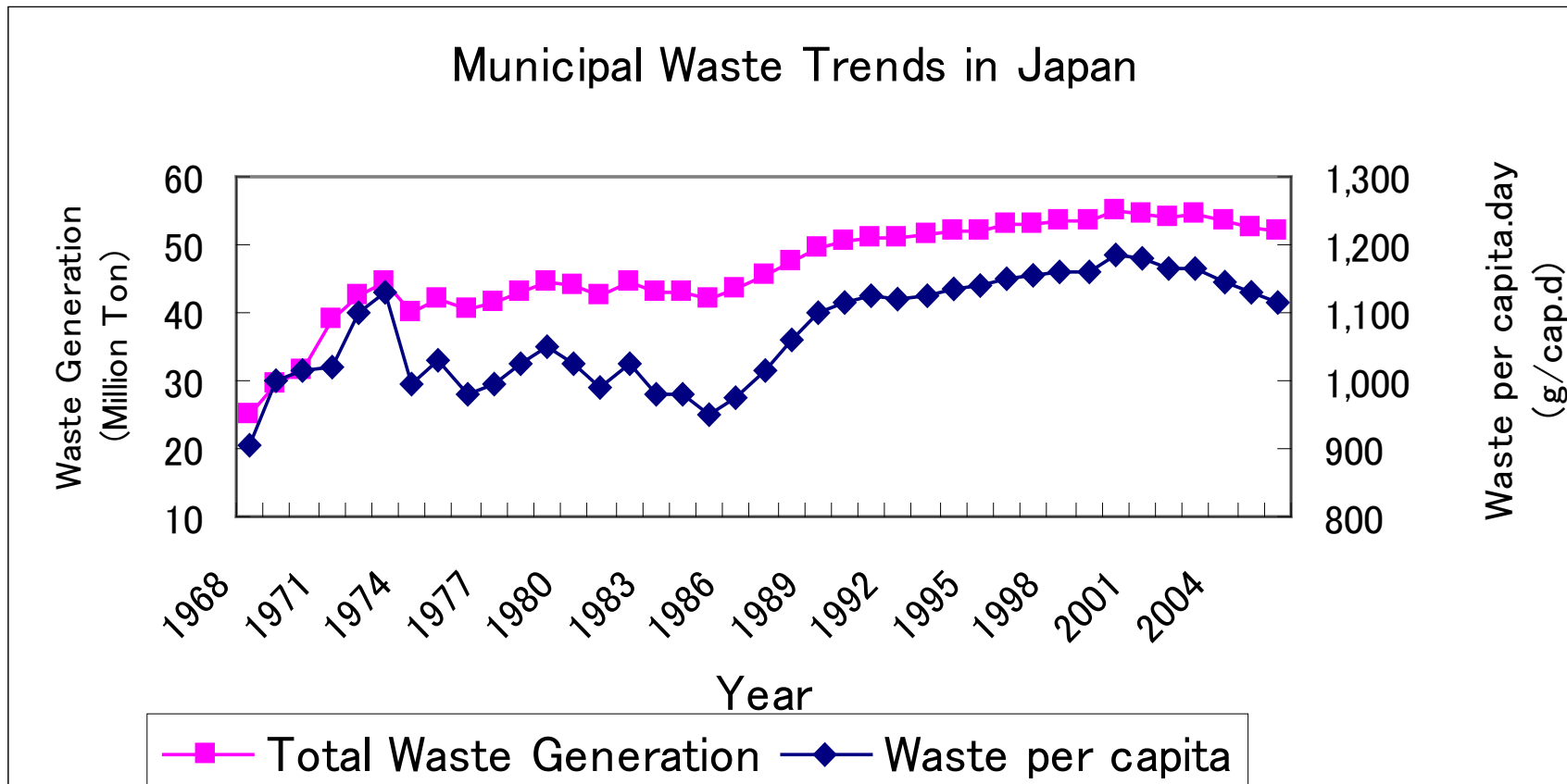
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Regional Workshop on Waste Agricultural Biomass, UNEP-IETC, GEC

