

10th Regional 3R and Circular Economy Forum in Asia and the
Pacific Advancing Circular Economy in Asia- Pacific
towards the SDGs under COVID 19 Pandemic

Plenary Session Background Presentation 1

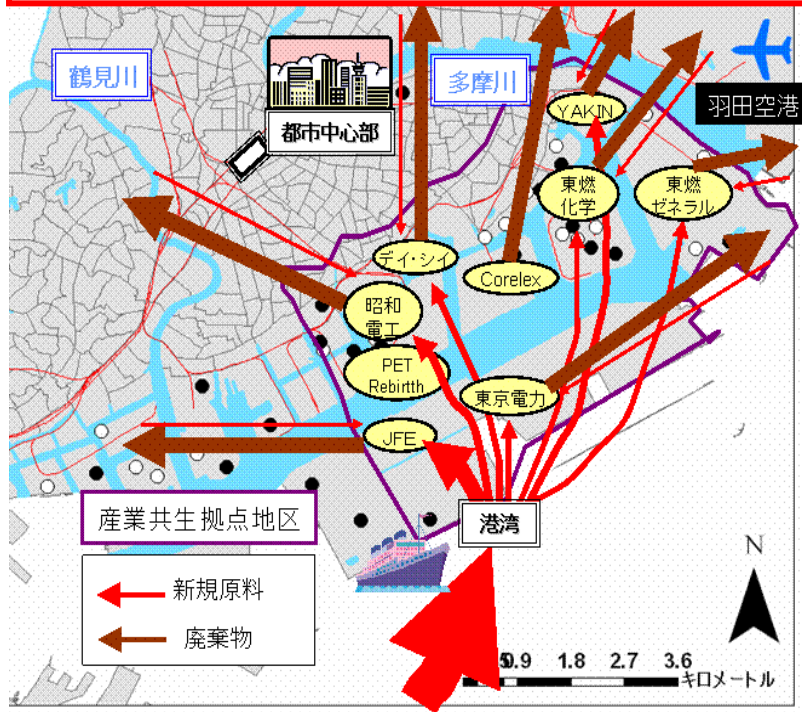
Role of Eco-towns in Advancing 3R and Circular Economy

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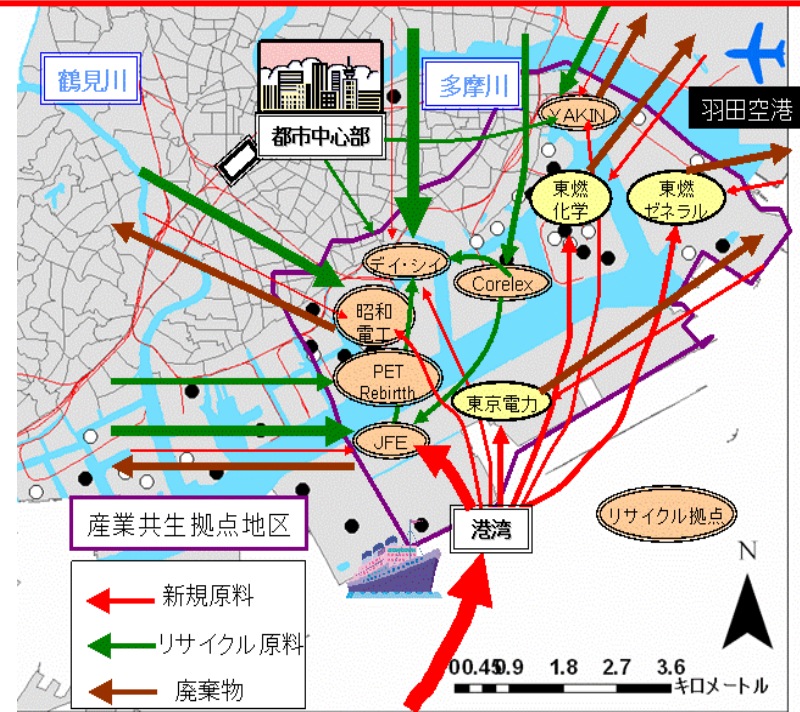
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Target and Accomplishment of Japanese Eco-towns

Material Flow of Traditional Industrial Parks



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



Conventional material flow: No-circulation

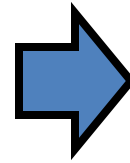
Virgin materials: largely depends on import
Wastes: Disposal based on provisions of the Waste Disposal and Public Cleaning Law
Recycle materials: Not used
Local material circulation: no use of recycle materials

Circular material flow of Eco-towns

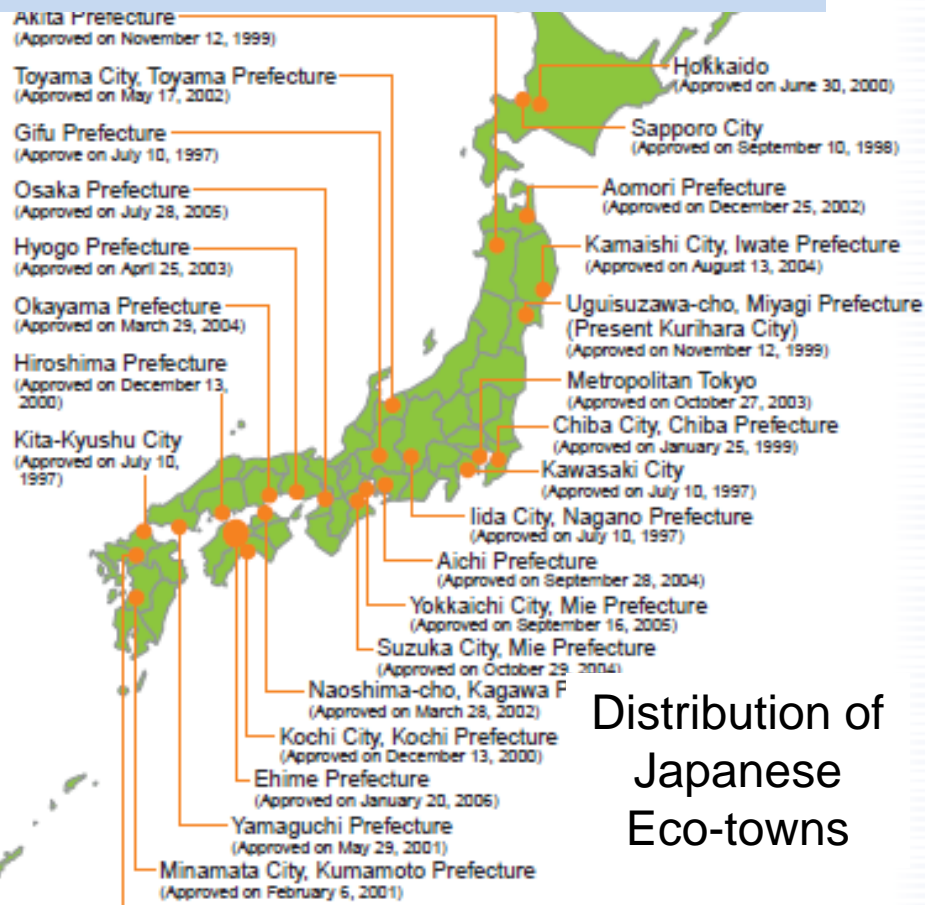
Virgin materials: part of virgin materials are substituted by recycle materials
Wastes: Disposal based on provisions of the Waste Disposal and Public Cleaning Law
Recycle materials: Use of recycle materials mainly provided from outside the city
Local material circulation: to some extent

Eco-town area as demonstration project for Sound material cycle society

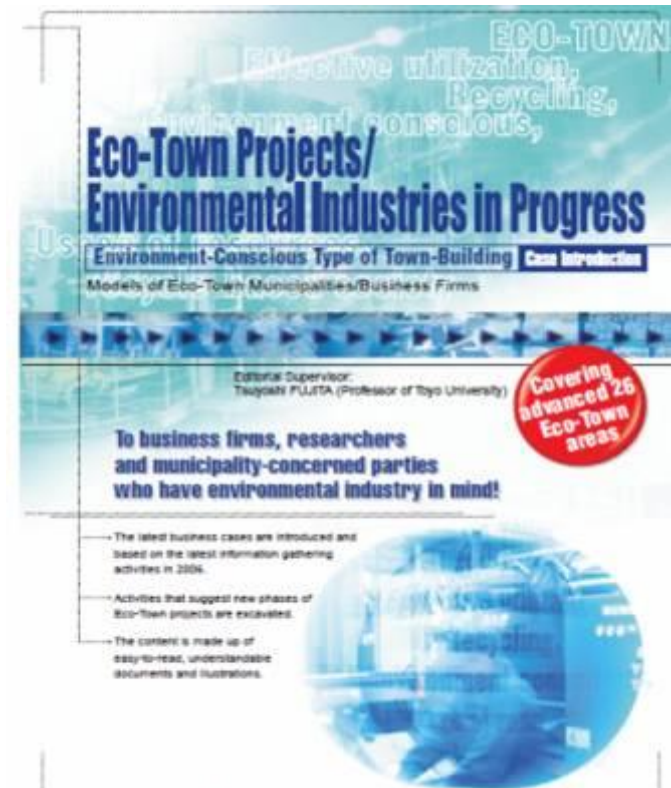
METI & MOE approved Eco-Town Plans for 26 areas as of the end of January 2006, and they provided financial support to 62 facilities located within the appropriate areas.



