

13th Asia-Pacific Eco-Business Forum in Kawasaki
Feb. 16th 2017

Future Eco City Session: Eco-city Challenge toward De-carbonization Society
-Through Collaboration among Industries, Public and Academia-

“Transitional Demonstration from Eco-City Kawasaki”

*–Innovative Challenges for
Urban Industrial Symbiosis–*

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Director of

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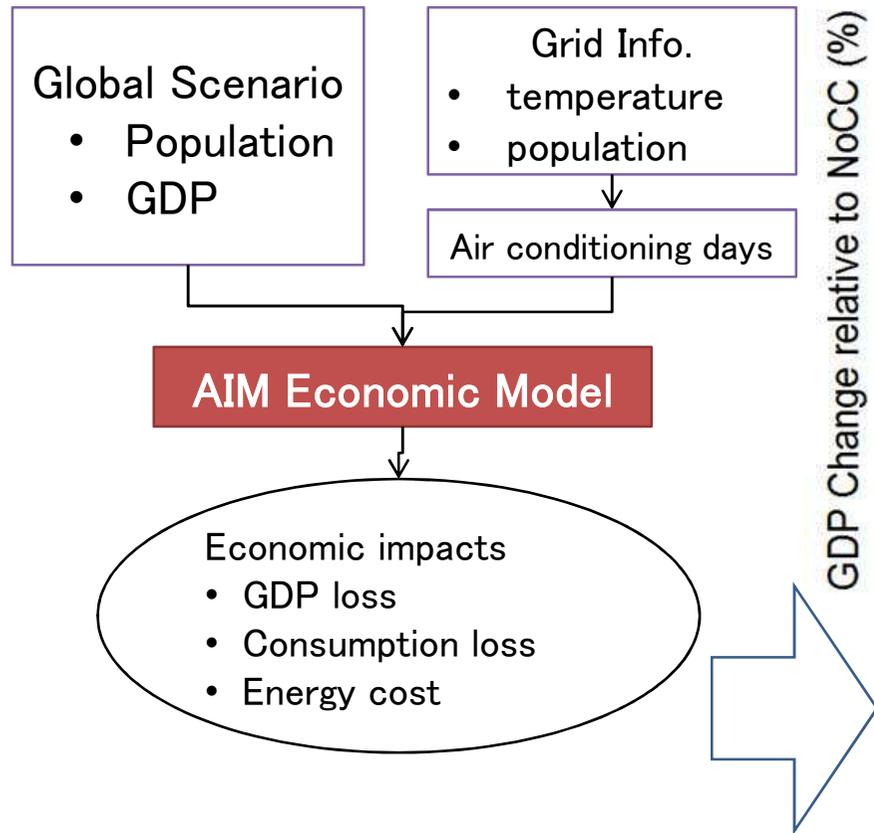
National Institute for Environmental Science, Japan

Alliance Professor of Nagoya University

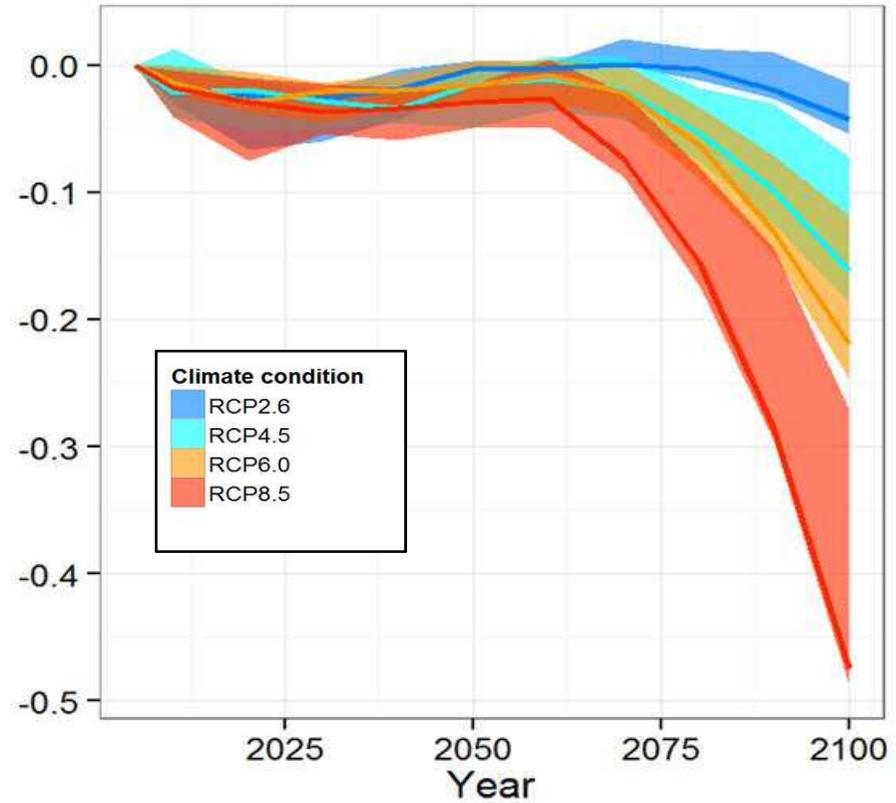
With Dr. FUJII Minoru

Integrated Assessment Model for the Global Socio economic Loss

AIM Applied Equilibrium Model



GDP Change relative to NoCC (%)

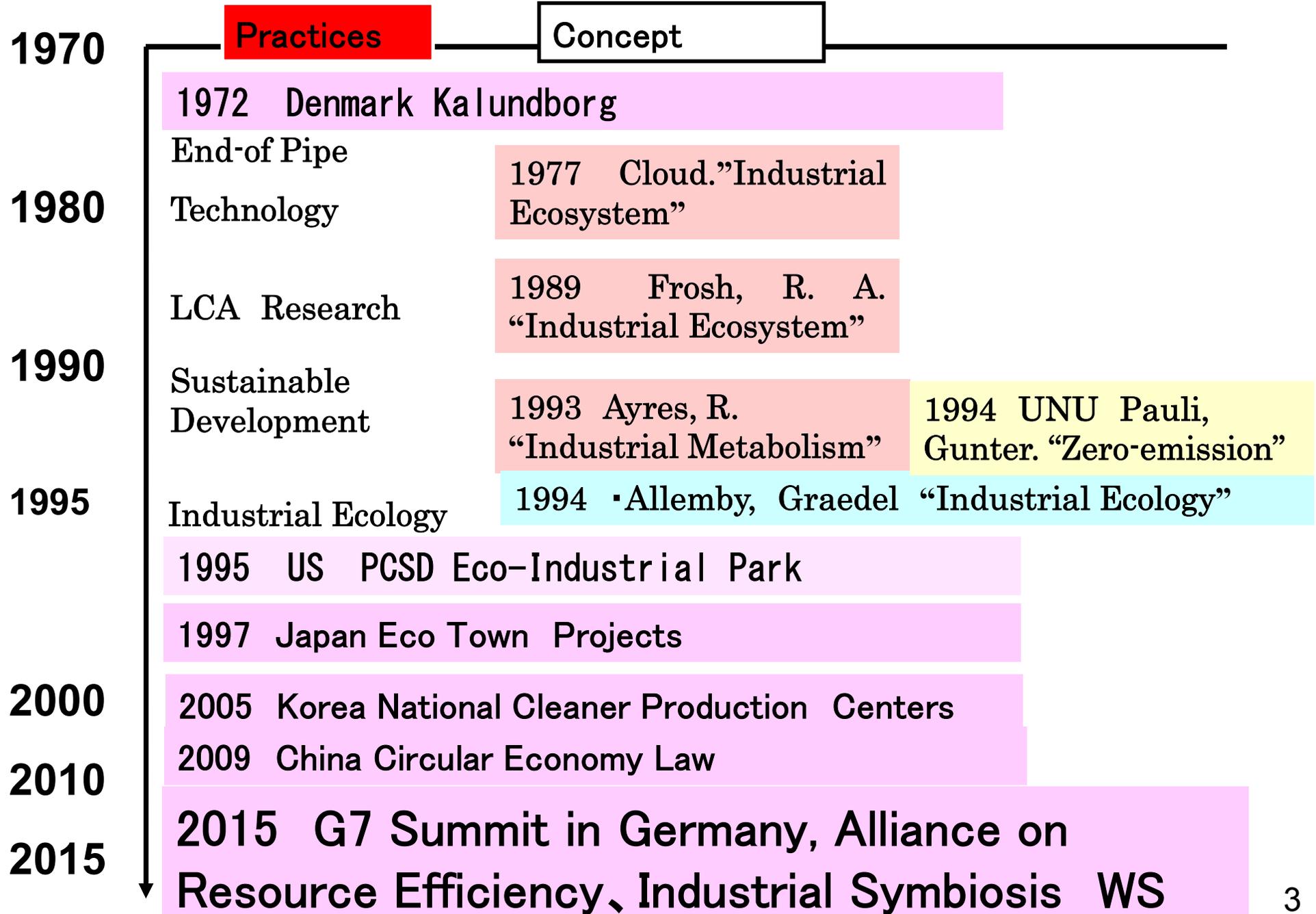


Climate condition represents 1.5, 2.5, 3.5, 4.5°C increase of global average temperature from 18th Century