Chronological Trend of Municipal Waste Generation In Japan



Data Source: Ministry of Environment, Japan

Economic Status and Waste Generation in Asian Nations and Japan

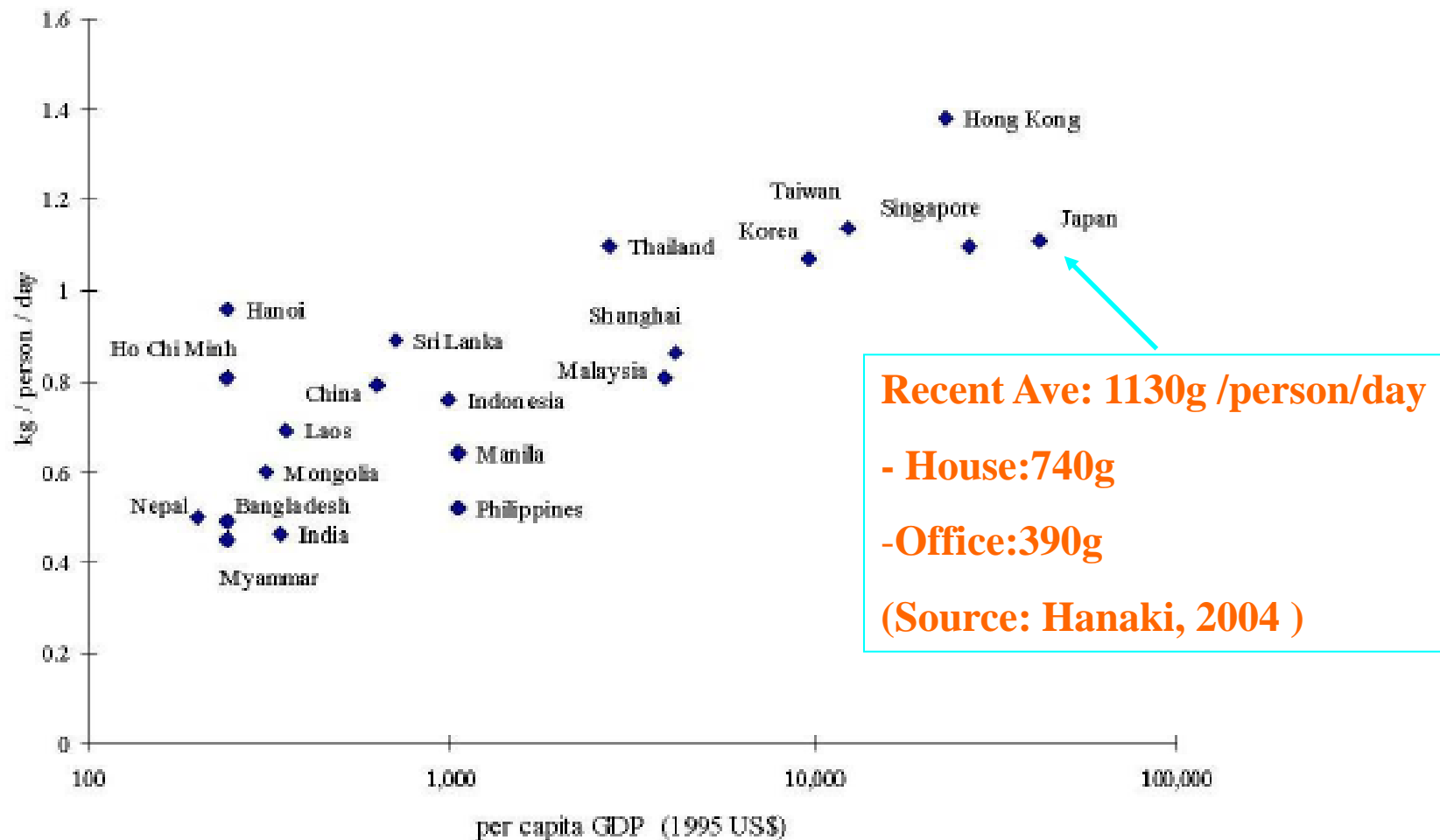
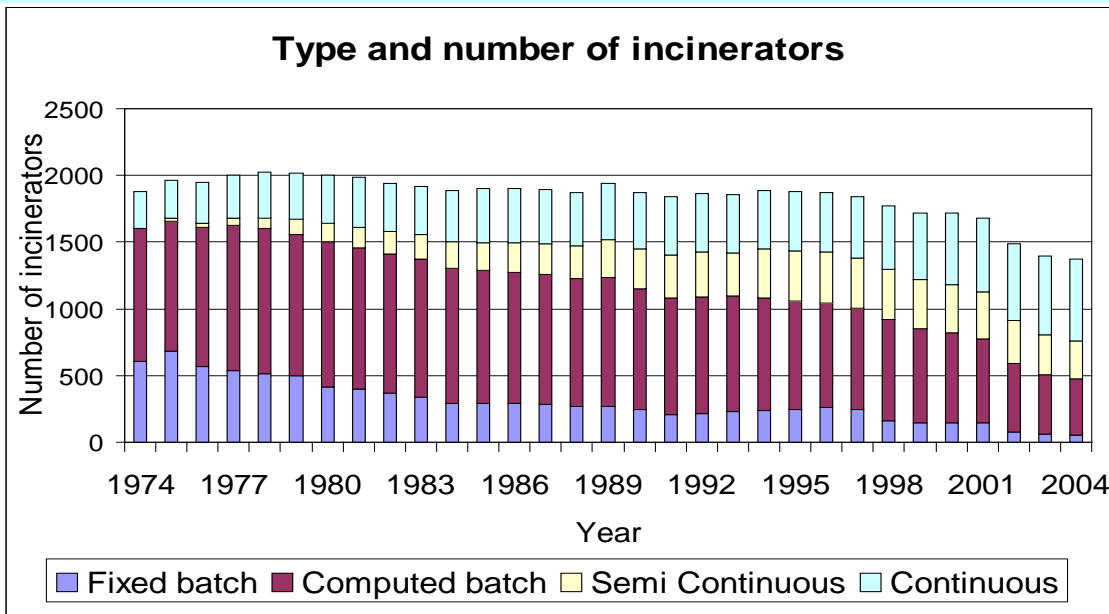
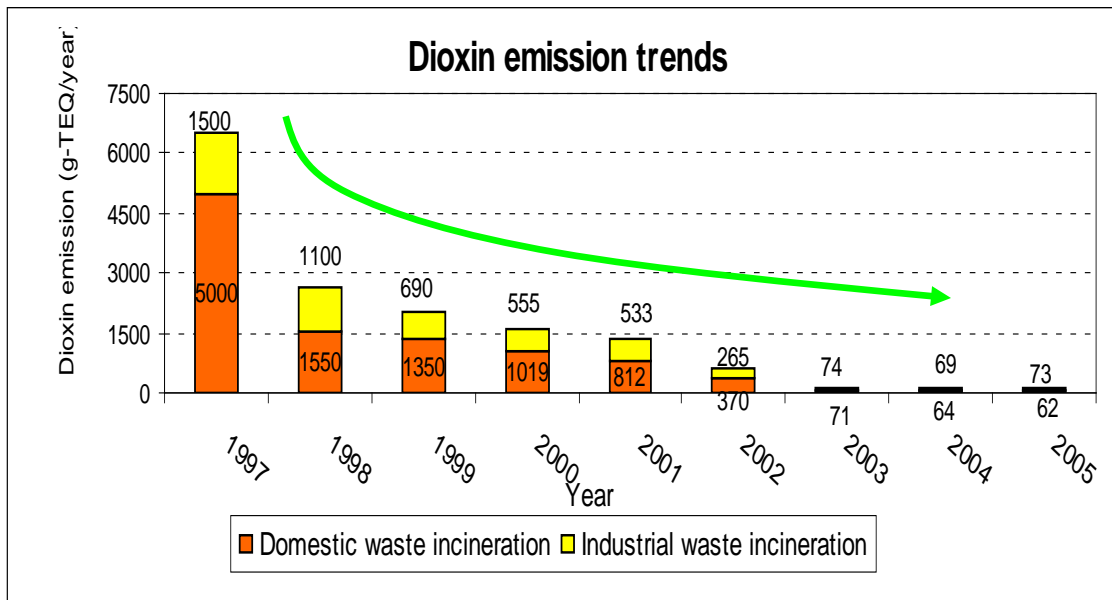


Figure 3. Comparison of MSW Generation Rates and per capital GDP in Asia
 Source: World Bank 1999