Forming the basis of capacity that totally 2.18 mil t of wastes were treated



Distribution of Japanese Eco-towns

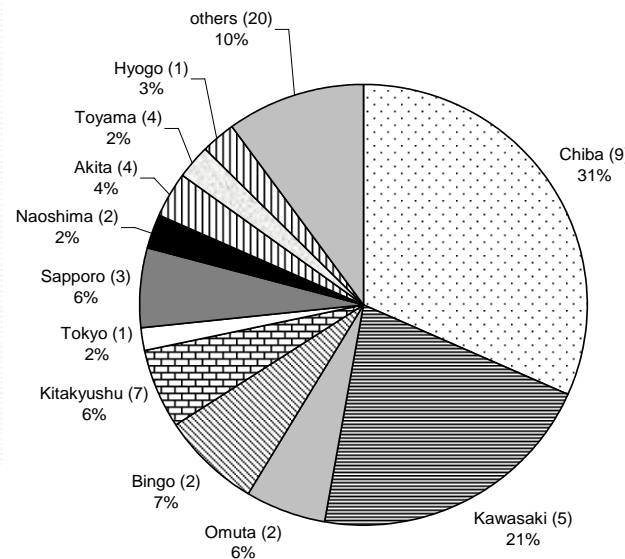


Edited by Prof. Fujita, T., Published by METI,,2006

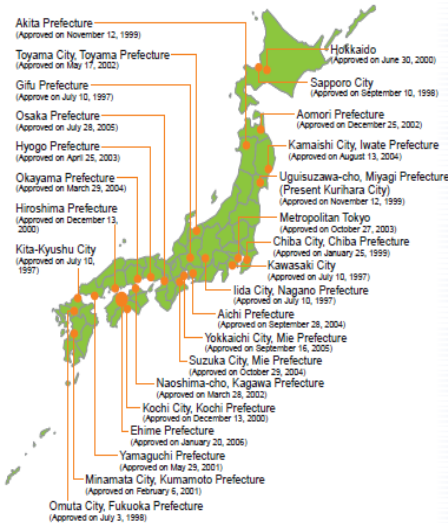
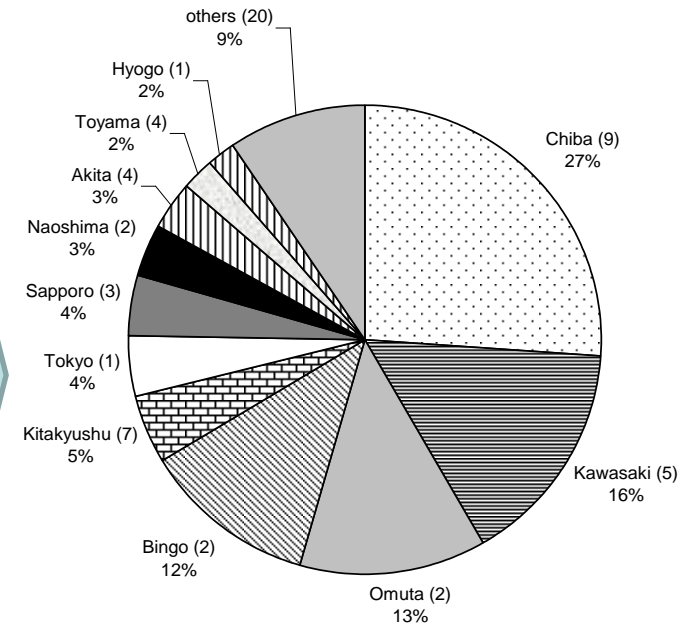
Governmental Subsidization for Eco-town Areas and Induced Investment

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\$**

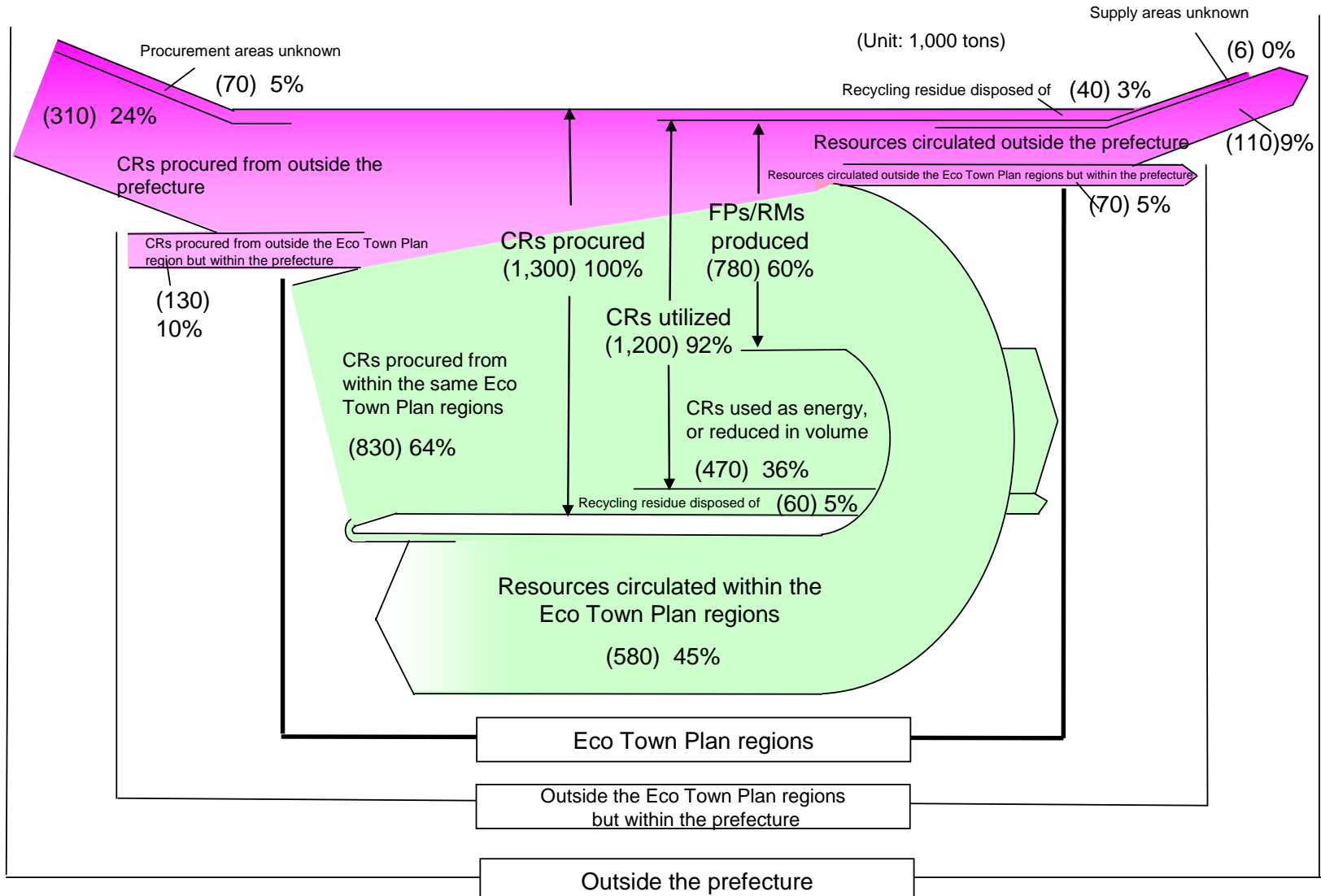


Evaluation of 90 Circular Facilities in 26 Eco-towns

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%



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

URBAN REDEVELOPMENT

TYPE EIP

Karundborg (Denmark)
Kawasaki

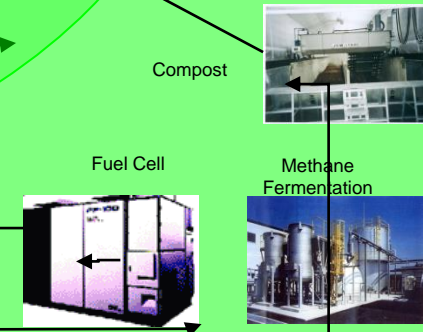
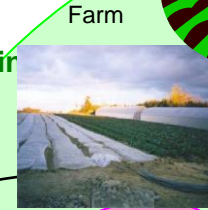
Green Institute
(Minneapolis)

