9th Asia pacific eco-business forum in Kawasaki
2013.1.31;Eco city session

Leading toward Innovative Eco-City from Kawasaki -from Eco-town to Eco Leading City-

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Alliance Professor of Nagoya University

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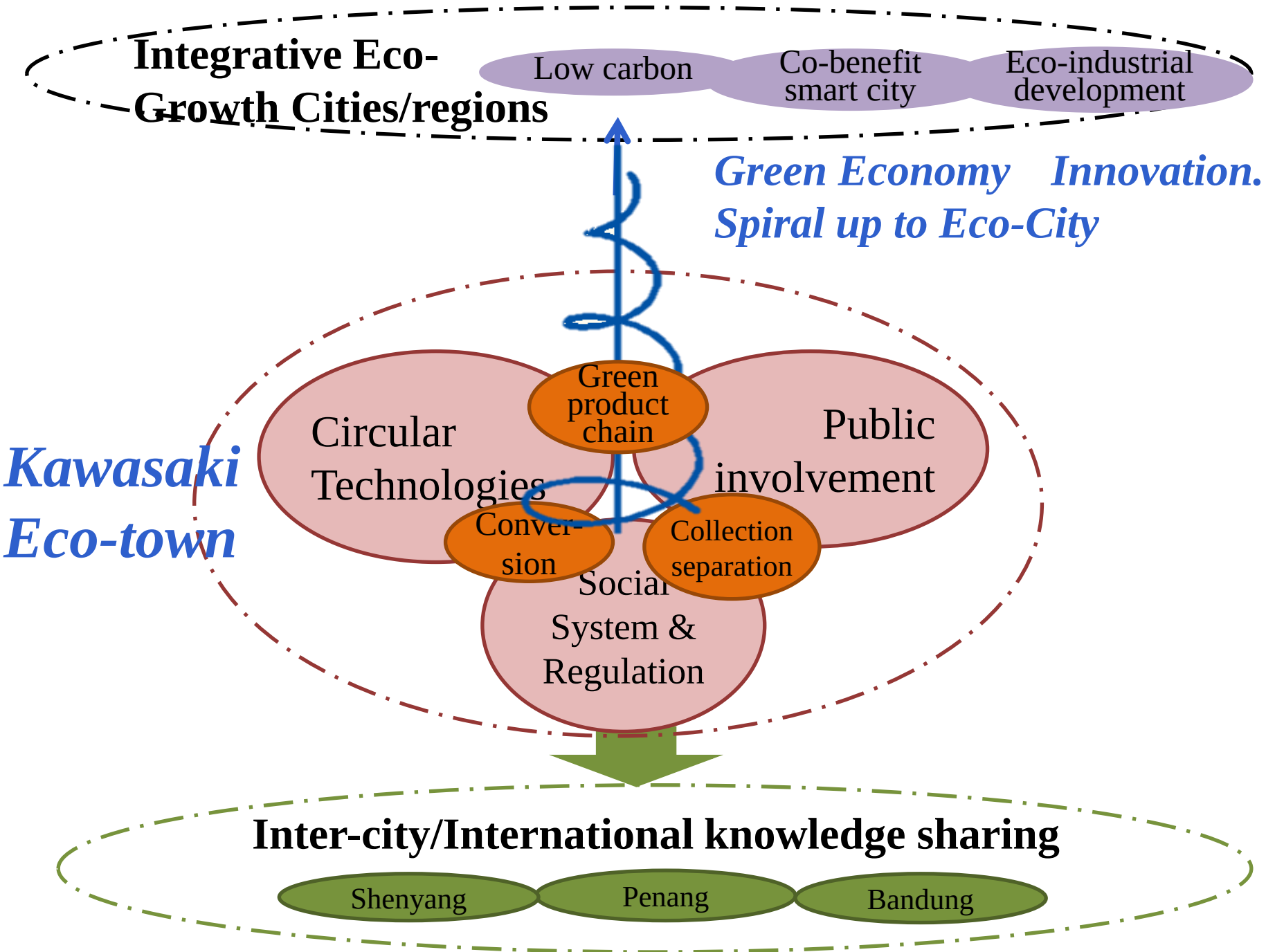

Integrative Eco-Growth Cities/regions
Low carbon
Co-benefit smart city
Eco-industrial development
Green Economy Innovation.
Spiral up to Eco-City
Kawasaki Eco-town
Green product chain
Circular Technologies
Public involvement
Conver-sion
Collection separation
Social System & Regulation
Inter-city/International knowledge sharing
Shenyang
Penang
Bandung

Contents

1. Eco-town projects in Kawasaki and Japan

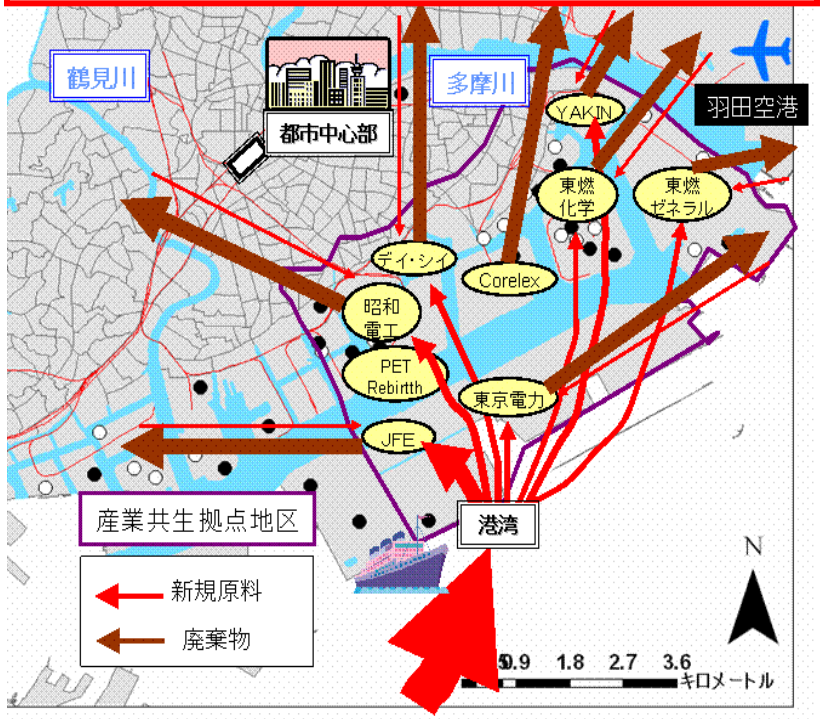
- eco-town projects from 1997
- innovative circularization system from ecotown

2.Toward Eco-city innovation from Kawasaki

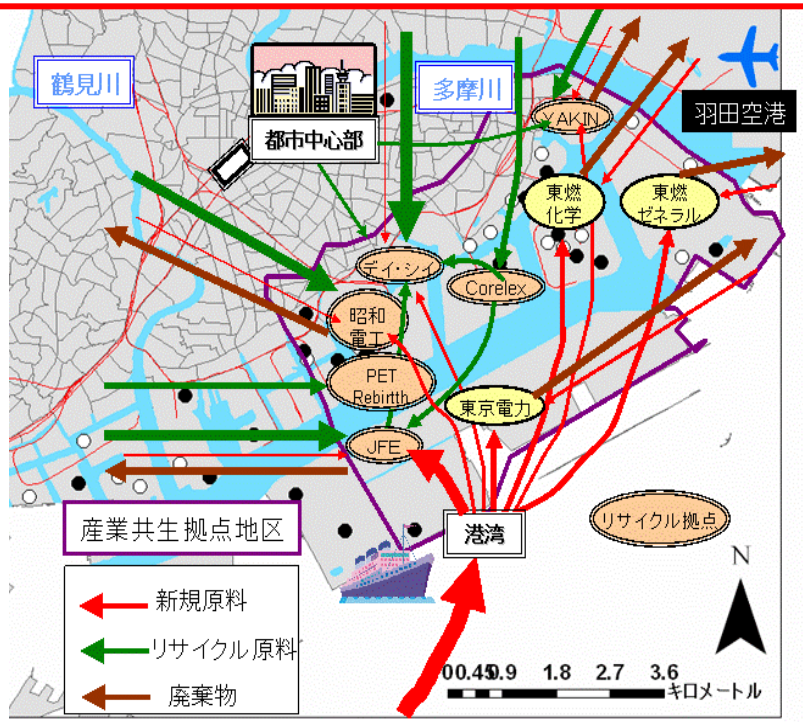
- Eco-city innovation model
- Innovation from Kawasaki ①
  （from circularization to production chain）
- Innovation from Kawasaki ②
  （from smart building to smart city）

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

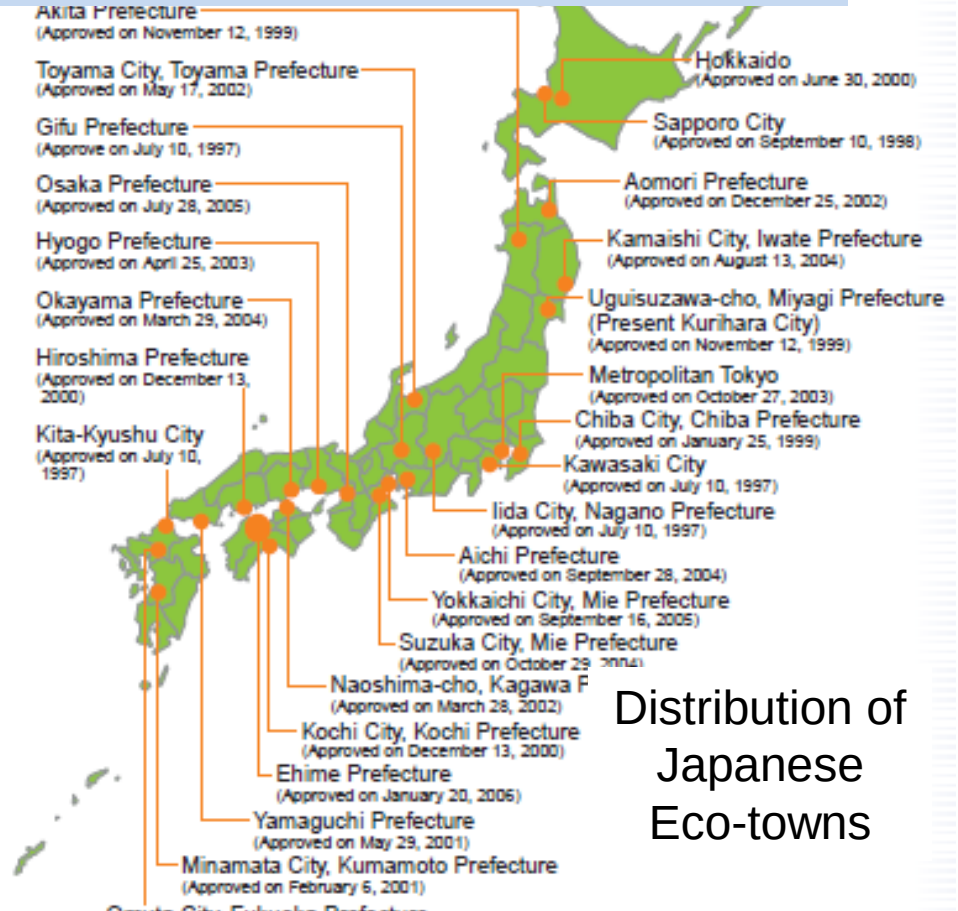
Recycle materials: Use of recycle materials mainly provided from outside the city

