Inaugural Meeting of the Regional 3R Forum in Asia, Nov.11th -12th, 2009

Day 1, Session 2-2: Challenges and Opportunities in the 3Rs/Waste Management in Asia - Sectoral Issues

Eco-towns for 3R promotion in Japan

AGENDA

1)Eco-towns to Promote 3Rs in Japan, Process and Development for a Decade and Future Targets

2)Evaluation Methodology of Environmental and Economic Accomplishments of Eco-town Development

3) Planning Guideline System for Sustainable Asian Eco-towns and Circular Cities/ Regions

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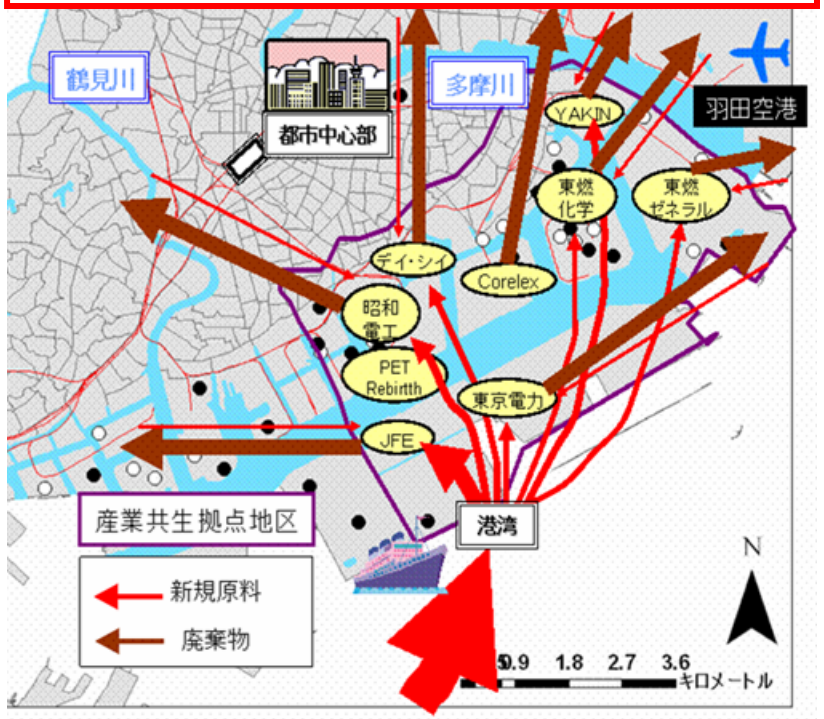
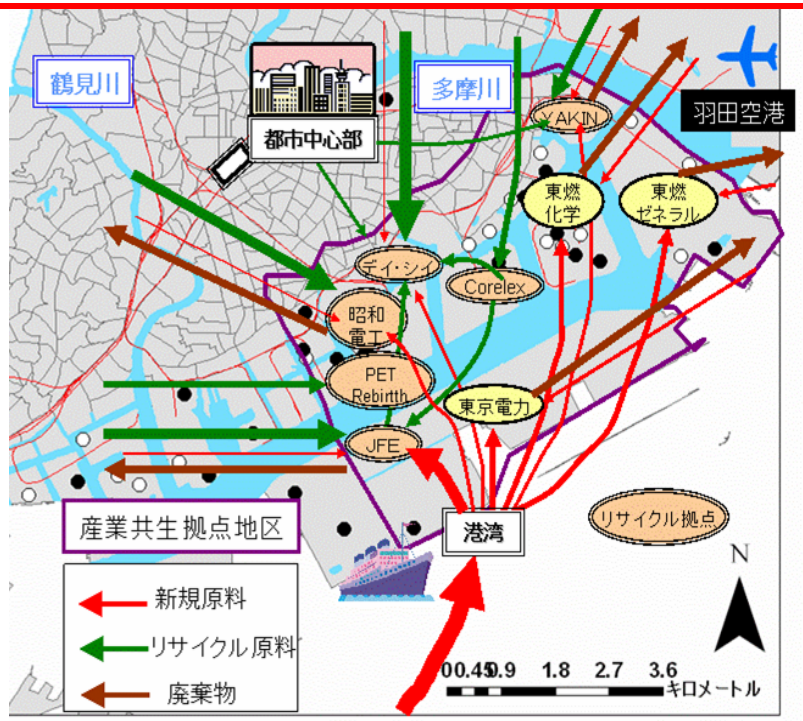
Target and Accomplishment of Japanese Eco-towns

Material Flow of Traditional Industrial Parks



Symbiotic Material Flow in Eco-towns or Eco-Industrial Parks



Conventional material flow: No-circulation

Virgin materials: largely depends on import

Wastes: Disposal based on provisions of the Waste Disposal and Public Cleaning Law

Recycle materials: Not used

Local material circulation: no use of recycle materials

Circular material flow of Eco-towns

Virgin materials: part of virgin materials are substituted by recycle materials

Wastes: Disposal based on provisions of the Waste Disposal and Public Cleaning Law

Recycle materials: Use of recycle materials mainly provided from outside the city

Local material circulation: to some extent

Legislative Framework of Eco-town Program

Eco-town program

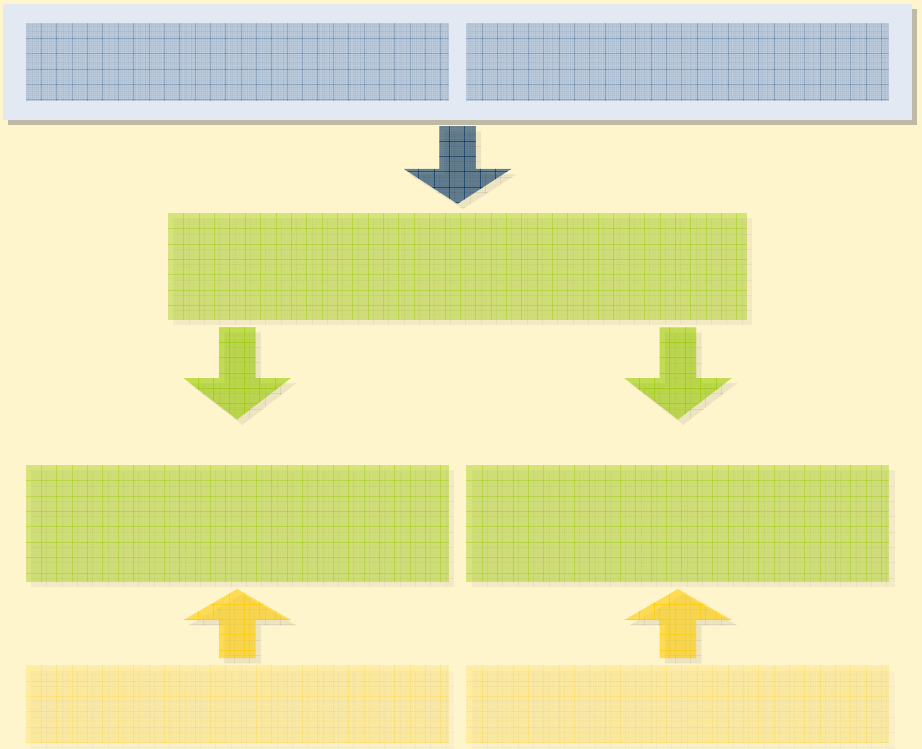
- **Inaugurated in 1997 by the MoE and METI as a national initiative**

Objectives: the program was intiated

1. To cope with serious shortage of final landfill sites and
2. To revitalize stagnating local industries at the same time

Under the slogan of "Zero Emissions"

Approval procedure



Approval procedure (Cont.)

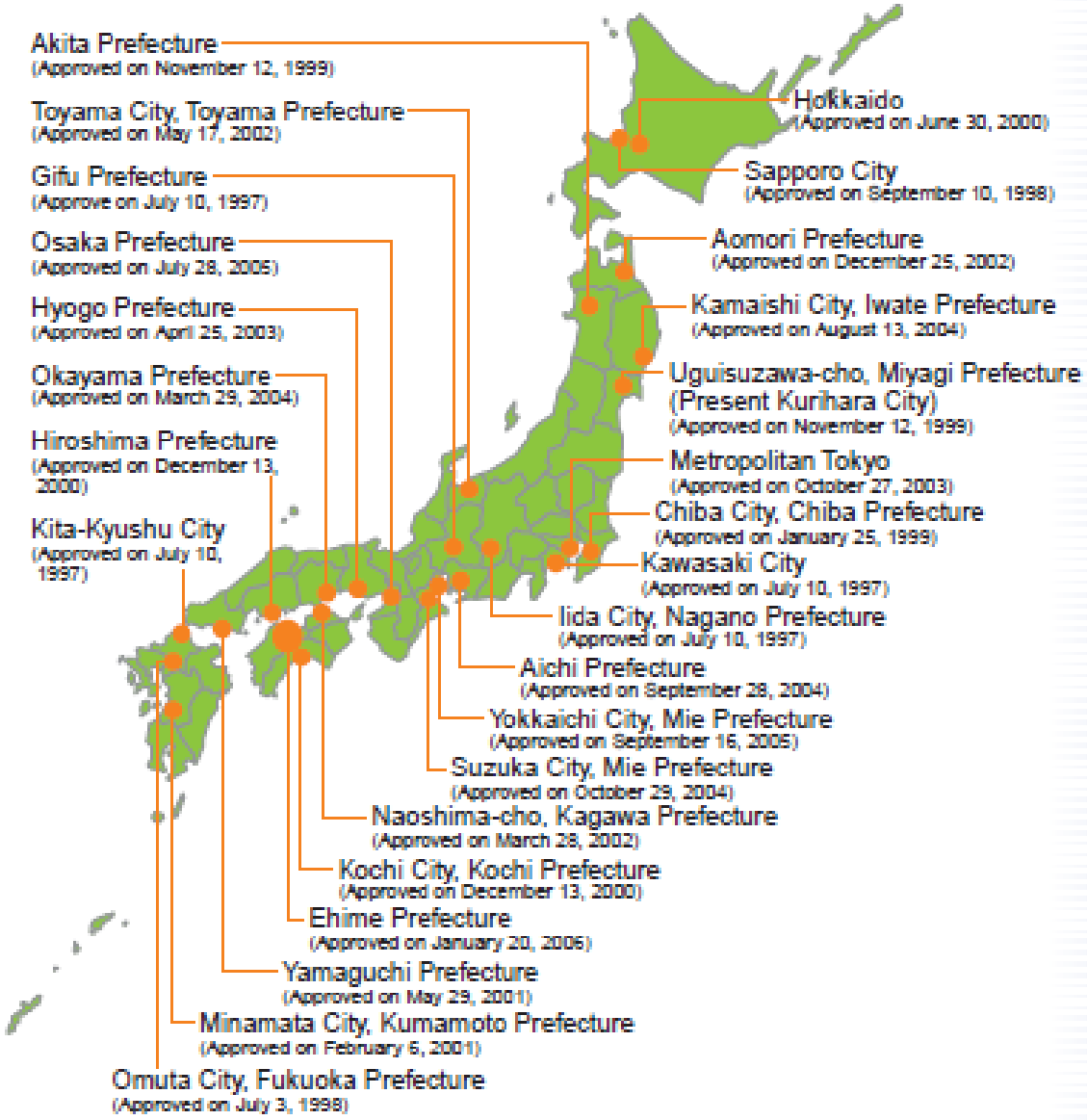
1. Local government may propose an Eco-town plan
   - to achieve regional developments through the promotion of environmental industries and
   - to develop recycle-based society through reduction and recycle of wastes
2. MoE and METI are to approve the plan
   - If the plan is both innovative and pioneering enough to be a model for other local governments.
3. If approved, the local governments obtain access to grants which cover the project cost up to 50 percent for
   - Hardware" project
     - Construction of a recycling plant
   - "Software" project
     - PR and networking activity and the promotion of information service and environmental education for stakeholders