Incinerators Types and Dioxin emissions

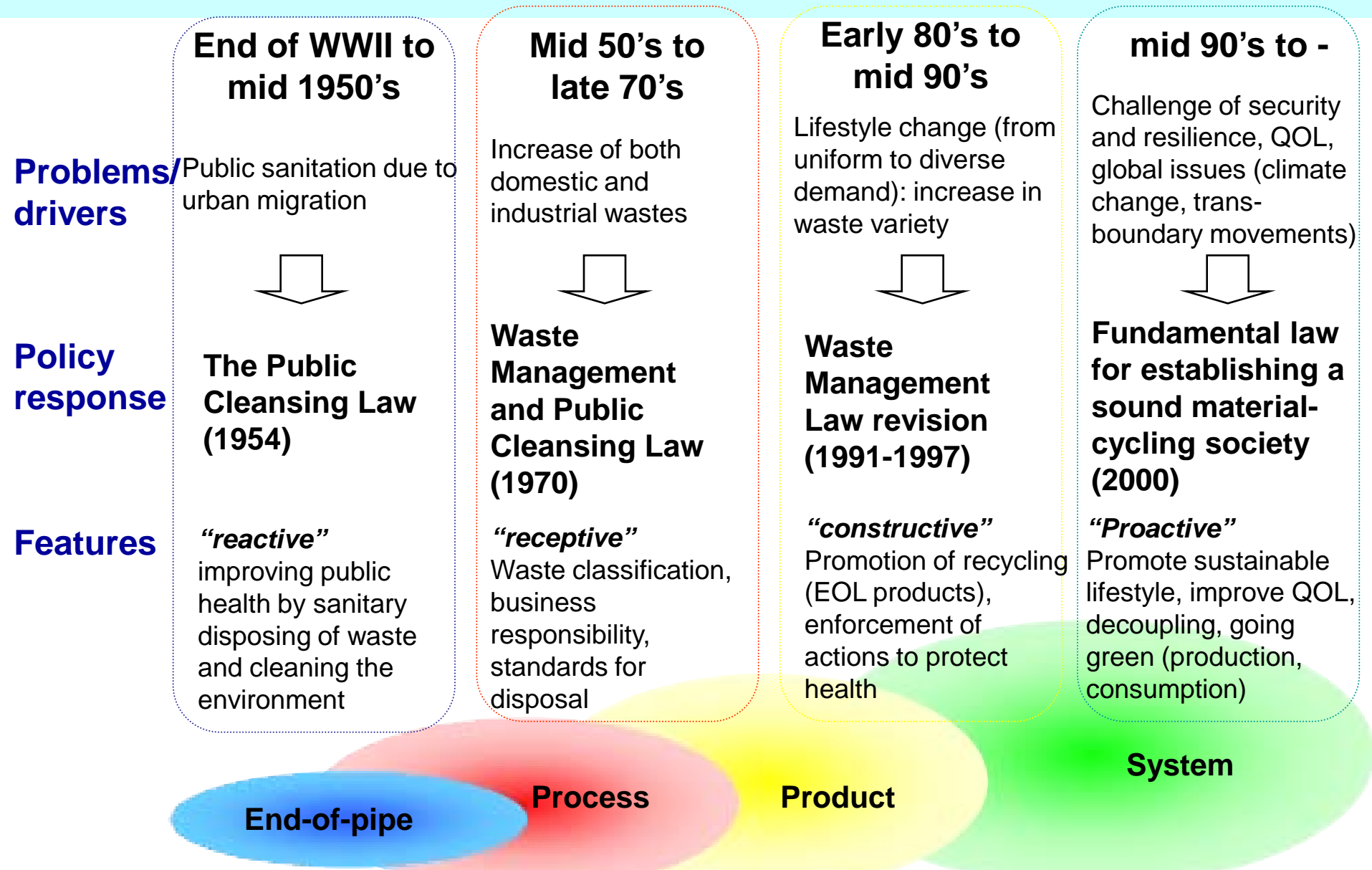


Types of Incineration facilities changed.



Dioxin emission has reduced drastically.

Evolution of Environmental Policies in Japan



Framework of the Implementation Plan

Sound Material-cycle Society (SMS)

The Basic Environment Law

The Basic Environment Plan

Fundamental Law for Establishing a Sound Material-Cycle Society

Fundamental Plan for Establishing a Sound Material-Cycle Society

Proper disposal of waste

Promotion of recycling

Waste Disposal and Public Cleansing Law

Law for the Promotion of Effective Utilities of Resources

Law for the Promotion of Sorted Collection and Recycling Containers and Packaging

Laws for promoting specific waste recycling

Law for the Recycling of Specified Kinds of Home Appliances

Construction Material Recycling Law

Law for Promotion of Recycling and Related Activities for Treatment of Cyclical Food Resources