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



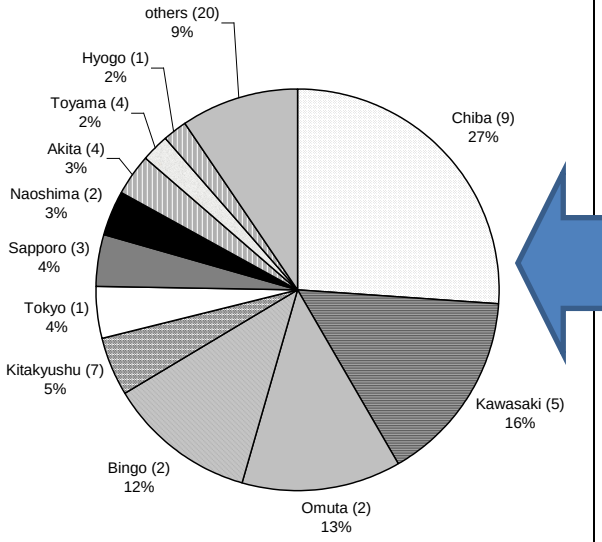
Distribution of Japanese Eco-towns

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

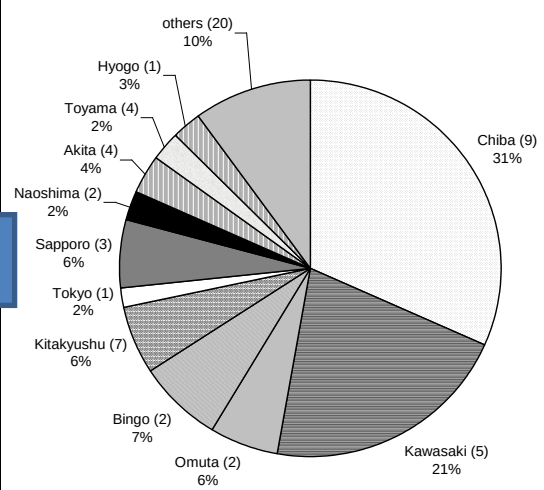
Eco-town Areas as demonstration projects of circular technologies; Berkel and Fujita et. al (2009)

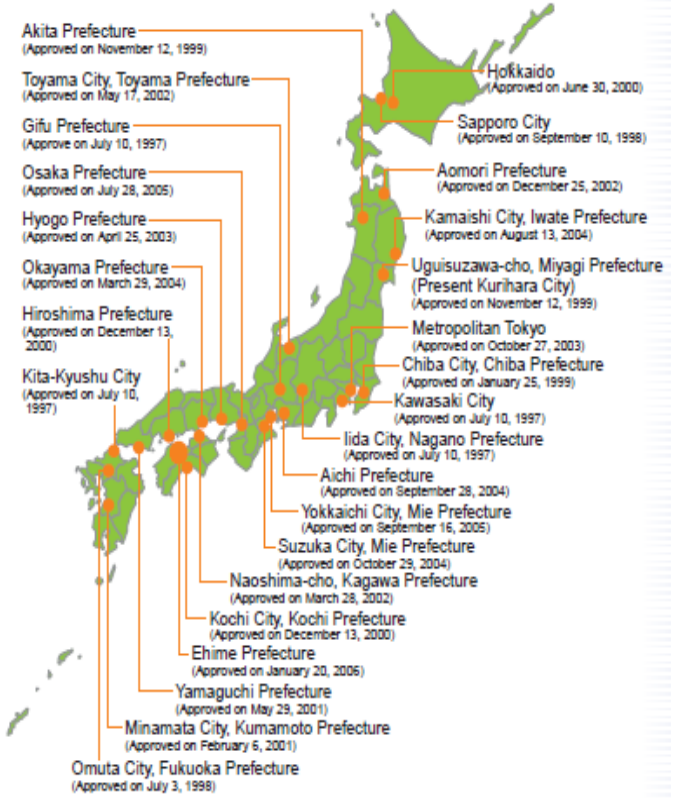
The Ministry of Economy, Trade and Industry and the Ministry of Environment approved Eco-Town Plans for 26 areas as of the end of January 2006, and they provided financial support to 62 facilities located within the appropriate areas.

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



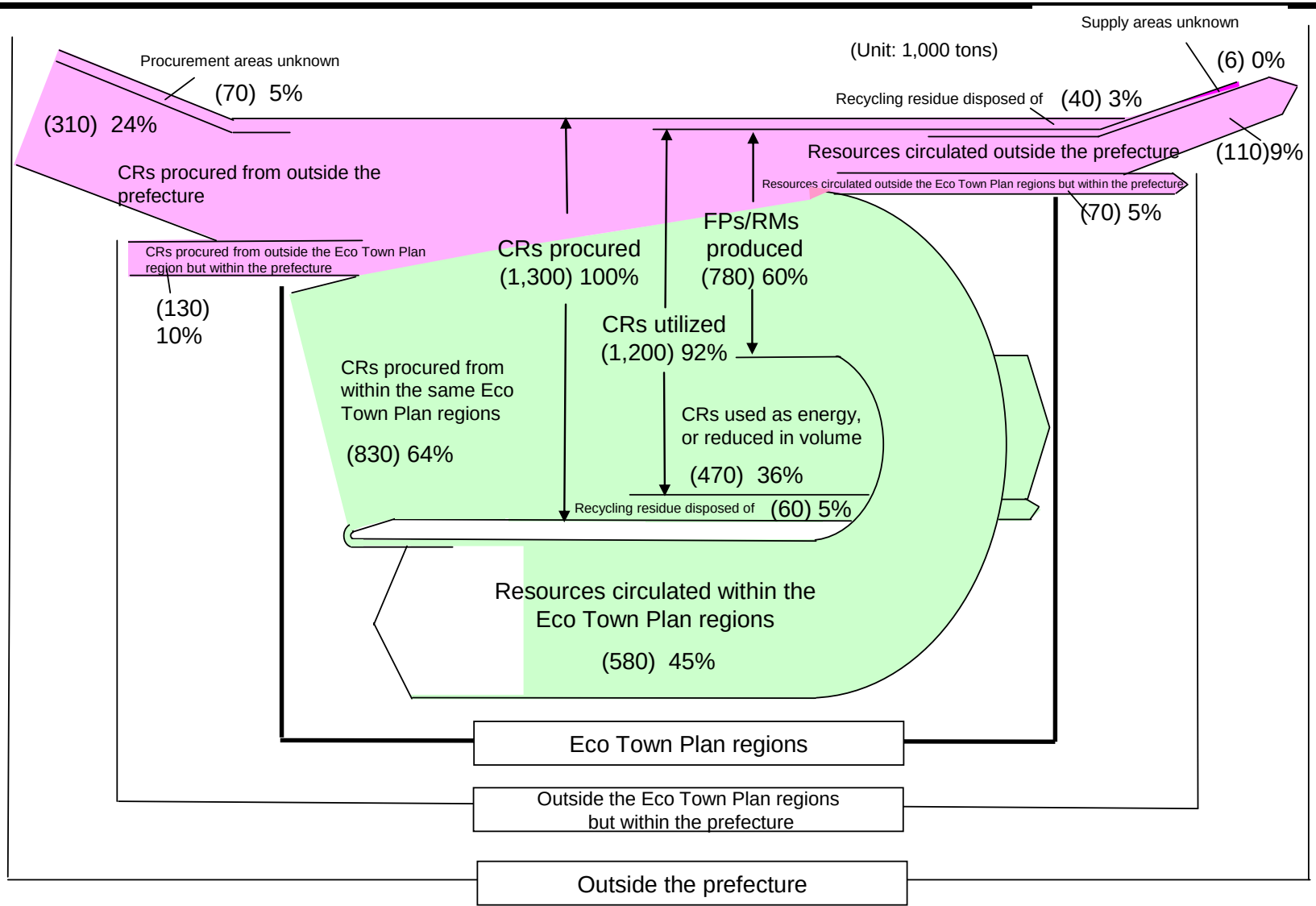
Distribution of Total Investment
Subsidy projects in 24 Eco-Towns
60 billion JPY or **600mil. US$**