Global GDP Loss

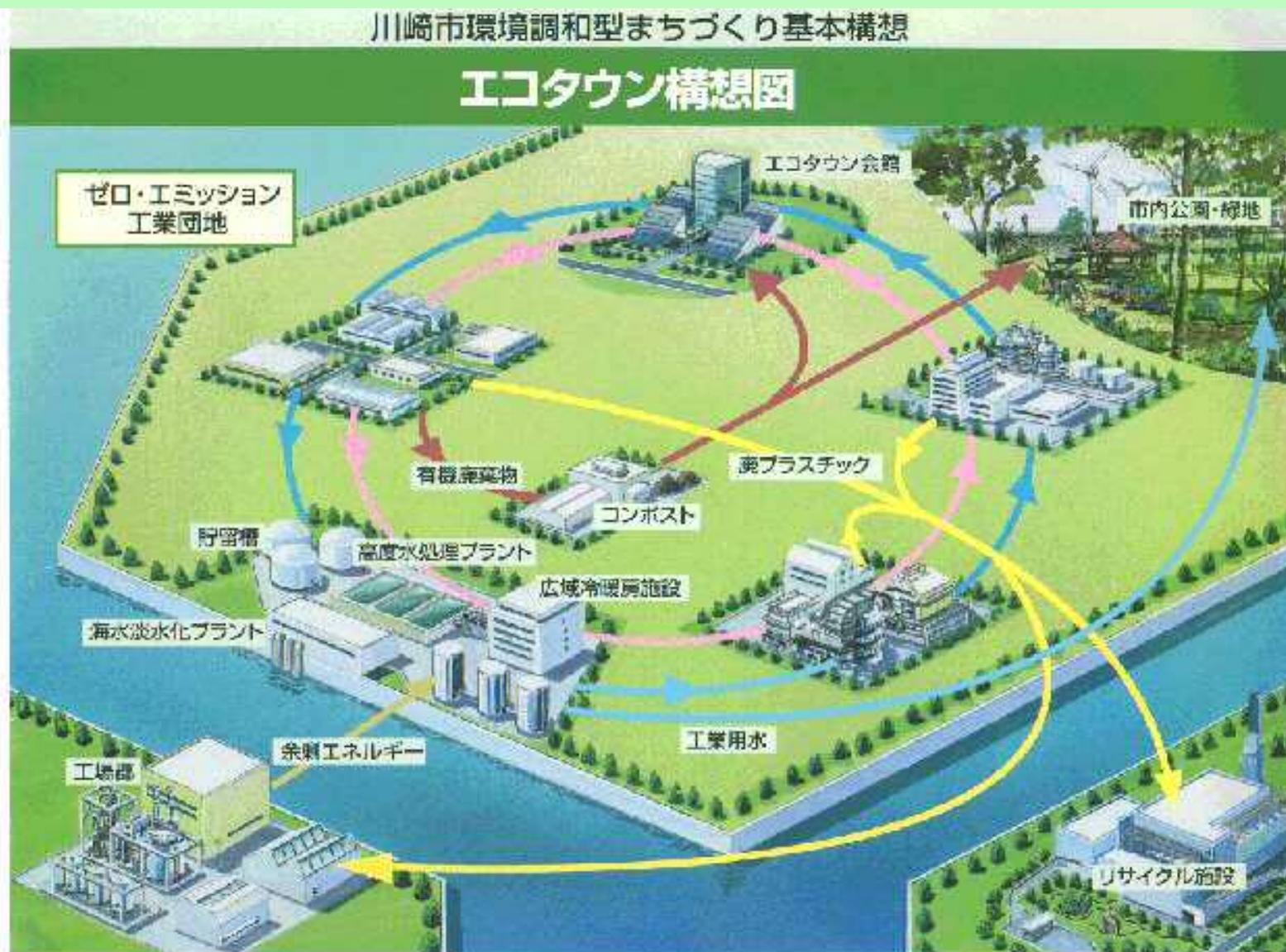
Hasegawa et al. (2016)

Theory and Practices for Industrial Symbiosis



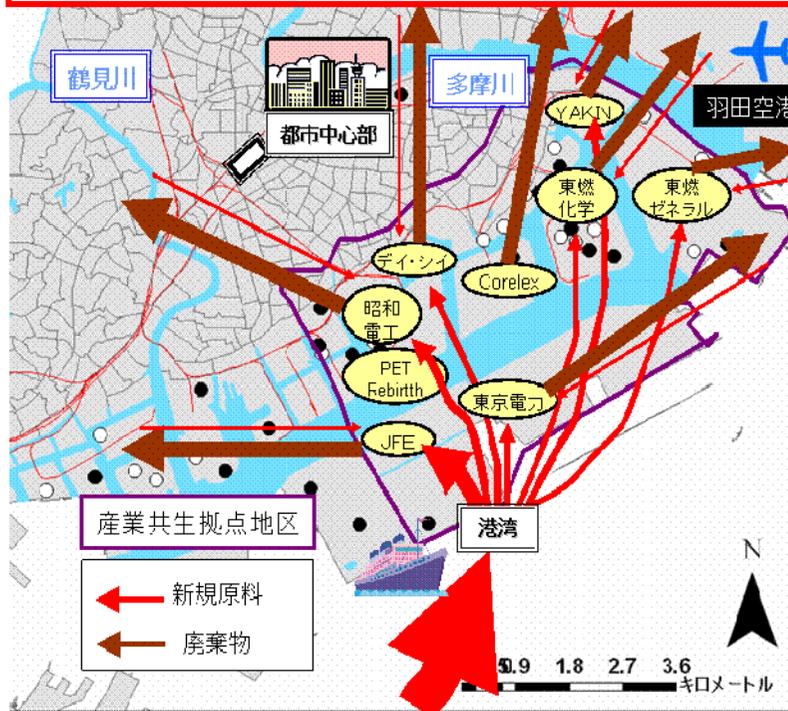
Industrial Symbiosis and Urban Industries to empower cities by circularization

(Kawasaki and Kitakyushu are pioneers in 1997→26 cities)

