10th Asia Eco-Business Forum
@ Kawasaki, Japan, February 13th, 2014

Eco-Industrial Network Challenges from Kawasaki Eco-town

Prof. FUJITA, Tsuyoshi
Director of Social Environmental Systems Center,
National Institute for Environmental Science, Japan

Contents of the presentation

- ***Background/Knowledge Resource***

from material symbiosis to comprehensive symbiosis with energy

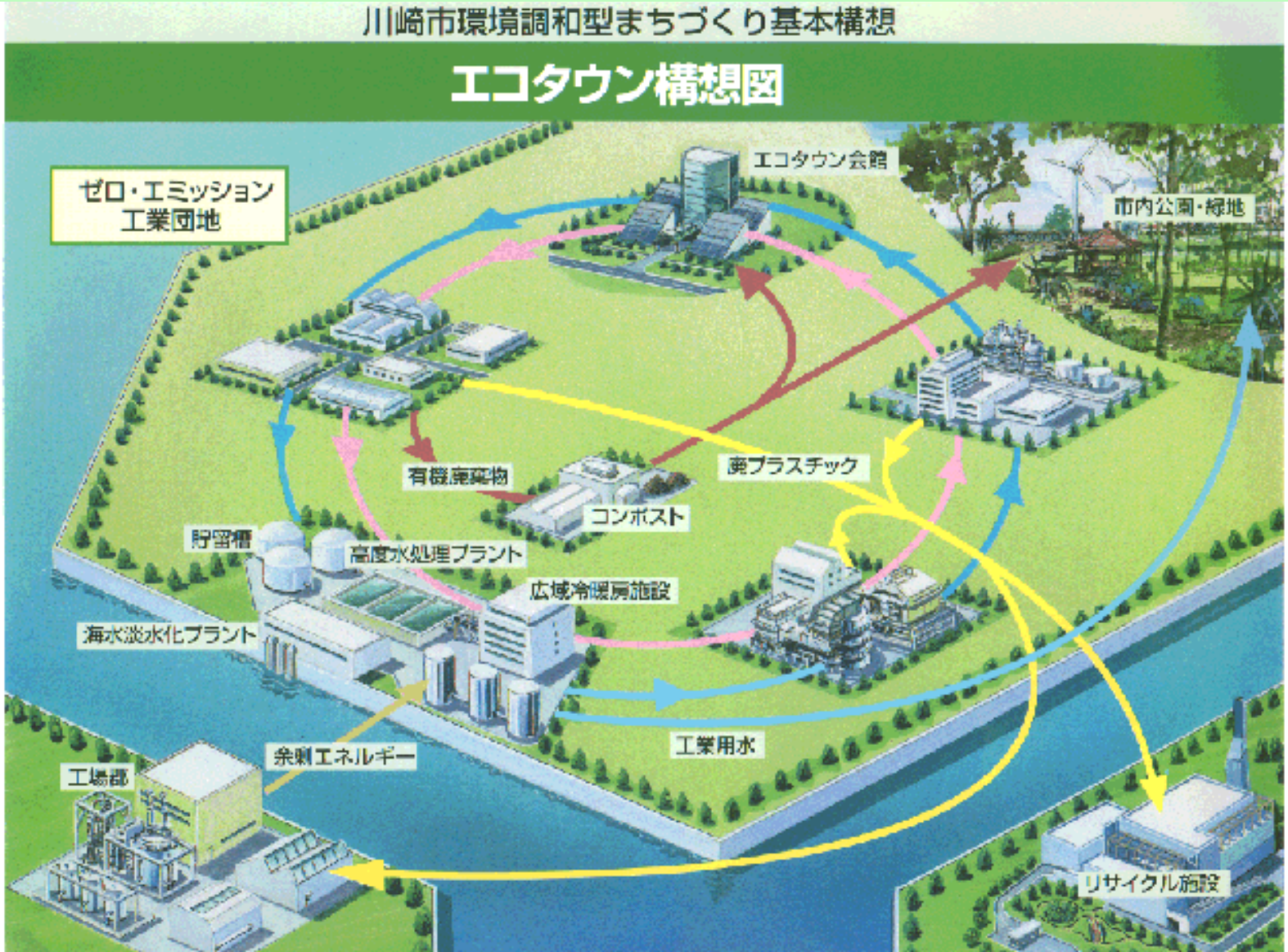
- ***Methodology***

tool for spatial analysis based on macro data and GIS data

- ***Discussion for New Challenges***

Industrial Symbiosis and Urban Industries to empower cities by circularization

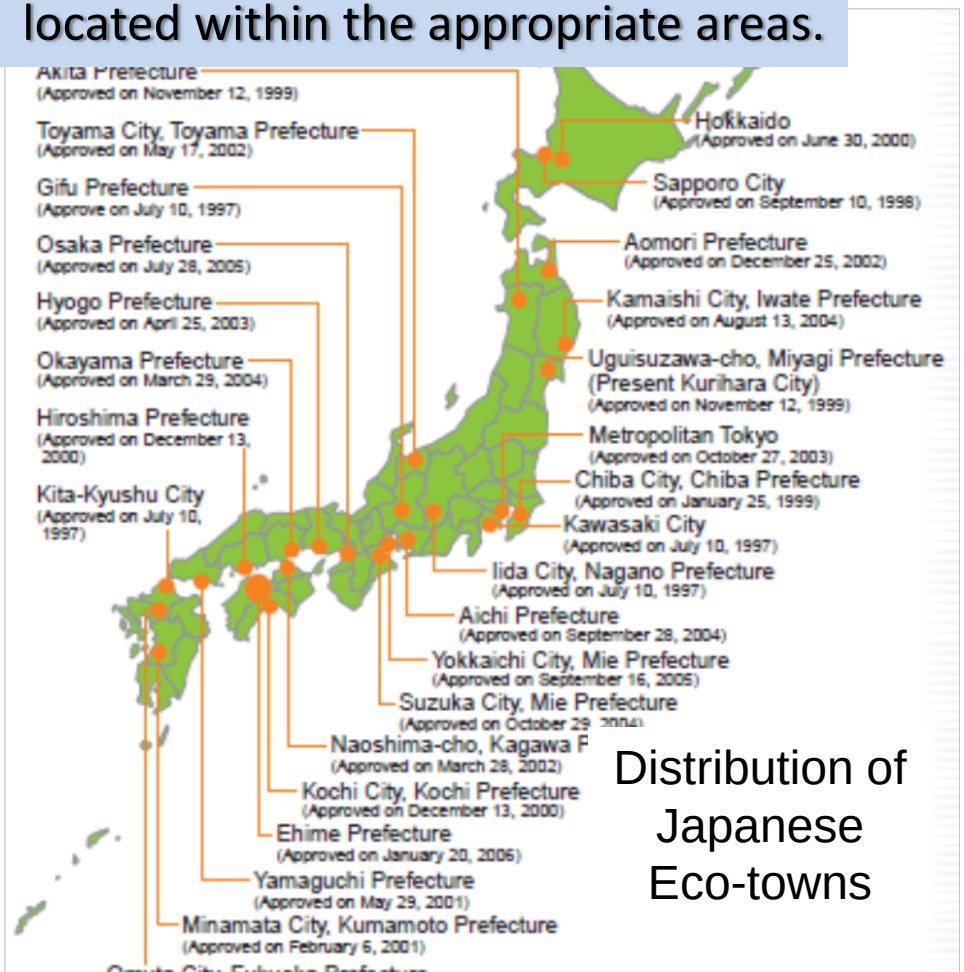
(Kawasaki and Kitakyushu are pioneers in 1997→26 cities)