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%

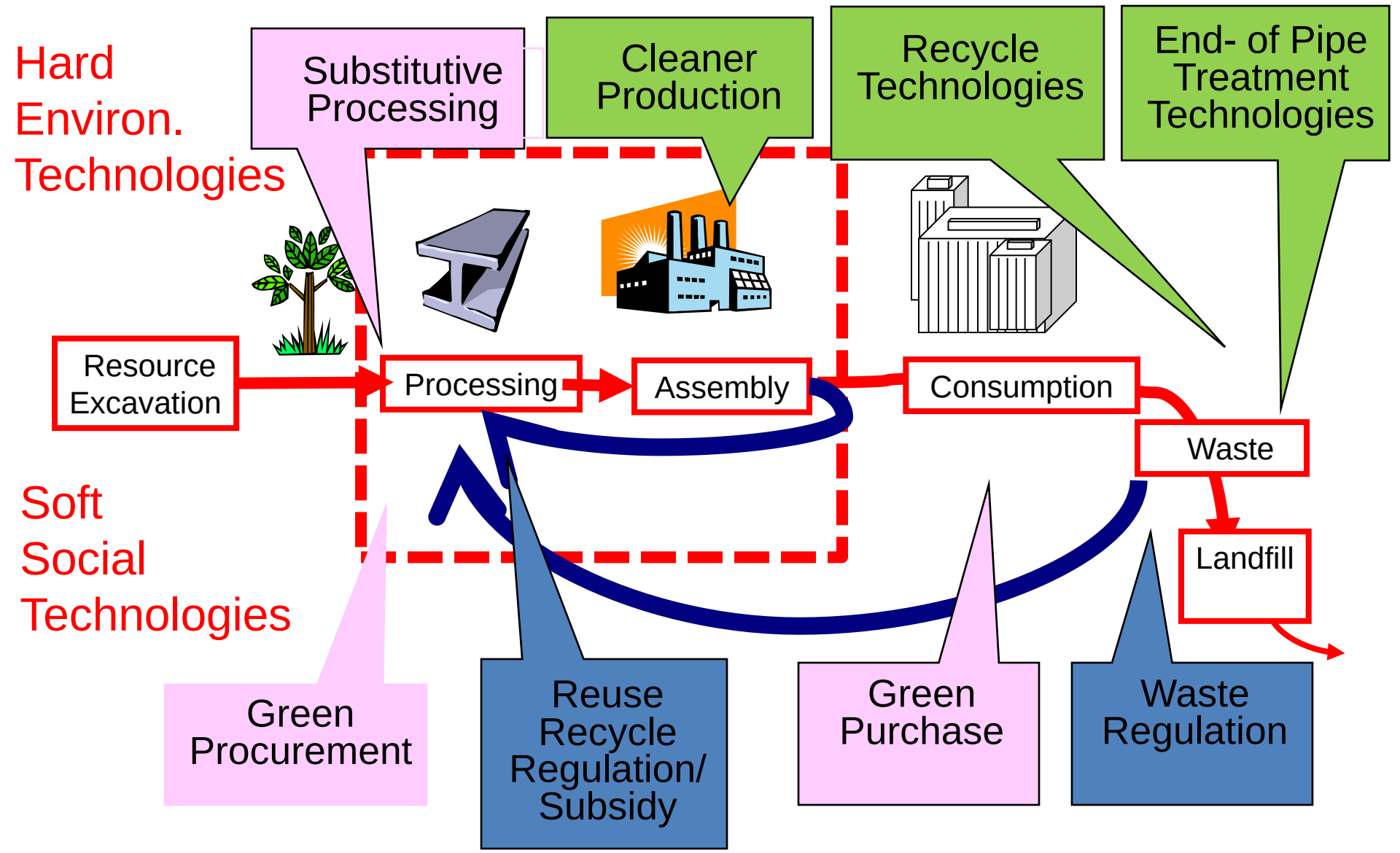


Accomplishment from eco-town

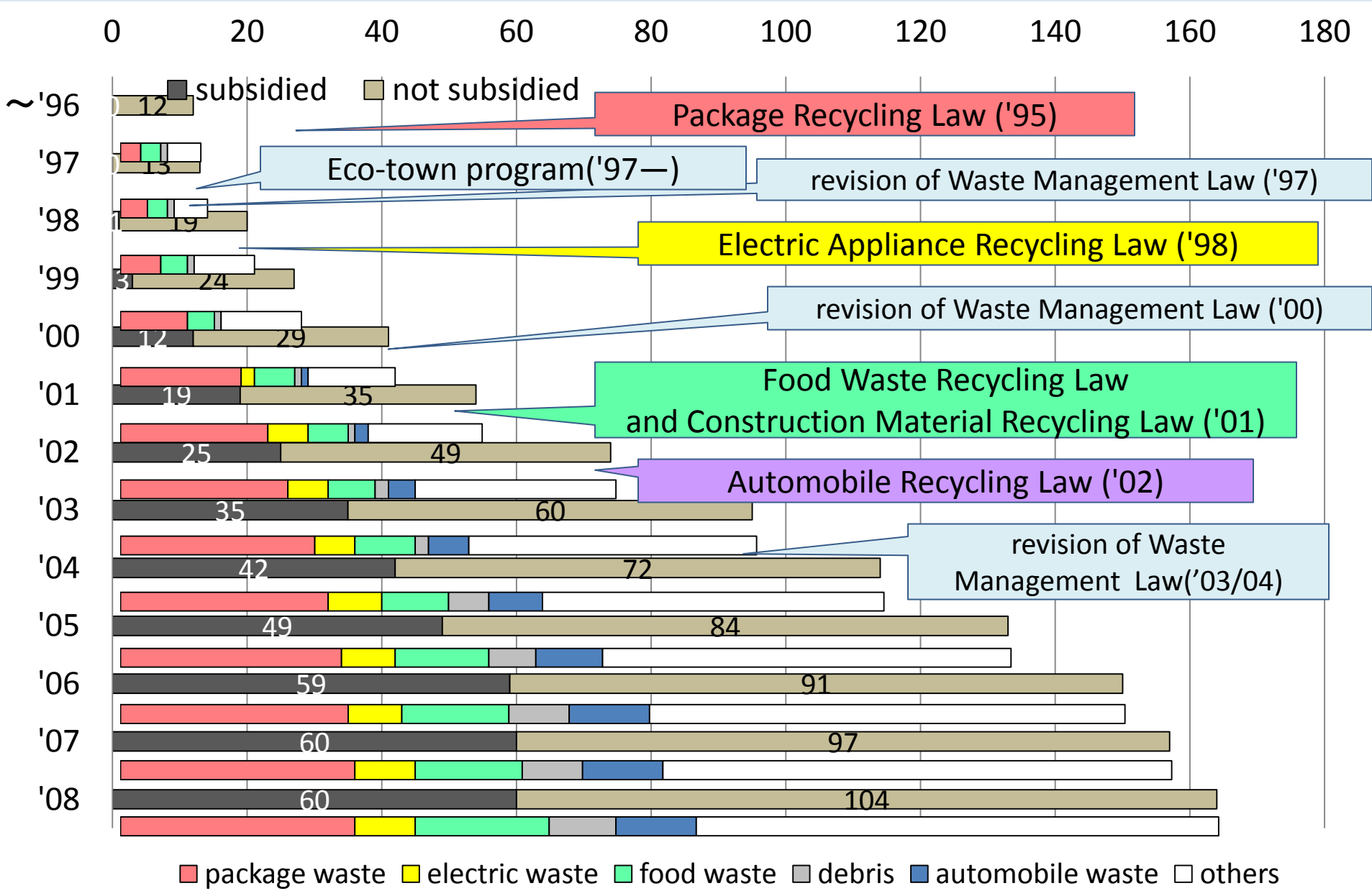
(1)Social system to promote the circularization of wastes and recycle

(2)Agglomeration effects of material industries and circularization industries

Alternative technologies for circular economies; resource circulation

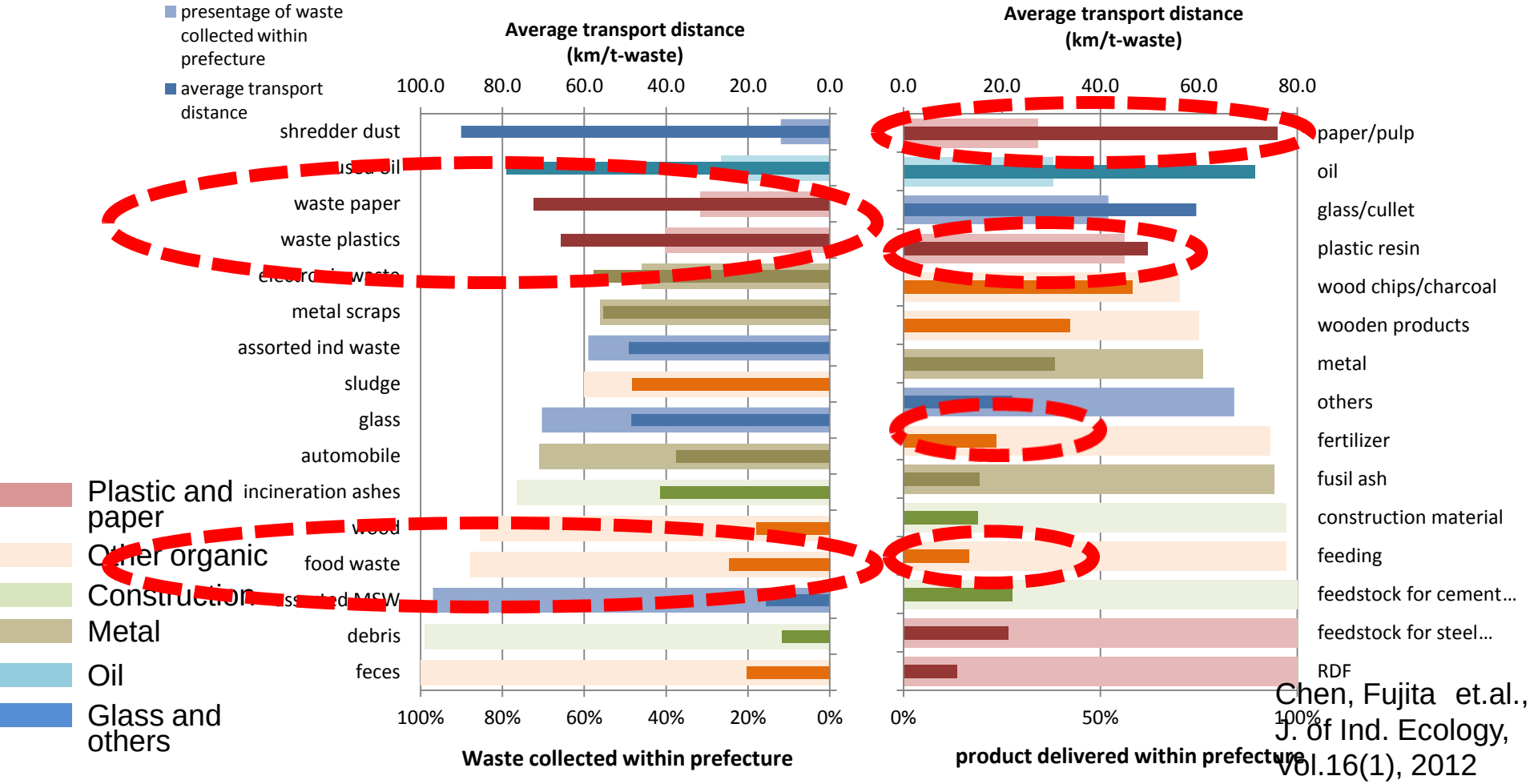


Recycle Facilities in 26 Eco-towns and Legislation System for Waste Management and 3R Promotion



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



Chen, Fujita et.al., J. of Ind. Ecology, Vol.16(1), 2012

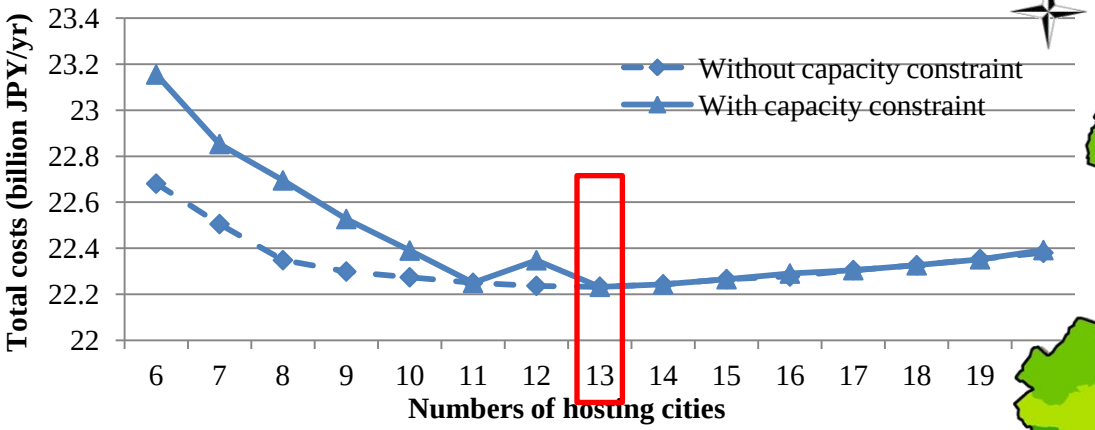
Accomplishment from eco-town

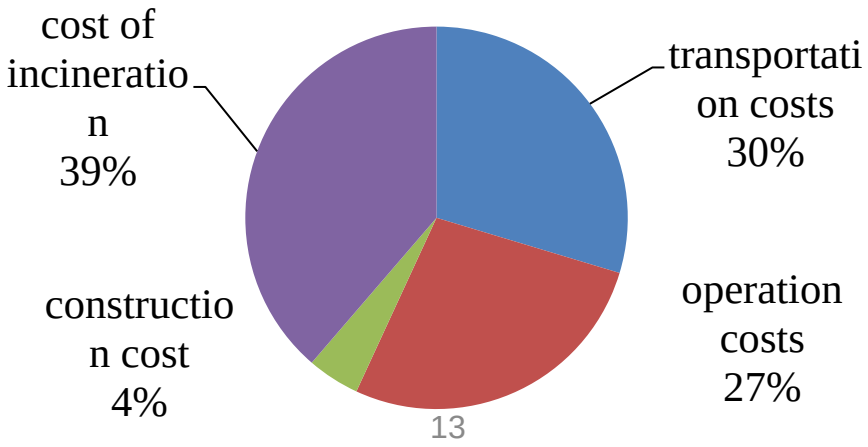
(1)Social system to promote the circularization of wastes and recycle