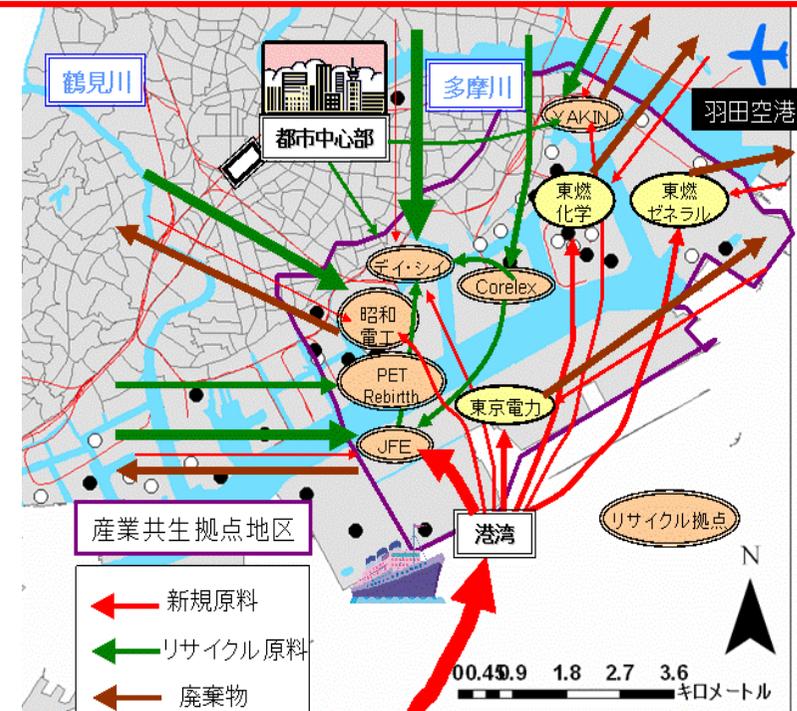


Target and Accomplishment of Japanese Eco-towns

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

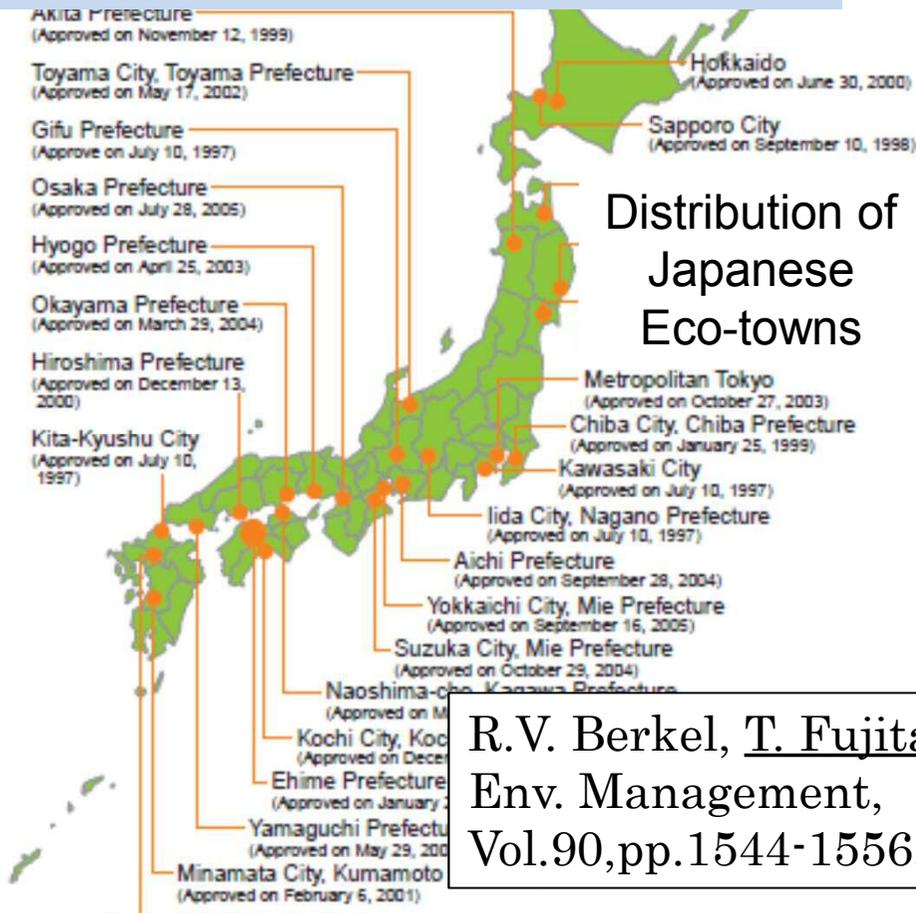
Eco-town area as demonstration project for Sound material cycle society

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.

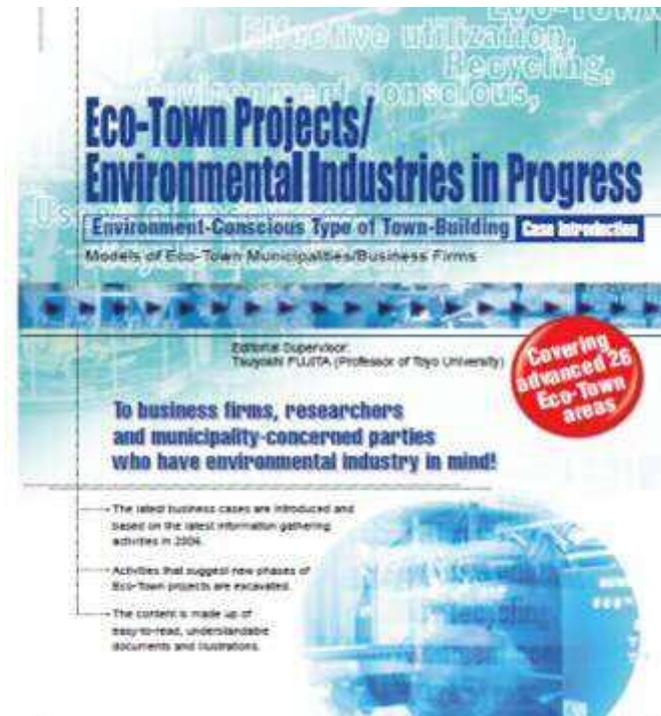


Forming the basis of capacity that totally 2.18 mil t of wastes were treated

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



R.V. Berkel, T. Fujita, J. of Env. Management, Vol.90, pp.1544-1556, 2009



Distribution of Total Investment Subsidy projects in 24 Eco-Towns 600mil. US\$

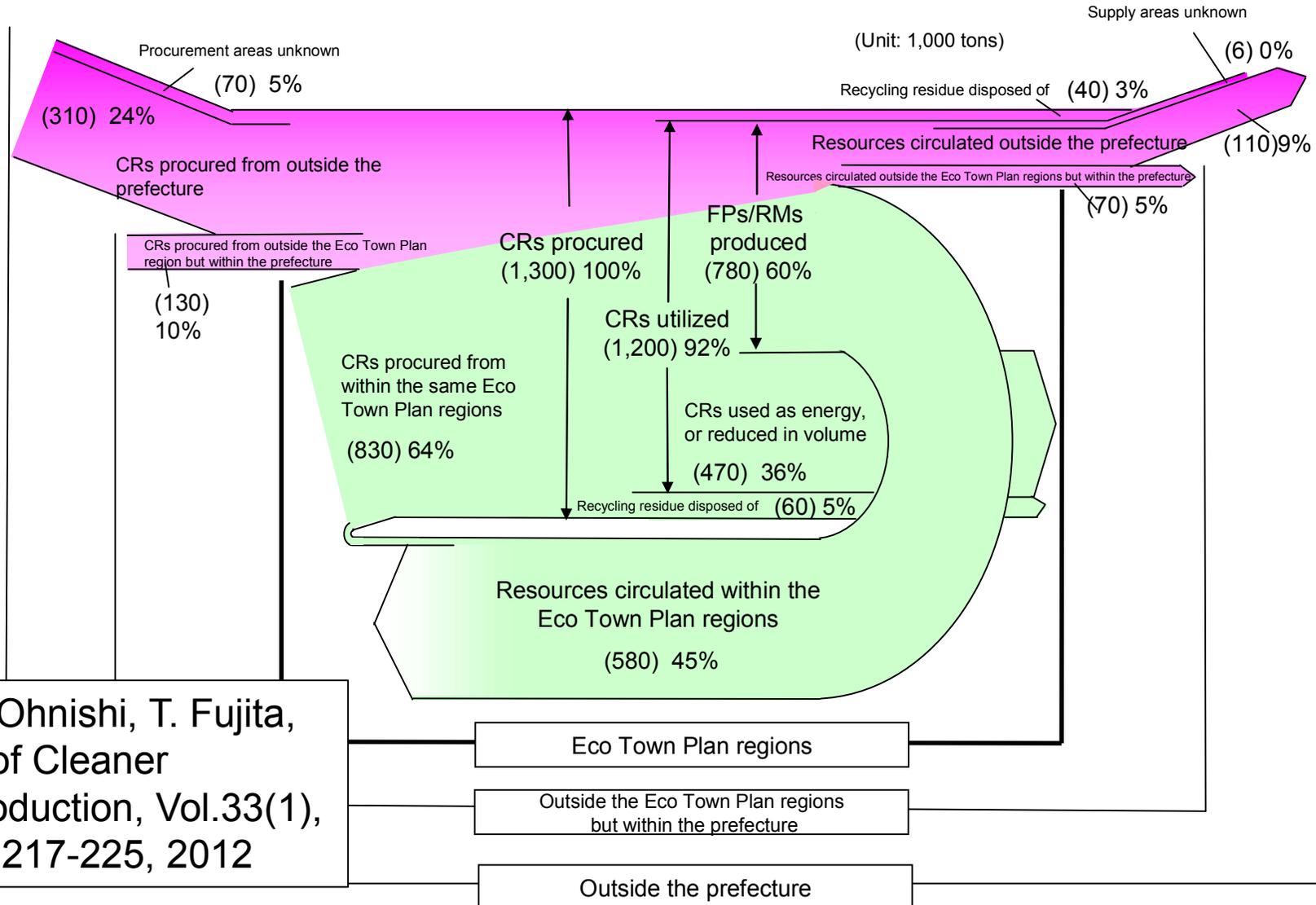
Distribution of Total Investment 60 projects in 24 Eco-Towns 1.6 bil. US\$