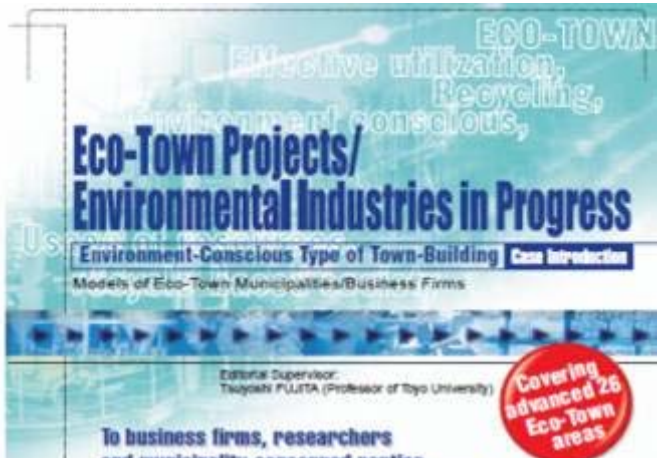
Eco-town area as demonstration project for Sound material cycle society

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

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$

Berkel and Fujita et. al., Environment, Science and Technology, 2010

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

Chen and Fujita et. al., Euro. J. of Operation Research, ii 2013

URBAN REDEVELOPMENT TYPE EIP

Kitakyushu

Recycle goods retail & sale*

Ecological consulting company*

Sustainable technology research company*

Environmental Information Business Support CCR

Ecological equipment manufacturing

EIP Center; Demonstration building*

Environmental data bank
Collaborative marketing purchase
·Waste collection and recycling
-Eco-material, Recycled Material
-Design for environment

Clean Energy Supply System
Energy Storage System*

Environmental communication*

Environmental education*

Green Institute (Minneapolis)

Cape Charles Sustainable Technology Park (Virginia)

Rural Area

Farm

CITY-FARM COLLABORATION TYPE EIP

Hokkaido

Compost

Fuel Cell

Methane Fermentation

Residential Districts

Urban Area

Brownfield Neighborhood

Industrial complex

Akita, Osaka

Organic waste
Methane fermentation
Composting

Plastic recycle center*

Collaboration reverse logistics
District heat supply

Building material recycle center*

PRODUCT REMANUFACTURING TYPE EIP

INDUSTRIAL SYMBIOSIS TYPE EIP

Cement factory

Chemical factory

Fertilizer

Heat

Fly ash

Power plant*

Heat

Oil

Petro chemical factory

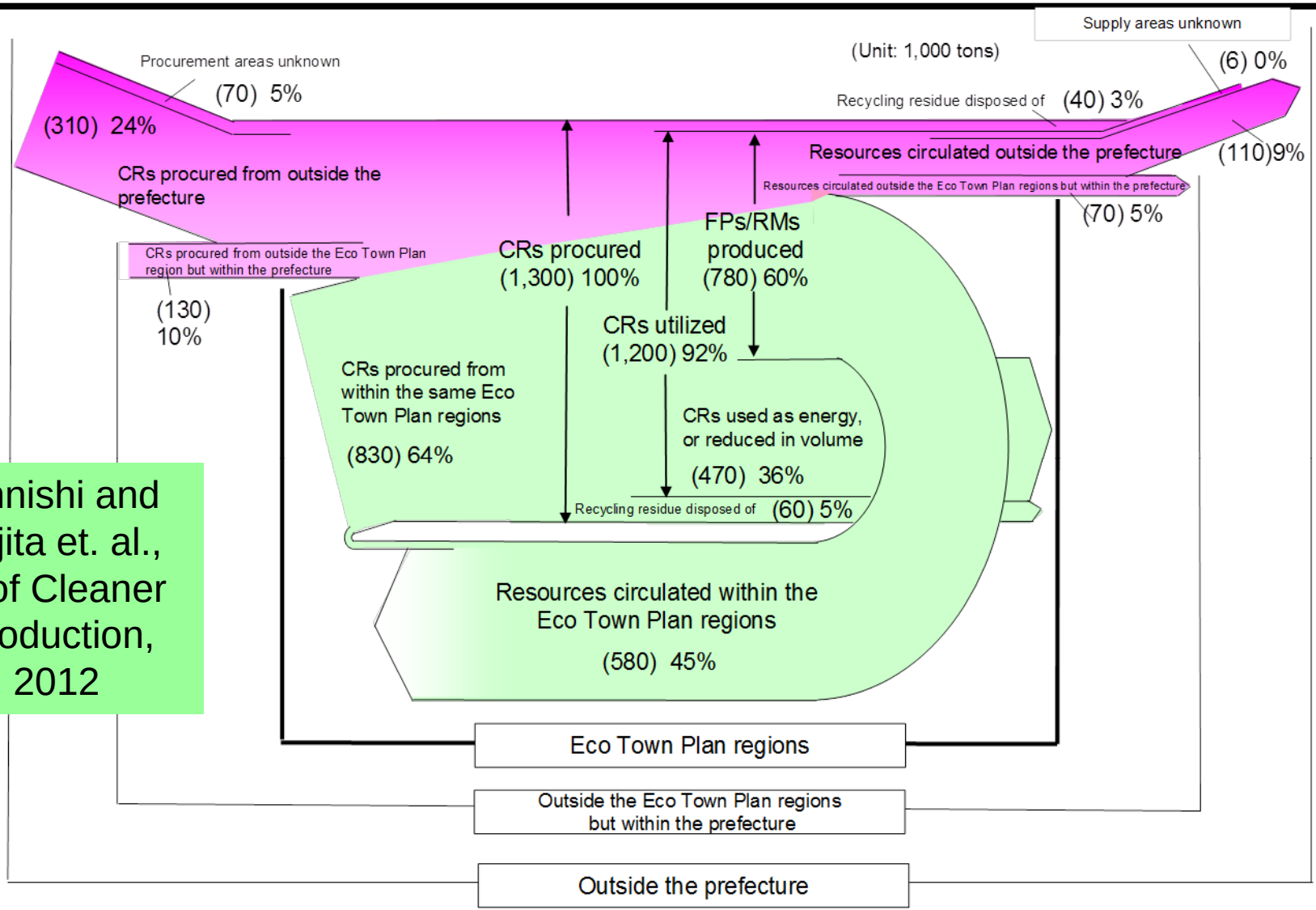
Industrial symbiosis type

Kawasaki, Minamata

Water Front

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%



Ohnishi and Fujita et. al., J. of Cleaner Production, 2012

Environmental technology inventory and tentative application for cities

Inventory of circular technologies

Urban energy management technologies

- Water retentively pavement
- Permeable pavement
- Town district energy control technology
- Underground water pumping ceramic
- Rainwater storage technology

Industrial symbiosis production technologies

- Cement field fuel making
- Waste plastic blast furnace reduction
- Waste plastic ammonia raw material making
- Waste plastic Concri type frame raw material making
- Used paper manufacture raw material making
- Gasification melting furnace

Biomass circulation tech.