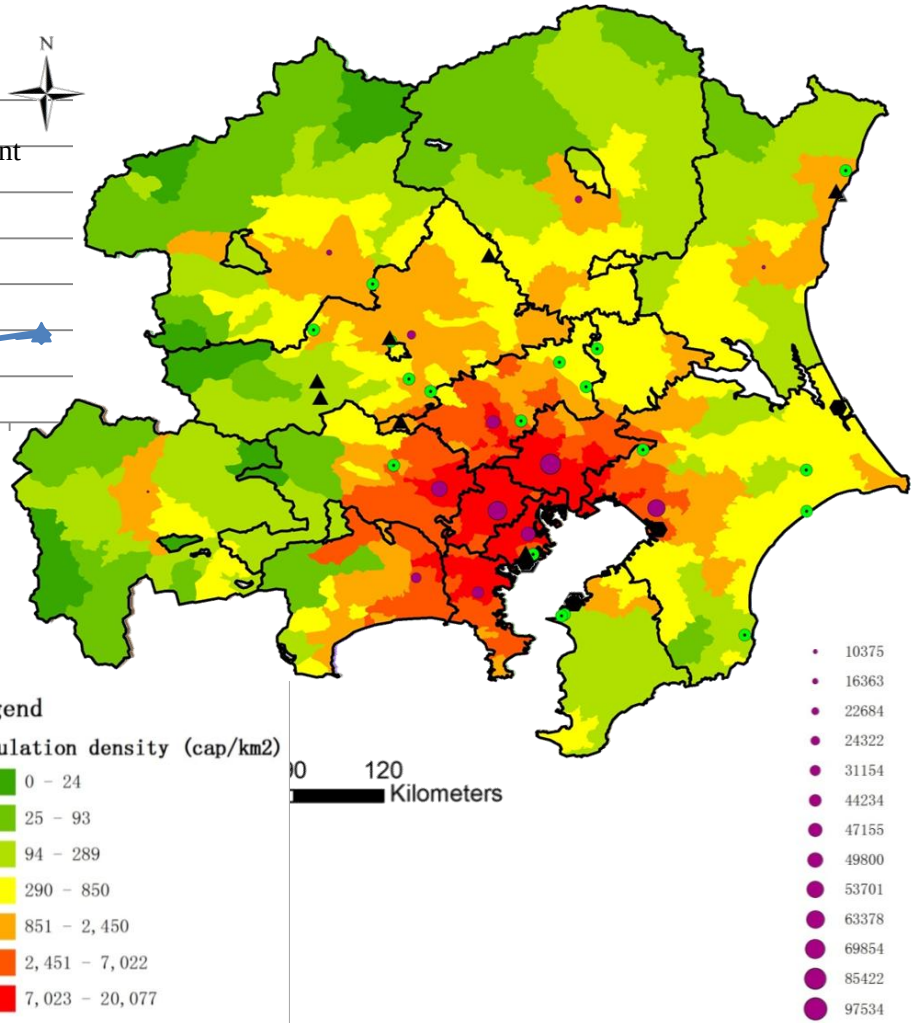
(2)Agglomeration effects of material industries and circularization industries

Modeling results: Cost and scale

- Example model outputs:
  - Results of the standard scenario in 2025
- Over 1/3 cheaper than new pre-treatment facilities built in each municipality





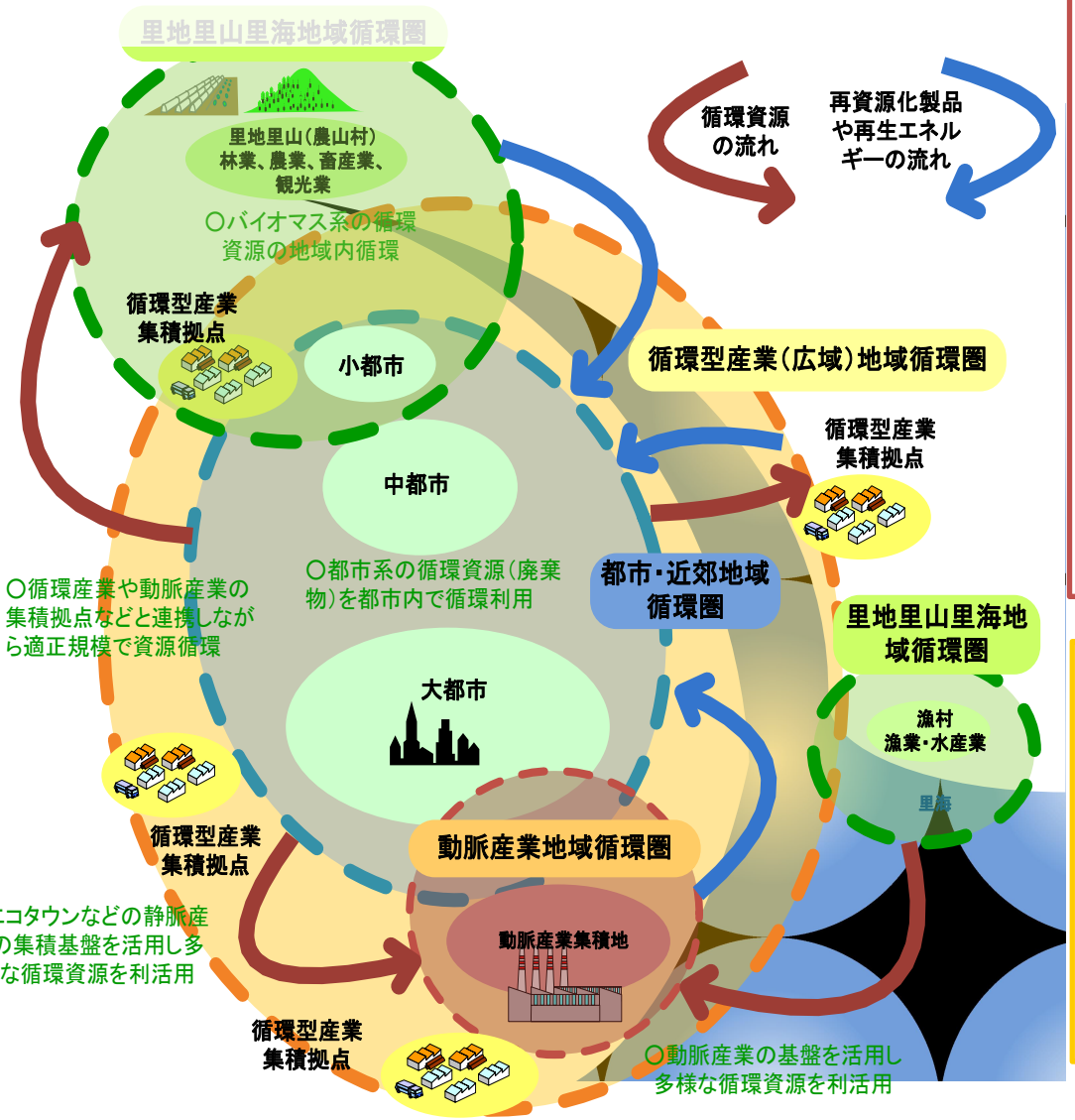


Design methodology for cities and regions with appropriate circularization system

地域の循環社会基盤（資源再生・処理施設、循環型動脈産業施設）の立地・集積と廃棄物の発生分布など地域特性を活かす地域循環圏の整備による重層的な「循環の環（わ）」

（1）里地里山里海地域循環圏
農山漁村を中心とした循環圏で、農村水産業に由来するバイオマス資源の地産地消的な利活用を推進する。

（2）都市・都市近郊地域循環圏
人口集積の多い都市エリアでは多種多様な循環資源を排出します。都市近郊の農村地域の連携も含め、循環型産業集積地（エコタウン等）や動脈産業の集積エリアとも連携をはかりながら、効率的な資源循環を構築する。

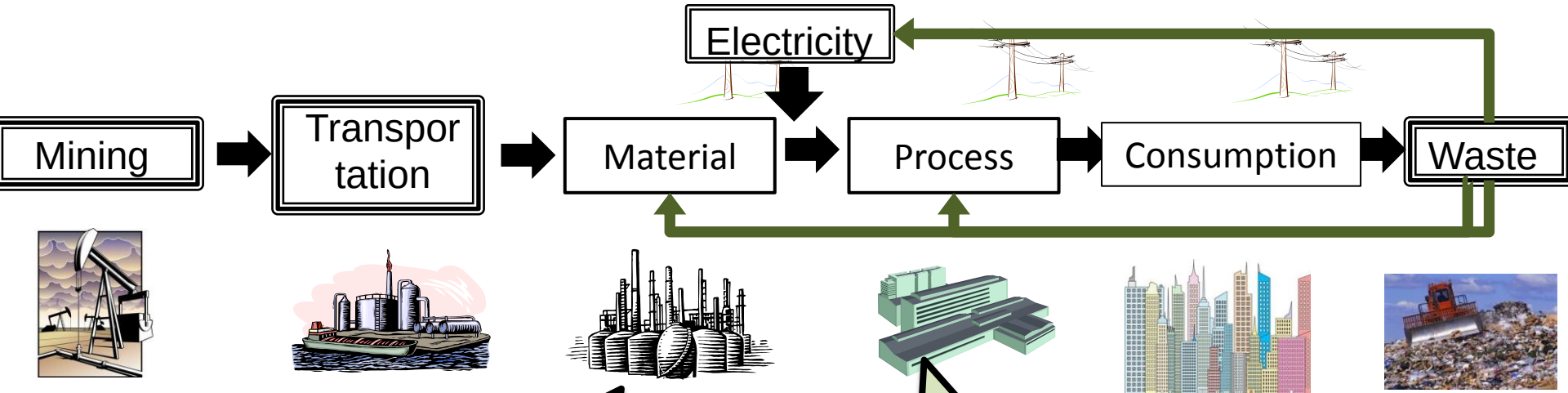


（3）動脈産業地域循環圏
セメント、鉄鋼、非鉄精錬製紙等の基幹産業の基盤やインフラをこれまで以上に活用しながら、循環資源を大量に抱えもつ大都市エリアとの物流システム等を高度化せ、より効率的な循環システムの構築やエネルギーの利活用システムを高度化。

（4）循環型産業（広域）地域循環圏
小型の廃家電リサイクルなどを、動脈産業地域循環圏との連動をはかりながら、レアメタルの回収などで優位性の持つシステムを形成。

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



Co-processing, Heat/energy recovery **resource circularization in the region**

Cleaner production Design for Env. **Green purchasing**

Green/regional consumption Regional credit

Red stand for social system

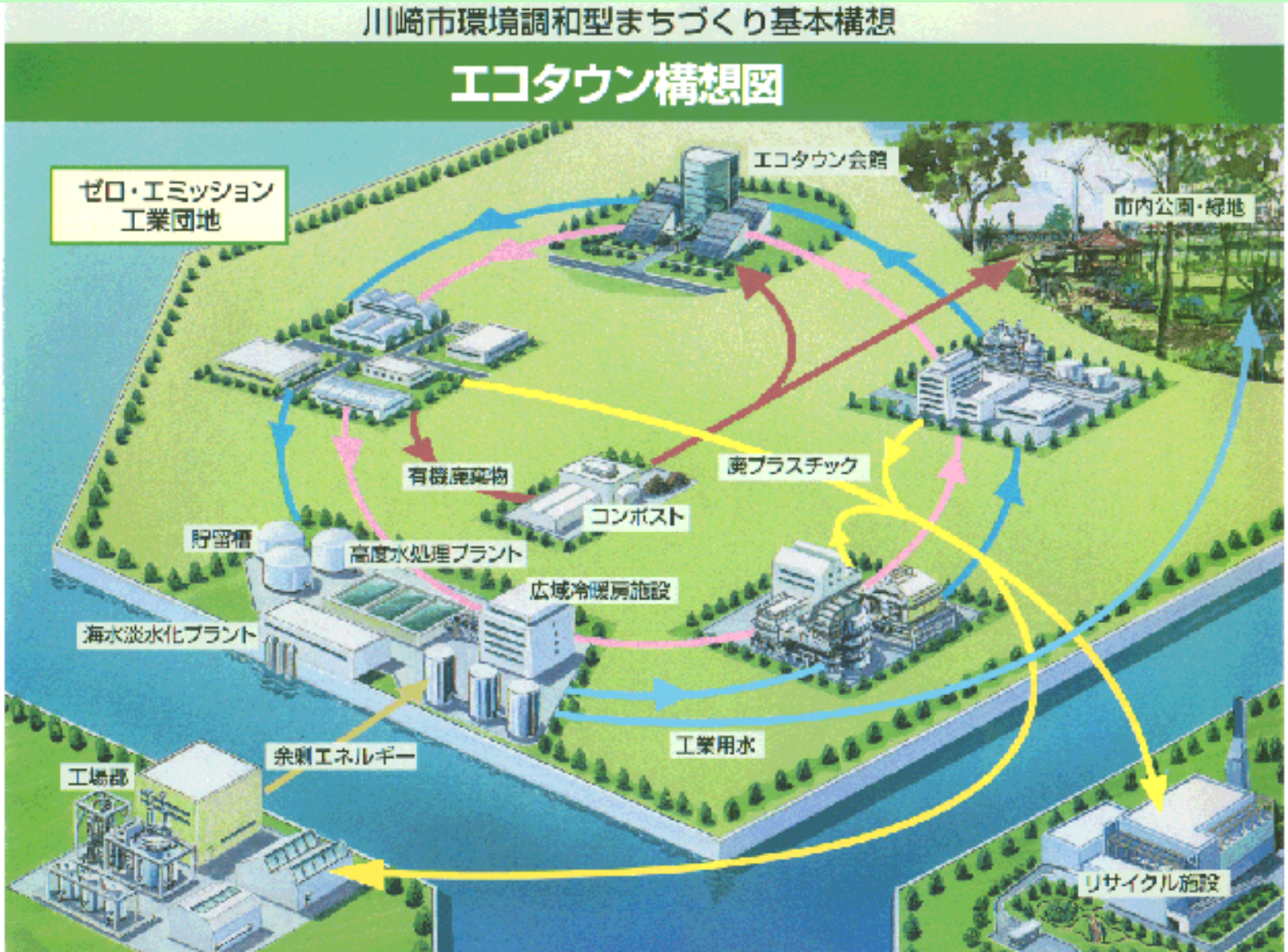
Logistic for circularization/Monitoring system