Evaluation of Circular Facilities in 26 Eco-towns

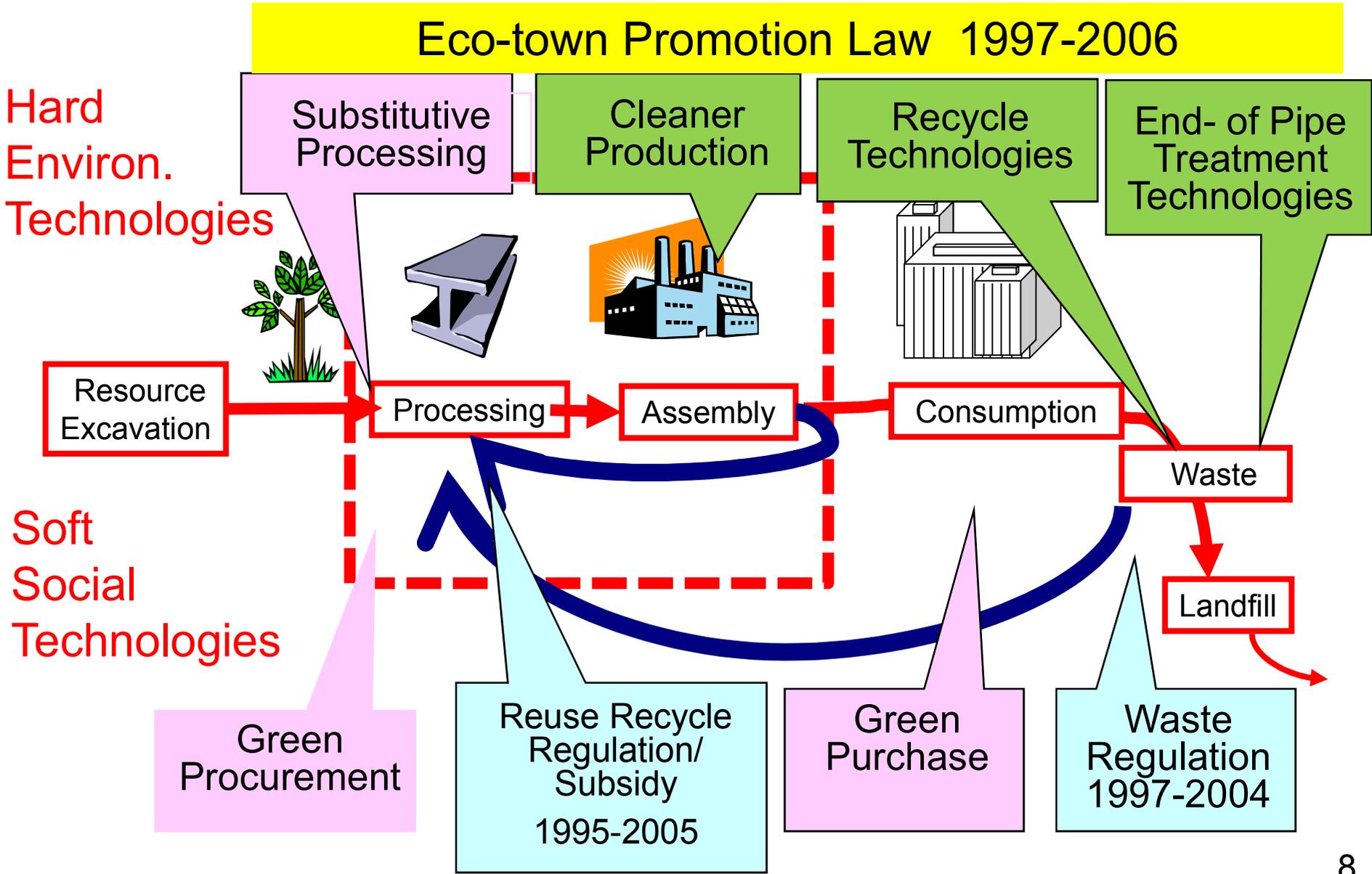
Reduction of Natural Resources; 900,000.ton /yr

CO2 Emission Reduction 480,000 t-CO2/yr

Circular use ratio of by-product 92% Intra-eco-town circulation ratio 61%



Implementation of EIP system into the society

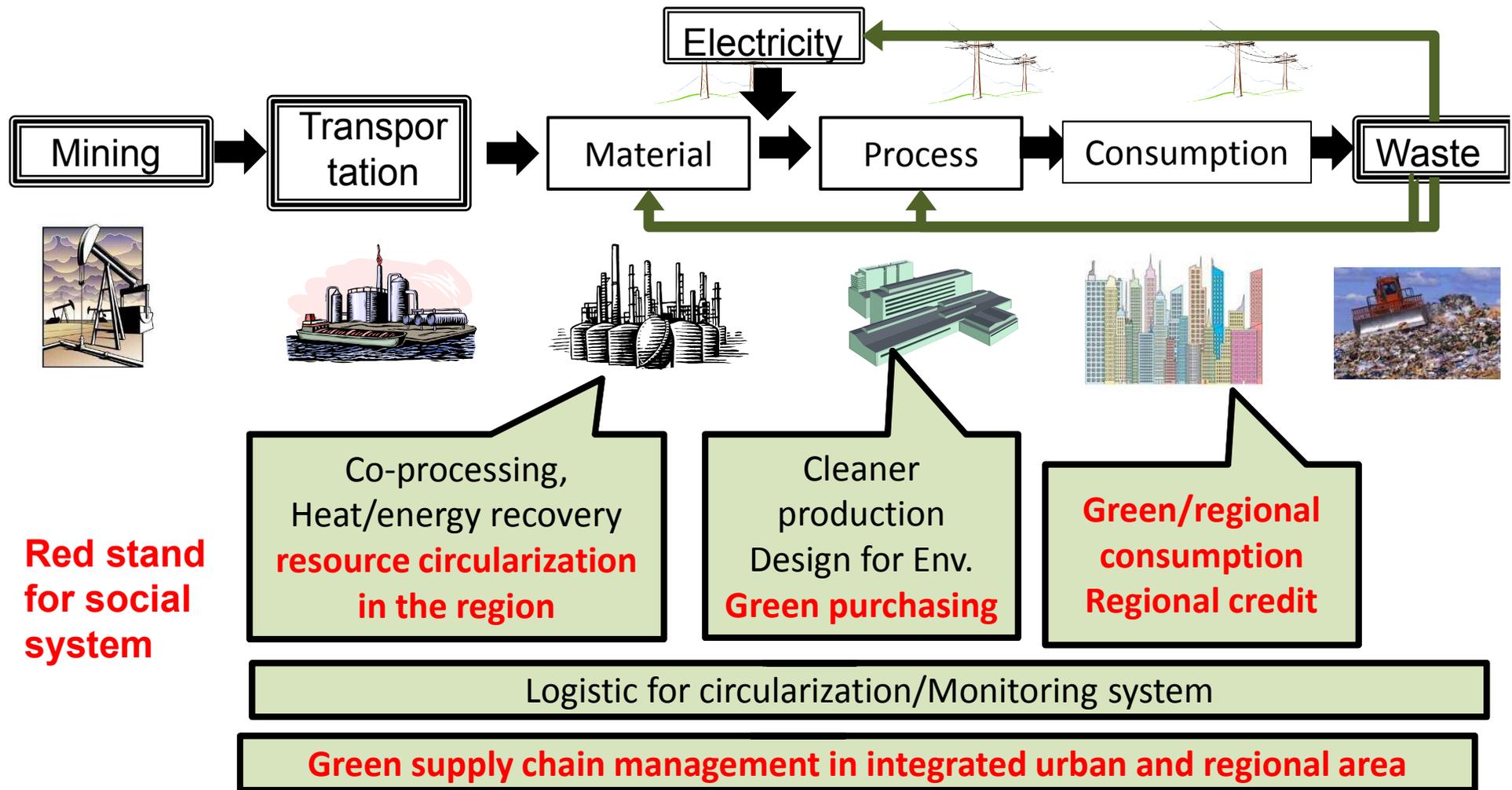


Three Keys for Sustainable Eco-Industrial Conversion from Experiences in Japan

- Innovative Societal (regulation / subsidization) System Transition
- Double Circularity for Material and Energy network
- Smart Green supply chain management through ICT

Social system to sustain the circularization in Eco-towns

Establishment of social system and business model along supply chain from mining to waste for low carbon and sound material cycle society



Red stand for social system

Eco-town Innovation Projects by Ministry of Environment, 2011-2013

2010

- **Research committee to identify the effects of 26 national eco towns and their projects**
 - Evaluation procedure for low carbon and environmental emission reduction effects
 - Extensive key technologies or policies for green supply chain management and regional resource circularization