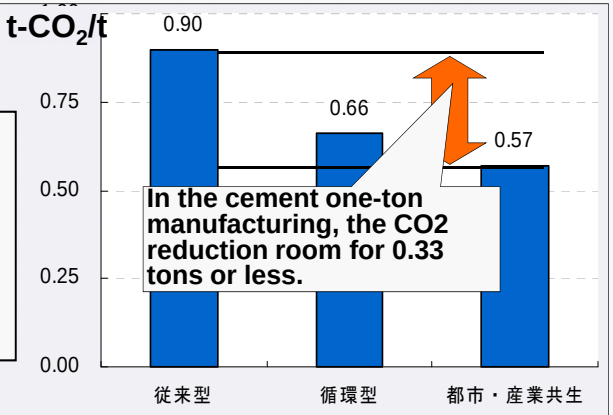
- Methane fermentation technology
- Bioethanol processing technology

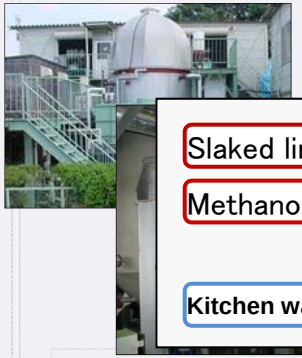
Circular water treatment tech.

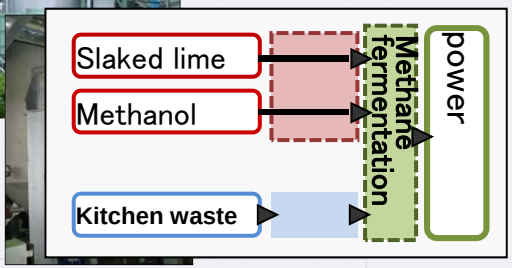
- Septic tank technology
- Sewage disposal technology
- Plant purification

Numerical Formulation of circular technologies and preparatory estimation

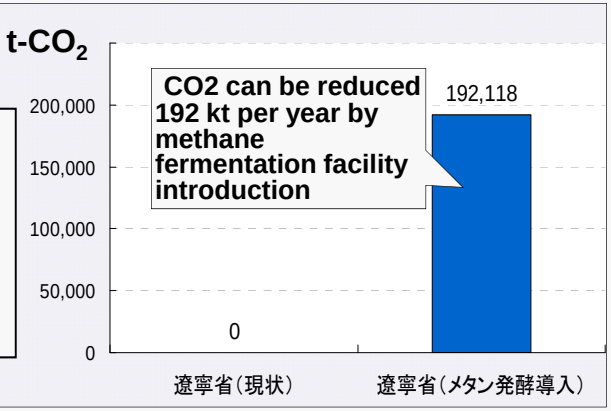
Cement production technology

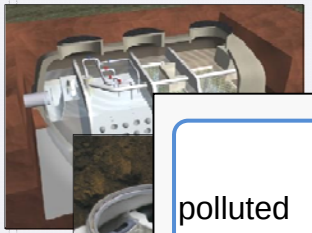


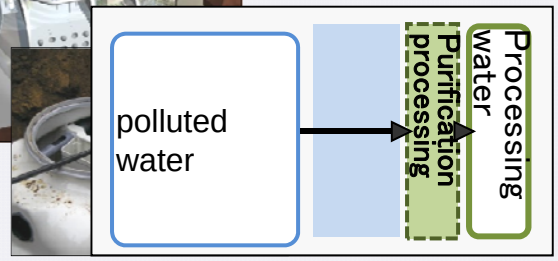




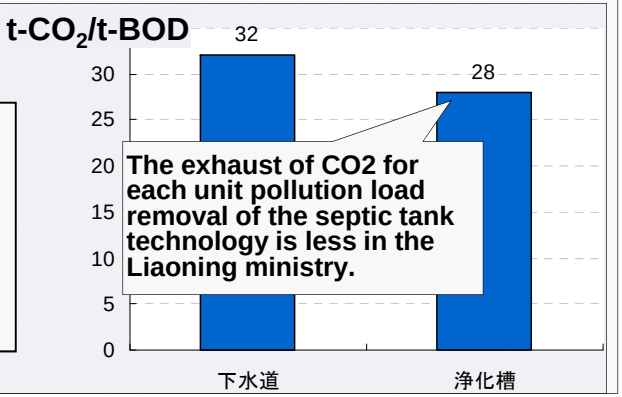
Gasification melting furnace





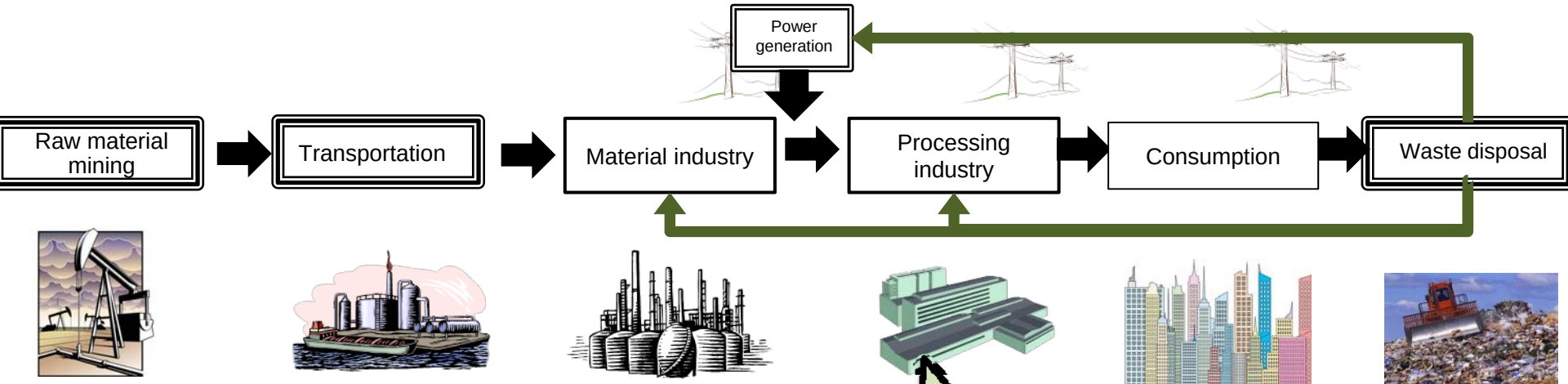


合併浄化槽技術



Strategic Planning of Integrative System with Environmental Technologies and Social Policy Intervention

Environmental innovation and business models for the supply chain, from the production of low-carbon, resource-circulation materials through to processing and consumption.