Law for the Recycling of End-of-Life Vehicles

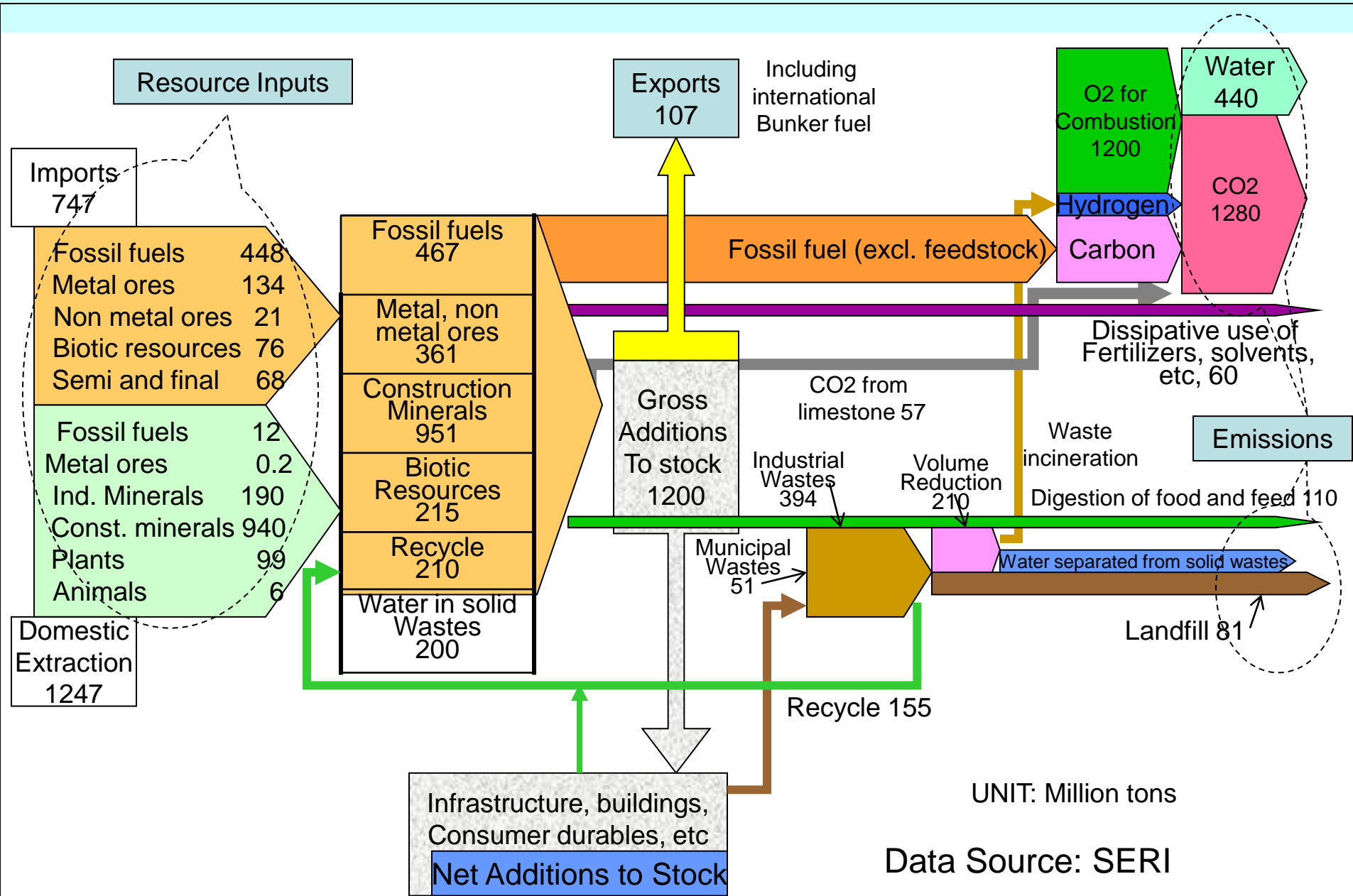
Local action plan

- Plan for Establishing Environmentally Sound Material-Cycle Society in local governments
- Promoting Eco-town Project

Local council

Establishing Council on Promoting Zero-waste City in Tokyo Metropolitan Area and Kyoto-Osaka-Kove Area

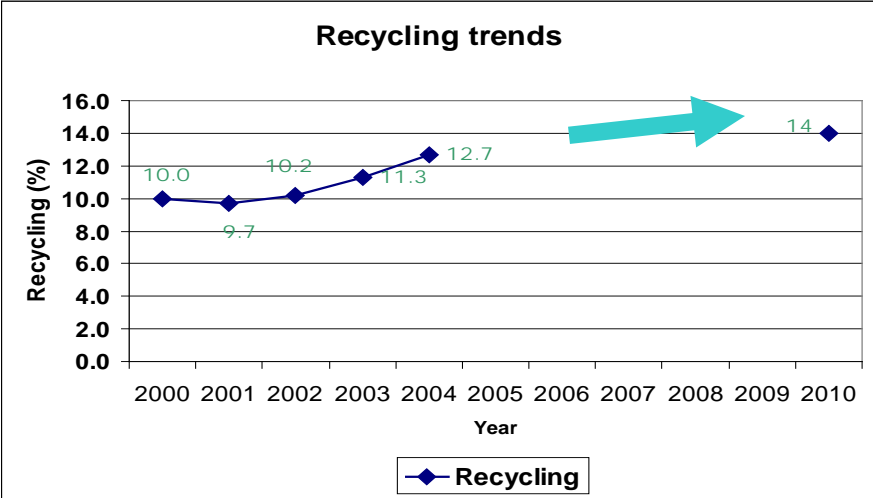
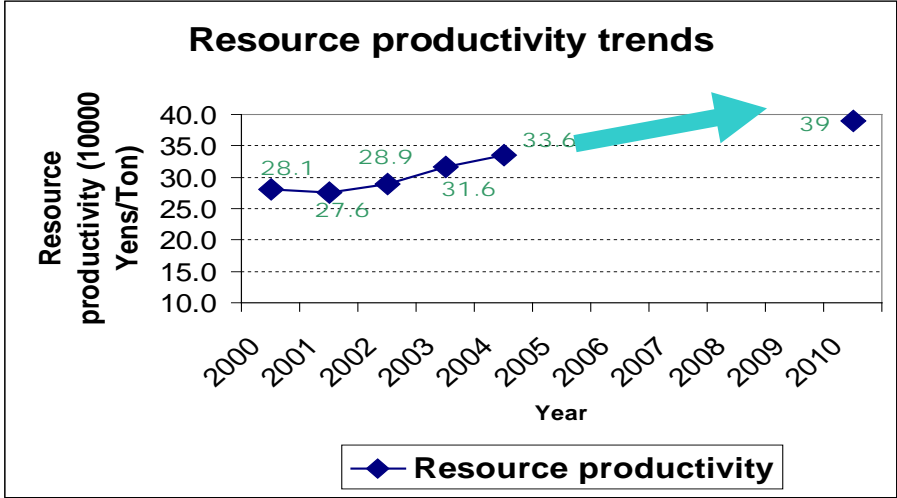
Overview of Material flow in Japan



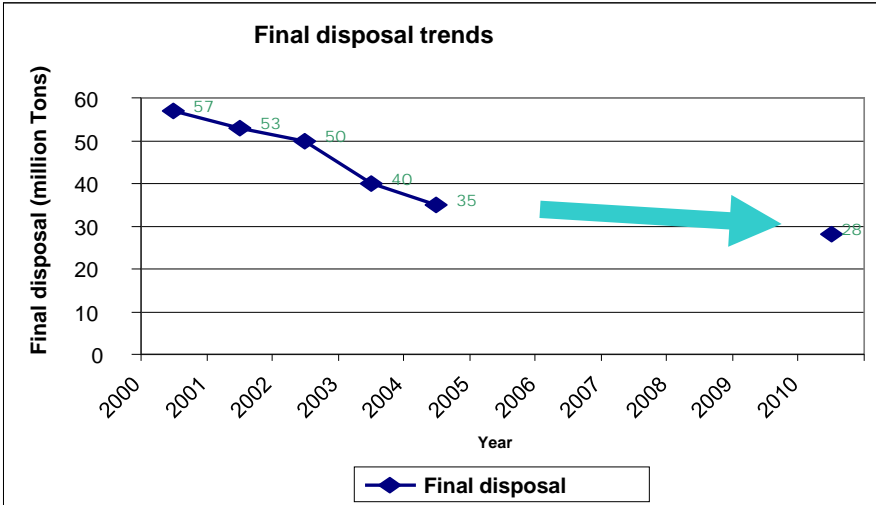
Macro Indicators to Measure the Material-cycle Society

(A): $\text{Resource Productivity} = \frac{\text{GDP (Service)}}{\text{DMI}}$

(B): Recycling Rate



(C): Final Disposal Amount

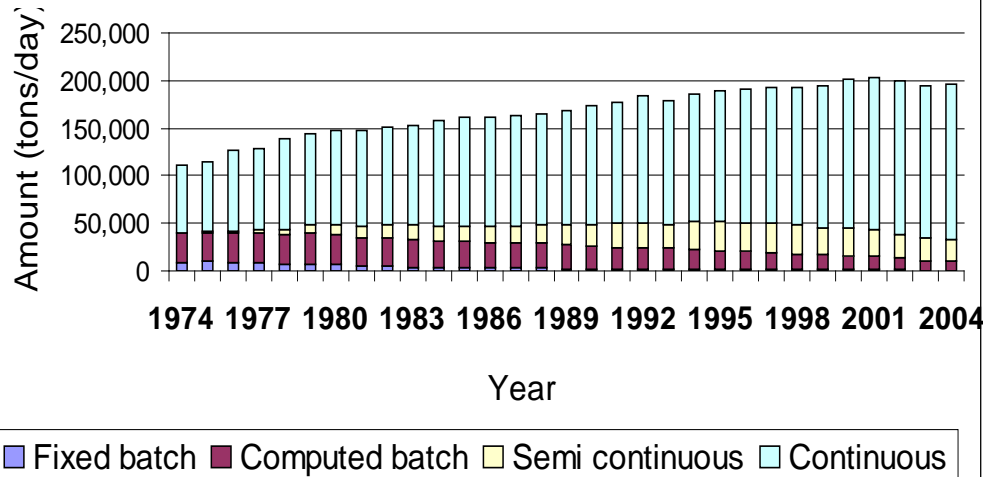


Fundamental Law for Establishing a Sound Material-Cycle Society was revised in 2008, **“biomass utilization rate”** was included as a monitoring indicator.