Key word: Zero Emissions

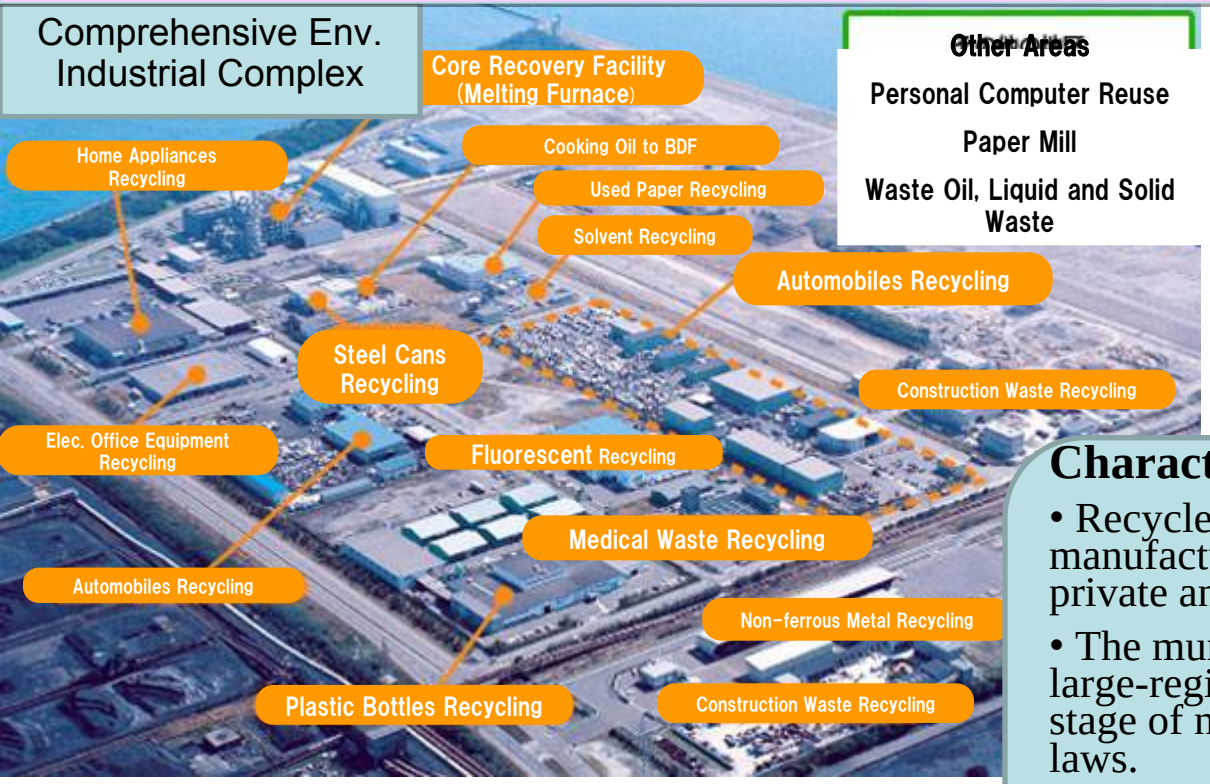
- Concept of alternative industrial system in which, in principle, all the wastes generated from one industry are utilized as input for another
  - Advocated by the United Nations University's Zero Emissions Research Initiative (ZERI)

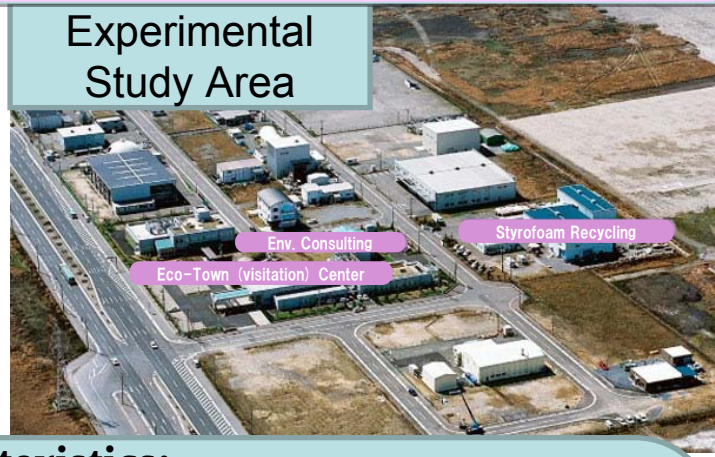
Approved eco-town areas

The Ministry of Economy, Trade and Industry and the Ministry of Environment approved Eco-Town Plans for 26 areas as of the end of January 2006, and they provided financial support to 62 facilities located within the appropriate areas.



Kitakyushu Eco-town as the Large Scale Accumulation of Recycle Facilities





Characteristics:

- Recycled materials are utilized in local manufacturing companies under the support of private and public sector.
- The municipality supported advanced and large-regional business schemes from the early stage of national legislation of environmental laws.
- A screening process has been set to objectively evaluate location and business scheme of new facilities.

-26 businesses are in operation within the municipality, mainly in the East Hibiki district, and more on the way, including the Experimental Study Area.

-A collaborative system has been constructed with steel, cement, and chemical industries, public landfills, and a melting furnace to receive and properly treat wastes in the region.

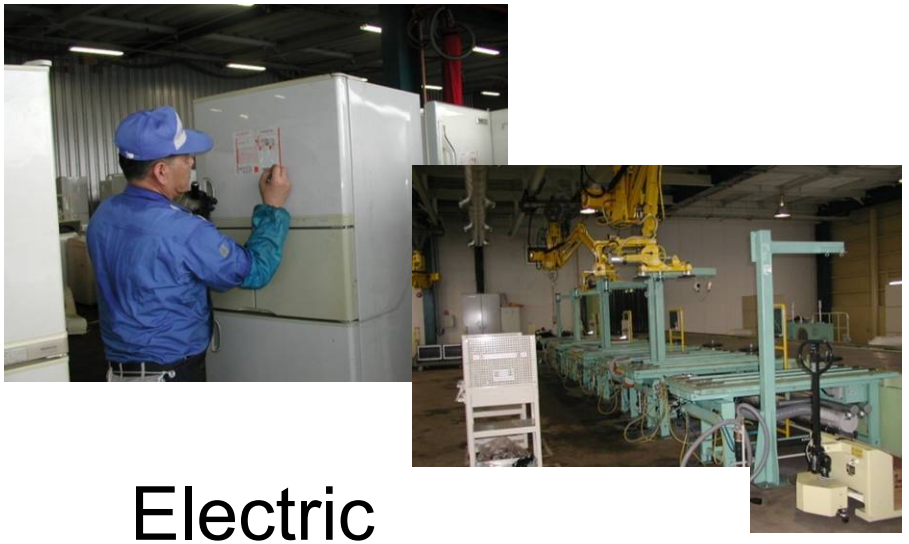
Recycle Plants Operated in Kitakyushu Eco-town