The red characters represent society control systems

Manufacturers accepting waste
(Co-processing) Supply of heat and energy
Regional circulation of resources

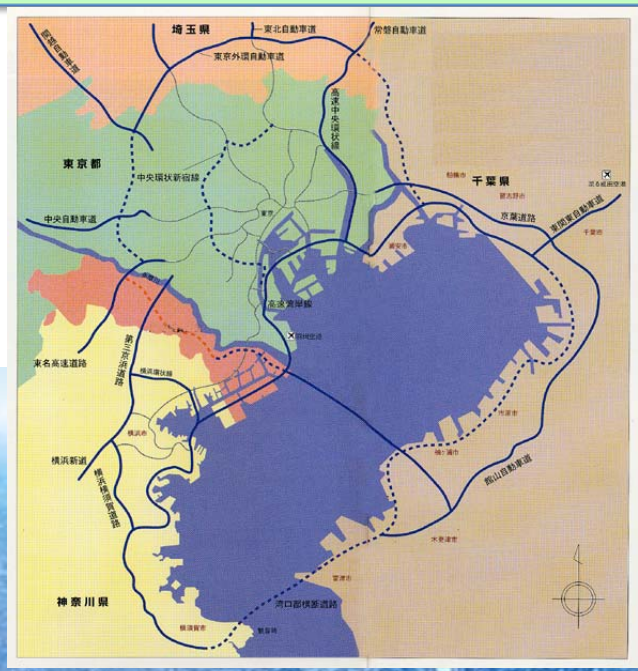
Cleaner Production
Environmentally considerate designs
Green procurement

Green consumption
Regional (circulatory) consumption
Regional credits

Resource-circulatory transportation infrastructure, and information monitoring systems

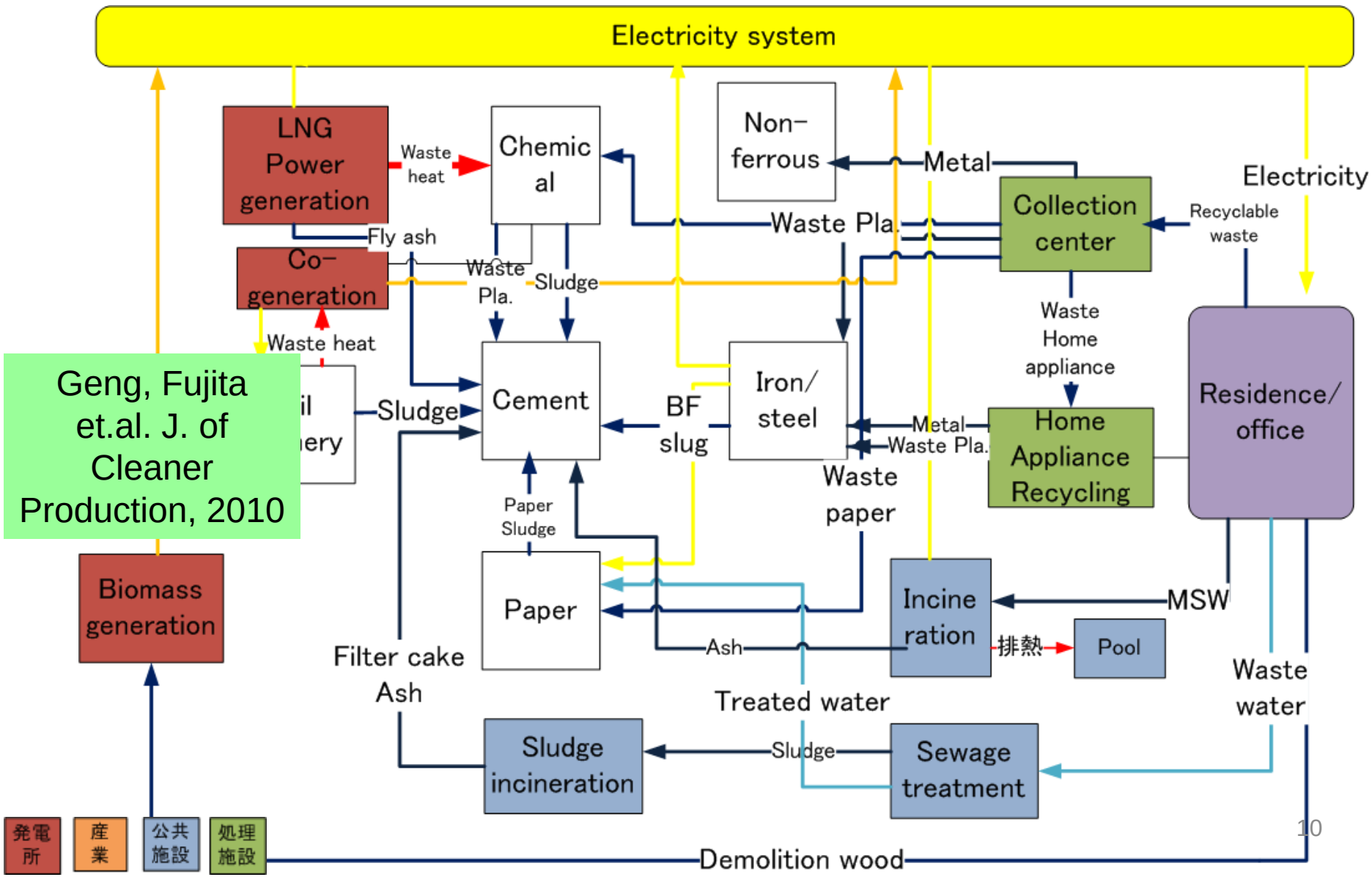
Green supply chain management in integrated cities and regions