Green supply chain management in integrated urban and regional area

Contents

Industrial Symbiosis and Urban Industries to empower cities by circularization

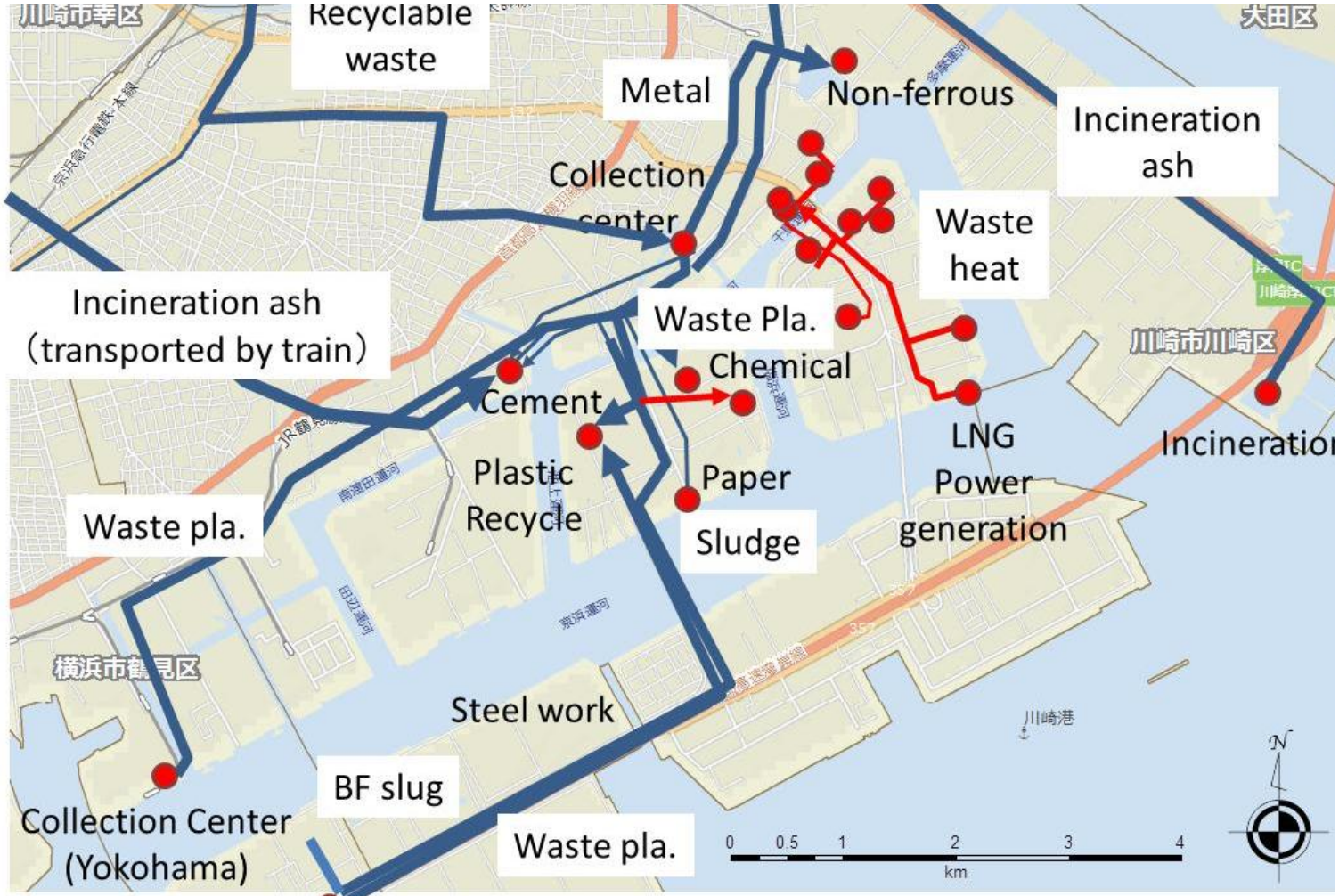
(Kawasaki and Kitakyushu are pioneers in 1997→26 cities)



17

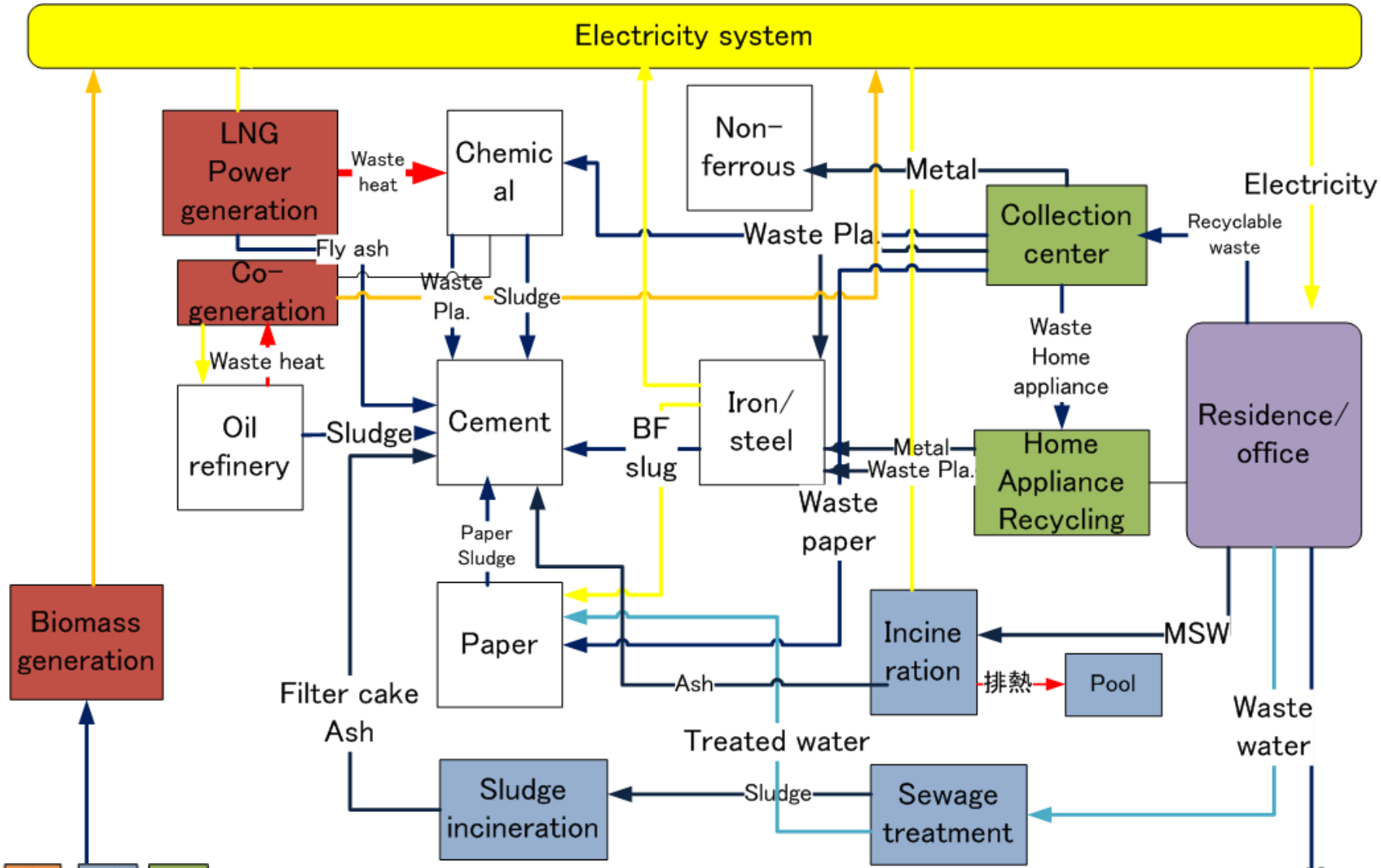
Accumulation Effect by IS; 2.accumulation effect in Kawasaki Eco-town

Accumulation of material (arterial) industries and recycling (vein) industries with geographical proximity enables Eco Town district to establish material and energy circularization. This collaboration has made a variety of wastes and by-product exchange in this district and industrial waste exchange from other region be possible.