Plastic Bottles

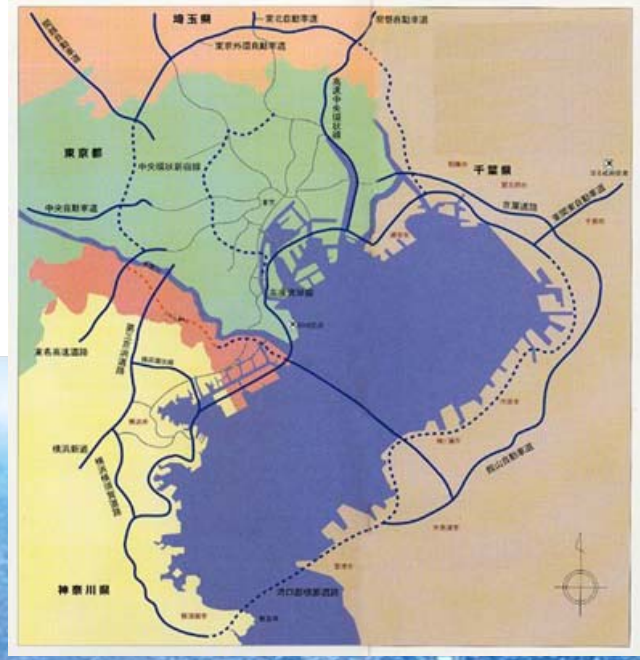
Photo-copy Machines

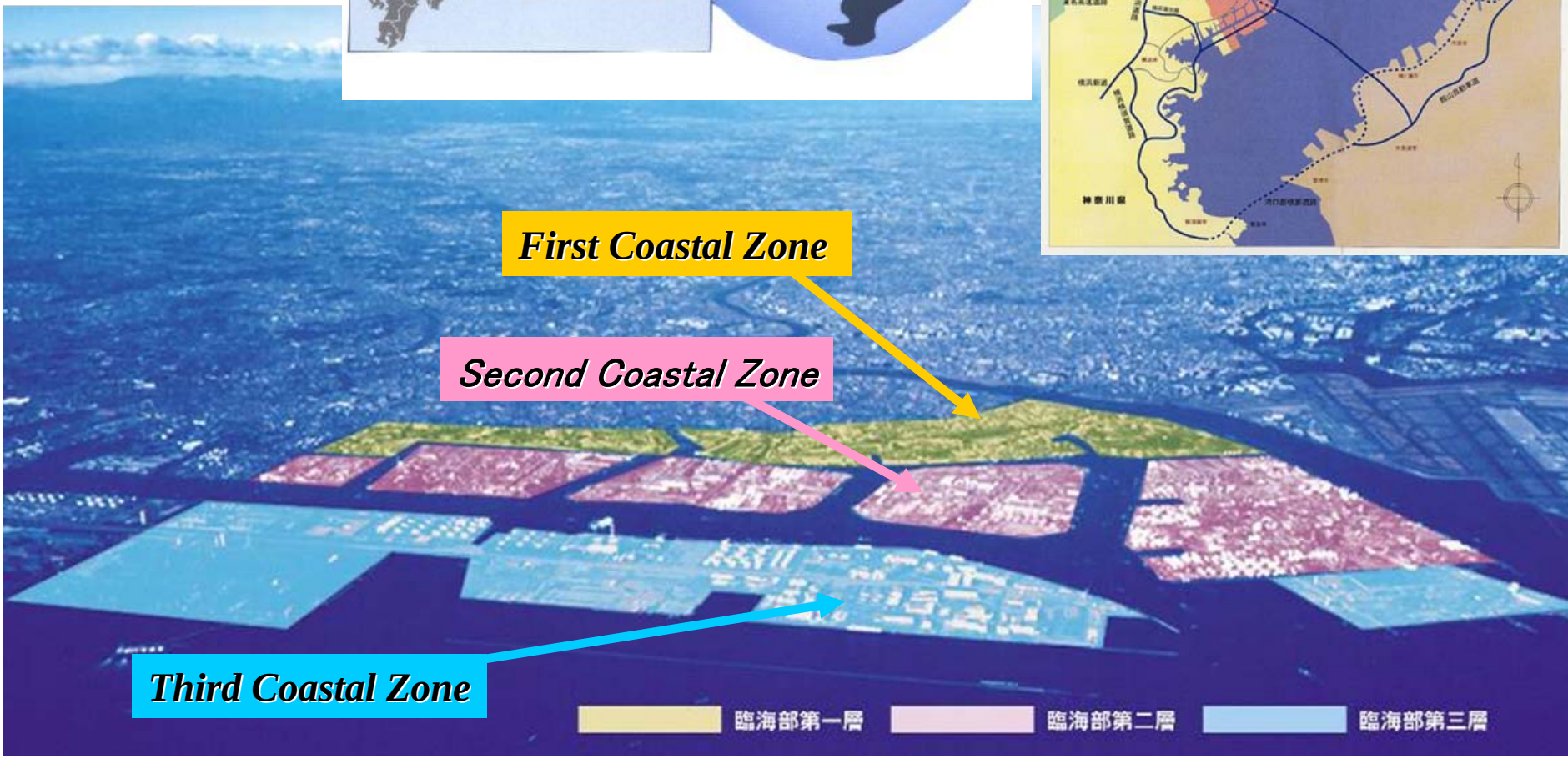
Automobile

Electric Appliances

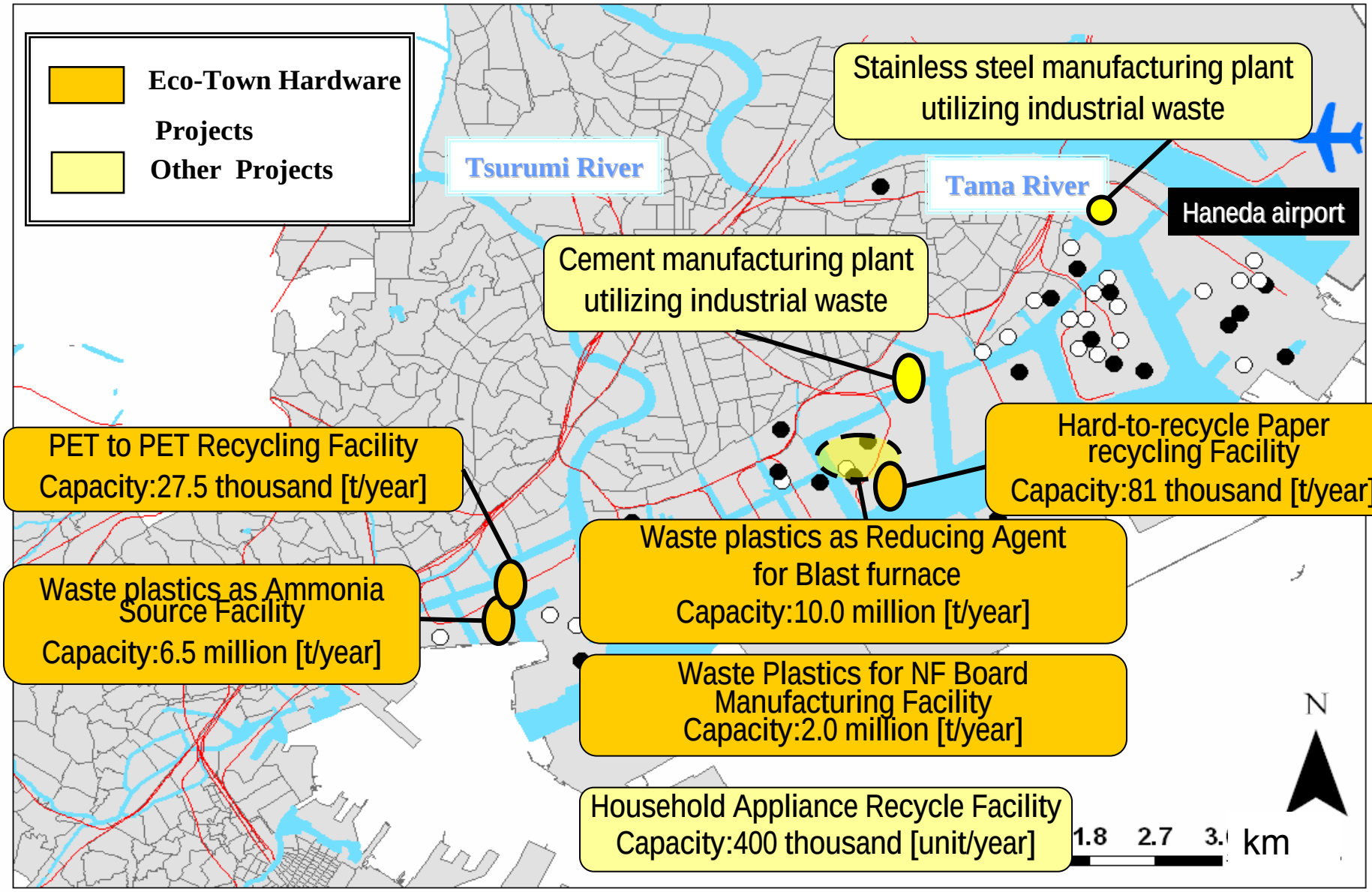


Geographical Conditions of Kawasaki Ecotown



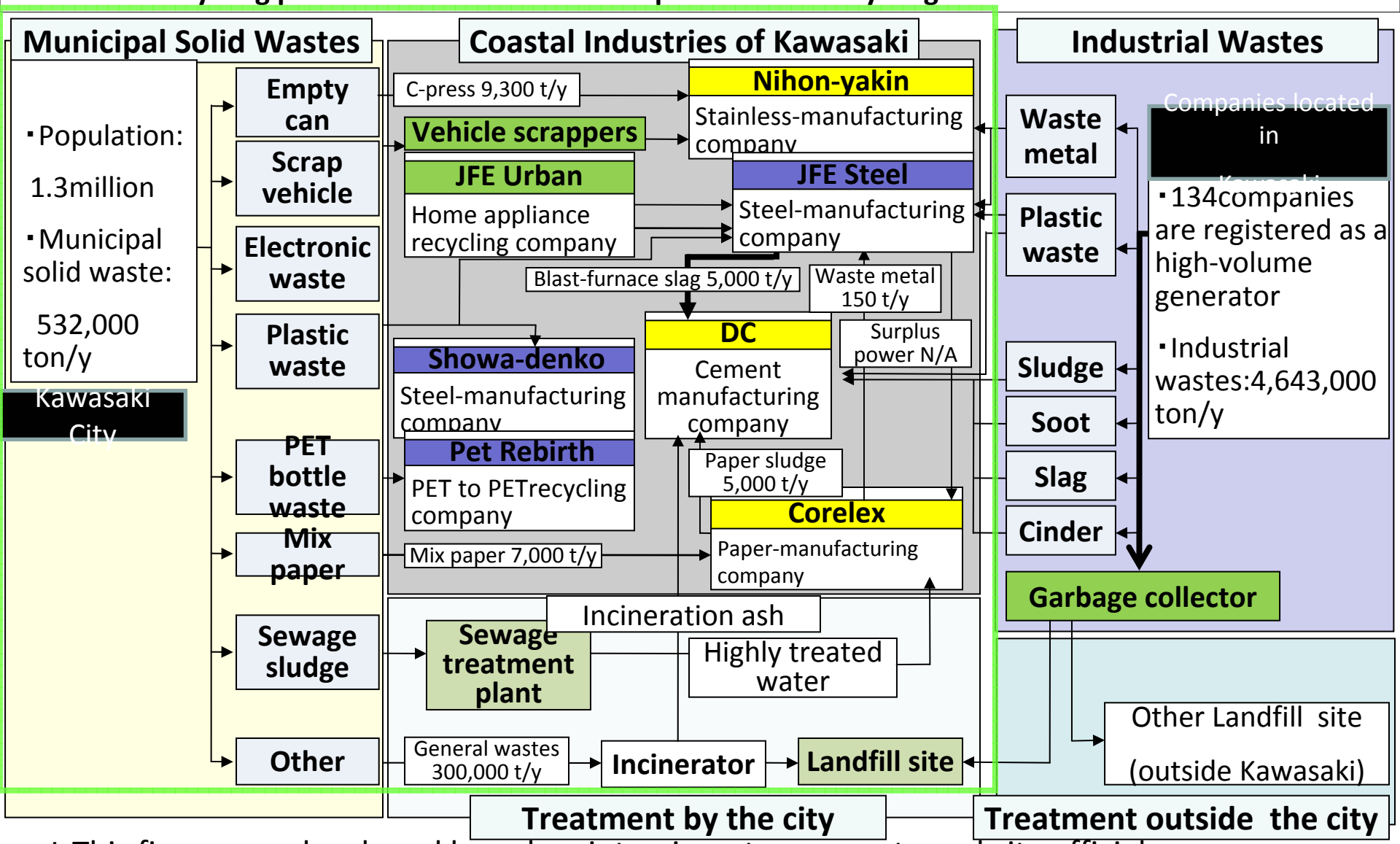


Kawasaki Eco-Town as the Combination of Recycle Facilities with Arterial Industries



Symbiotic Synergy Network of by-product Exchanges in Kawasaki Eco-town

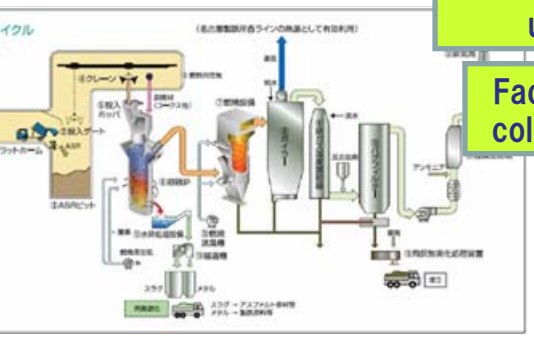
► **Both industrial and municipal solid wastes are utilized in manufacturing industries of Kawasaki, while not all recycling plants utilize their maximum potential for recycling**