2011- Eco town innovation projects
Proposals for Model
Eco-towns

Eco-town Innovation Projects【2011, 2012, 2013】

Solution and
Improvement

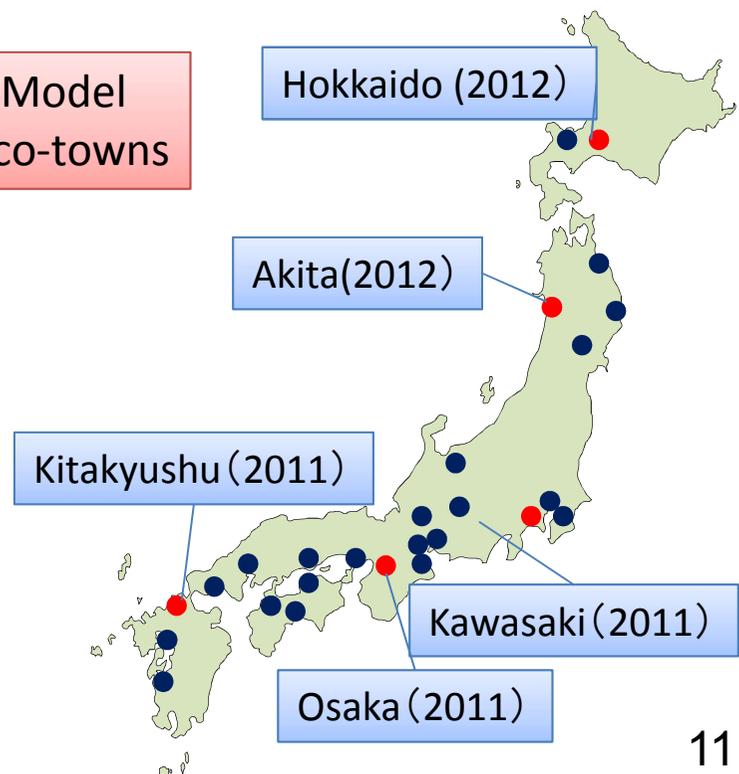
Validation of innovative
circularization projects

Green
Innovation

Business scheme design

Extension for national projects

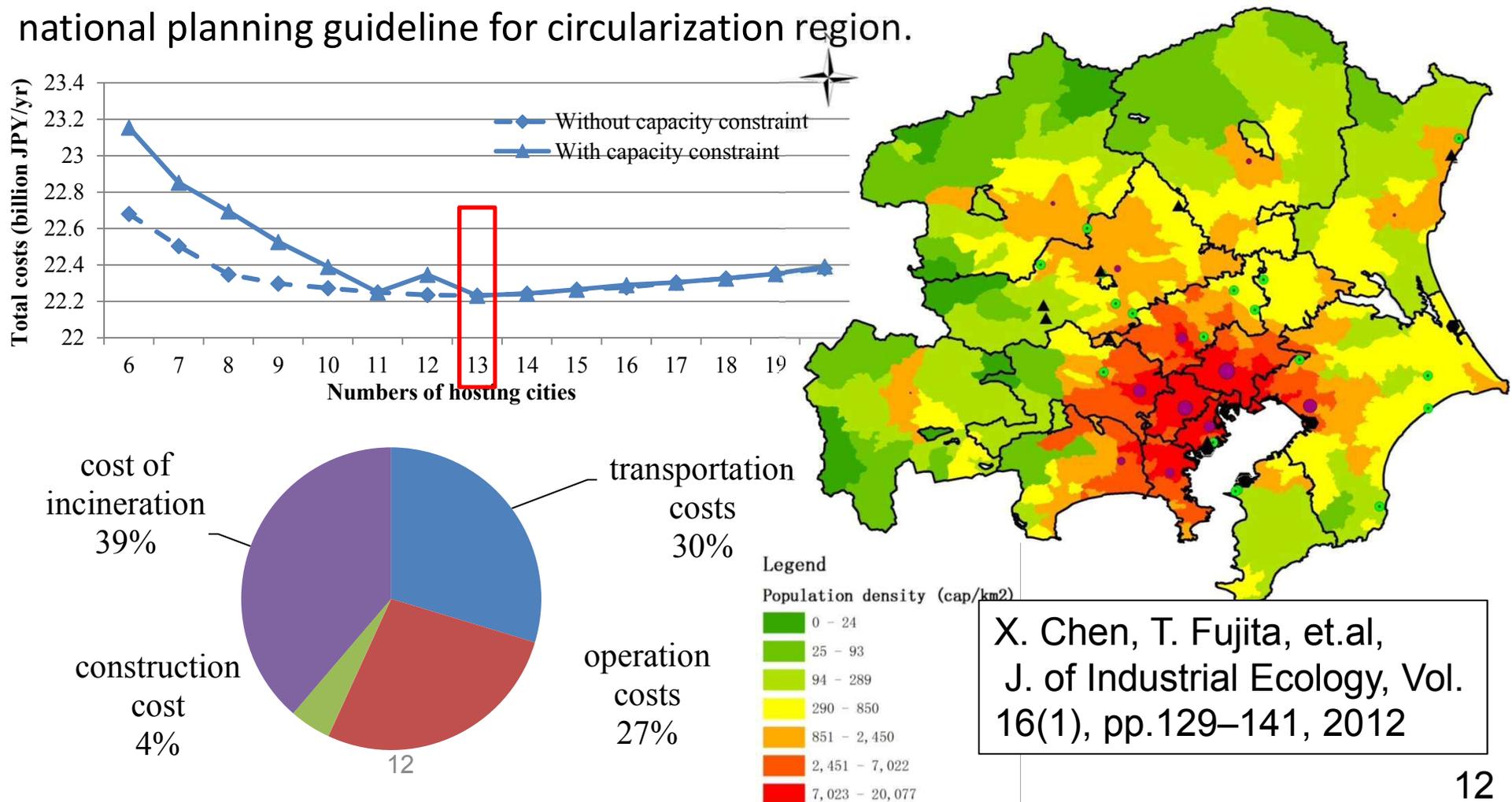
Model
Eco-towns



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.



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

URBAN REDEVELOPMENT TYPE EIP

Kitakyushu



Green Institute (Minneapolis)

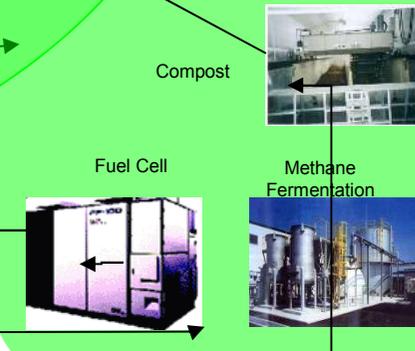
Rural Area

Cape Charles Sustainable Technology Park (Virginia)