Kawasaki Synergy Network（current situation）

Bio/life science | Power generation & material industry | Treatment or recycling facility | City

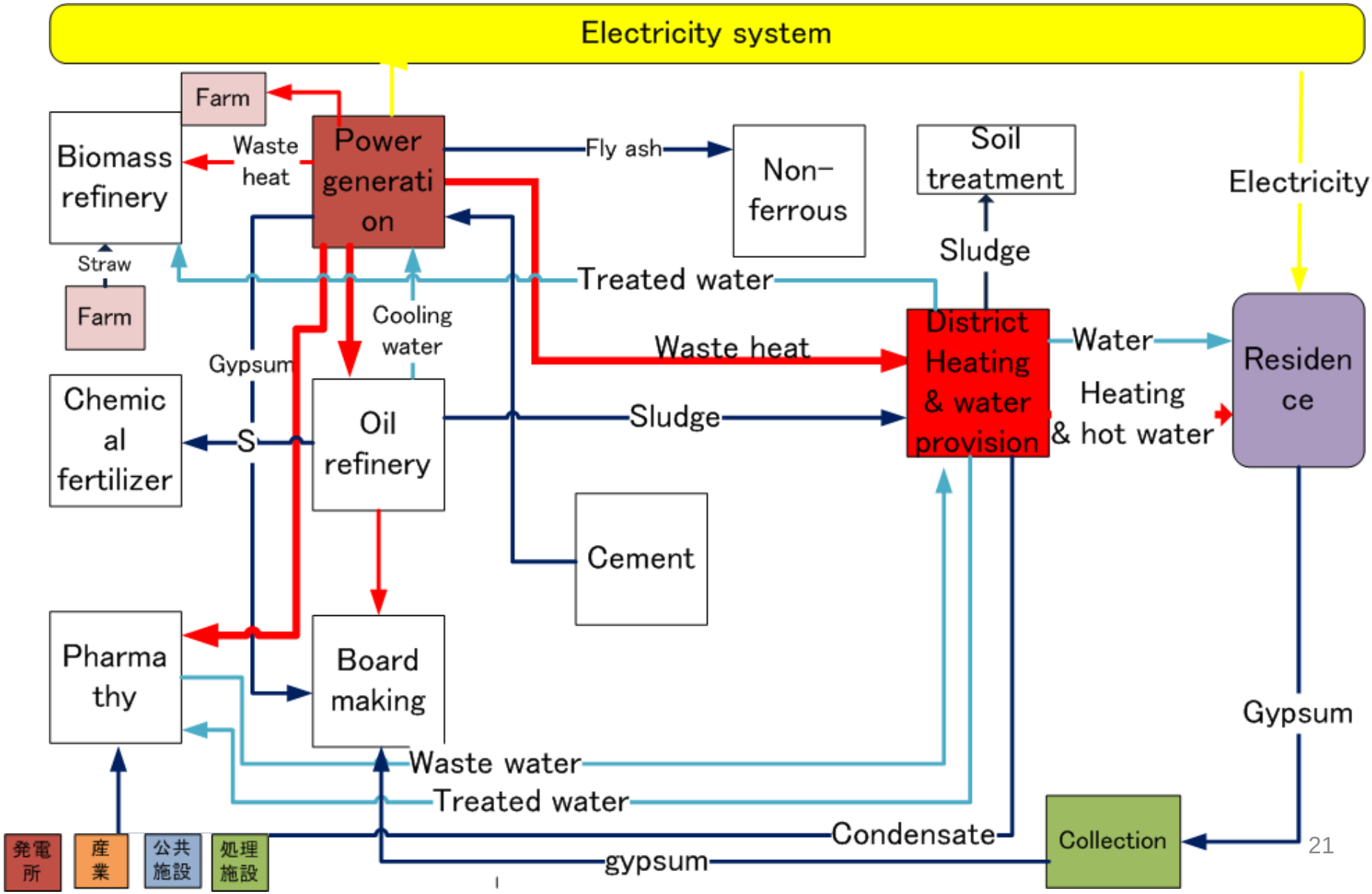


Industrial Symbiosis in Kalundborg, DENMARK
カルンボー市（デンマーク）の産業共生

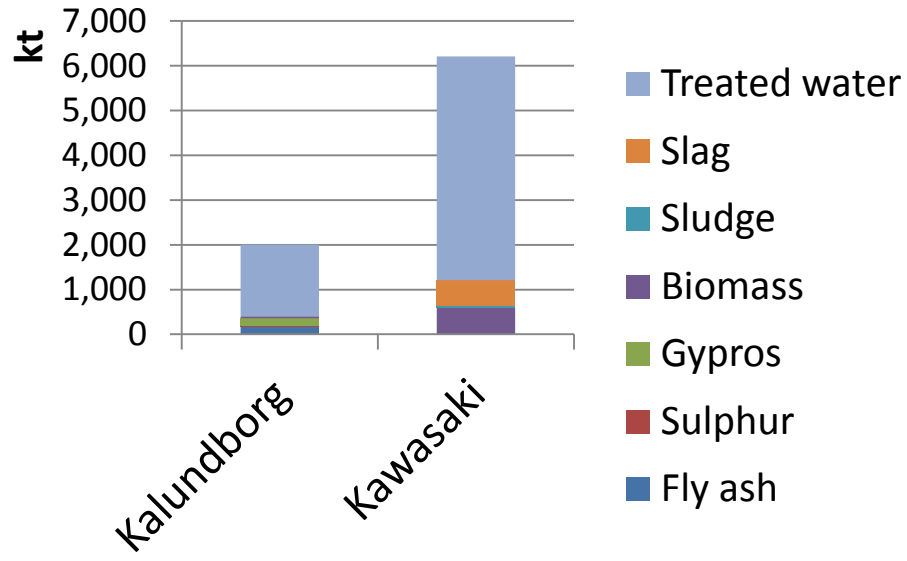
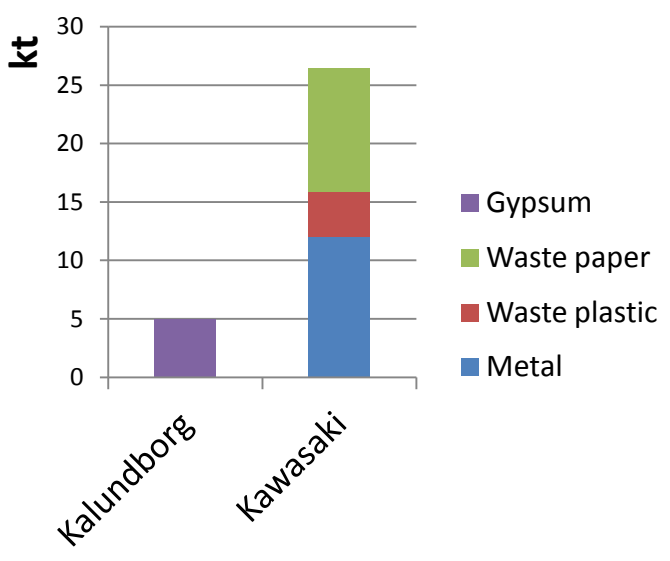
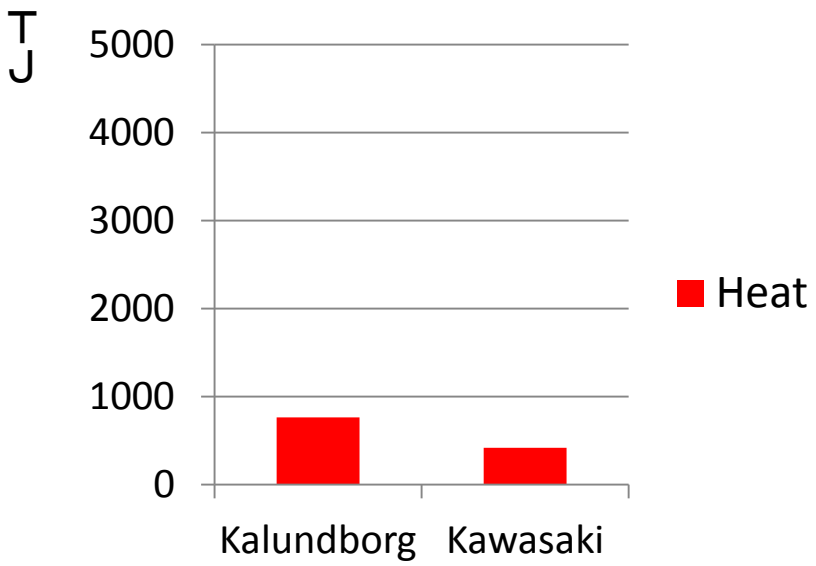
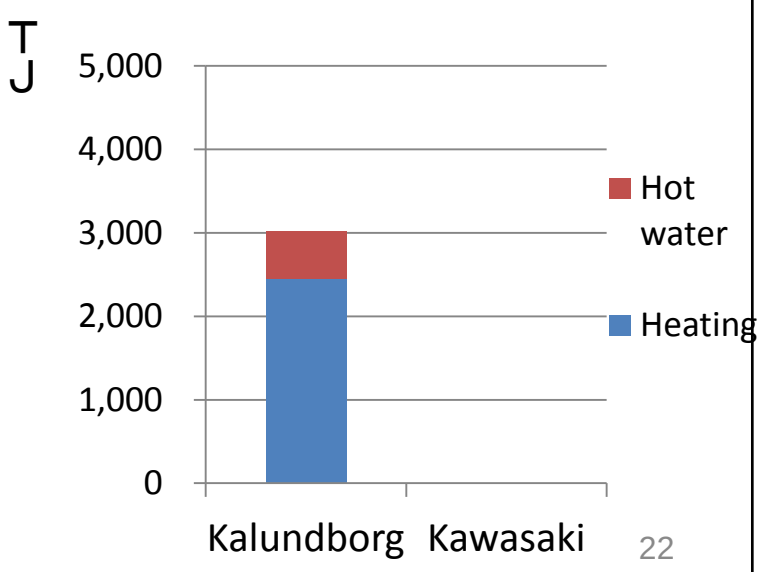
コペンハーゲンから約100km、人口：市街地16500人、市域：48000人
火力発電所を中心とする、異業種間の廃熱、副産物利用ネットワークを先駆的に形成

Industrial symbiosis in Kalundborg

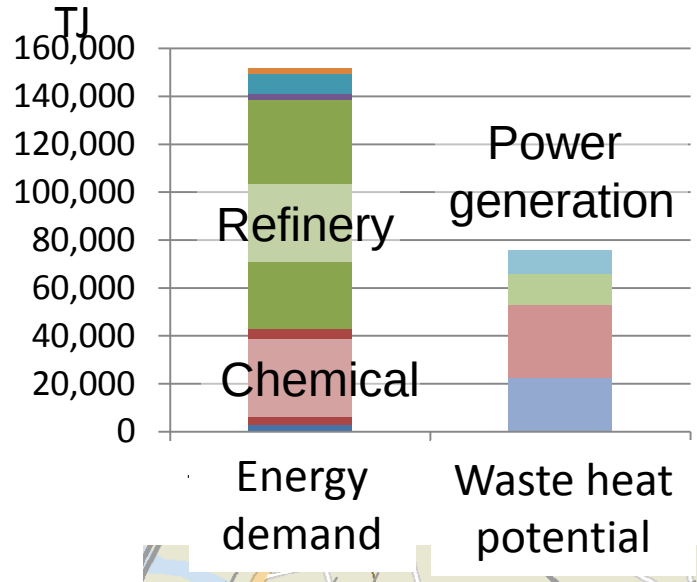
Bio/life science | Power generation & material industry | Treatment or recycling facility | City