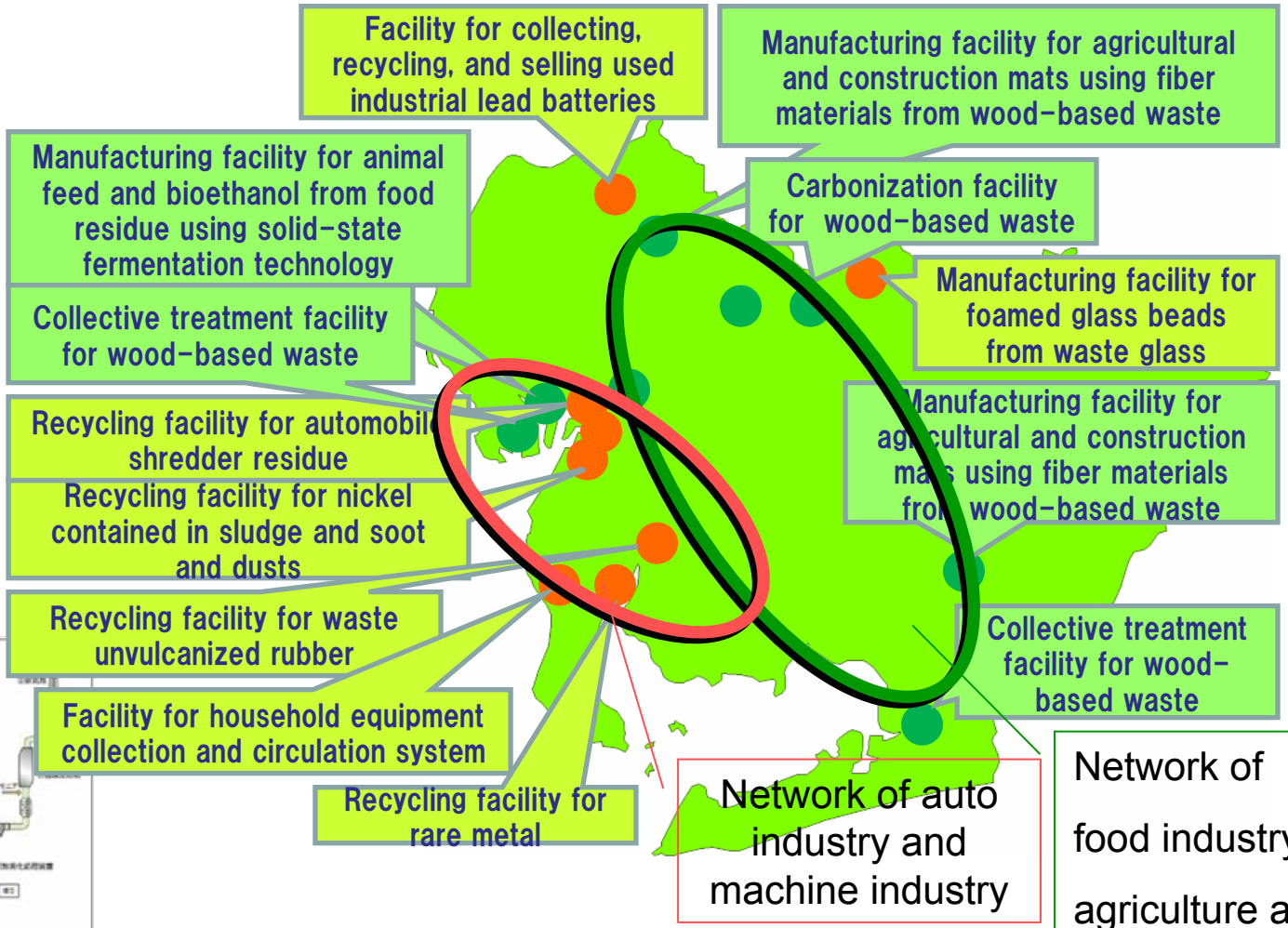


＊This figure was developed based on interviews to corporate and city officials

Aichi Eco-town as Regional Scale of Recycle Facilities with Municipal Revenue Resource

- Support for Recycling Businesses using Industrial Waste Tax
- Development of an environmental network for arterial(manufacturing) industry and veinous (recycling) industry in Aichi





Sapporo Eco-town Cascade Recycle Complex for Wasted Plastics

Recycling facility for PET bottles (flakes)

Nakanuma Recycling Center

Recycling facility for PET bottles (sheets)

Recycling facility for waste concrete

Recycling facility for waste tires

Food scrap recycling center

Nakanuma Industrial Waste Treatment Center

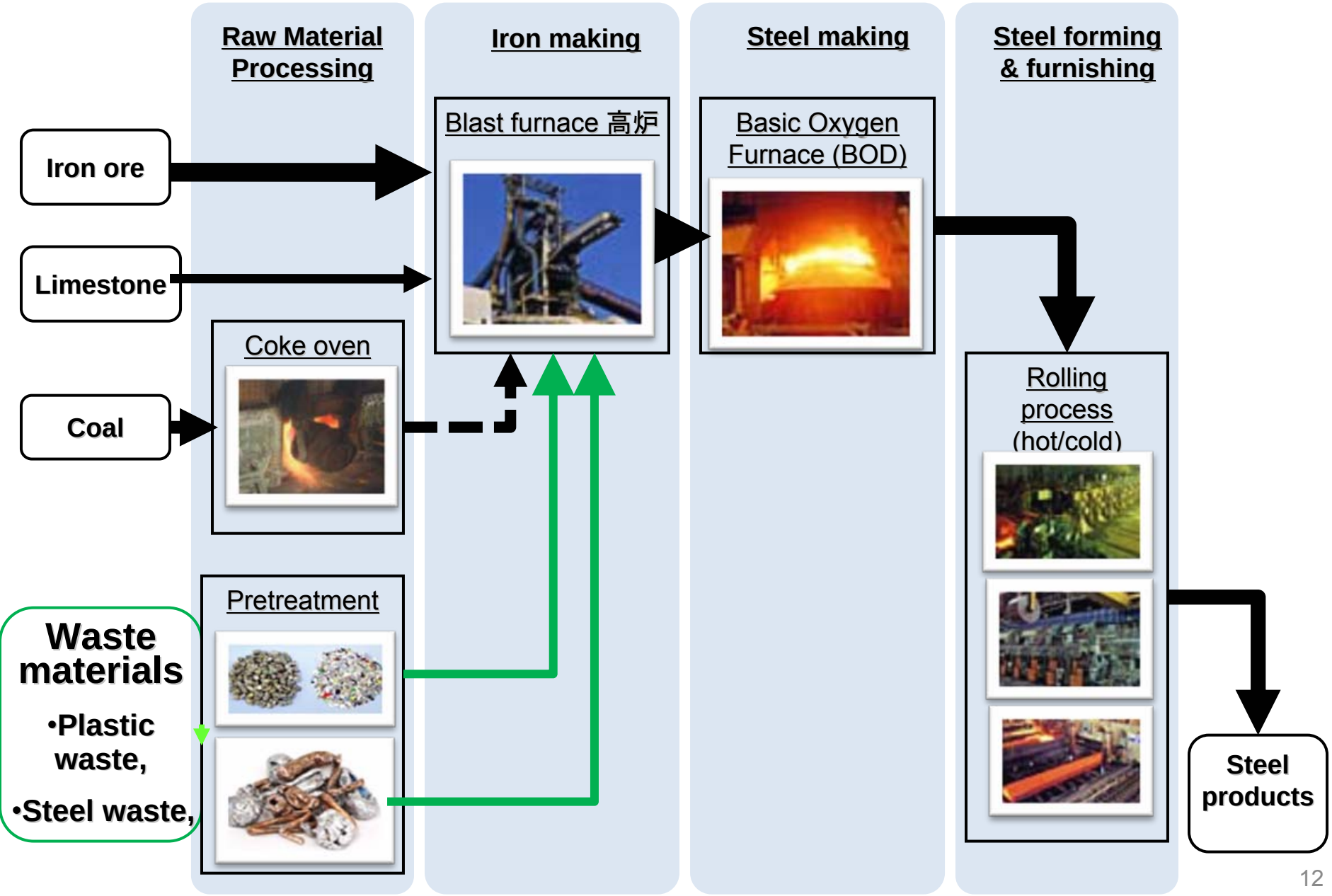
Oil producing facility from waste plastic

Sapporo Nakanuma Plastic Sorting Center

・Complex of various plastic recycle technologies such as recycling PET bottles into flakes or sheets and a facility for producing oil from waste plastic inside the Sapporo Recycling Industrial Complex, where 9 recycling facilities are concentrated in 23 hectares site

・The public and private sectors jointly work on procurement and supply of wastes and by-products, promotion of efficiency in reclaimed production and promotion of regional material circulation

Co-processing as Variation of Eco-towns



Variation of Eco-Industrial Parks(EIP) in Eco-towns

URBAN REDEVELOPMENT TYPE EIP

Recycle goods retail & sale*

Ecological consulting company*

Ecological equipment manufacturing

Sustainable technology research company*

Environmental Information Business Support CCR

EIP Center; Demonstration building*

Environmental data bank

·Collaborative marketing purchase

·Waste collection and recycling

·Eco-material, Recycled Material

Environment conscious commuting system

LRT, Pedestrian Path

Clean Energy Supply System Energy Storage System*

Environmental communication*

Environmental education*

Rural Area

Farm

CITY-FARM COLLABORATION TYPE EIP

Compost

Fuel Cell

Methane Fermentation

Residential Districts

Urban Area

INDUSTRIAL SYMBIOSIS TYPE EIP

Fertilizer

Cement factory

Chemical factory

Heat

Heat

Fly ash

Power plant*

Heat

Oil

Petro chemical factory

Industrial symbiosis type

Brownfield Neighborhood

Industrial complex

Kitakyushu

Organic waste Methane fermentation Composting

Plastic recycle center*

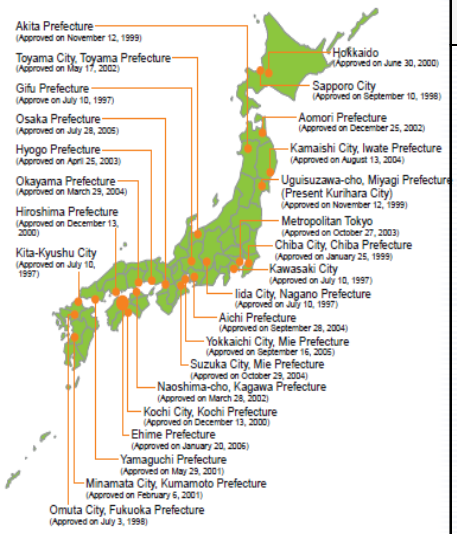
Collaboration reverse logistics District heat supply

Building material recycle center*

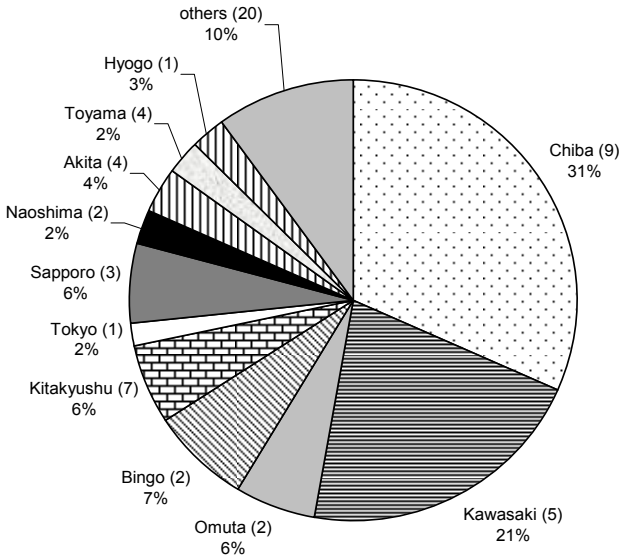
PRODUCT REMANUFACTURING TYPE EIP

Governmental Subsidization for Eco-town Areas and Induced Investment

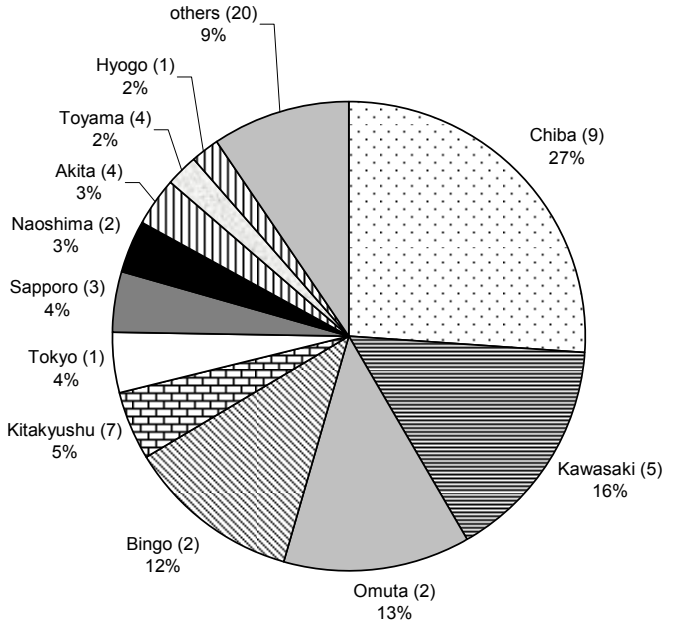
The Ministry of Economy, Trade and Industry and the Ministry of Environment approved Eco-Town Plans for 26 areas as of the end of January 2006, and they provided financial support to 62 facilities located within the appropriate areas. ; Berkel and Fujita et. al (2009)