Rural Area

CITY-FARM COLLABORATION
TYPE EIP

Hokkaido

Cape Charles Sustain
Technology Park
(Virginia)

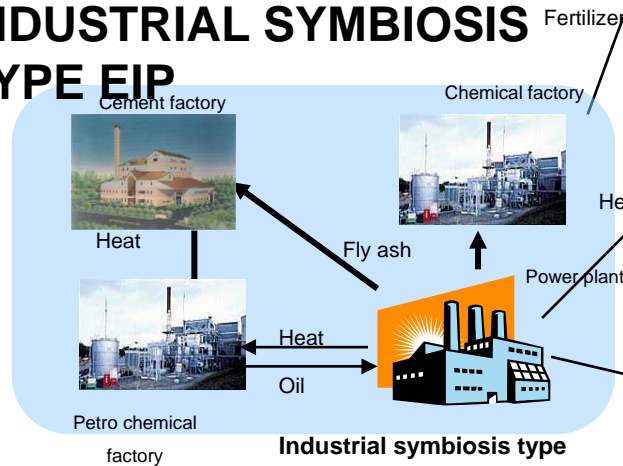


INDUSTRIAL SYMBIOSIS

TYPE EIP

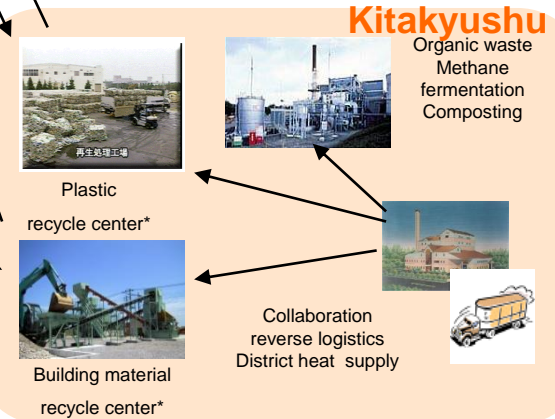
Urban Area

Brownfield Neighborhood



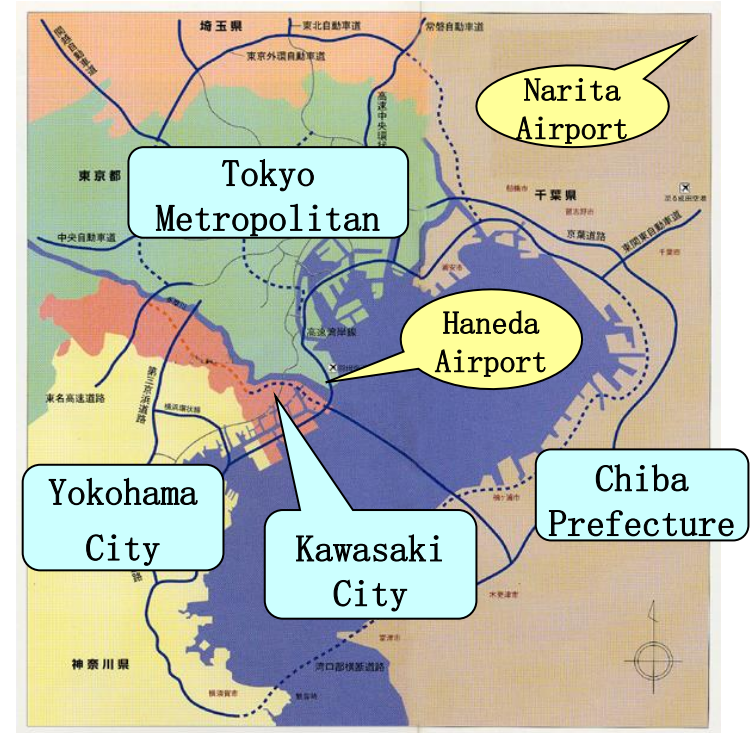
Kalundborg (Denmark)
Kawasaki

PRODUCT REMANUFACTURING
TYPE EIP



Water Front

KAWASAKI, JAPAN



Kawasaki ⇒ Narita Airport 90min
 Kawasaki ⇒ Haneda Airport 13min

- >Intensive Transportation Network system
- >Industrial Agglomeration and Urban Accumulation locally and regionally

Accumulation of High-tech Recycling Plants

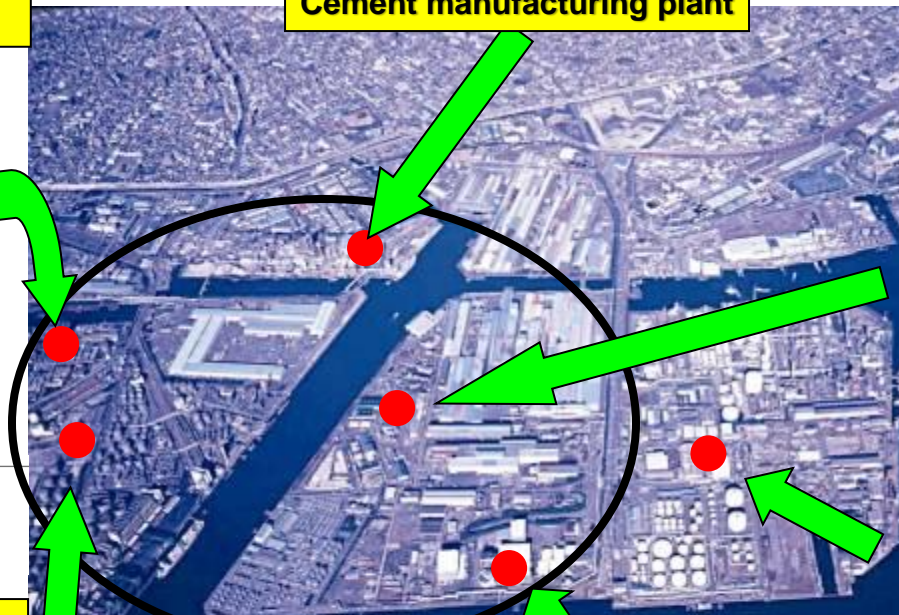
Plastic waste recycling plant for ammonia production



PET-to-PET recycling plant



Cement manufacturing plant



within a 1.5km radius

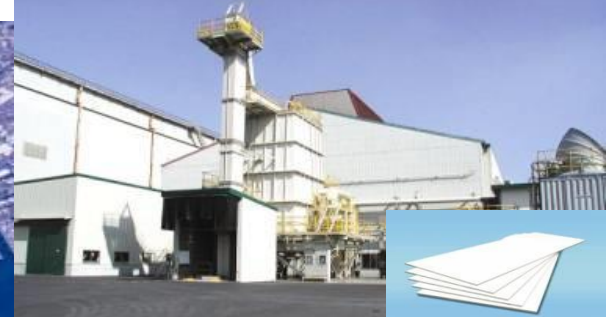
Hard-to-recycle paper recycling plant



(CORELEXグループHPより転載)

●Plastic waste recycling plant for blast furnace production

●Plastic waste recycling plant for concrete formwork production



Kawasaki Zero-emissions industrial park (H14.11操業)



位置	川崎市川崎区水江町
敷地面積	3万332m ²
構成	14社(金属加工業、製紙業、メッキ業等)
就業者数	約400人

Major Efforts

- Use of natural gas vehicle
- Use of hydroelectric power plant for factories
- Circulation of industrial chemicals and water
- Operation of plating plant which never excrete liquid wastes to outside

Quantified material accounting for Symbiosis in Kawasaki

R.V. Berkel and T. Fujita et. al. ;
Environmental Science & Technology(2009)