Comparison between Kawasaki and Kalundborg

	Industrial symbiosis	Urban symbiosis
Water/waste/by-product		
Heat & energy		

Kawasaki Synergy Network（Future scenario）



Waste heat networking among industries with proximity to power generation

Waste heat

Waste heat

Waste heat

Chemical

LNG Power generation

Incineration

Waste heat

Paper

Waste heat

Biomass Power generation

LNG Power generation

Steel work

鶴見区

川崎港

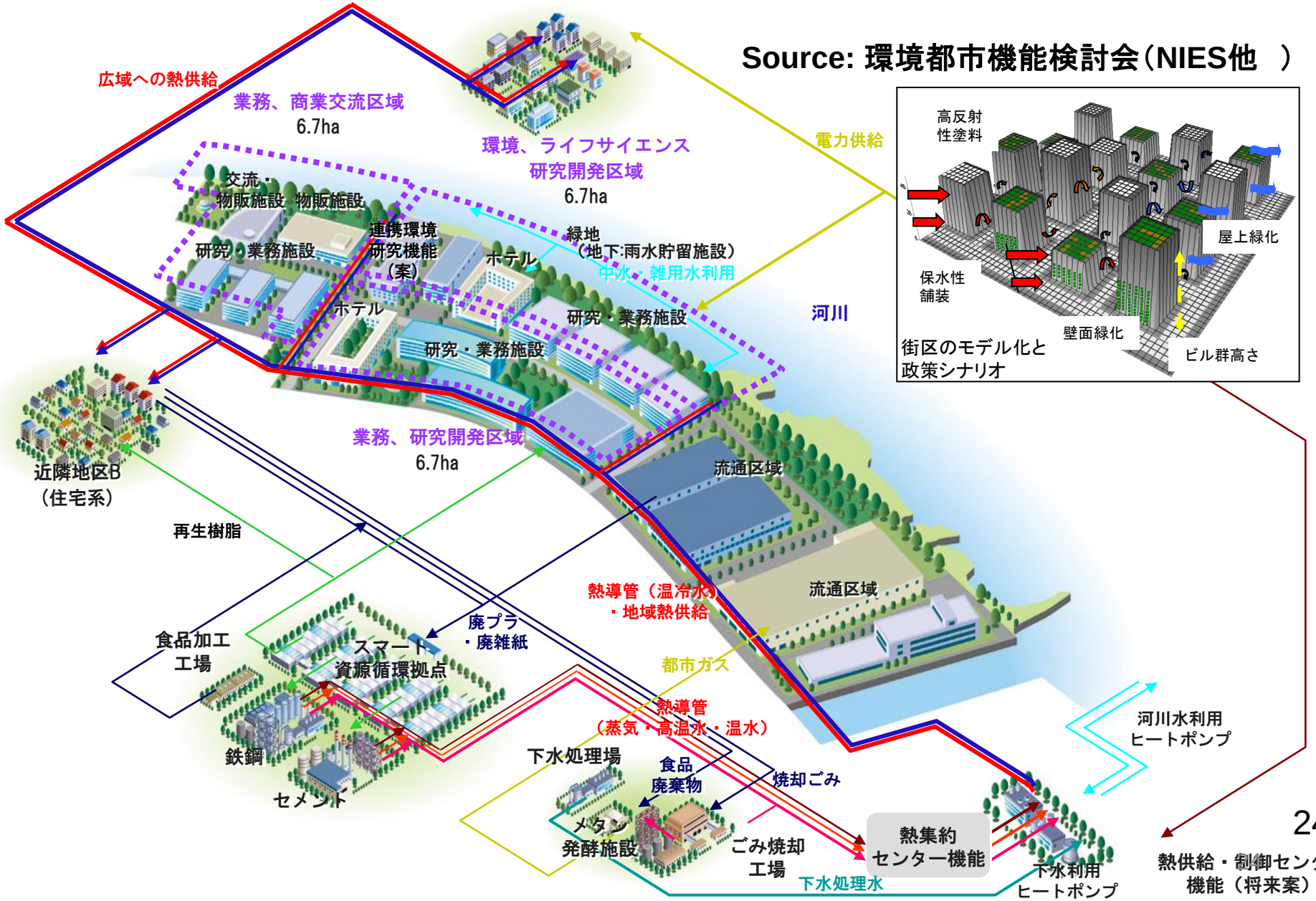
浮島

川崎浮島JCT

エネルギー供給源～1.5km

エネルギー供給源～3km

Image of low carbon and energy model district by collaboration between industry and city

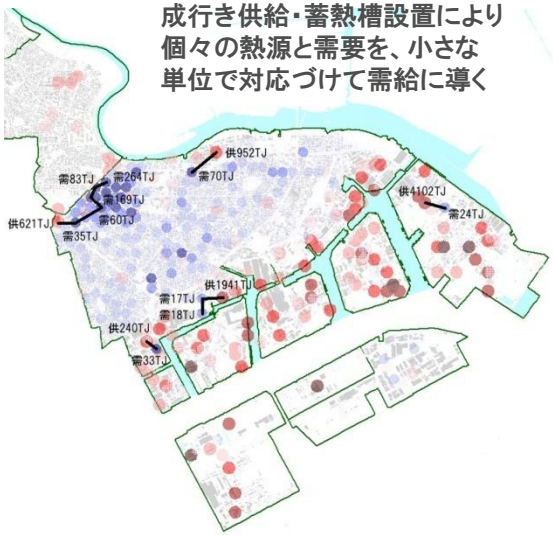


Energy symbiosis network planning in Kawasaki City

■ 熱需要と熱源のマッチングには、個別対応・ネットワーク化・需要操作等による多様な組合せが考えられる。
自治体の特性に合せてマッチングのタイプを整理し、分析シナリオを構築してポテンシャル推計を行っていく。

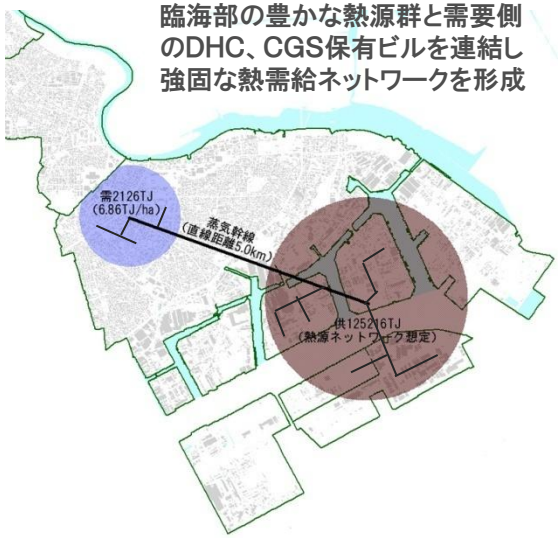
A.熱源単体＋地区・街区の組合せ

成行き供給・蓄熱槽設置により
個々の熱源と需要を、小さな
単位で対応づけて需給に導く



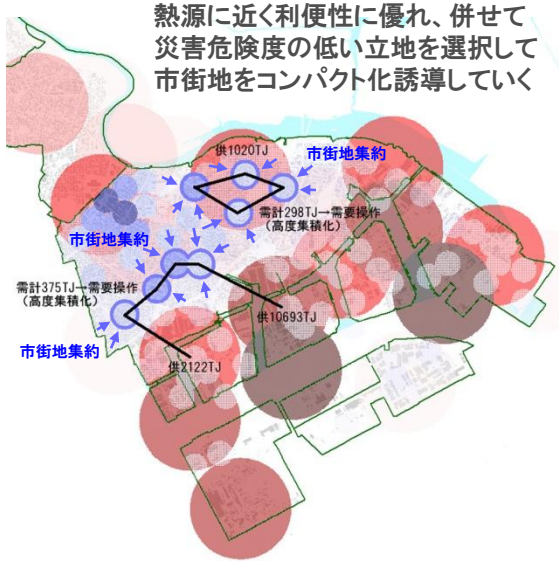
B.熱源ネットワーク＋需要地側ネットワークでの組合せ

臨海部の豊かな熱源群と需要側
のDHC、CGS保有ビルを連結し
強固な熱需給ネットワークを形成



C.需要操作（熱源側へ市街地誘導）による、コンパクト型での組合せ

熱源に近く利便性に優れ、併せて
災害危険度の低い立地を選択して
市街地をコンパクト化誘導していく



昨年度の低炭素ポテンシャル推計手法（ステージ2）に代入

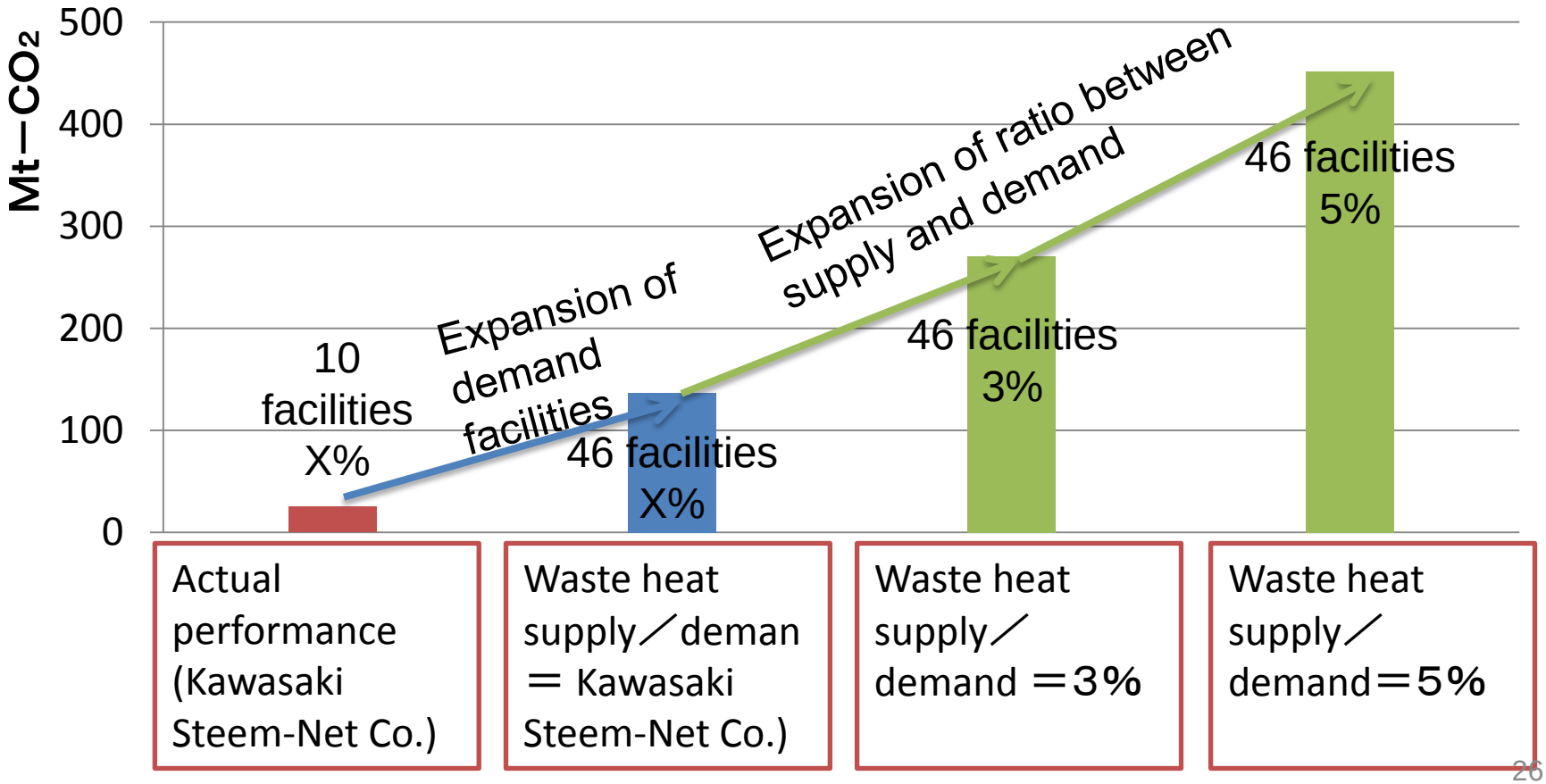
⇩

自治体または区全体の低炭素化（目標値）に対する貢献率が推計される

(株)アバン・アソシエーツ計画本部　谷口知史副部長　作成

Kawasaki Synergy Network（Future scenario）

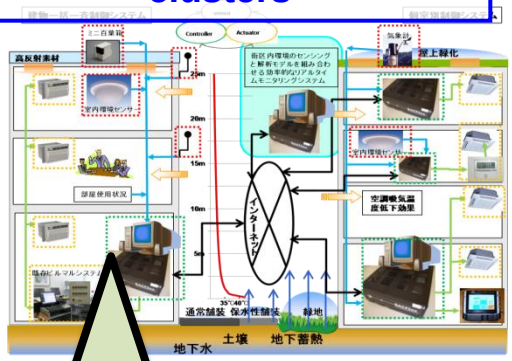
When industries with geographical proximity to power generation utilize waste heat, we could estimate 400,000t-CO_2 emission reduction by alter the fossil fuel to waste heat.