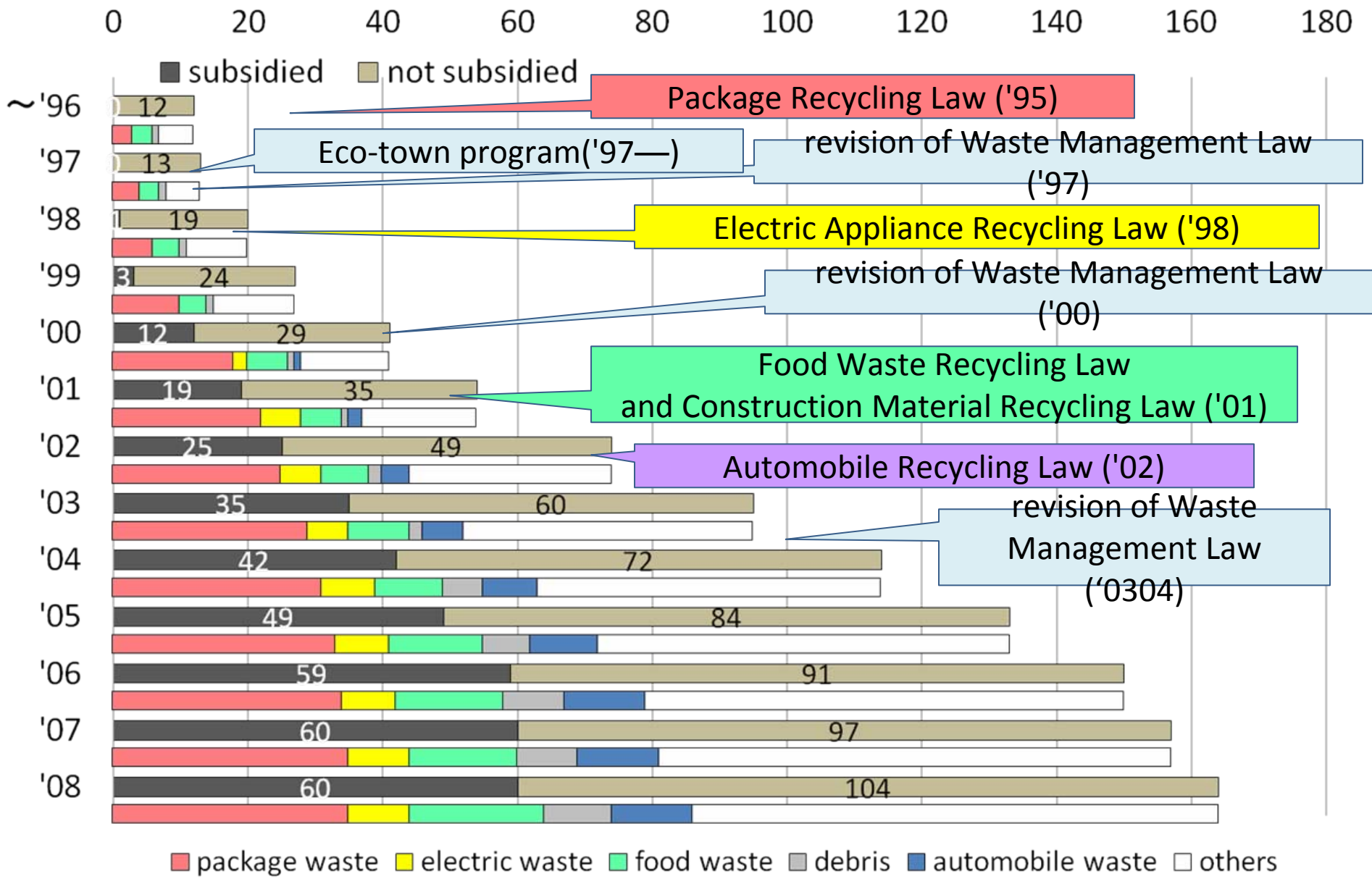
Distribution of Total Investment
Subsidy projects in 24 Eco-Towns
60 billion JPY or **600mil. US$**



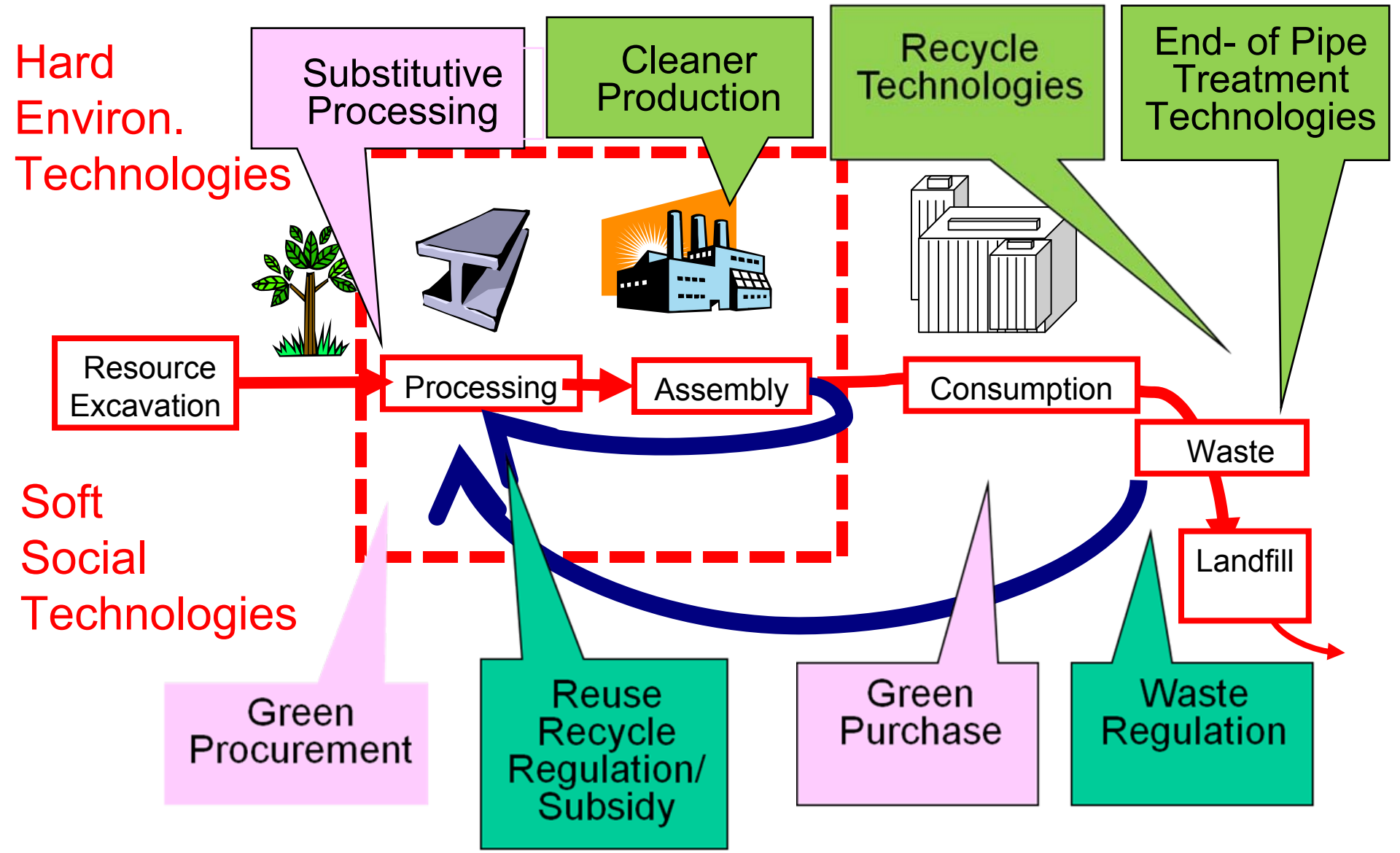
Distribution of Total Investment
60 projects in 24 Eco-Towns
165 billion JPY or **1.6 bil. US$**



Recycle Facilities in 26 Eco-towns and Legislation System for Waste Management and 3R Promotion



Environmental Technologies and Social Systems to Promote Eco-towns



Accomplishment of Eco-towns for a Decade and Future Targets

1997-Subsidization of recycle facilities (62fac. 26ecs)
1998- National Fundamental Law for Recycle Economy Oriented Society

Eco-towns as Social environmental infrastructure (1997-2007)
-capacity control of landfill site
-revitalization of heavy industries
>hazardous waste treatment
>circular business promotion

1997- Recycle Promotion Law for Electronics, ink cans and bottles, and construction wastes
2003- Stringent Regulation against illegal dumping

Circular cities and regions
-rare metal
-carbon resources

Low carbon cities and regions
-national target of 60-80% reduction by 2050

Asian Eco-industrial networks with knowledge data base of eco-towns

Quantification methodology and tools for further national projects and generalization among Asian Cities