Data source: Ministry of Environment of Japan <http://www.env.go.jp/doc/toukei/contents/index.html>

Basic guidelines to transform wastes into energy resources

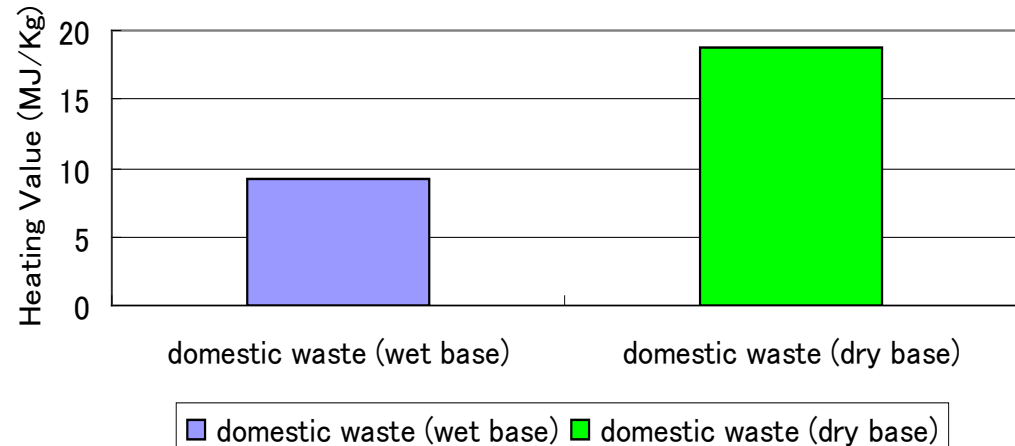
Trends in wastes incineration (by type of incinerator)





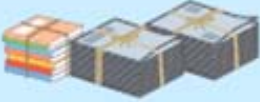






Until now, wastes have been basically incinerated, and the society as a whole has not taken advantage of the associated recovery potential (energy, industrial use, etc).

It is important to change current patterns in waste treatment to obtain the maximum benefits (environmental, economical and social) of wastes

Heating value for domestic wastes (MJ/Kg)