Geographical Conditions of Kawasaki Eco-town



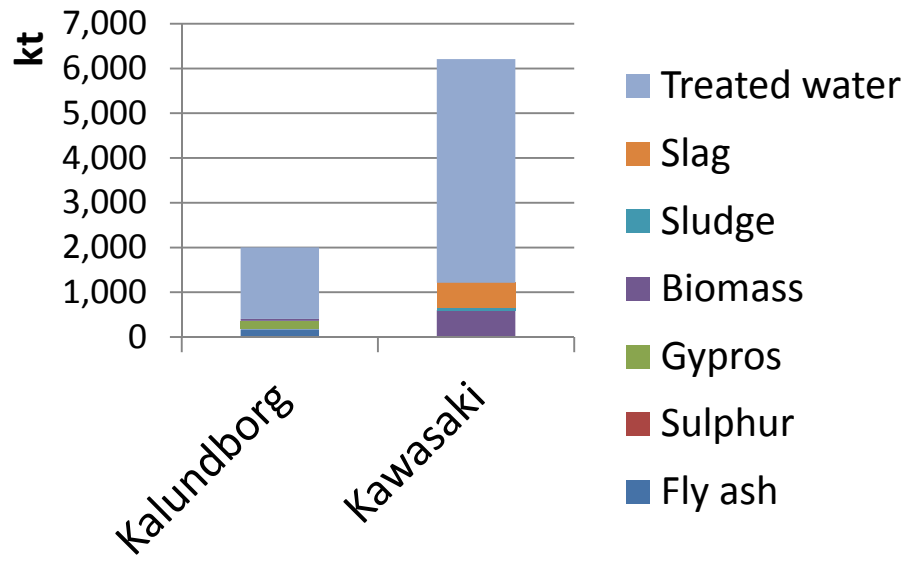
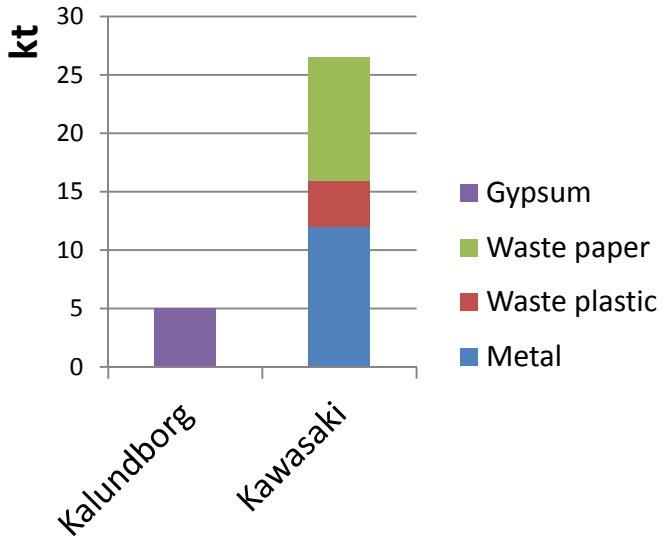
Kawasaki Synergy Network（current situation）