Strategic Business Models for Environmental Innovation
From Smart Buildings to Low-Carbon, Circulatory Cities

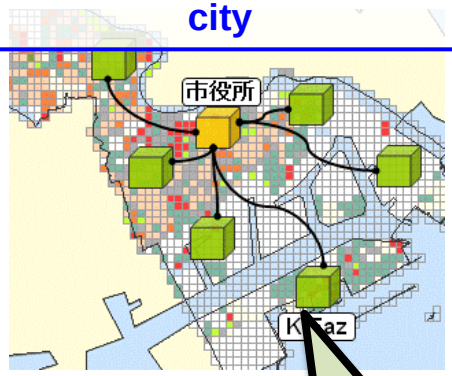
Area effects and network effects that interact with individual technologies to produce synergy can be achieved by moving up from energy management at the individual building level to efficient management of supply and demand at the area level and management of land use and facility locations at the city level.

Demonstration with building clusters



Network development within the city

Network development by the city



Social institutional systems in red

Energy-efficient buildings
Smart meters
—
External air supply through BEMS
Co-generation
Carbon credits

Local hybrid heat and power supply system
Supply-demand coupling' energy management
Zoning for low-carbon facilities

Low-carbon energy monitoring network
Capping and trading
Guiding industrial location close to cities (compact cities)

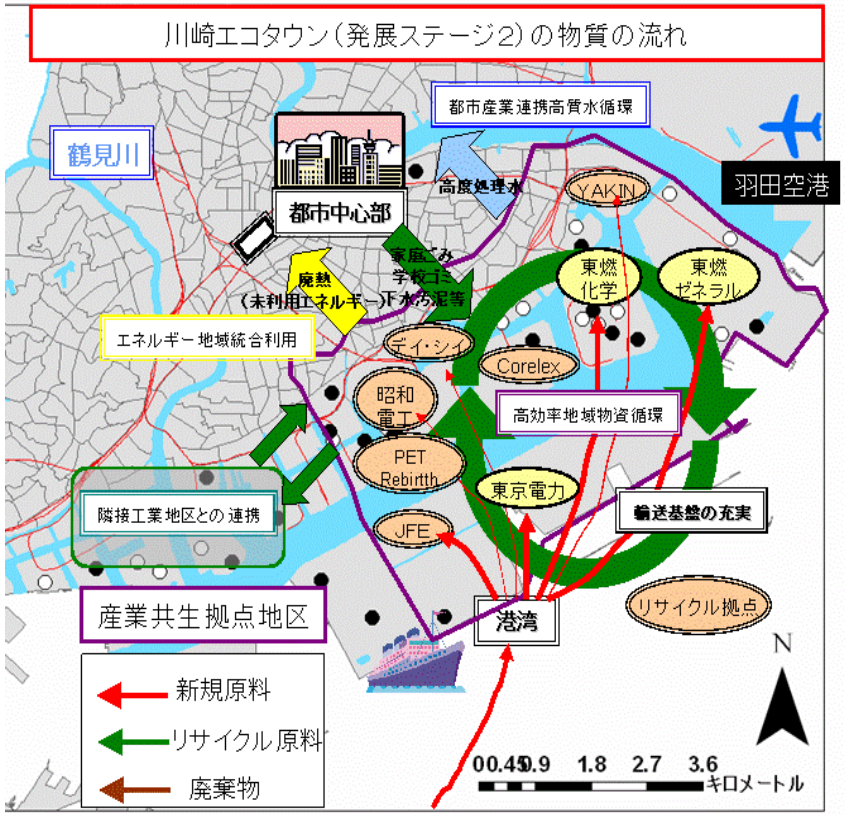
Accumulation Effect by IS for the future; 3.low-carbon district as a hub in Eco-towns

Integrative low carbon planning systems to compile eco-towns, urban sectors

【たとえば、事業評価として】
地域の物質循環や廃棄物発生，環境負荷の分布を測定して，モデル事業の効果を定量的に把握することのできる統合的な評価システム（地理情報システムの活用）

【たとえば、モデル事業として】
地域での廃棄物を地域で循環する「地域循環」の社会実験モデル事業.　（案）一般廃棄物、産業廃棄物、農業系廃棄物を合わせて循環性状によりで組み合わせて収集・地域再資源化

【たとえば、制度として】
産業政策，環境政策と加えて，都市開発や道路・下水道・インフラなどの都市政策，港湾政策の統合組織と都市スケールでの循環支援政策



Carbon Free Industrial Symbiosis District

循環基盤、産業基盤を活用して、都市の資源効率向上、低炭素化を進める総合的な低炭素・資源循環の拠点地区・地域の形成

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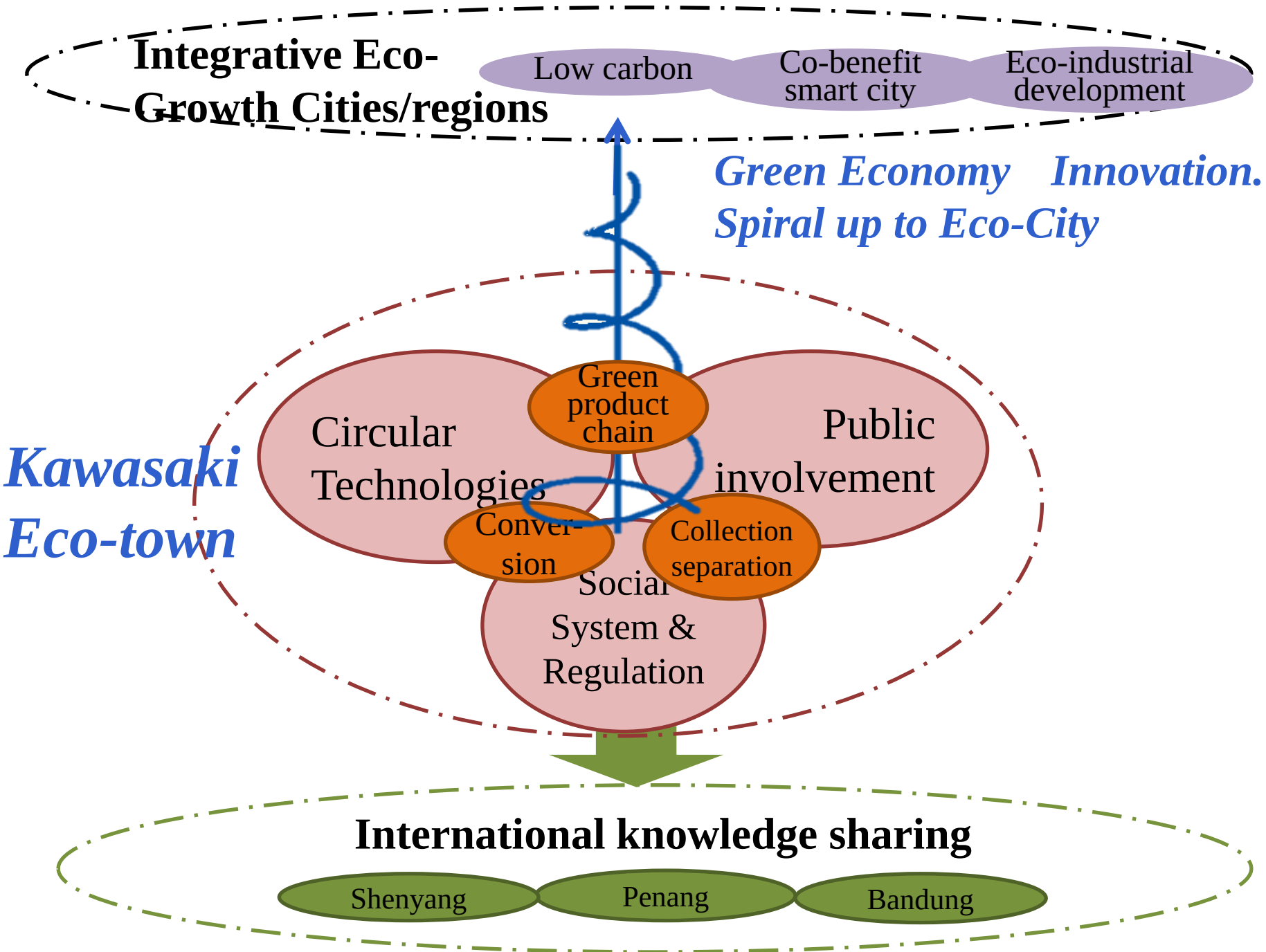
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Kawasaki Eco-town
Circular Technologies
Green product chain
Public involvement
Conver-sion
Collection separation
Social System & Regulation
International knowledge sharing
Shenyang
Penang
Bandung

Related Publication

Xudong Chen, Tsuyoshi Fujita, Satoshi Ohnishi, Minoru Fujii, Yong Geng ; The Impact of Scale, Recycling Boundary, and Type of Waste on Symbiosis and Recycling: An Empirical Study of Japanese Eco-Towns, Journal of Industrial Ecology, Vol.16(1), pp.129–141, February, 2012

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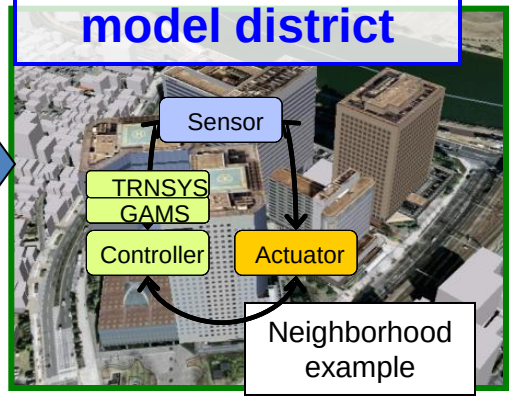
Environmental Technologies: Spreading throughout Asia from Local Demonstrations

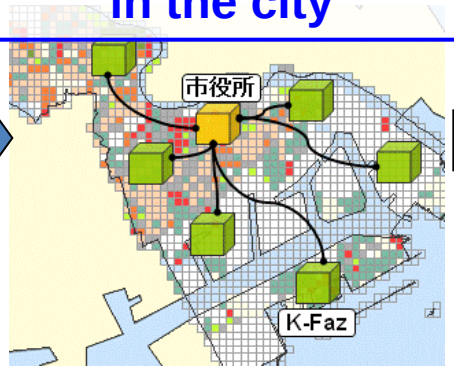
Designate model districts generating social value from low carbon and circularization, and create pioneer social frameworks that use technology clusters and enhance their effectiveness. Convert national land management systems and develop policy packages for the rest of Asia through the selection of priority areas at the municipal level and through the construction of networks.

Feedback on environmental innovation

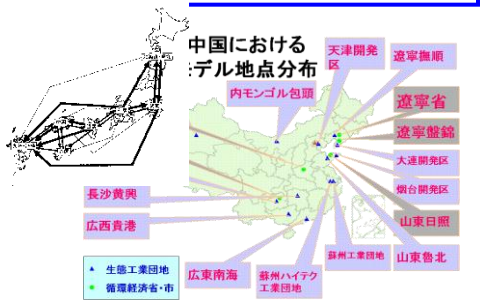
Demonstration in model district



Network expansion in the city



Conversion to national system Expansion into Asia



Busi-ness

Technological development Cost reduction

Production to order → Efficient production → Planned production → Elevation internation standard

Gove-rnment

Framework design Subsidies, regulation

Flexible administration of special zones, etc. → Support through local laws, etc. → Makeover of national framework

都市･地域の環境イノベーション戦略

- 市場で取引される環境価値はごく一部にすぎない。低炭素化や資源循環は長期的、広域的な価値を持つが、この内部化の仕組み。
- 「環境市場メカニズム」；環境事業支援、環境規制、環境プレミアム価格等外部費用を内部化する「環境市場化」
- 「環境基盤形成サポート」環境問題の深刻化による将来の必要性が高く、整備に時間がかかる環境インフラ（ハードとソフト）

  ＊ハードな環境基盤；資源循環輸送インフラ、高効率コンパクト都市、高効率素材製造業　等