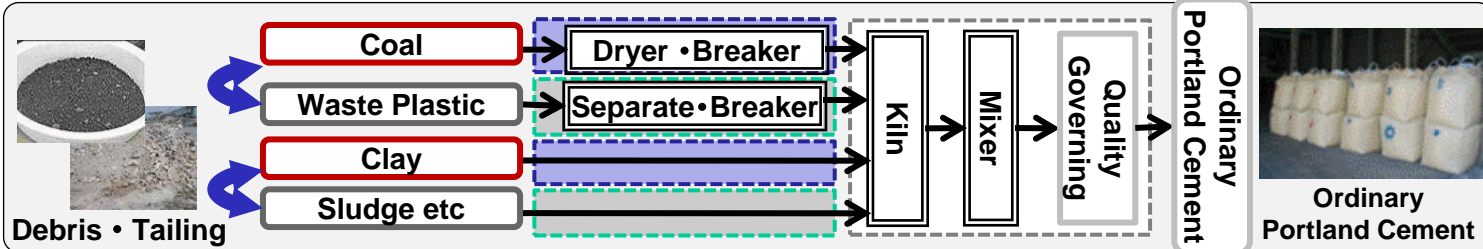
Recycling Facilities

Input

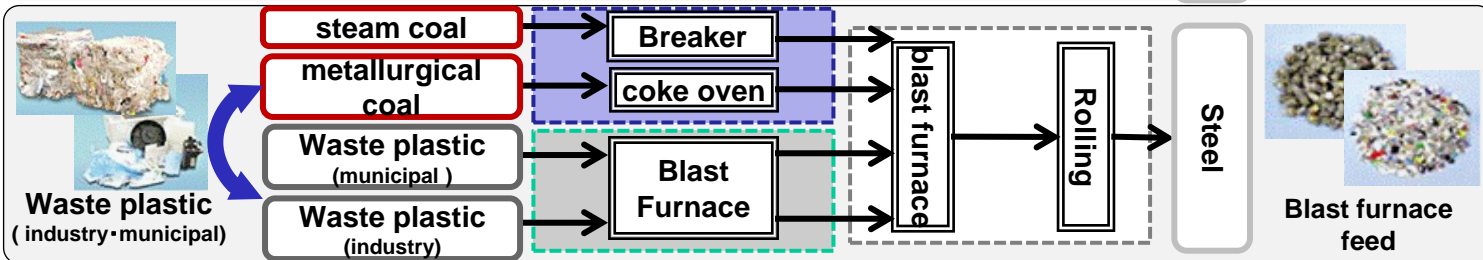
Processing

output

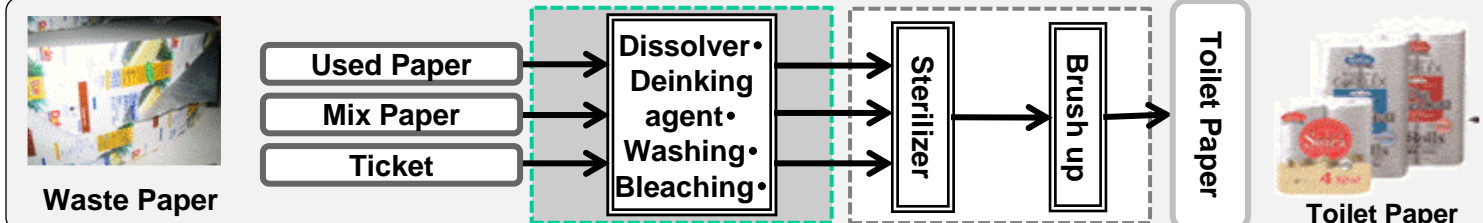
Cement manufacturing plant utilizing industrial waste



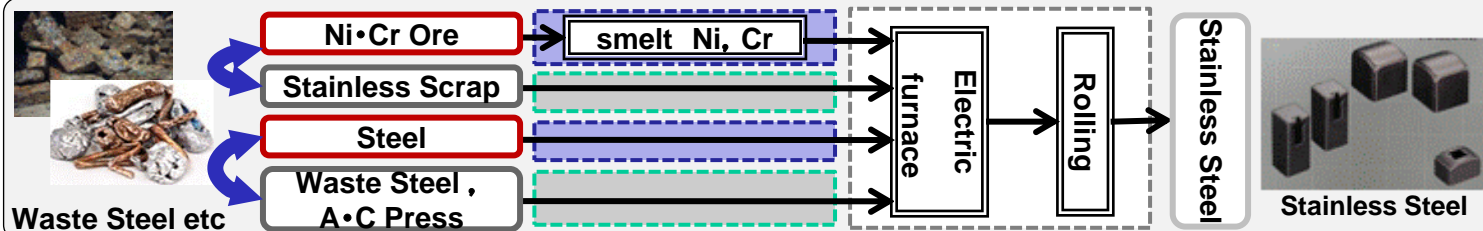
Waste plastics as Reducing Agent for Blast furnace



Hard-to-recycle Paper Recycling Facility



Stainless steel manufacturing plant utilizing industrial waste



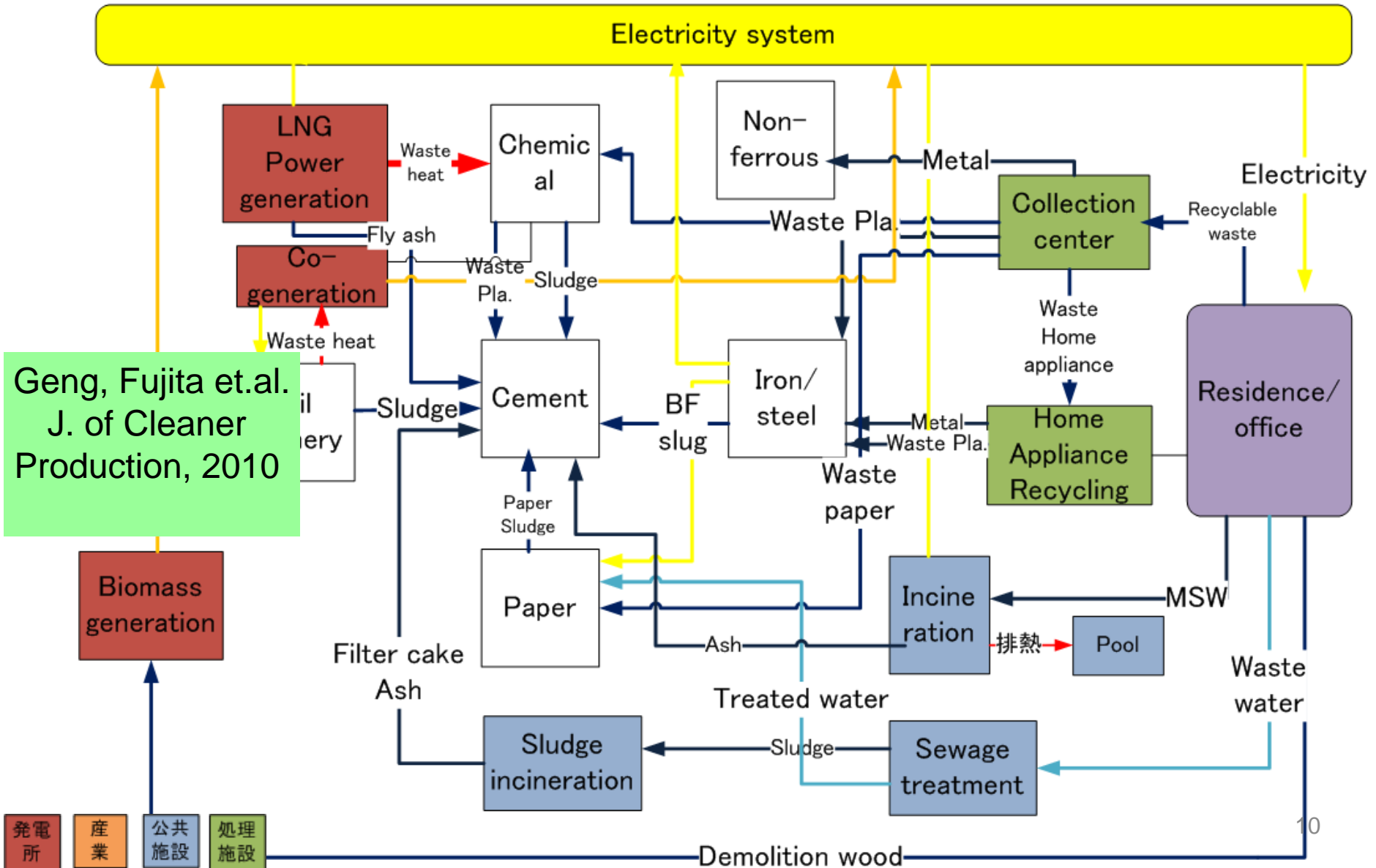
Kawasaki Synergy Network (current situation)

Bio/life science

Power generation & material industry

Treatment or recycling facility

City



Material Flow Analysis for Kawasaki Eco-town

Material flow of waterfront area

Virgin material (domestic),
3,044,501 [t/y]
(14.1%)

Limestone,
1,858,805 [t/y]

Virgin material (abroad),
16,328,019 [t/y]
(75.6%)

LNG, 5,360,000 [t/y]

Ironstone, 5,345,000 [t/y]

Coal, 3,633,719 [t/y]

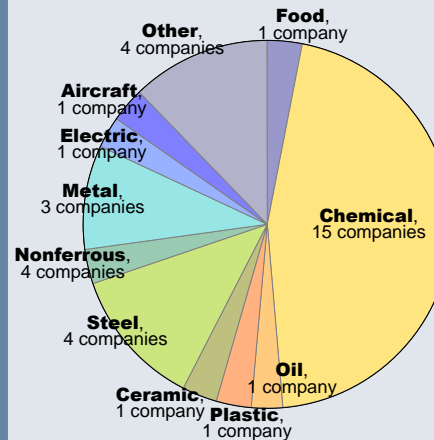
Ferroalloy, 141,000 [t/y]