CITY-FARM COLLABORATION TYPE EIP

Hokkaido



Urban Area

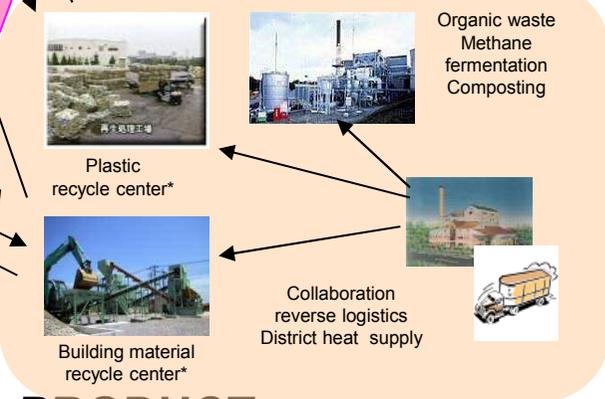
Akita, Osaka



Brownfield Neighborhood

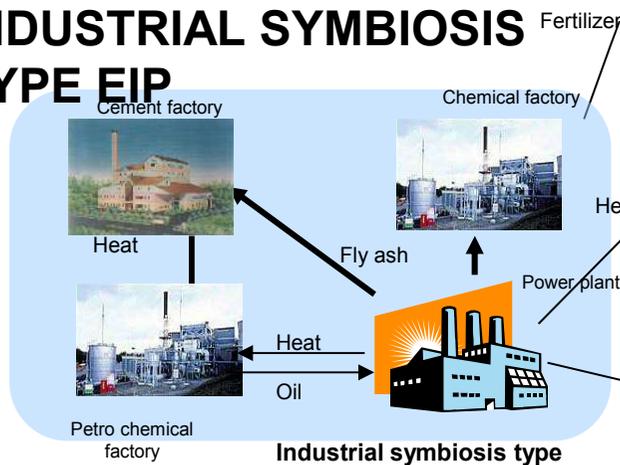


Industrial complex



PRODUCT REMANUFACTURING TYPE EIP

INDUSTRIAL SYMBIOSIS TYPE EIP



Kawasaki, Minamata

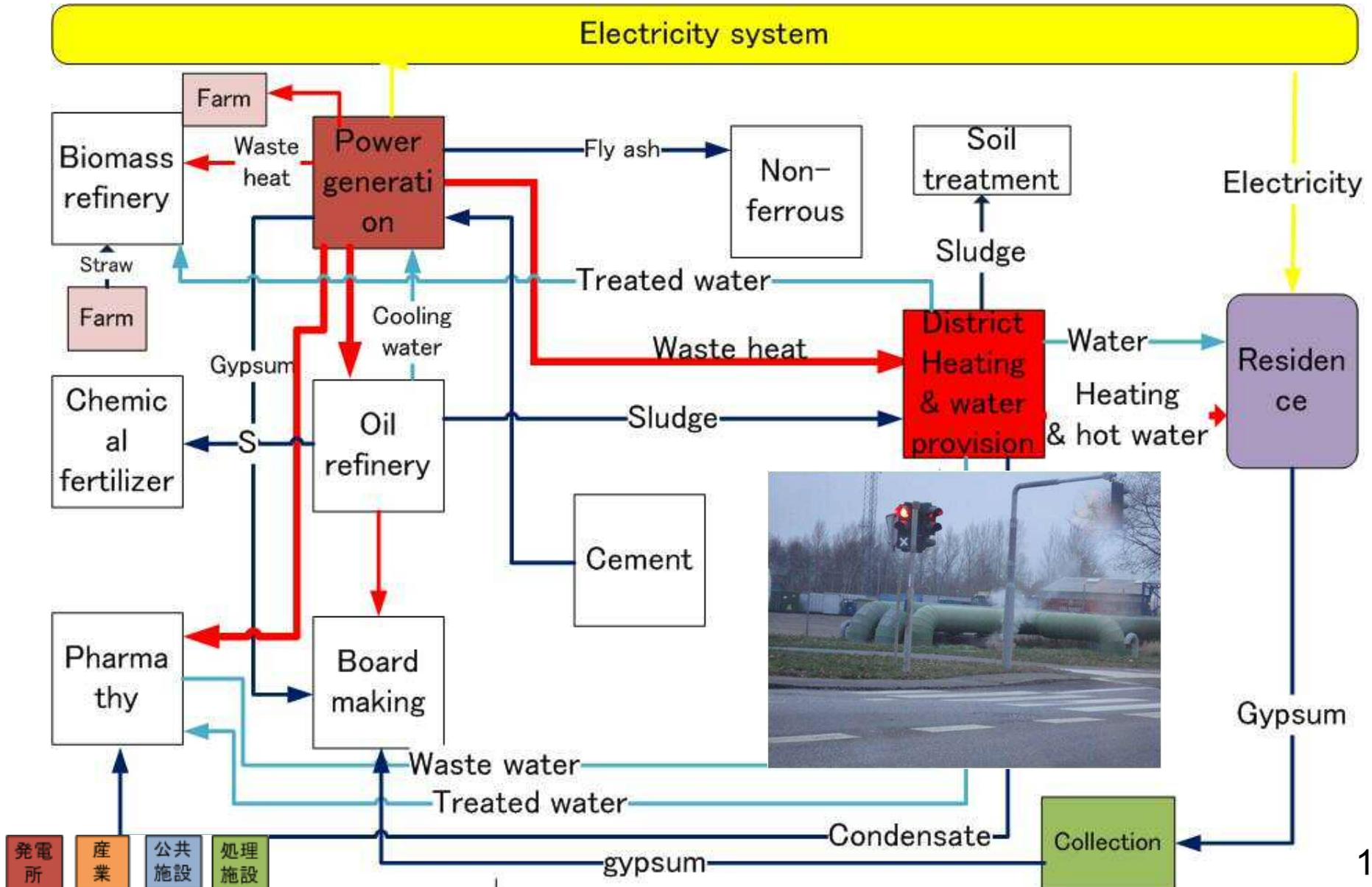
Industrial symbiosis in Kalundborg

Bio/life science

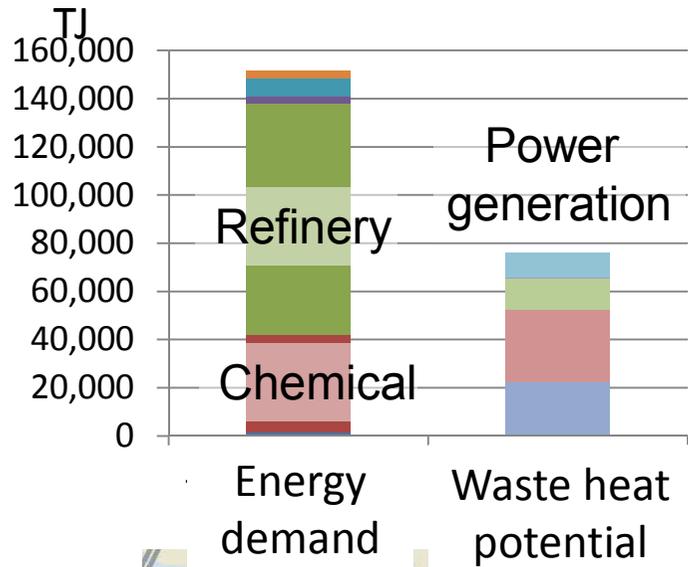
Power generation & material industry

Treatment or recycling facility

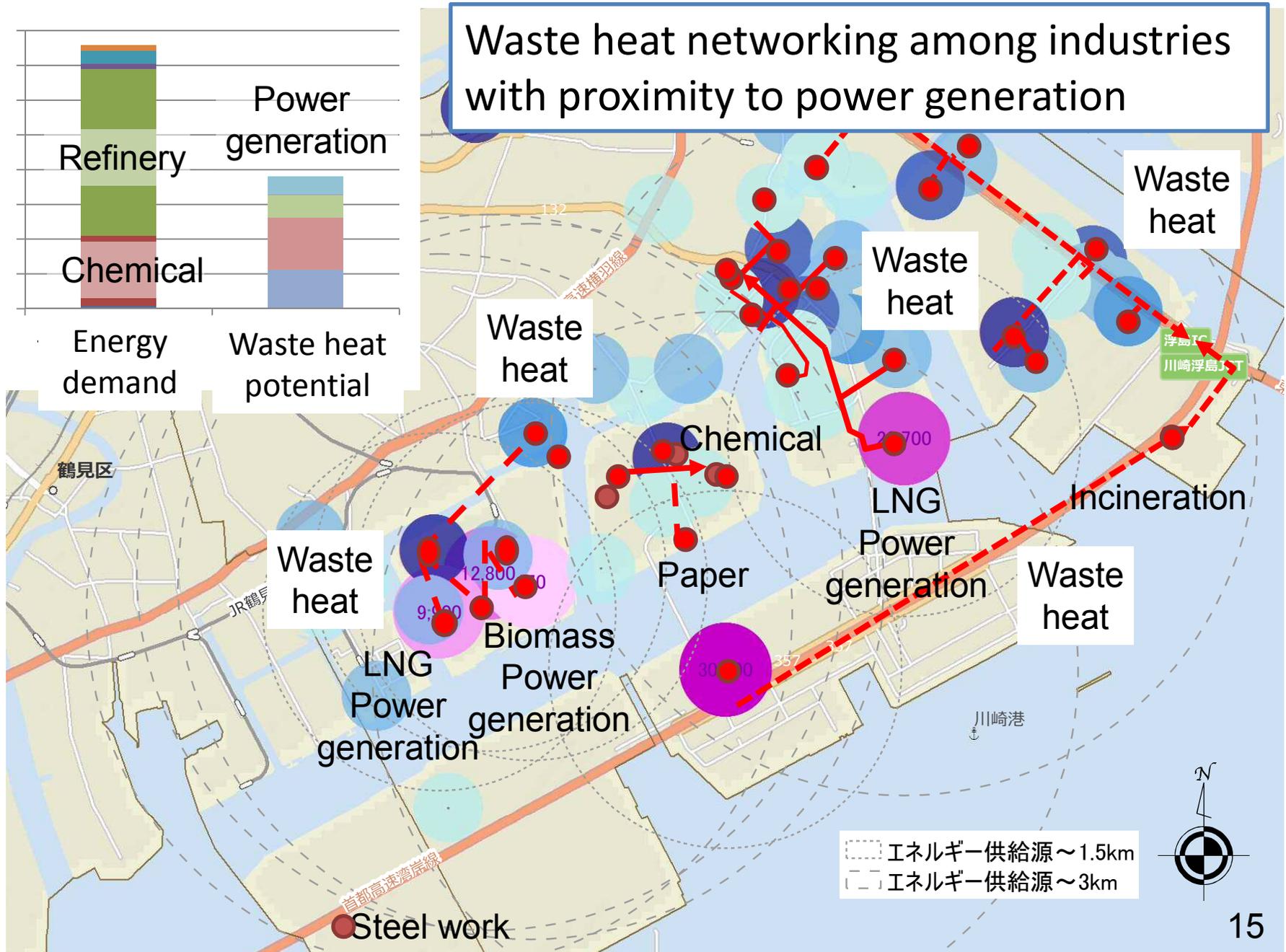
City



Kawasaki Synergy Network (Future scenario)