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



Geng, Fujita et.al. J. of Cleaner Production, 2010

Comparison between Kawasaki and Kalundborg

	Industrial symbiosis	Urban symbiosis
Water/waste/by-product		

Comparison between Kawasaki and Kalundborg

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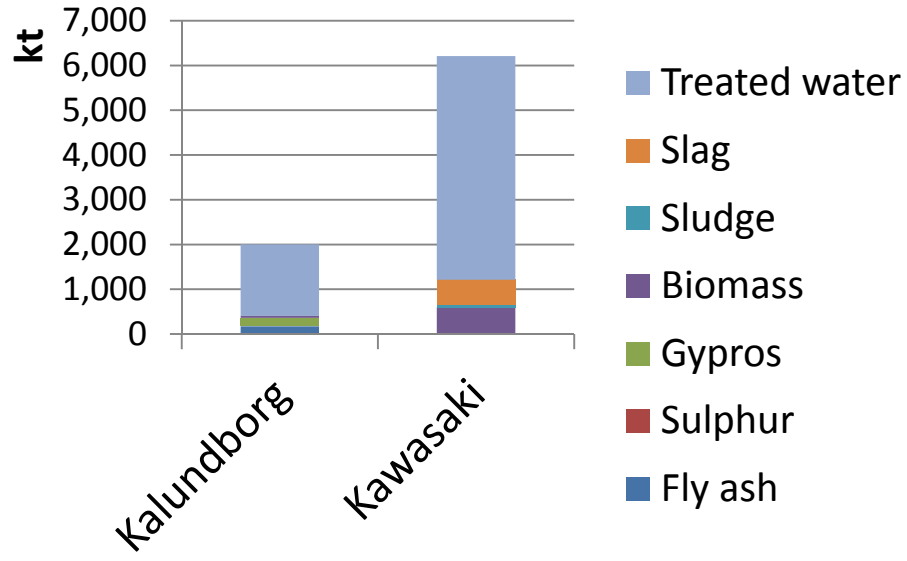
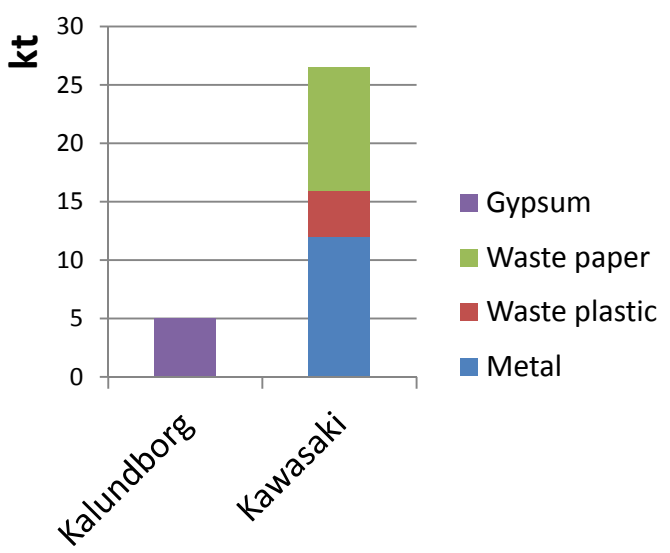
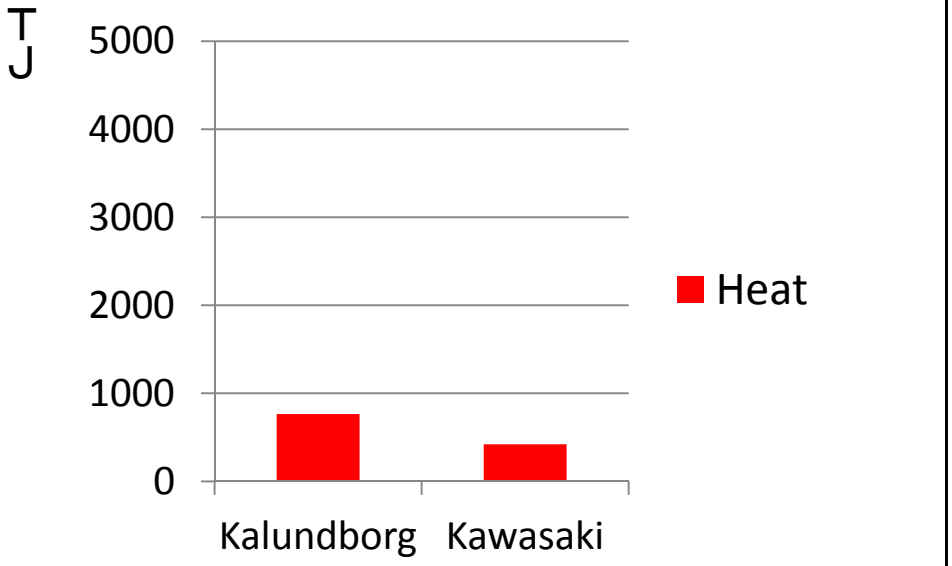
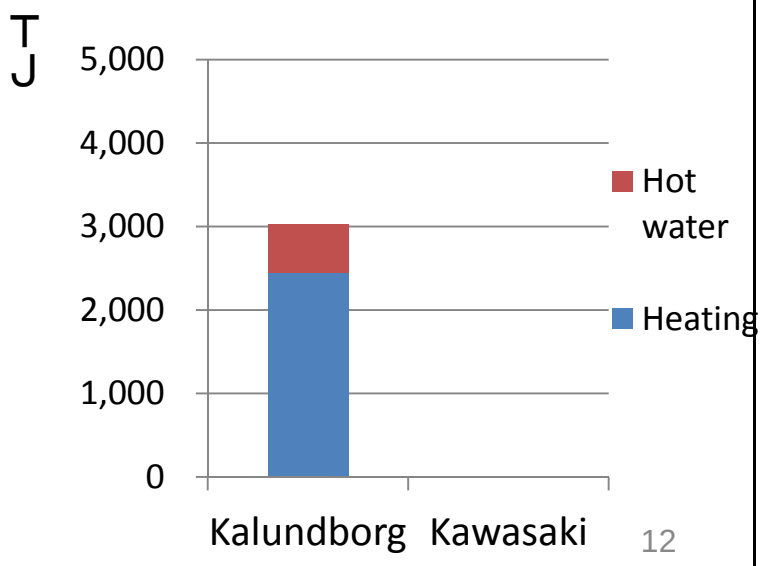
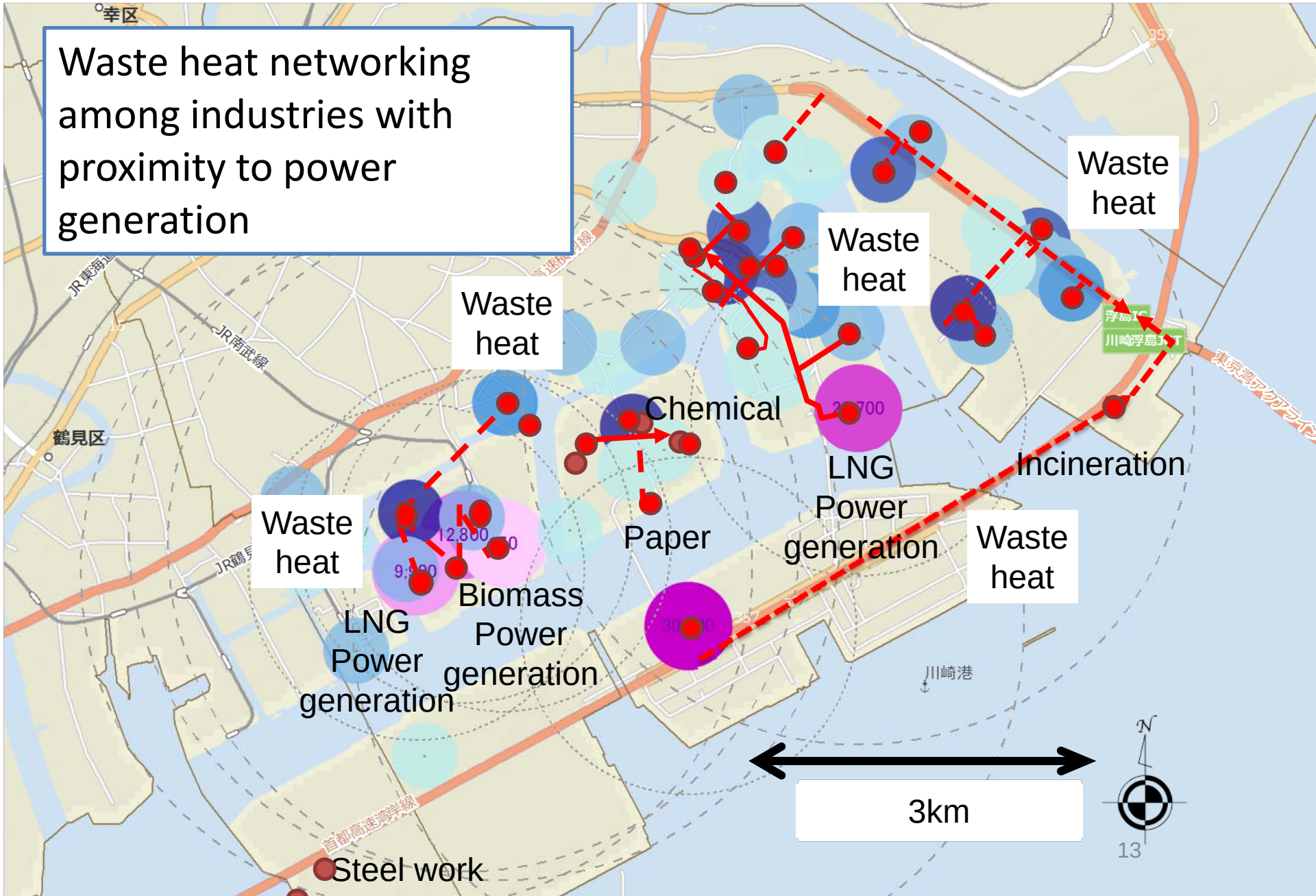
Water/waste/by-product		
Heat & energy		

Local hear potential in Kawasaki Eco-town



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- ***Background***

from material symbiosis to comprehensive symbiosis with energy

- ***Methodology***

tool to estimate low carbon effects of energy symbiosis based on macro data and GIS data

- ***Discussion***

Development of Process Model for Regional Energy Planning

Stage 1: Construction of a methodology for local governments to analyze the energy potential.

Stage 2: Support the urban planning according to the spatial characteristics.