Other

Recycled material (other),
851,620 [t/y], (3.9%)

- Based on the questionnaire survey to 57 enterprises situated in waterfront area of Kawasaki
- 35 companies responded
- 32 are situated in Eco-town

Composition of Eco-town related 32 companies



Steel, 4,000,000 [t/y]

Cement, 4,000,000 [t/y]

Ethylene, 4,000,000 [t/y]

Stainless, 4,000,000 [t/y]

Other

Products,
8,685,608 [t/y]

Electric power
8,954,935 [Mwh]

Waste (Kanagawa)
184,905 [t/y]

Waste (Kanto)
170,748 [t/y]

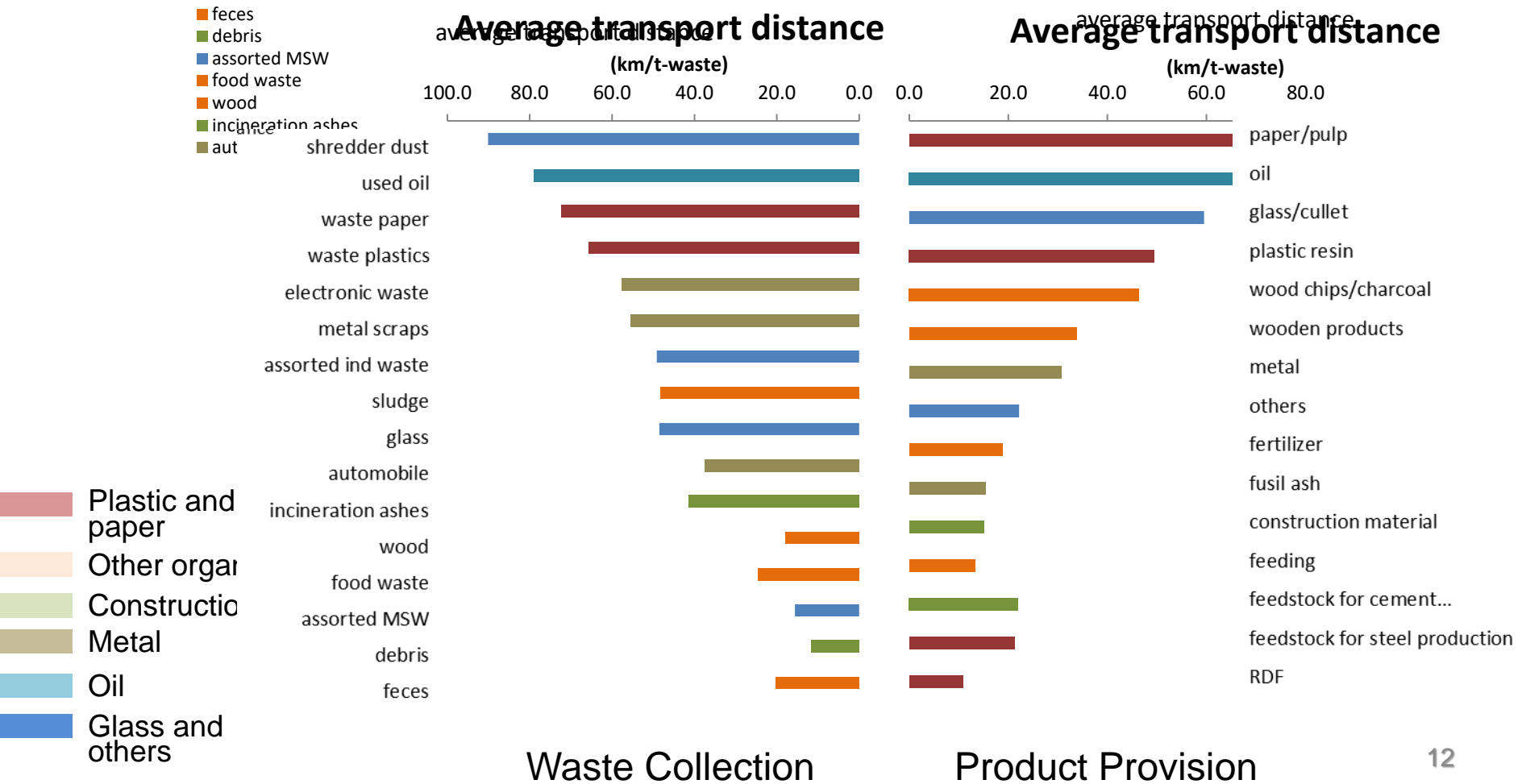
Waste (Japan)
39,472 [t/y]

Recycled material (inside Kawasaki),
1,382,000 [t/y], (6.4%)

Hashimoto, Fujita, et.al (2010)
Resources, Conservation and
Recycling, 54(10),

Collection and product supply scale and transportation distances

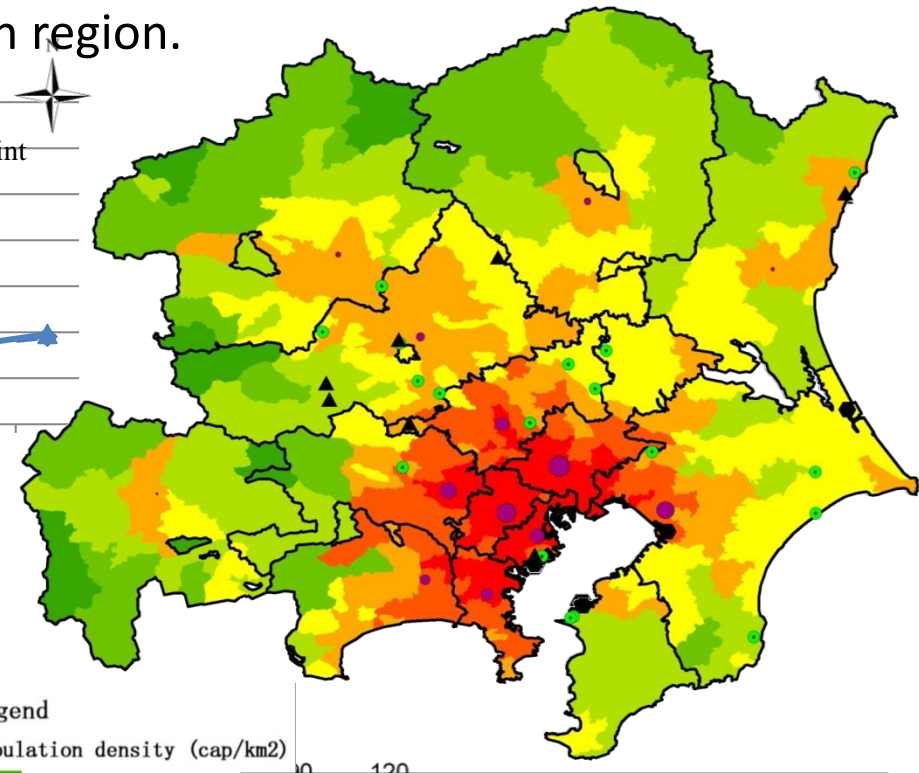
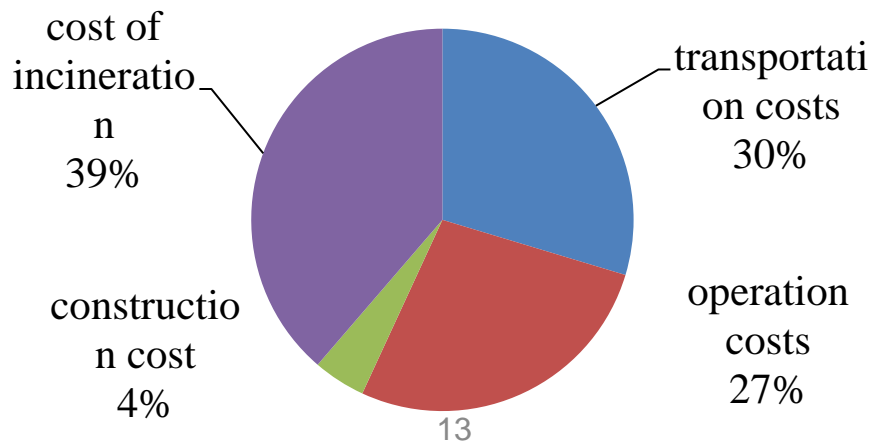
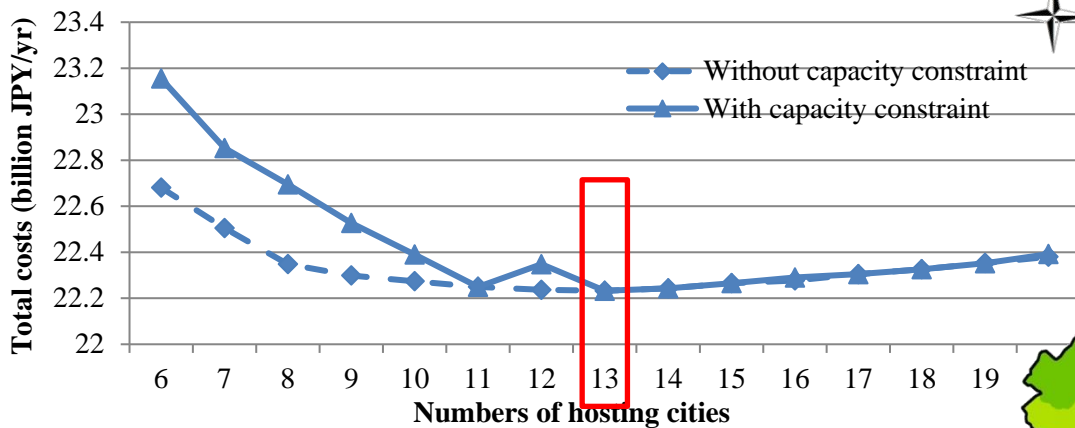
- Wastes with high added-value are with relatively long transport distances
Plastics, paper, oil, electronic wastes
- Products with demand in large volumes and locally are with shorter transport distances
RDF, feedstock for steel and cement production, construction materials, feedings, fertilizer