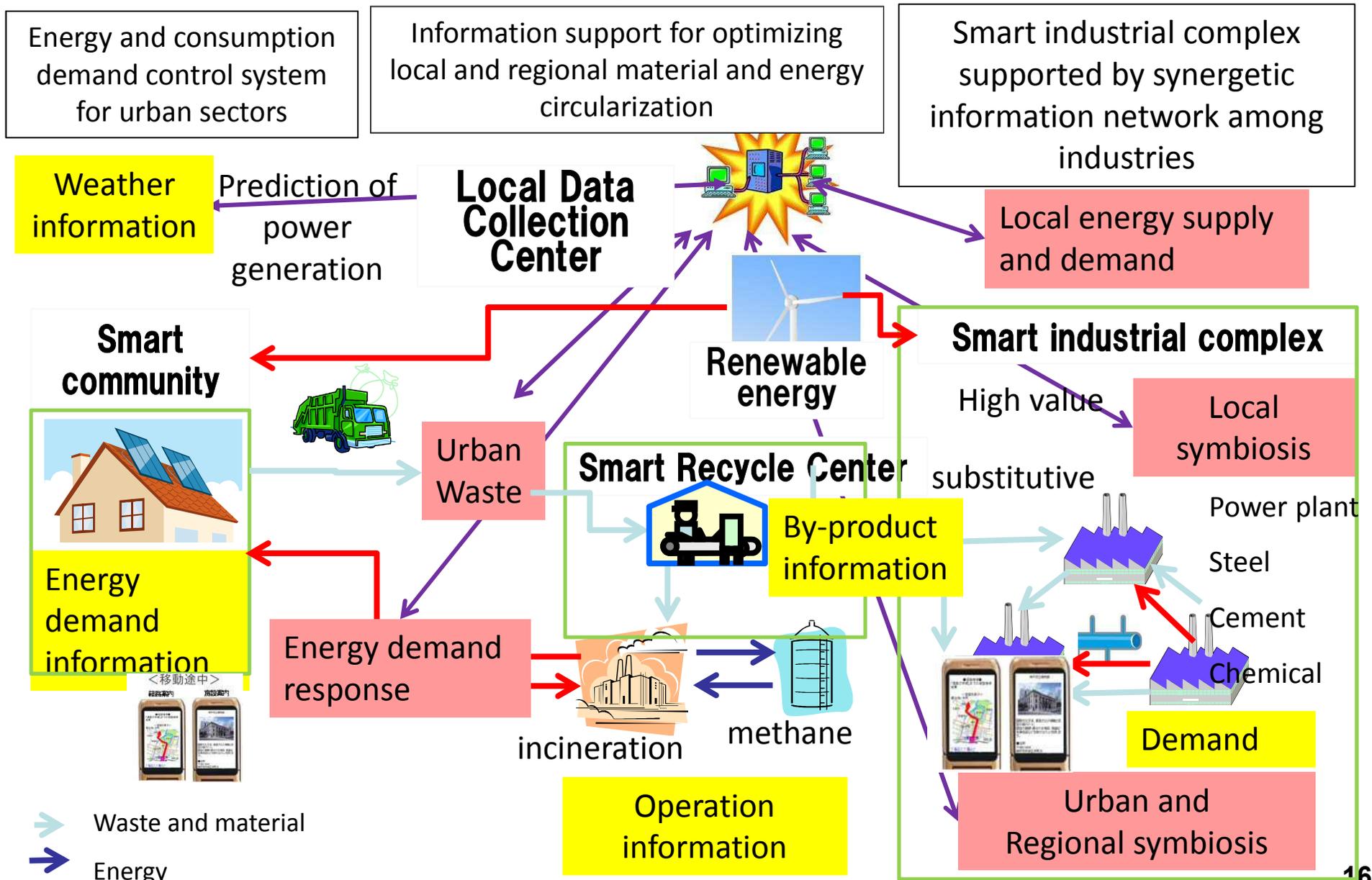


Waste heat networking among industries with proximity to power generation



Smart Symbiosis Initiatives for Eco town Innovation

Smart ICT network will promote and complement the synergetic network functions among stakeholders