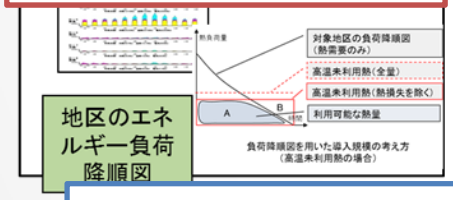
Stage1 Macro Analysis

Stage2 Micro Planning

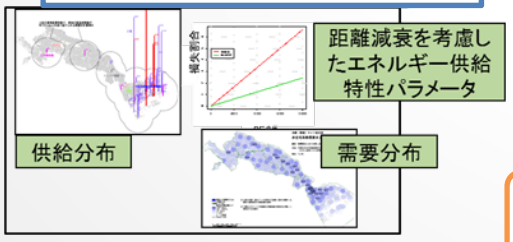
MACRO-STATISTICS

- A national census
- •Enterprise census
- •Industrial census
- •Forestry census

GIS Data

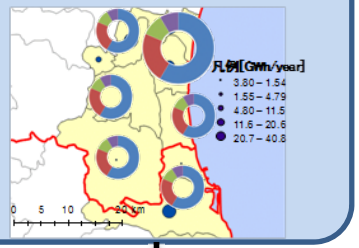


Spatial characteristics

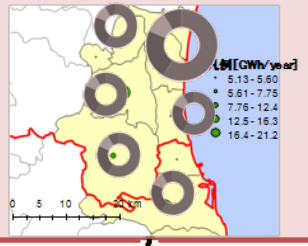


Analysis Model for Regional Energy Potential

Demand Potential Evaluation



Supply Potential Evaluation

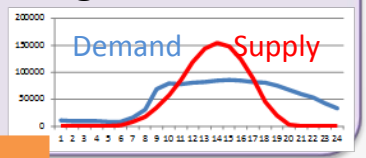


Planning Model for Regional Energy System

Analysis of energy demand characteristics

Analysis of energy transmission process

Supply-Demand Matching Simulation model of district-city block unit

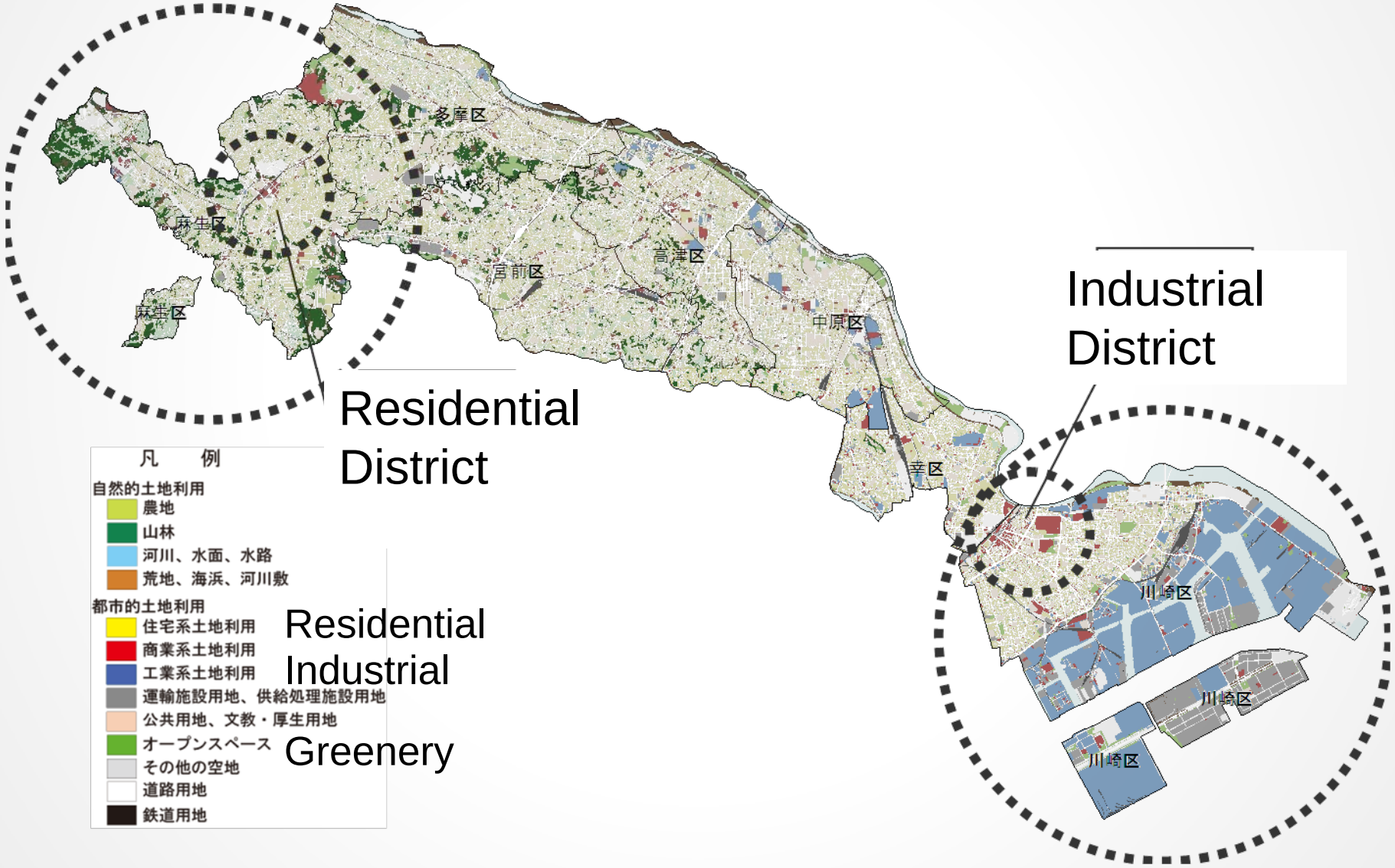


Quantitative evaluation of low carbon effect

Identification of Suitable Policy

Feedback

Land Use GIS Data of Kawasaki City