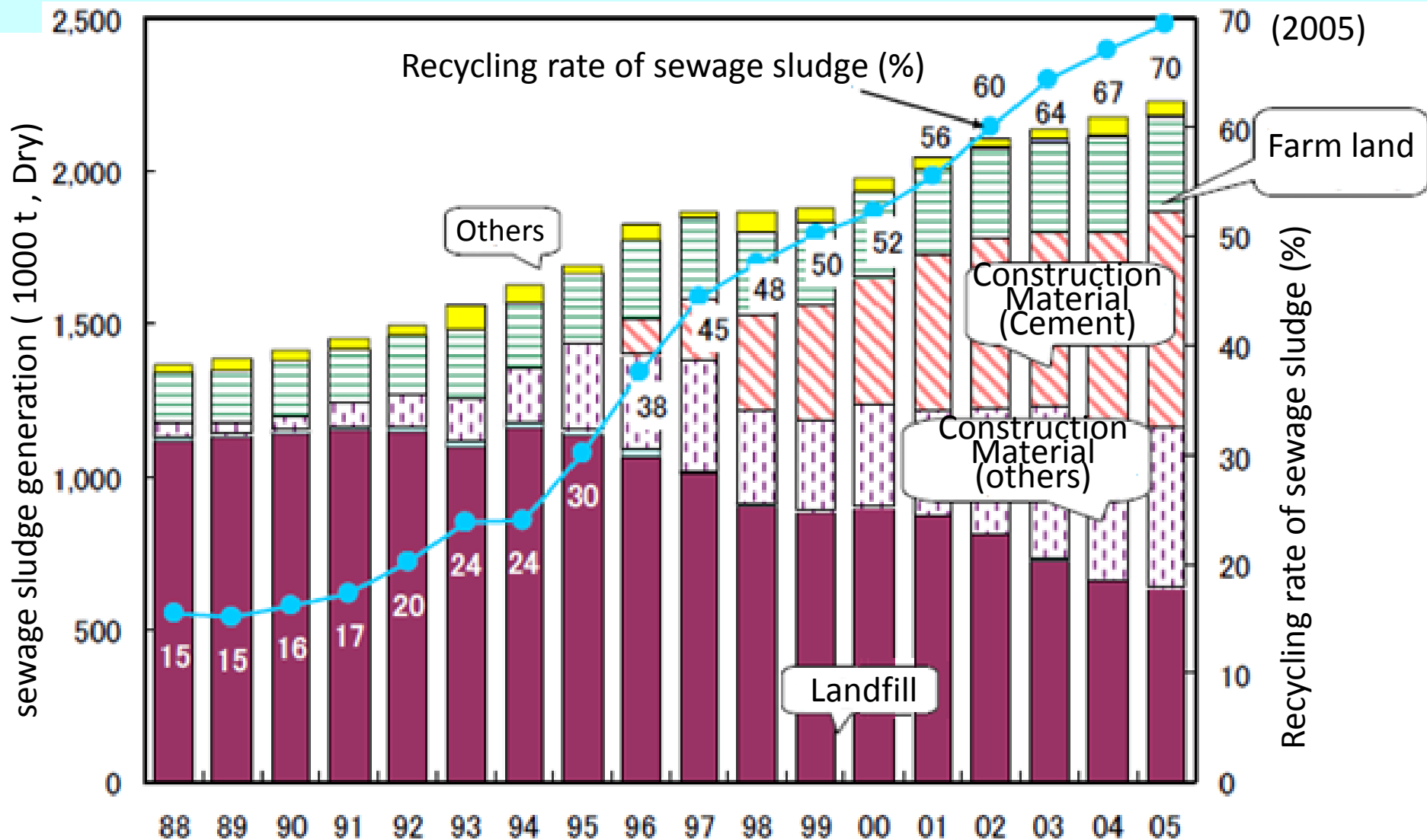


Generation and Utilization of biomass in Japan, 2005

| biomass | annual output | state of utilization |
|--|-------------------------------------|--------------------------|
| animal manure 家畜排せつ物  | × 10 ⁴⁴ ton 約8,900万トン | use 約90% non-use 約10% |
| food waste 食品廃棄物  | 約2,200万トン | 未利用 80% |
| waste paper 廃棄紙  | 約1,400万トン | |
| Black liquor ハルプ廃液 (乾燥重量)  | 約1,400万トン | |
| sawmill residuals 製材工場等残材  | 約 500万トン | use 約90% non-use 約10% |
| wooden construction waste 建設発生木材  | 約 460万トン | use 約60% |
| forestland residuals 林地残材  | 約 370万トン | |
| sewage sludge 下水汚泥 (濃縮汚泥ベース)  | 約7,500万トン | use 約64% non-use 約36% |
| non-eatable organics 農作物非食用部 (稲わら、もみがら等)  | 約1,200万トン | use 約30% non-use 約70% |

Utilization of sewage sludge

2,227,000
DStons
(2005)



Utilization of sewage sludge as energy resources covers only 7% of total.

Source: Ministry of Land, Infrastructure and Transport

Backgrounds of sewage sludge management in Tokyo

- The volume of raw sewage sludge has been **Increasing** steadily.
- Tokyo has historically suffered from **limited capacity** of **final disposal site**.
- **No agricultural use, composting use**

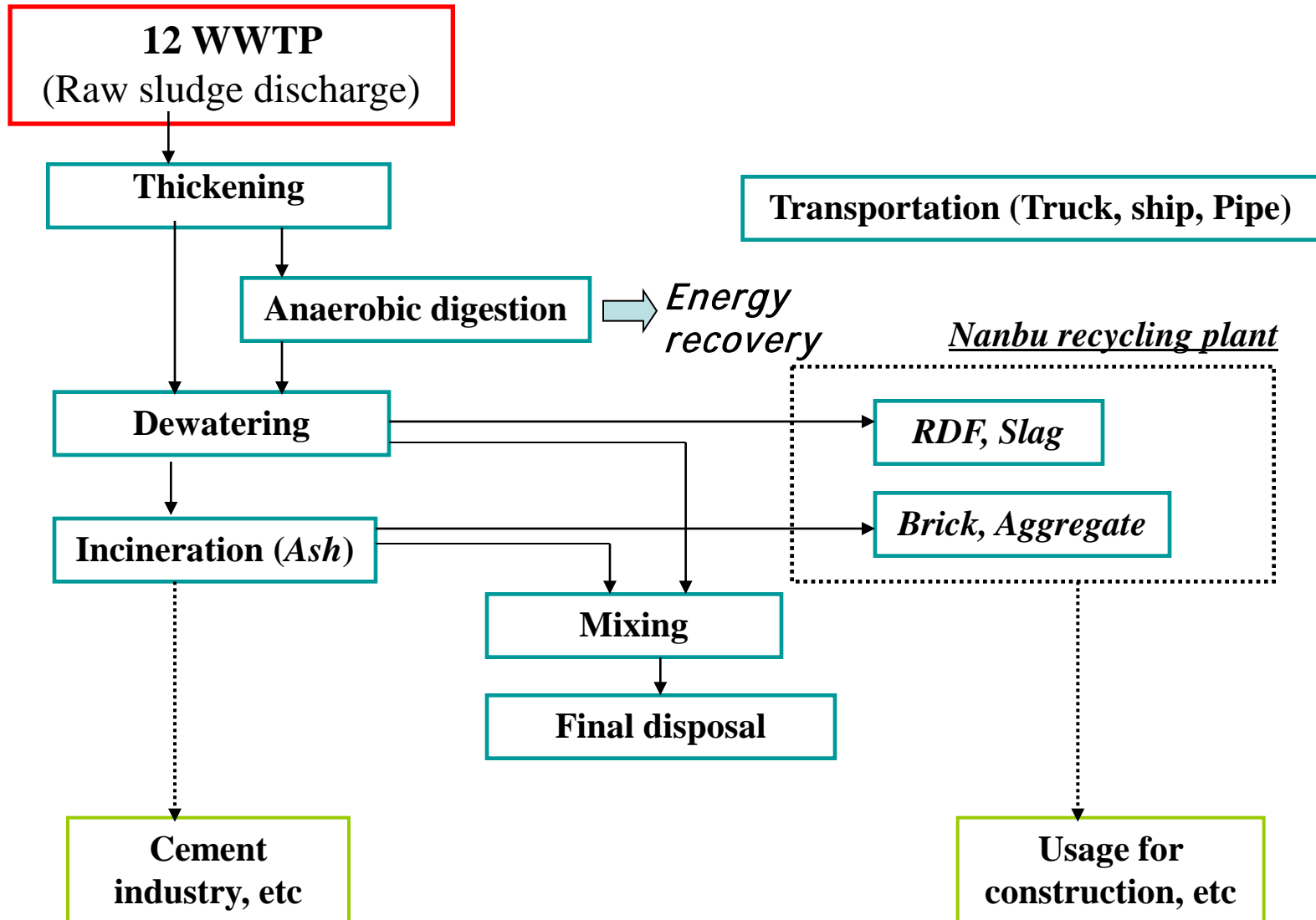


Sewage management system has been designed to reduce the sludge volume eventually disposed in final disposal sites