National Guideline for the Circular Region Planning

Modeling results: Cost and scale

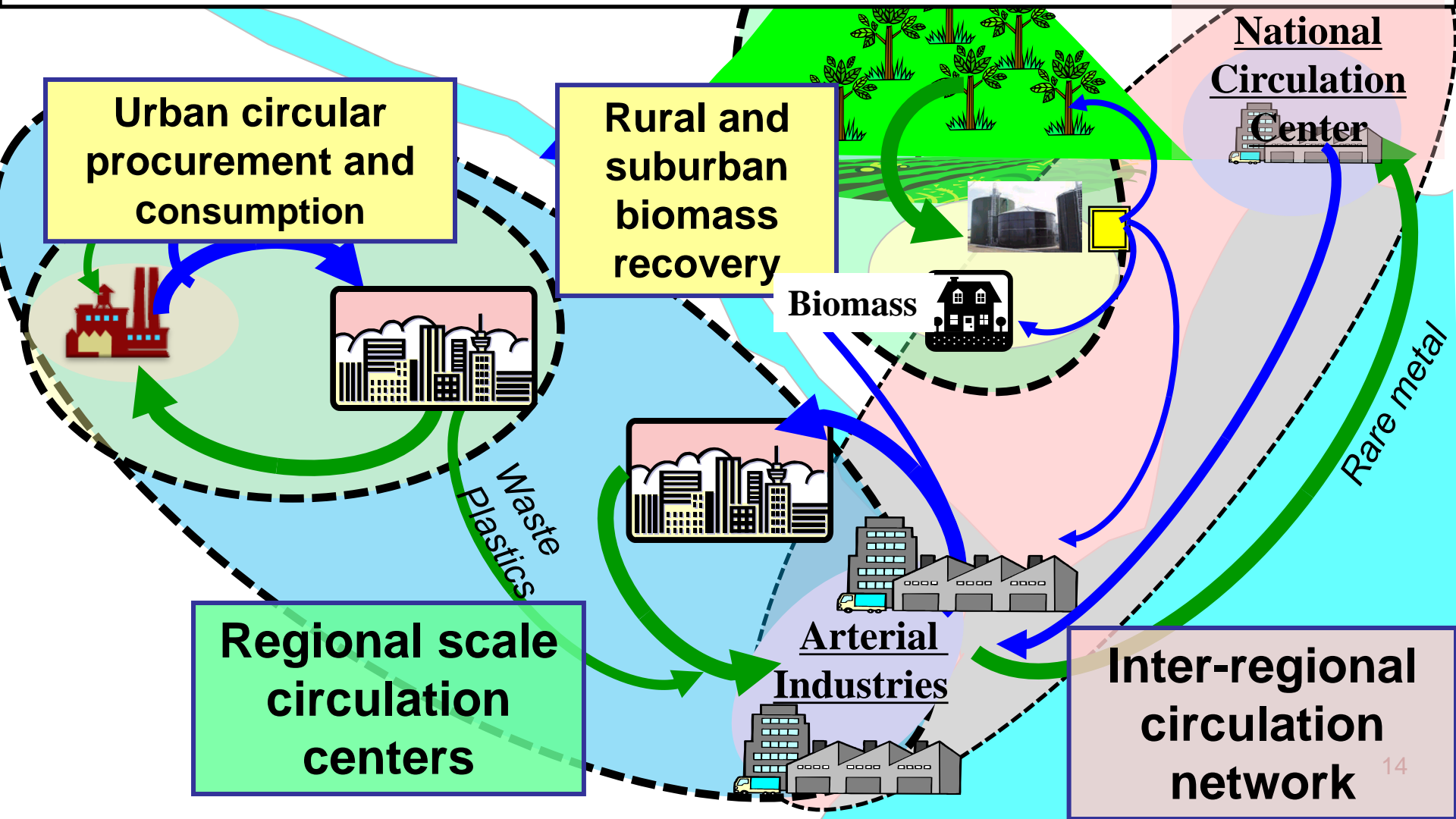
Optimal scales of circularization is also discussed and we made quantitative analysis based on the spatial information of the distribution of solid waste in Tokyo Metropolitan Region with 30 million population. The results are incorporated into the national planning guideline for circularization region.



X. Chen, T. Fujita, et.al,
J. of Industrial Ecology, Vol.
16(1), pp.129–141, 2012

Strategies to Promote Eco-town Development

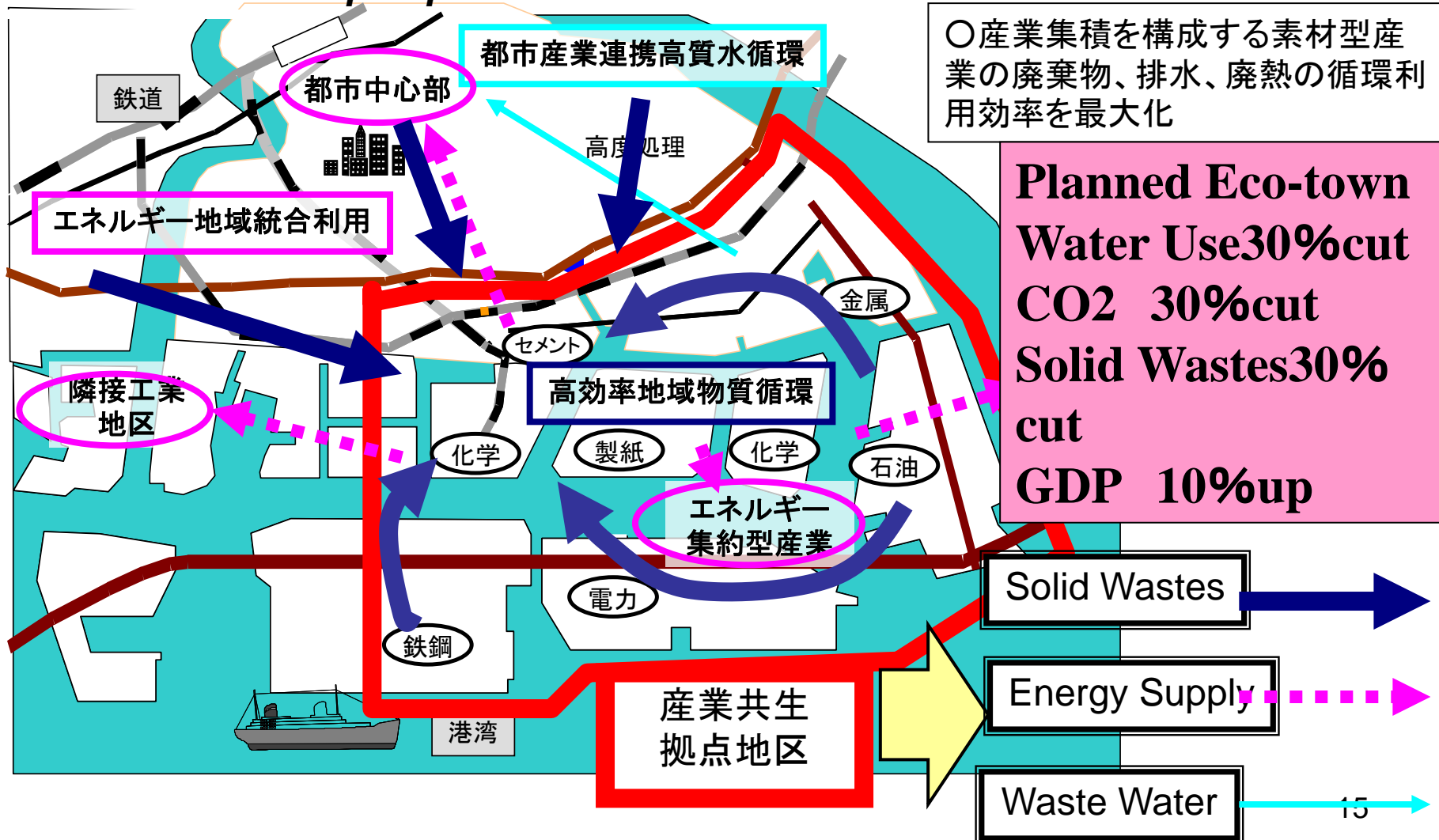
- Establishment of multi scale circulation system considering appropriate social waste transportation cost and environmental value of recycle products
- Social multi-stakeholder collaboration scheme for such separation, collection and green purchase
- Development of regional circulation center for multi-layered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