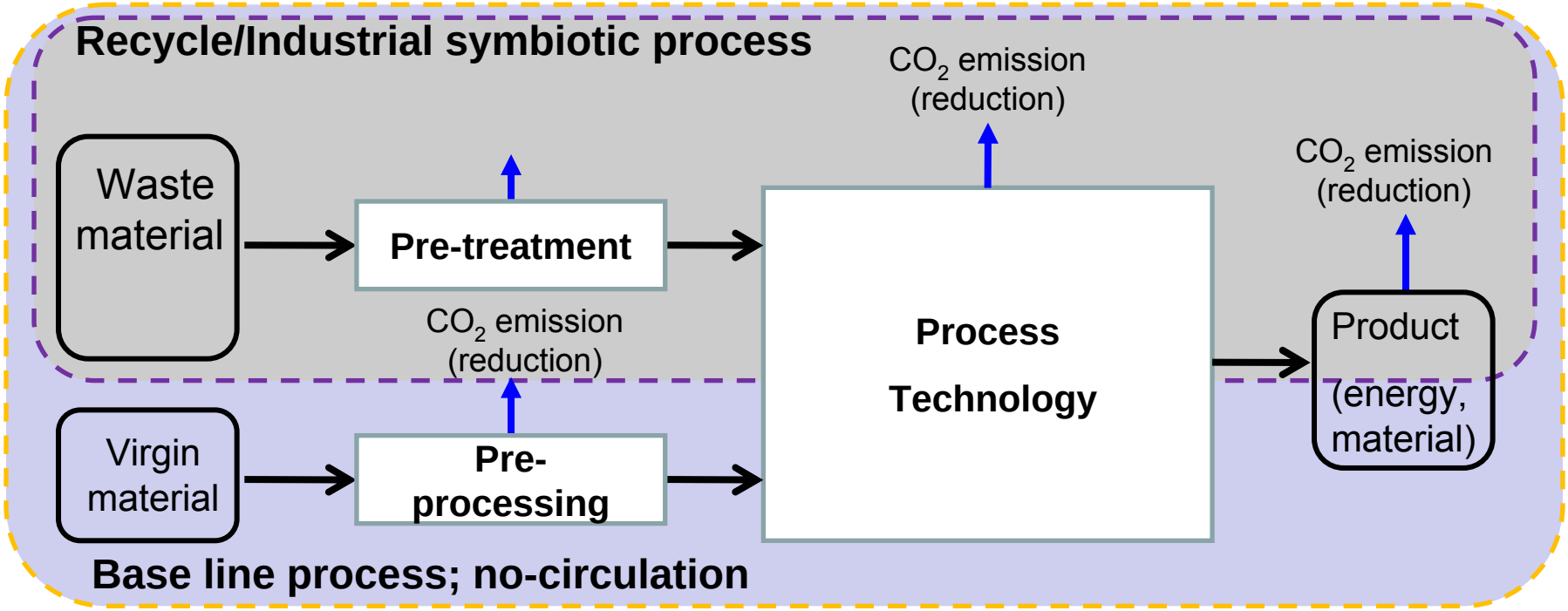
Eco-town Survey for Quantitative Analysis to Design Sustainable Eco-Industrial Developments

Berkel and Fujita et. al.; Env. Sci. & Tech. , Vol.43, No.5, pp.1271-1281.0129.2009

In order to evaluate the effectiveness eco-town systems, circular production functions were investigated and identified

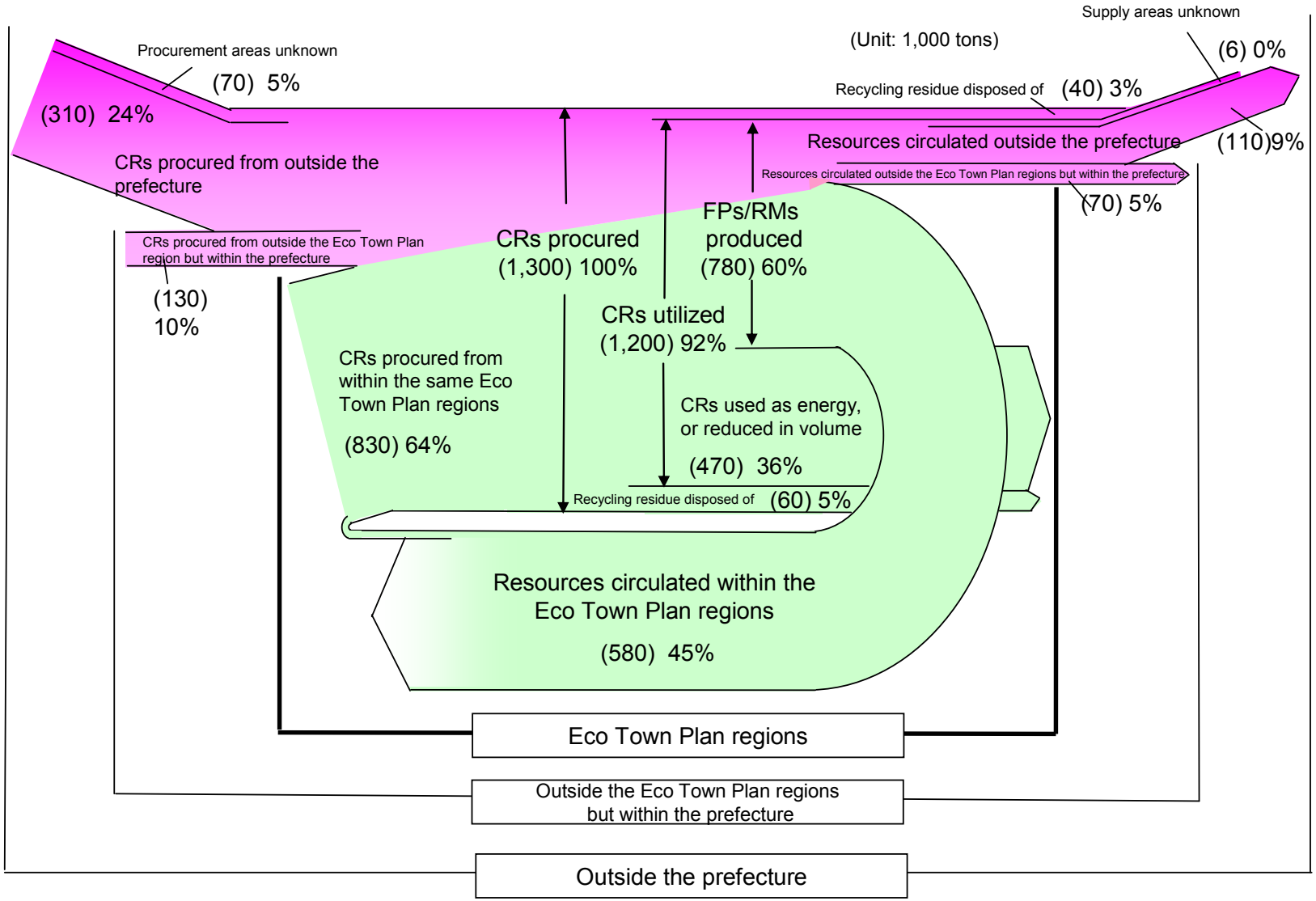
1. Production functions of circular technologies (industrial symbiosis process)for either material reprocessing or energy production from unit waste need to be investigated.

2. Total CO_2 emission reduction (total energy consumption reduction) can be identified by designing base line system such as (even hypothetical)non-circulation alternative



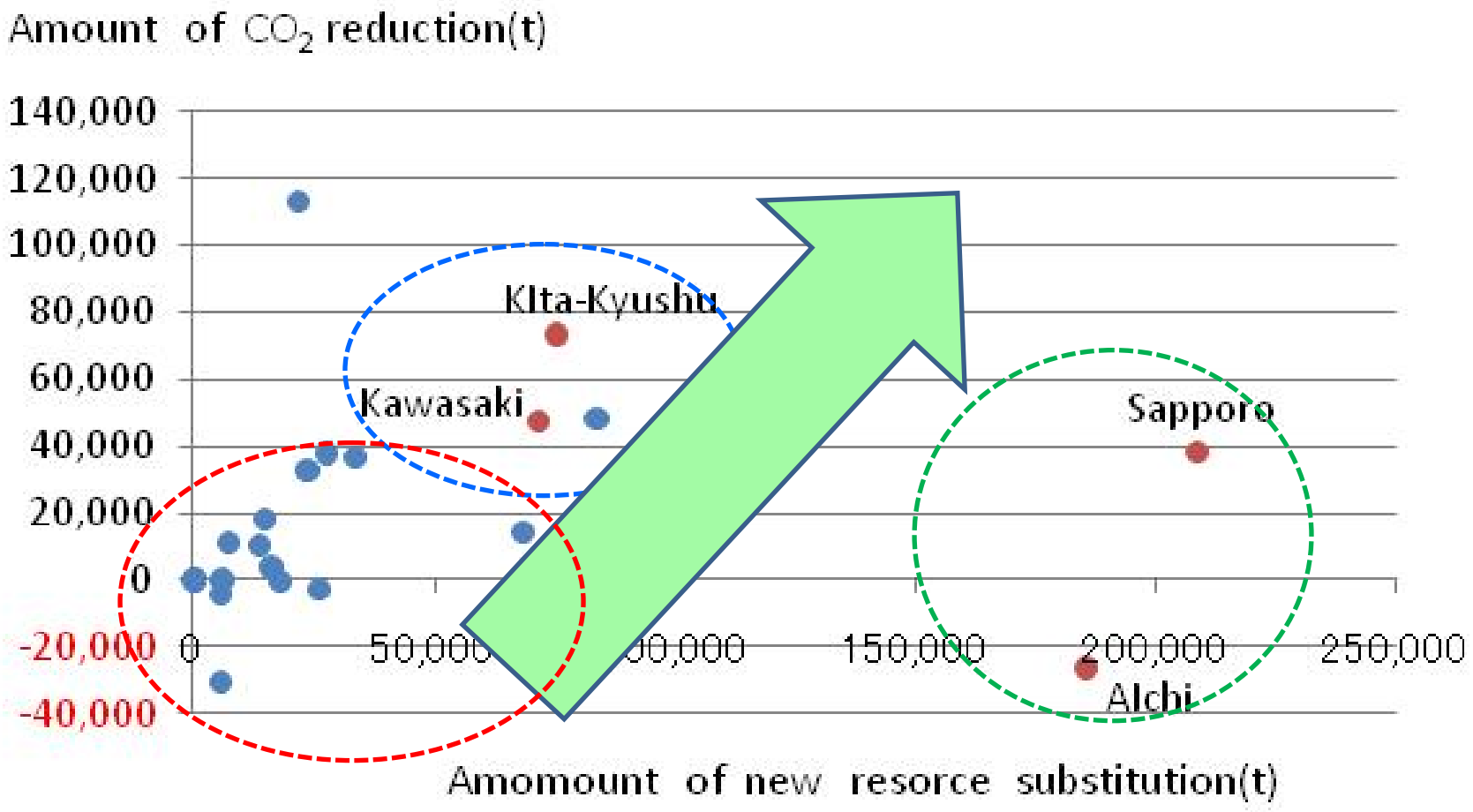
Evaluation of 90 Circular Facilities in 26 Eco-towns

Reduction of Virgin Materials; 900,000.ton /yr
CO2 Emission Reduction 480,000 t-CO2/yr
Circular use ration of by-product 92% Intra-eco-town circulation ratio 61%