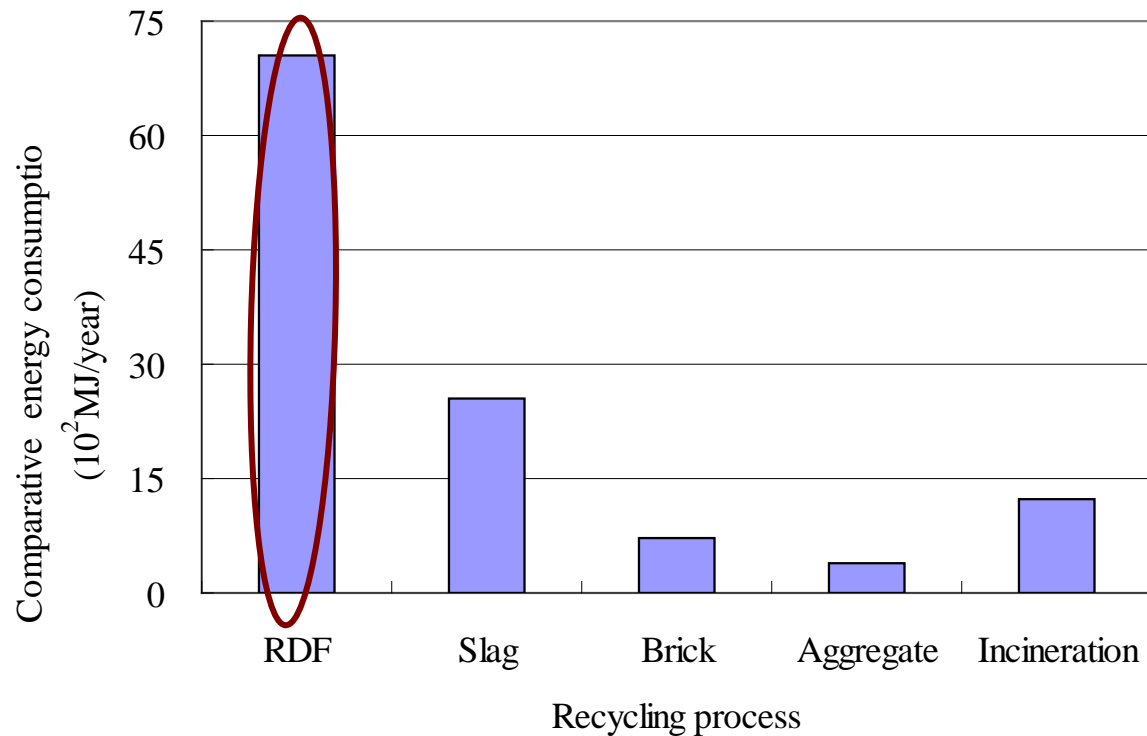
For reducing the amount of final disposal

- **Incineration** has been facilitated.
- **Sludge recycling** (Brick, Aggregate, Slag, RDF) has been tested.
- **Utilization of ash in cement industry as raw material for cement** (after 1997)

Summarized sludge management system in the Tokyo 23 Wards area

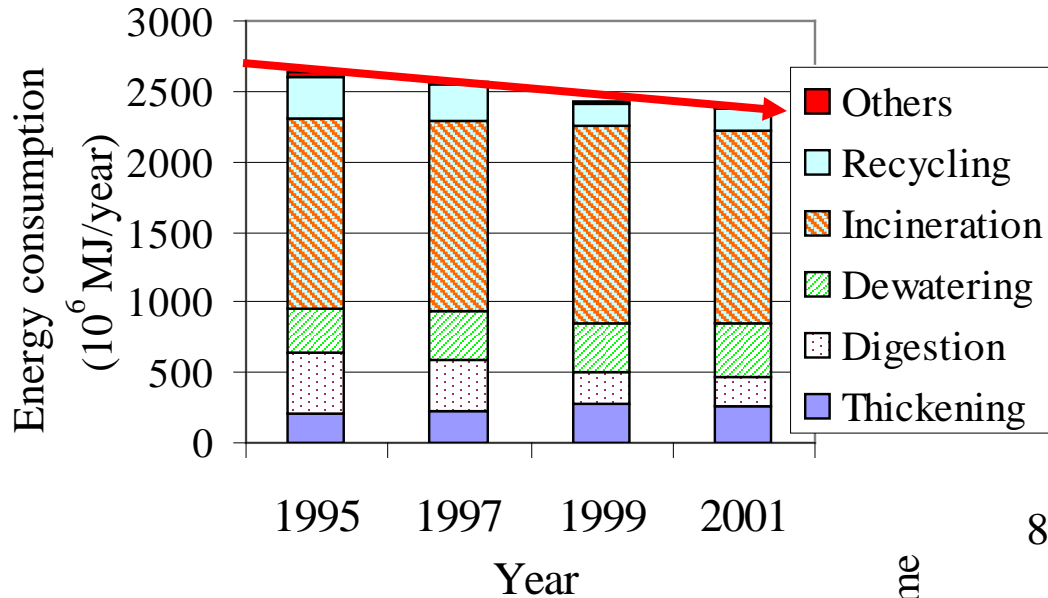


Comparative energy consumption in each recycling process



Hara, K and Mino, T. (2008). Environmental Assessment of Sewage Sludge Recycling Options and Treatment Processes in Tokyo, Waste Management, Vol 28 (12), pp. 2645-2652