Eco-town as a Driver toward Low Carbon City

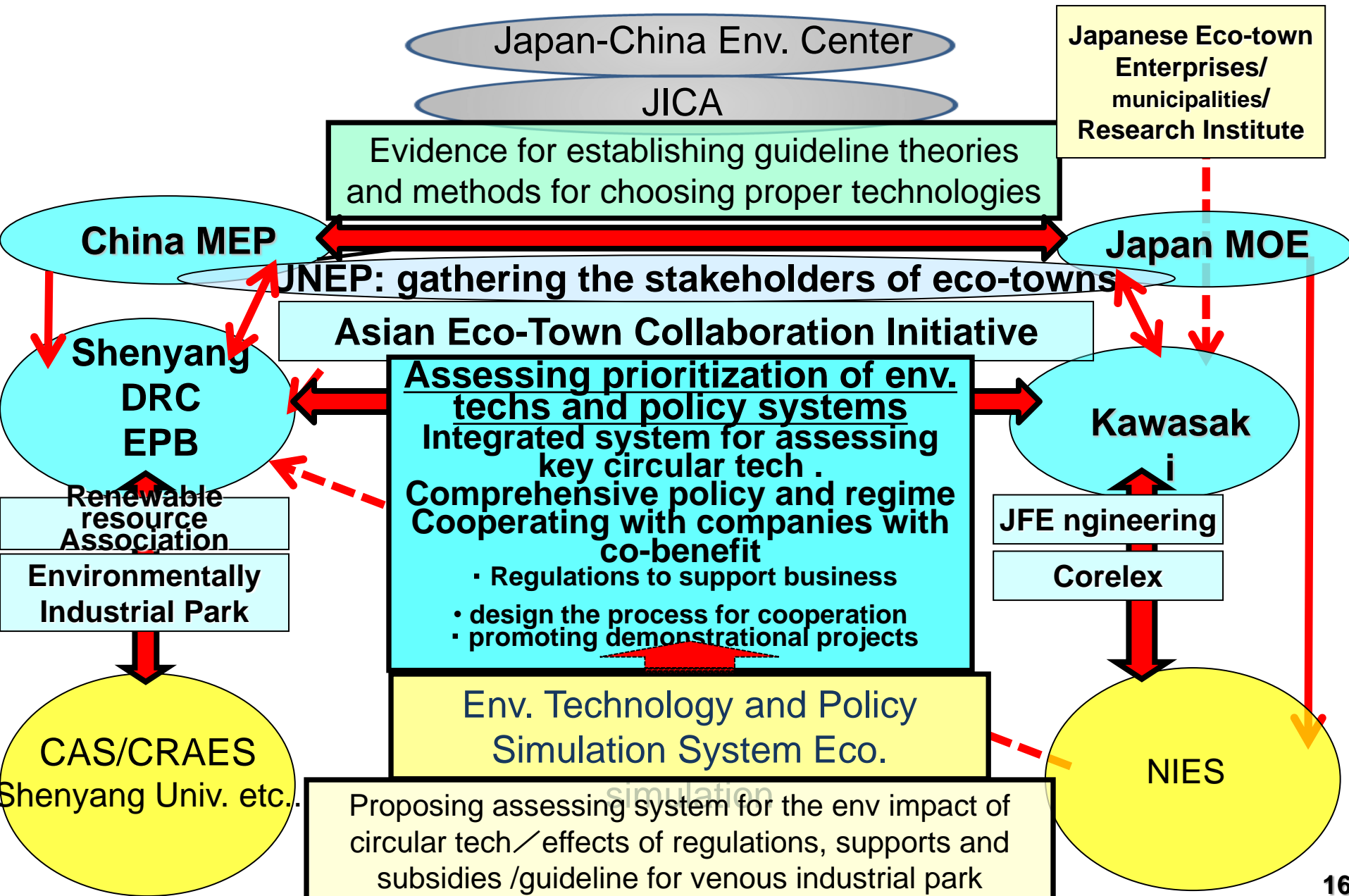
・Industrial Re-development from Eco-town Guideline

・Urban and Industrial Infrastructure from Eco-city perspectives



Research on Env. City Technology and Policy Simulation System

The Material to Japan-China Cooperation



Eco-cities, Smart Cities and SDGs Future Cities

● Eco-Model Cities since 2008; 23 cities

Low-carbon Unification Initiatives for Cities/Regions

● Future Cities since 2011; 11 cities

The creation of successful examples to be spread throughout Japan and internationally