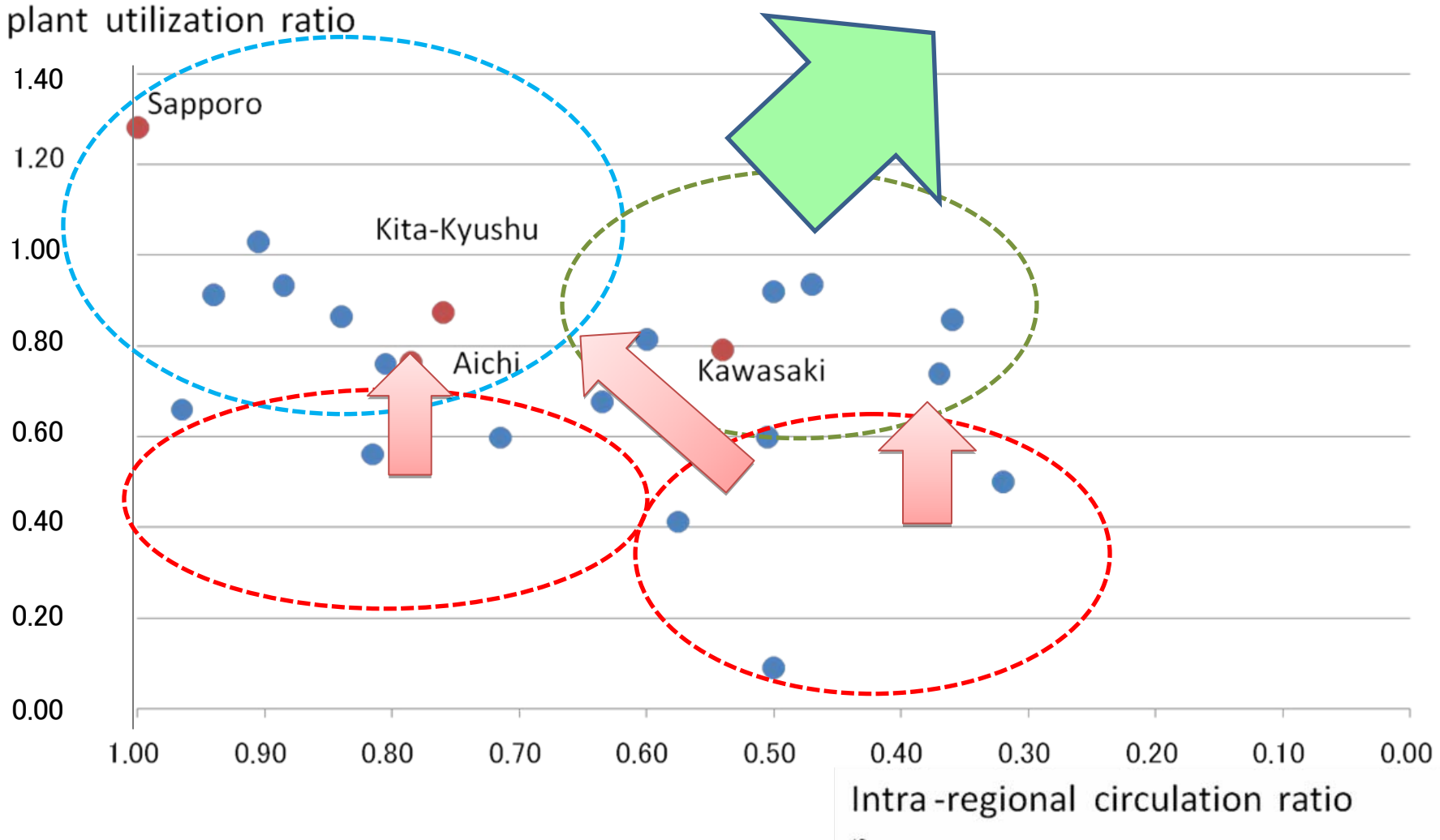
Quantitative Evaluation of Good Practices of Eco-towns(1) -substitution effects of virgin resources and low carbon effects of eco-towns-

Quantitative evaluation of economic effects for resource substitution and environmental effects of low carbon for 26 eco-towns identifies good frontier practices, Kitakyushu, Kawasaki ,Sapporo, and Aichi



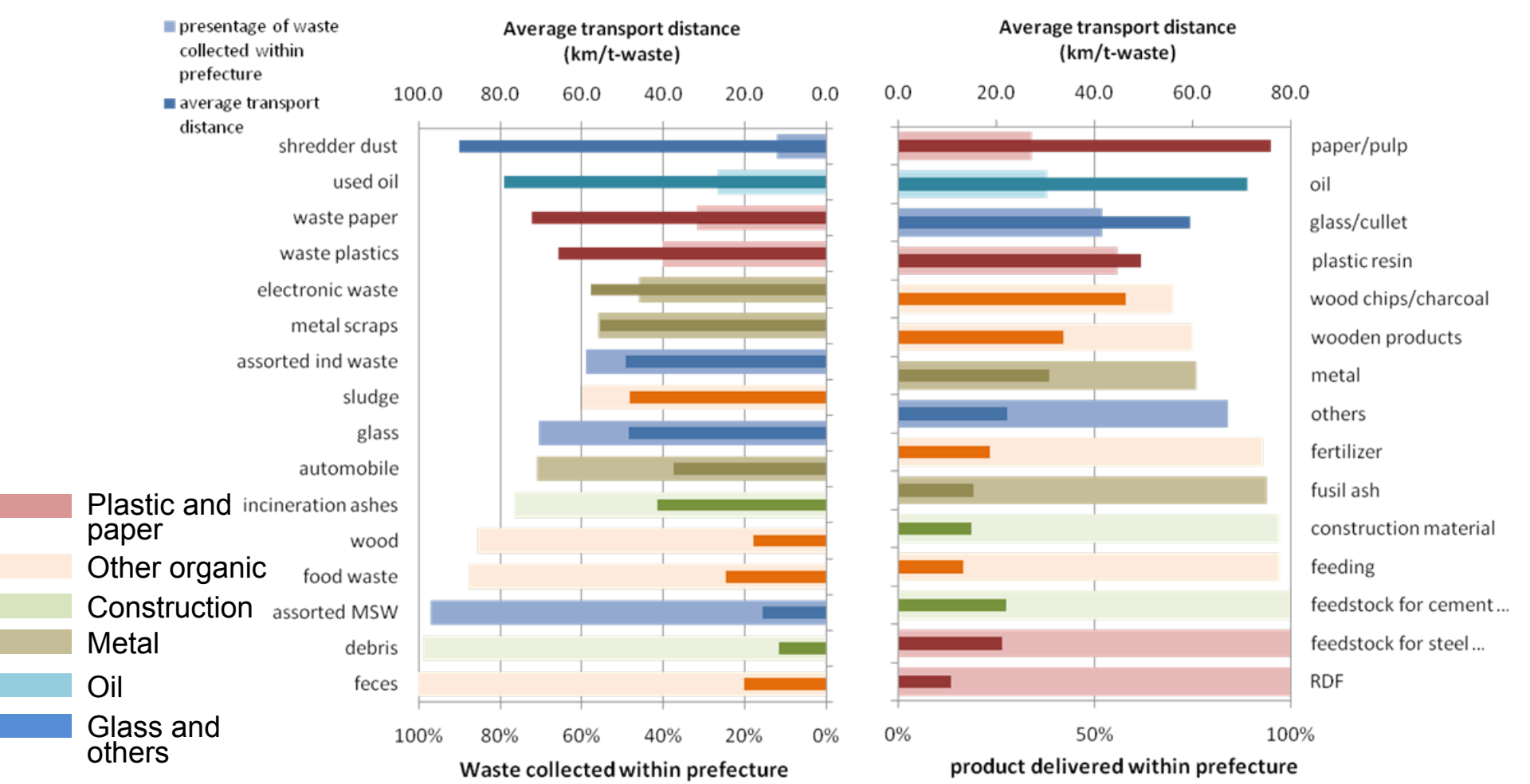
Quantitative Evaluation of Good Practices of Eco-towns(2) -plant Utilization efficiency and regional circulation ratio-

Regional circulation promotion and larger scale circulation as to promote the business efficiency of eco-town facilities



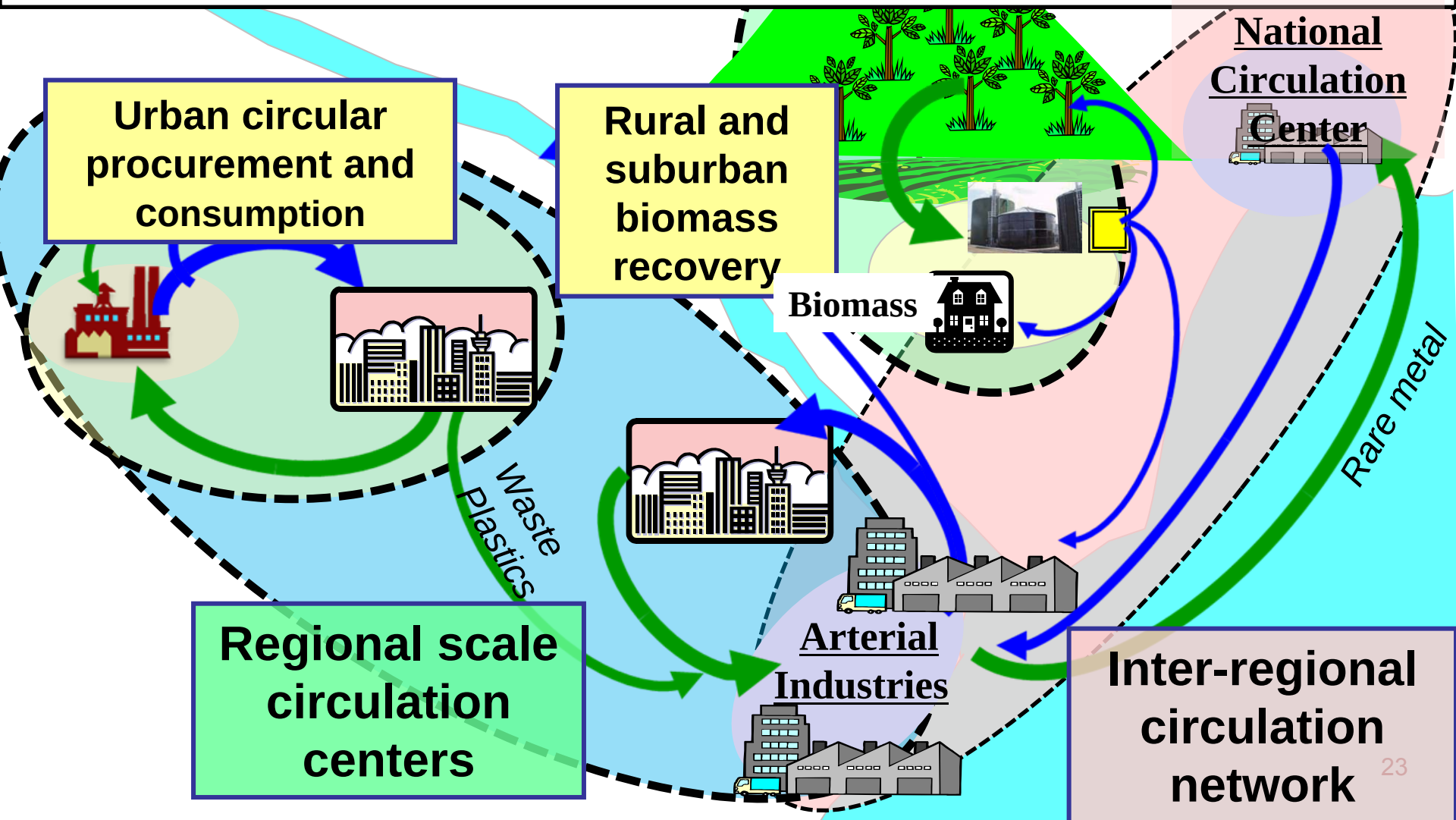
Quantitative Evaluation of Good Practices of Eco-towns(3)
-Waste collection and product supply scale and transportation distance-