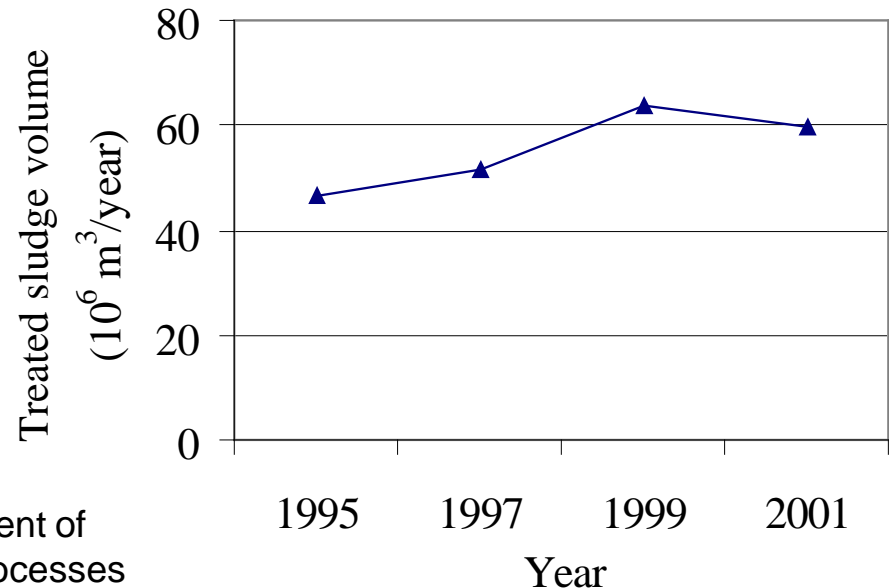
Energy consumption



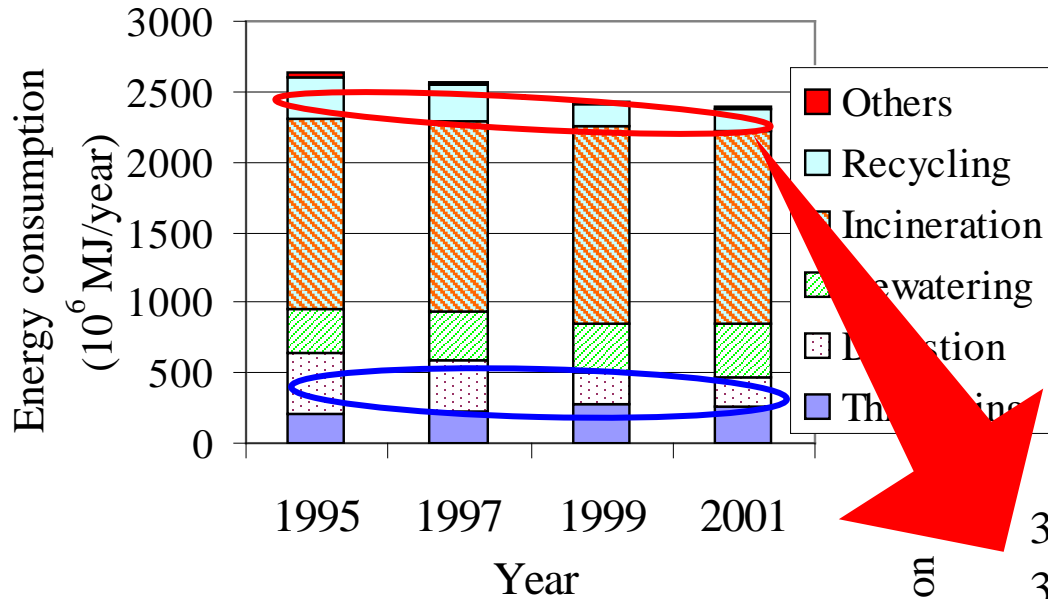
Total energy consumption shows a tendency to decrease.

Note: "Others" is the sum of mixing, transportation and final disposal process.

Raw sludge volume has been increasing.

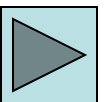
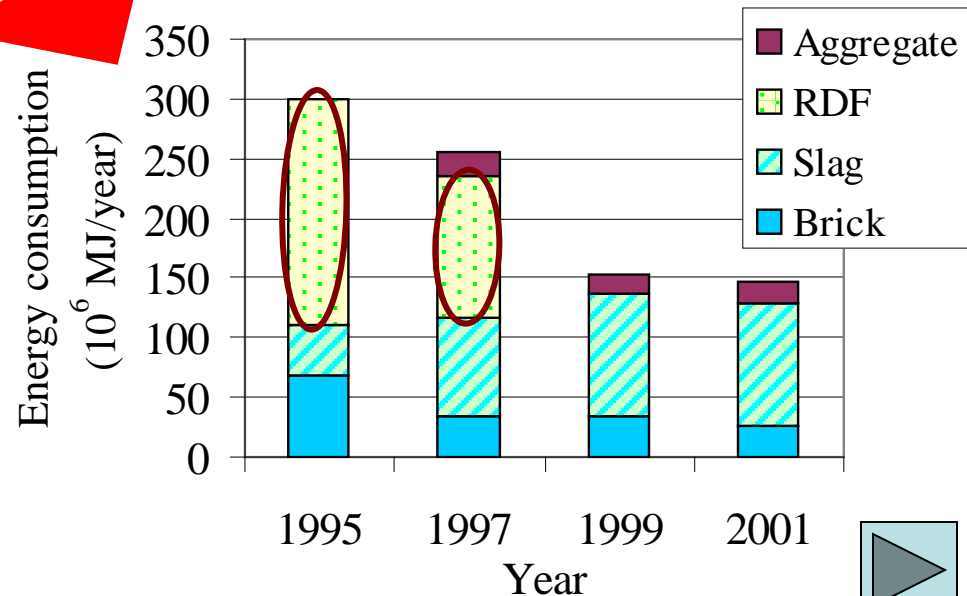


Energy consumption in recycling process

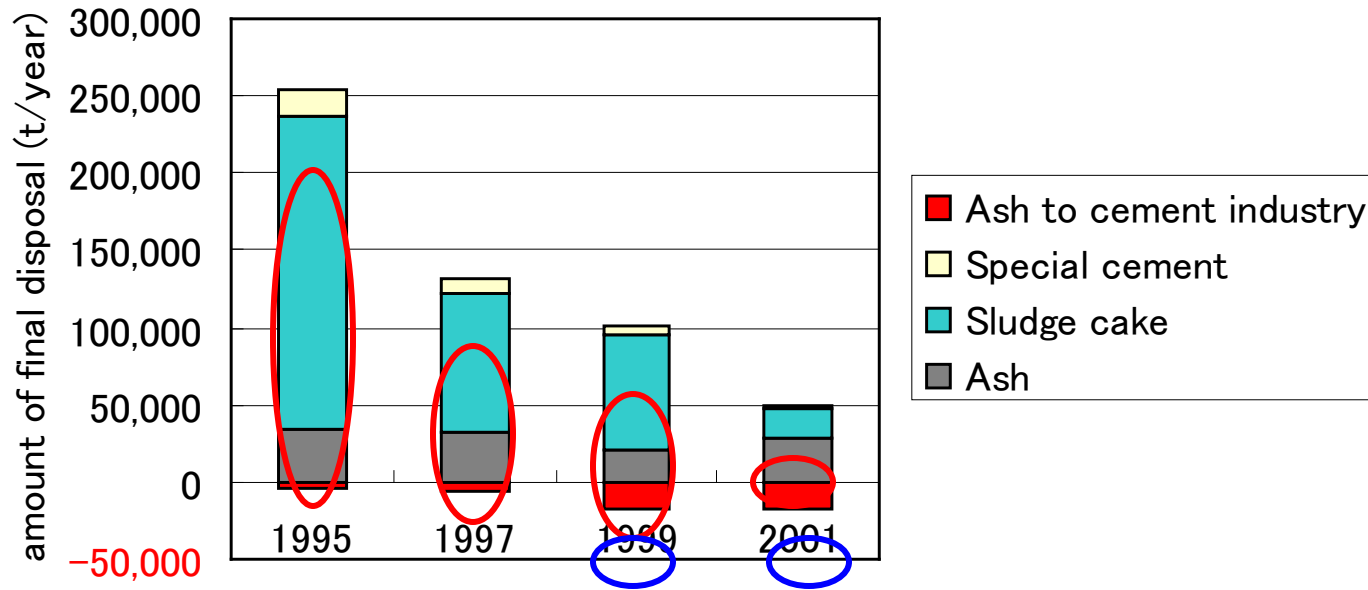


This reduction can be mainly explained by reduction in recycling and digestion process.

RDF process which constituted the largest part in 1995 and 1997, was scrapped after 1997.



Amount of final disposal



Due to the increase of incineration ratio, the amount of final disposal decreased significantly.

Utilization of ash in cement industry started after 1997.

New perspective in sewage sludge management in Tokyo (Japan)

- Shift to energy efficient material use, such as cement production.
- Re-evaluation of sewage as an energy source (i.e. methane production), in the era of global warming.
- Integrated management with other wastes such as household wastes

Some remarks

- Utilization of biomass in urban and rural areas is an essential policy direction to develop a sustainable society (with sound-materials cycle society and low-carbon society, combined.)
- Institutional design for integrated approaches is indispensable in promoting biomass utilization.