Industrial Collective Monitoring System Overview Image

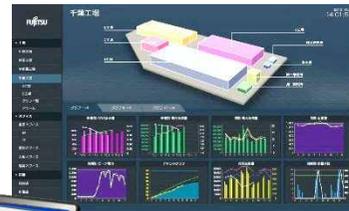
1. Selecting monitoring points

The points expecting large energy saving are selected based on site survey

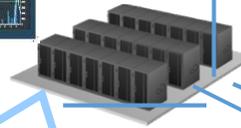


Stakeholders meeting

2. Monitoring of facilities / factories



Urban Area



Cloud server

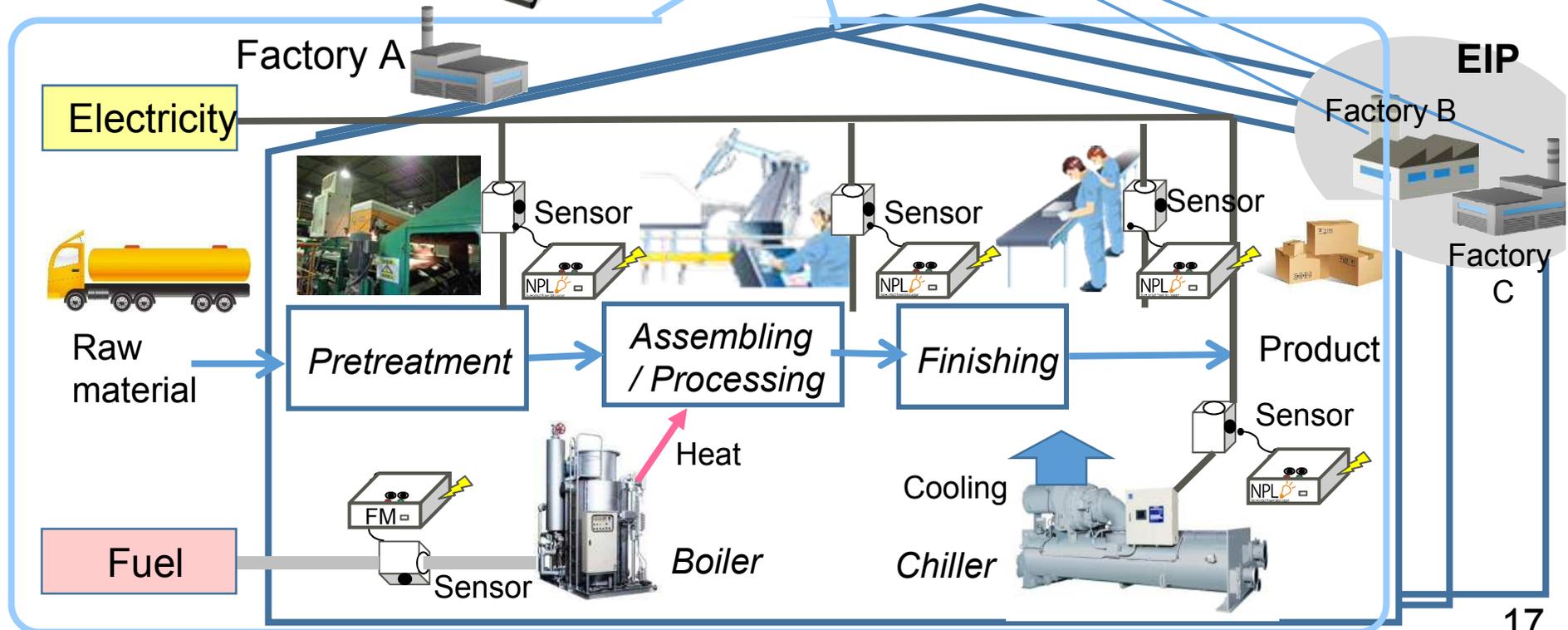
3. Data analysis and solution design

Factory scale solution

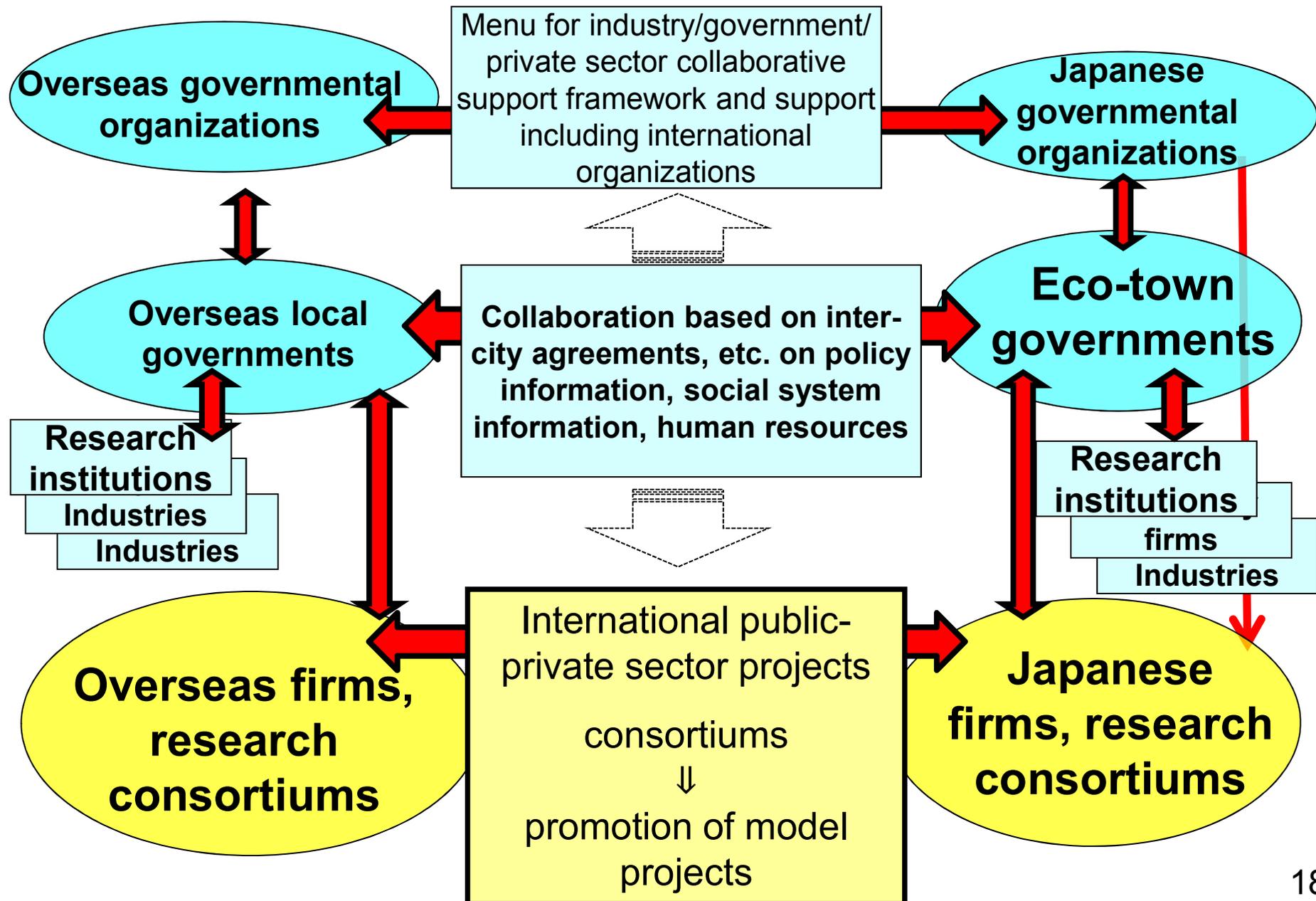
EIP scale solution

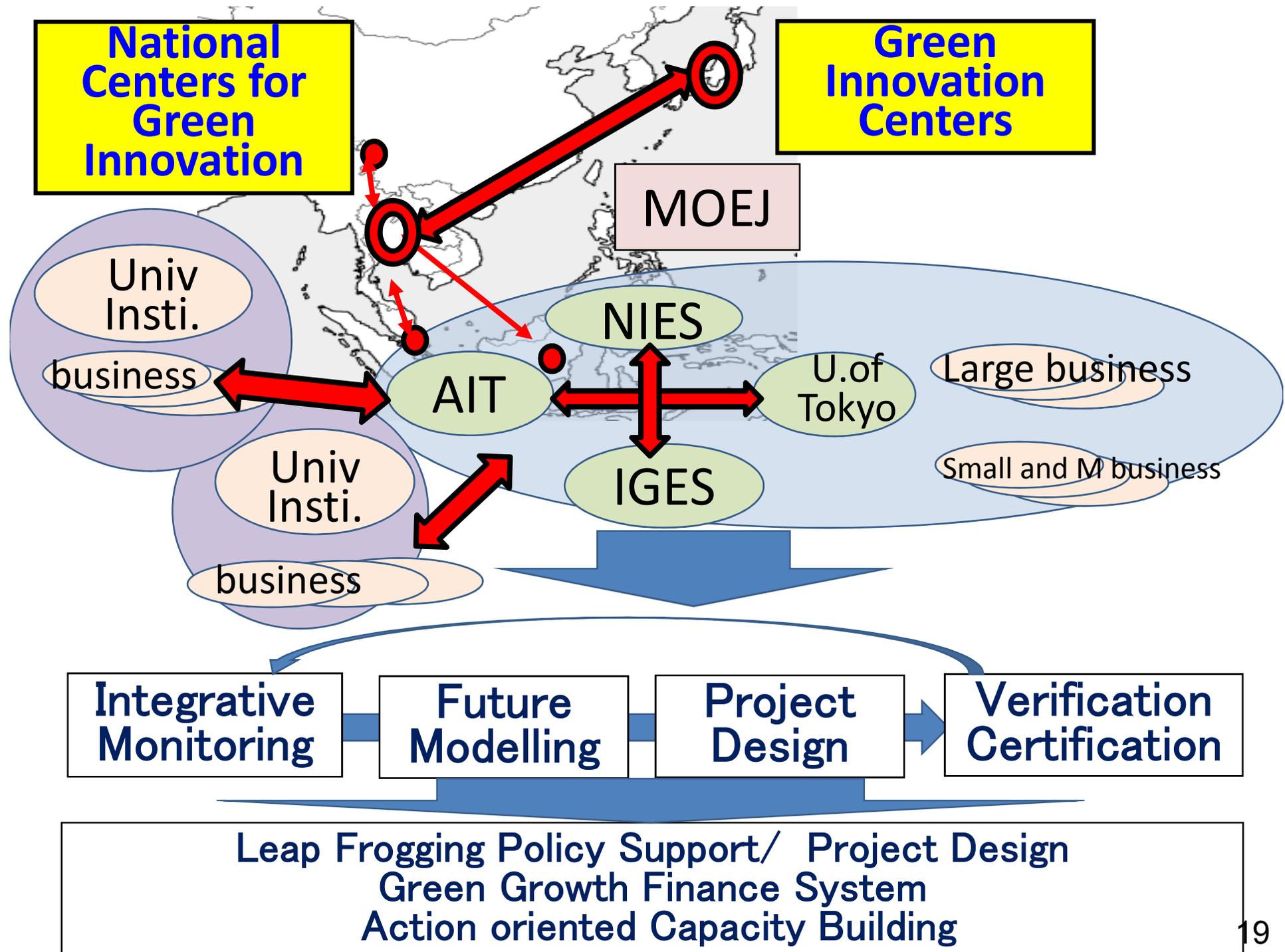
Region scale

#Monitoring device is used for verification after implementation



Promoting Projects between Japan and Overseas through “Eco-town” Collaboration





Related Papers

- X. Chen, T. Fujita, et.al.; The Impact of Scale, Recycling Boundary and Type of Waste on Urban Symbiosis: An Empirical Study of Japanese Eco-Towns, Journal of Industrial Ecology, 2012
- Satoshi Ohnishi, Tsuyoshi Fujita, Xudong Chen, Minoru Fujii; Econometric Analysis of the Performance of Recycling Projects in Japanese Eco-Towns, Journal of Cleaner Production, (modified), 2011
- 藤田壮; グリーン・イノベーションを推進する環境都市システム, 環境情報科学, Vol.40(3), pp.46-51, 2011
- 藤田壮; 地域循環圏とその拠点形成の展開に向けて, The Circular Regions and its Deployment of Base Formation, 季刊「環境研究」, 公益財団法人日立環境財団, pp.12-18, 2011
- T. Fujita, et.al.; 3-2 Regional Management of Waste Circulation and Eco-Industrial Networks, Establishing a Resource-Circulating Society in Asia: Challenges and Opportunities, pp.1-24, UNU Press, 2011
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- 藤田他共著, 環境科学, 6章「循環型社会」, pp.162-173, 専門基礎ライブラリー, 実教出版, 2006
- 大西, 藤田他; 循環型産業システムの計画とその環境改善効果の算定 - 川崎エコタウンにおける循環セメント事業のケーススタディ - 環境システム研究論文集, Vol.33, pp.367-376, 11, 2005
- 藤田, 盛岡通他; 循環型の産業集積開発事業の計画と評価, 環境システム研究論文集, Vol.28, pp.285-293, 2000 20