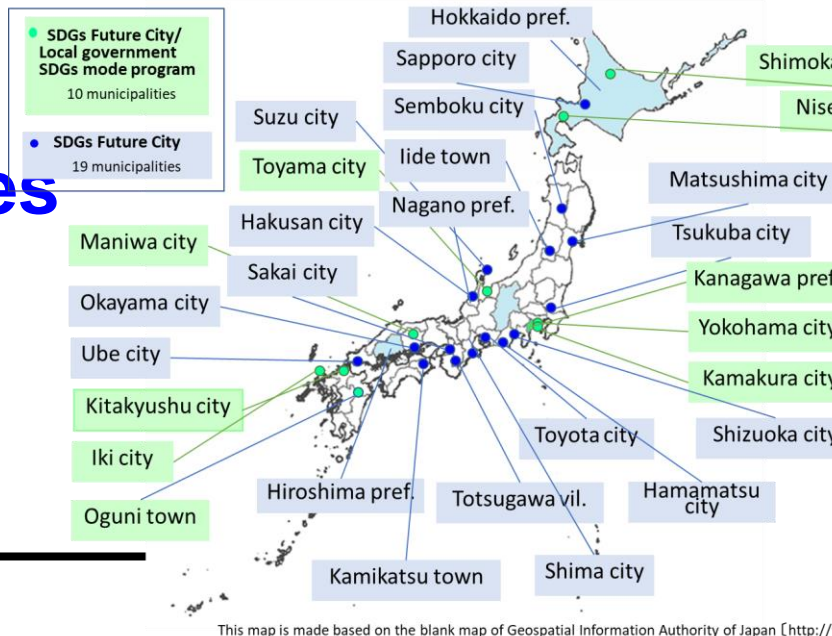


● SDGs Future Cities

2018;29 2019;31 2020;33 Cities

Autonomous SDGs Plans
and Model Project Cities

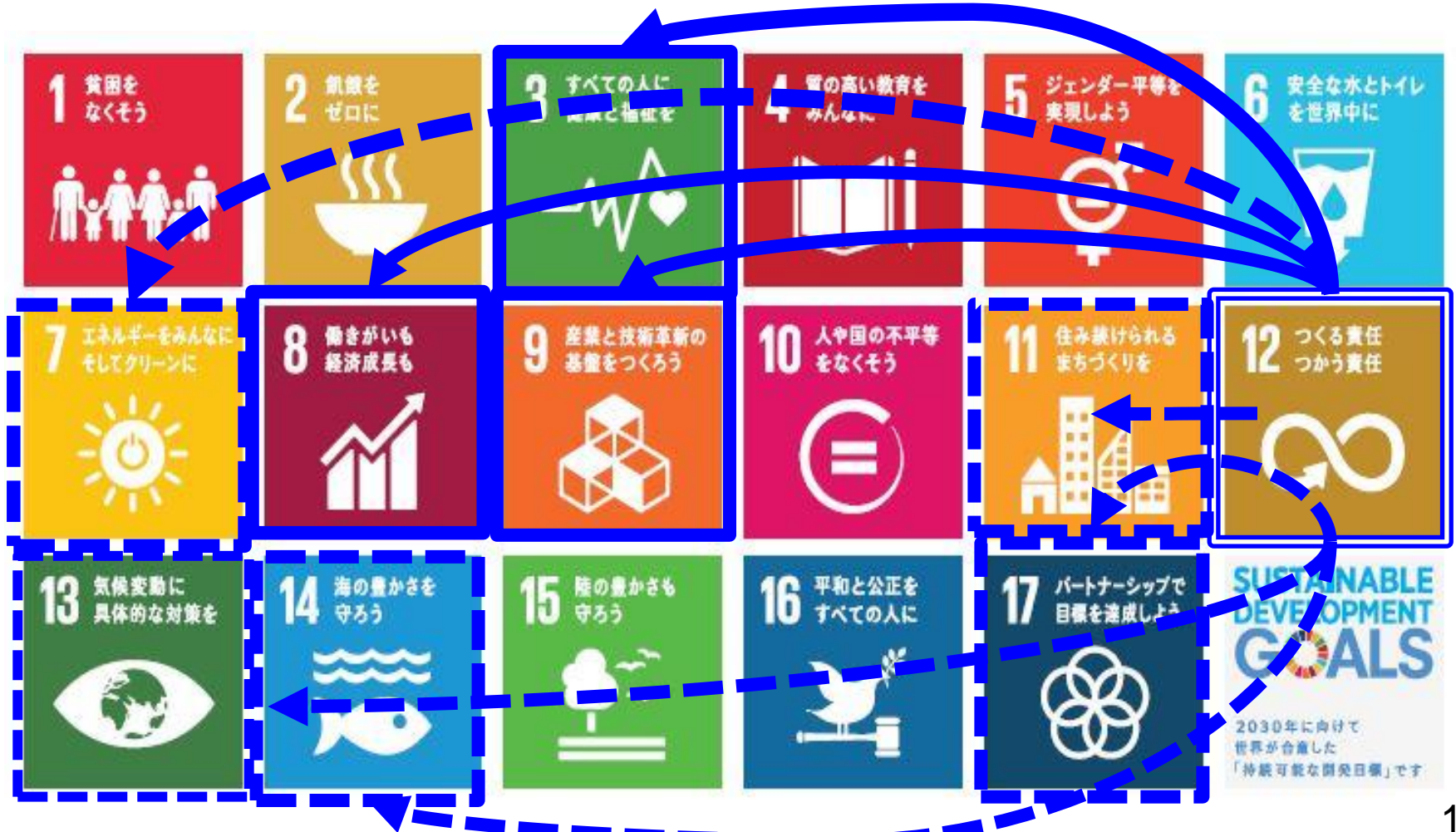
SUSTAINABLE DEVELOPMENT GOALS
17 GOALS TO TRANSFORM OUR WORLD



This map is made based on the blank map of Geospatial Information Authority of Japan [http://www.gsi.go.jp]

SDGs Cities from Circular Economy

- Circular region through local circularization and energy management
- Information and infrastructure system for resource circularization, local energy management and eco-system utilization

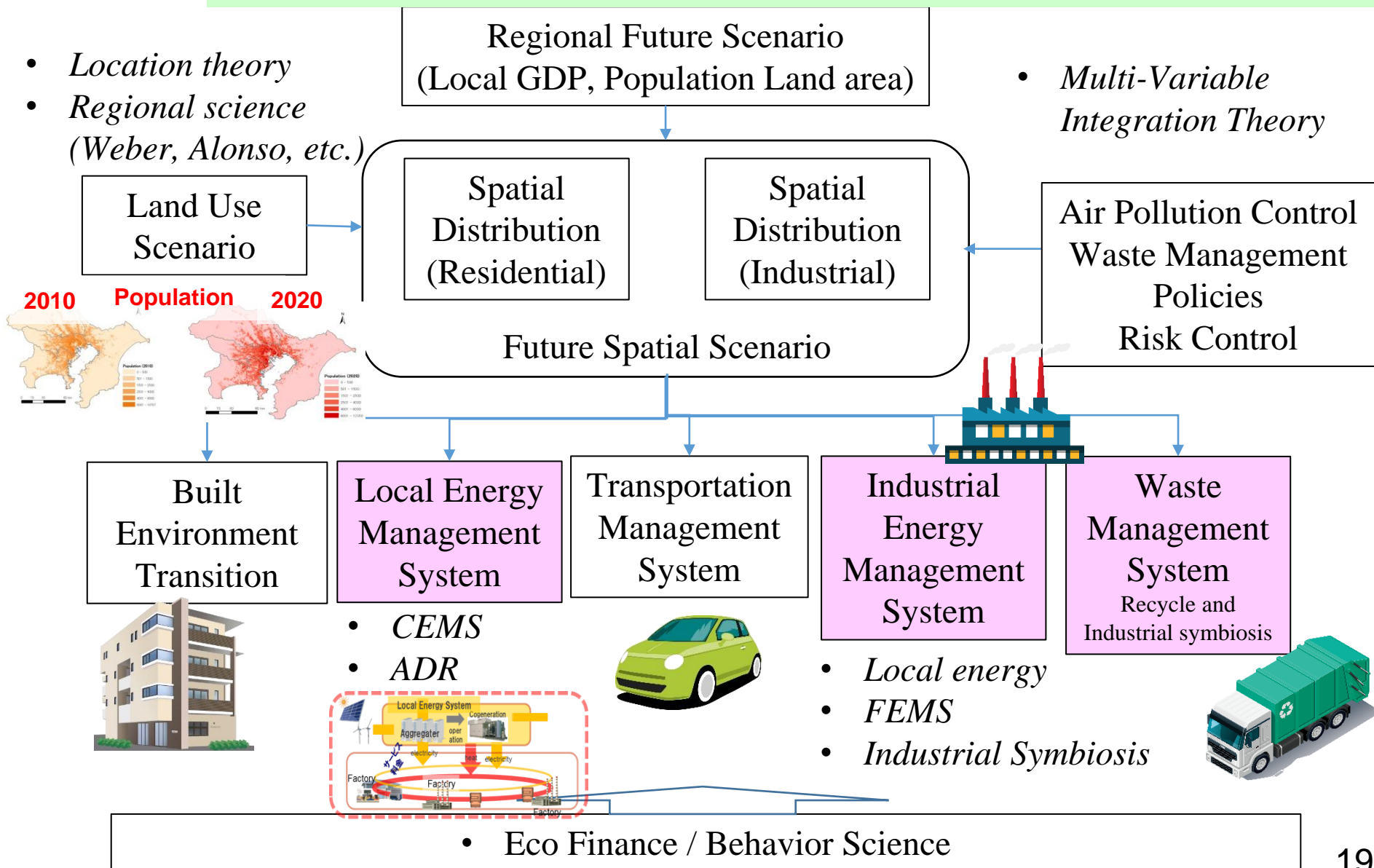


Integrative Eco-city Assessment Challenges

② Integrated Industrial Urban Simulation

- *Location theory*
- *Regional science*
(Weber, Alonso, etc.)

- *Multi-Variable Integration Theory*



List or related key publications

- Yong Geng, Tsuyoshi Fujita, Hung-suck Park, Anthony S.F. Chiu, Donald Huisingh (2016) Recent progress on innovative eco-industrial development. Journal of Cleaner Production, 114, 1-10
- Satoshi Ohnishi, Minoru Fujii, Tsuyoshi Fujita, et.al. (2016) Comparative analysis of recycling industry development in Japan following the Eco-Town program for eco-industrial development. Journal of Cleaner Production, 114, 95-102
- Takuya Togawa, Tsuyoshi Fujita, et.al. (2016) Integrating GIS databases and ICT applications for the design of energy circulation systems. Journal of Cleaner Production, 114, 224-232
- Minoru Fujii, Tsuyoshi Fujita, et.al. (2016) Possibility of developing low-carbon industries through urban symbiosis in Asian cities. Journal of Cleaner Production, 114, 376-386
- Liang Dong, Tsuyoshi Fujita, Ming Dai, Yong Geng, Jingzheng Ren, Minoru Fujii, Yi Wang, Satoshi Ohnishi (2016) Towards preventative eco-industrial development: an industrial and urban symbiosis case in one typical industrial city in China. Journal of Cleaner Production, 114, 387-400
- Huijuan Dong, Tsuyoshi Fujita, Yong Geng, Liang Dong, Satoshi Ohnishi, Lu Sun, Yi Dou, Minoru Fujii (2016) A review on eco-city evaluation methods and highlights for integration. Ecological Indicators, 60, 1184-1191
- Yong Geng, Fujita Tsuyoshi, Xudong Chen; Evaluation of Innovative Municipal Solid Waste Management through Urban Symbiosis: A Case Study of Kawasaki, Environmental Sci and Tech., 2009 (revised)
- 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
- 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