- Wastes with high added-value are with relatively long transport distances
  Plastics, paper, oil, electronic wastes
- Products with demand in large volumes and locally are with shorter transport distances
  RDF, feedstock for steel and cement production, construction materials, feedings, fertilizer



Strategies to Promote Eco-town Development

-Establishment of multi scale circulation system considering appropriate social waste transportation cost and environmental value of recycle products
-Social multi-stakeholder collaboration scheme for such separation, collection and green purchase
-Development of regional circulation center for multi-layered circulation areas

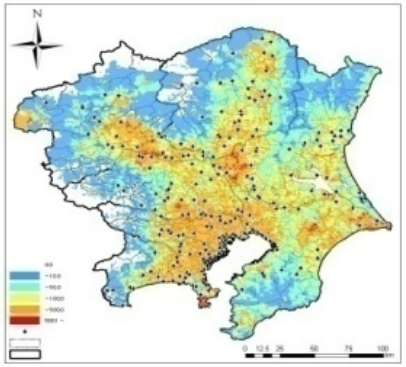


Circular Technology/Policy Simulation System for Cities/Regions

Urban and regional GIS data base system

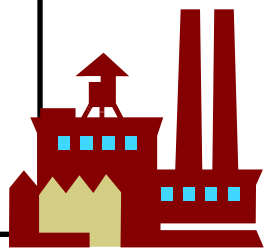
- Agriculture and forestry
- Industry
- urban
- Communal facilities
- Forest and coast region

Analysis of spatial migration and impacts of environmental flux by scientific model

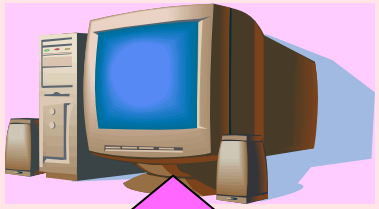


Circular technology system

(hardware technology)



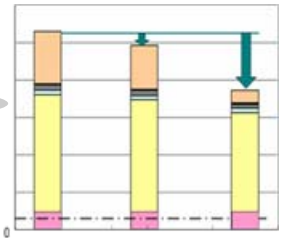
Urban/regional simulation system for circular economy



Social technology and system

Regulation and subsidization m

(software technology)



Planning and evaluation for technology policy future scenario plans circular cities and regions

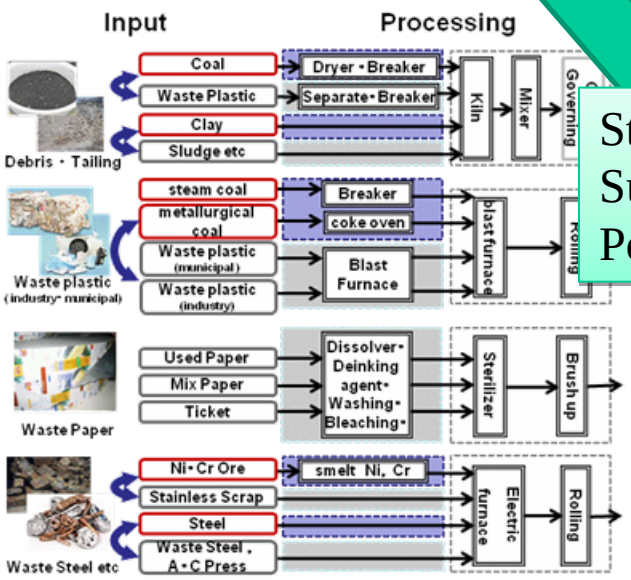
Planning Guideline for Sustainable Eco-towns and Circular Regions

Eco-town Data Base

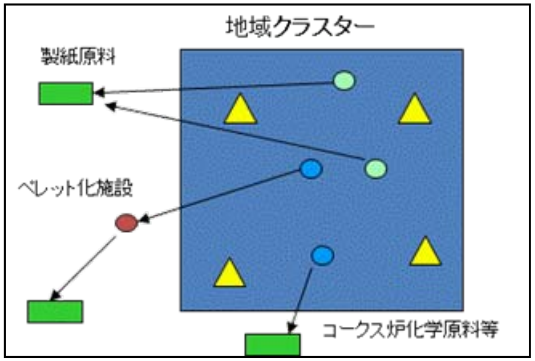
Life Cycle Inventory for Circular Technologies

Regional Data Base for Circular Economy

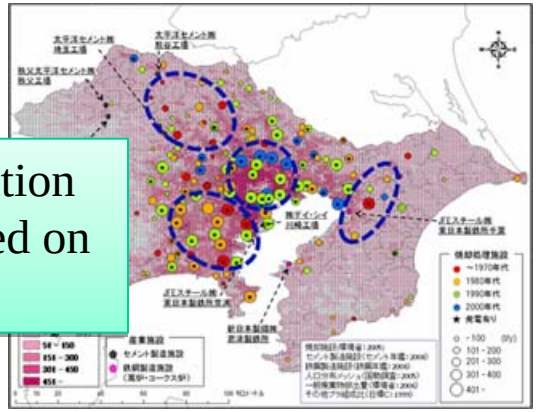
Stage 1; Suitability analysis of alternative technologies and circular policy systems



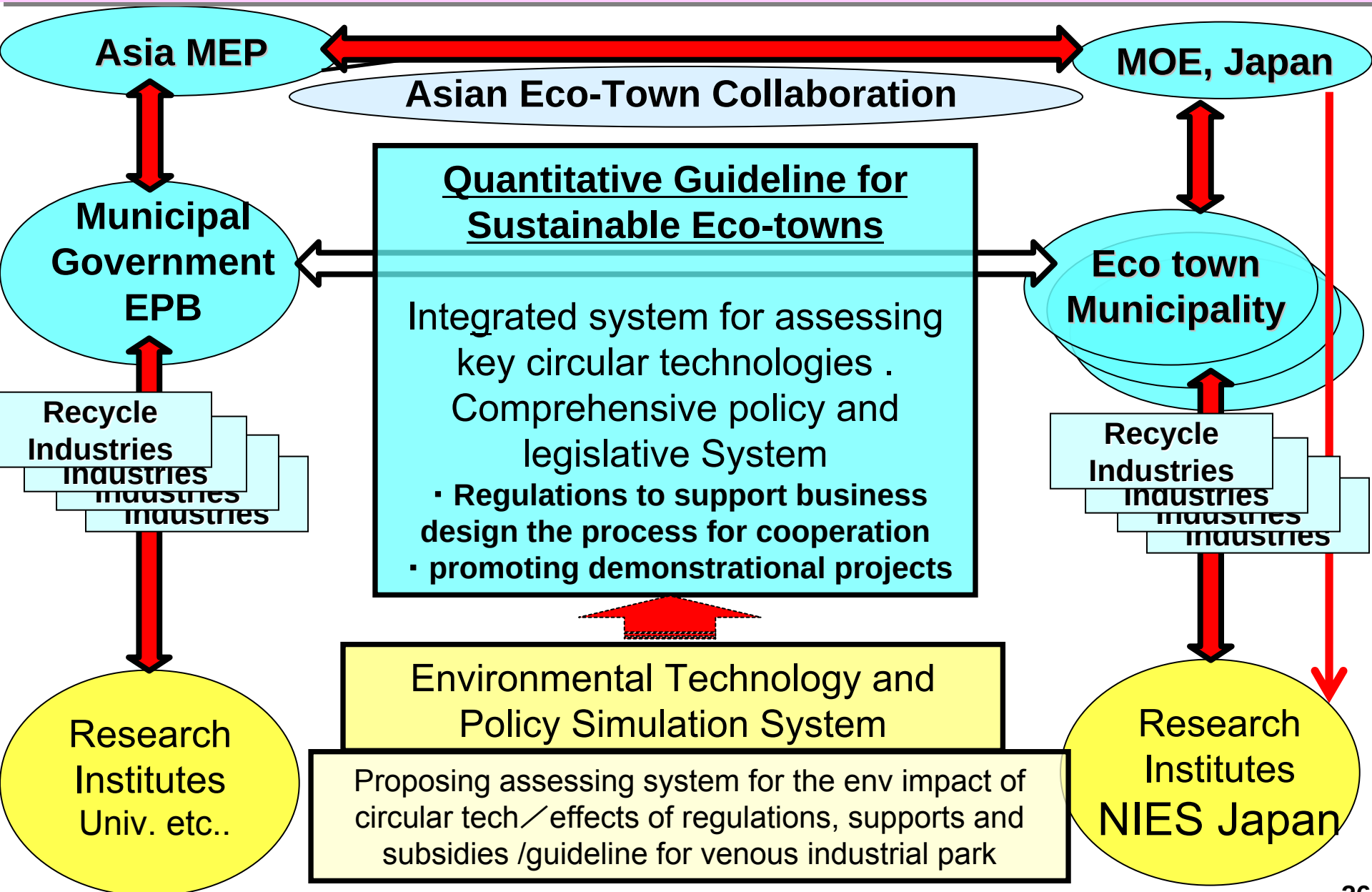
Stage2 ; Schematic Model for Suitable Technology and Policy



Stage3; Regional Circulation Scenario Simulation based on Spatial Data Base



Guideline for Sustainable Eco-towns / Eco-Industrial Developments in Asian Cities and Regions



List or related publications

- Rene Van Berkel, Tsuyoshi Fujita, Shizuka Hashimoto, Minoru Fujii；Quantitative Assessment of Urban and Industrial Symbiosis in Kawasaki, Japan, Environmental Science & Technology , Vol.43, No.5, 2009 ,pp.1271-1281,0129.2009
- Rene van Berkel, Tsuyoshi Fujita, Shizuka Hashimoto, Yong Geng；Industrial and Urban Symbiosis in Japan : Analysis of the Eco-Town Program 1997-2006；Journal of Environmental Management, vol.90,pp.1544-1556,2009
- Shizuka Hashimoto, Tsuyoshi Fujita, Yong Geng, Emiri Nagasawa； Achieving CO2 Emission Reduction through Industrial Symbiosis: A Case of Kawasaki , Journal of Environmental Management, 2008 (submitted)
- Yong Geng, Qinghua Zhu, Brent Doberstein, Tsuyoshi Fujita； Implementing China's Circular Economy Concept at the Regional Level: a review of progress in Dalian, China, Journal of Waste Management, vol.29,pp996-1002,2009
- Yong Geng, Rene Van Berkel , Tsuyoshi Fujita ；Regional Initiatives on Promoting Cleaner Production in China: A Case of Liaoning, Journal of Cleaner Production, 2008 (submitted)
- Zhu Qinghua, Yong Geng, Tsuyoshi Fujita , Shizuka Hashimoto ；Green supply chain management in leading manufacturers: Case studies in Japanese large companies, International Journal of Sustainable Development and World Ecology, 2008 (submitted)
- Yong Geng, Pang Zhang, Raymond P. Cote, Tsuyoshi Fujita；Assessment of the National Eco-industrial Park Standards for Promoting Industrial Symbiosis in China, J. of Industrial Ecology, Vol.13, No.1, pp.15-26, 2008
- Looi-Fang Wong, Tsuyoshi Fujita, Kaiquin Xu； Evaluation of regional bio-energy recovery by local methane fermentation thermal recycling systems, Journal of Waste Management,vol.28, pp.2259-2270, 2008

Thank you for your Attention