Stage1 ;Estimation of energy symbiosis effects by macro-statistical data

【Residential district】

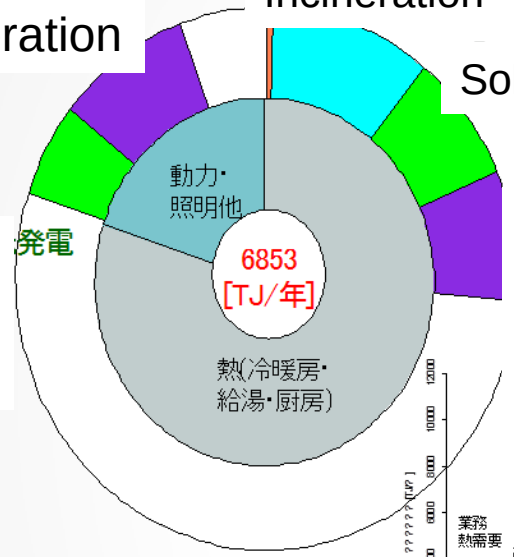
Gas Cogeneration

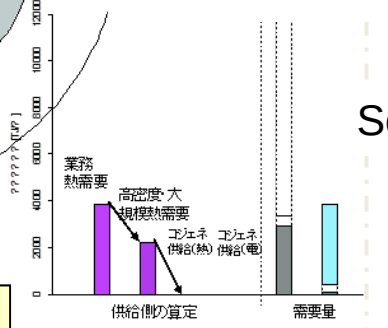
Heat from Waste Incineration

Solar Heat

PV Solar Power

Gas Cogene-ration



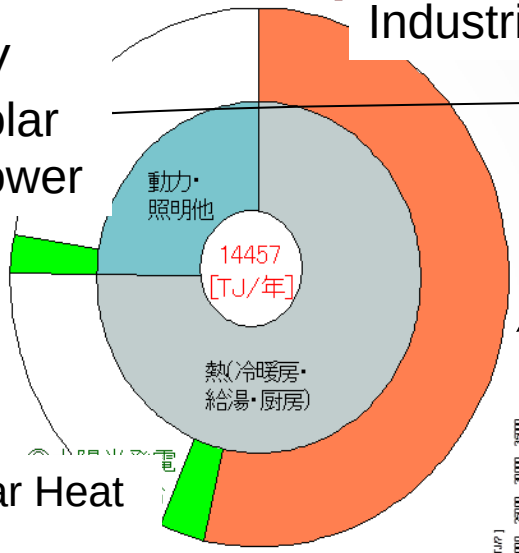


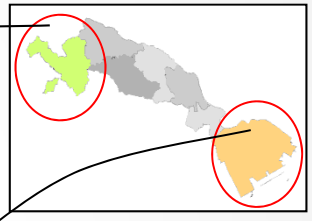
【Industrial District】

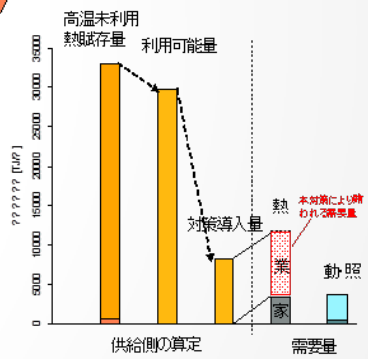
Steam from Industries

PV Solar Power

Solar Heat



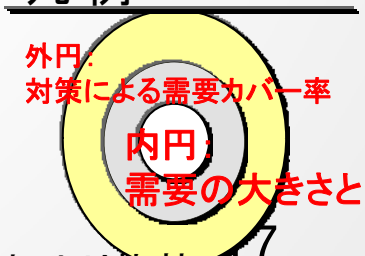




複数対策の組み合わせによるバランスのとれた低炭素化の可能性（コジェネ有効）

高温未利用熱による効果的な低炭素化の可能性

凡例



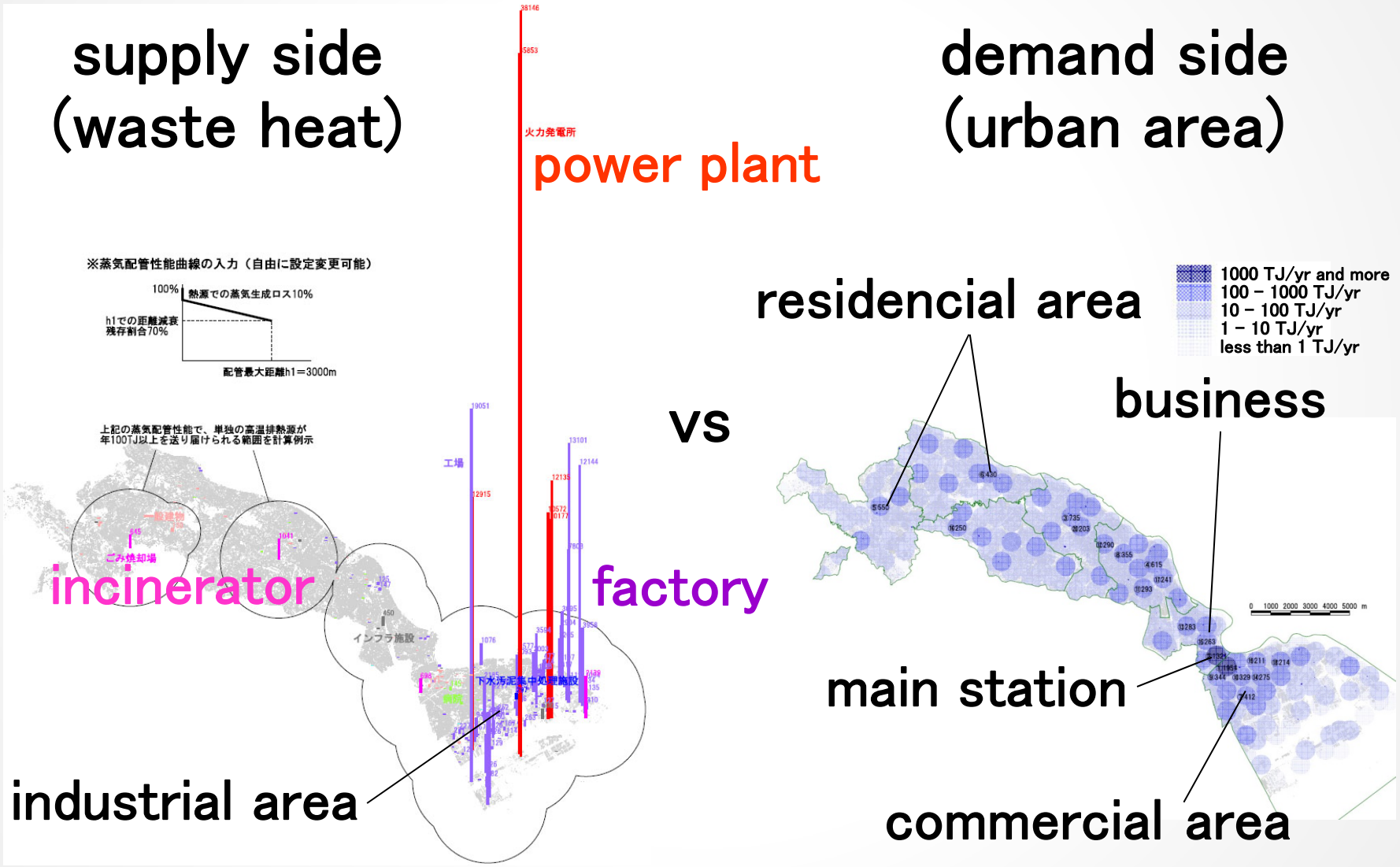
ステージ1推計手法により、
・エリア別の取り組み方針の検討、施策の優先順位・重点施策の検討
・市全体の削減目標に対する追加的対策の検討

平成23年度「環境省地方実行計画策定マニュアルに関する低炭素手法評価手法検討」より抜粋・加工

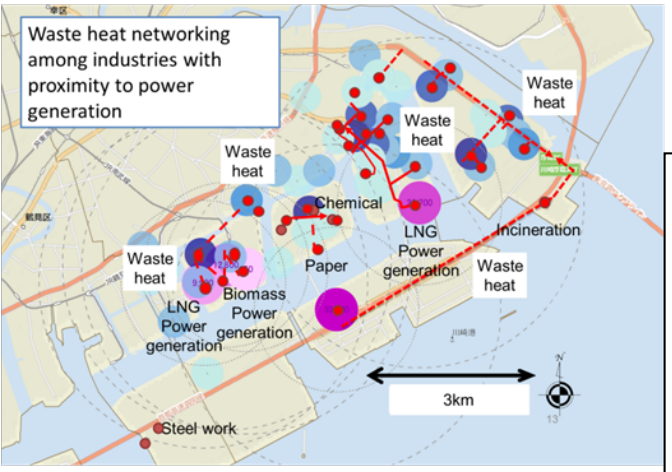
Local energy resource survey in Kawasaki

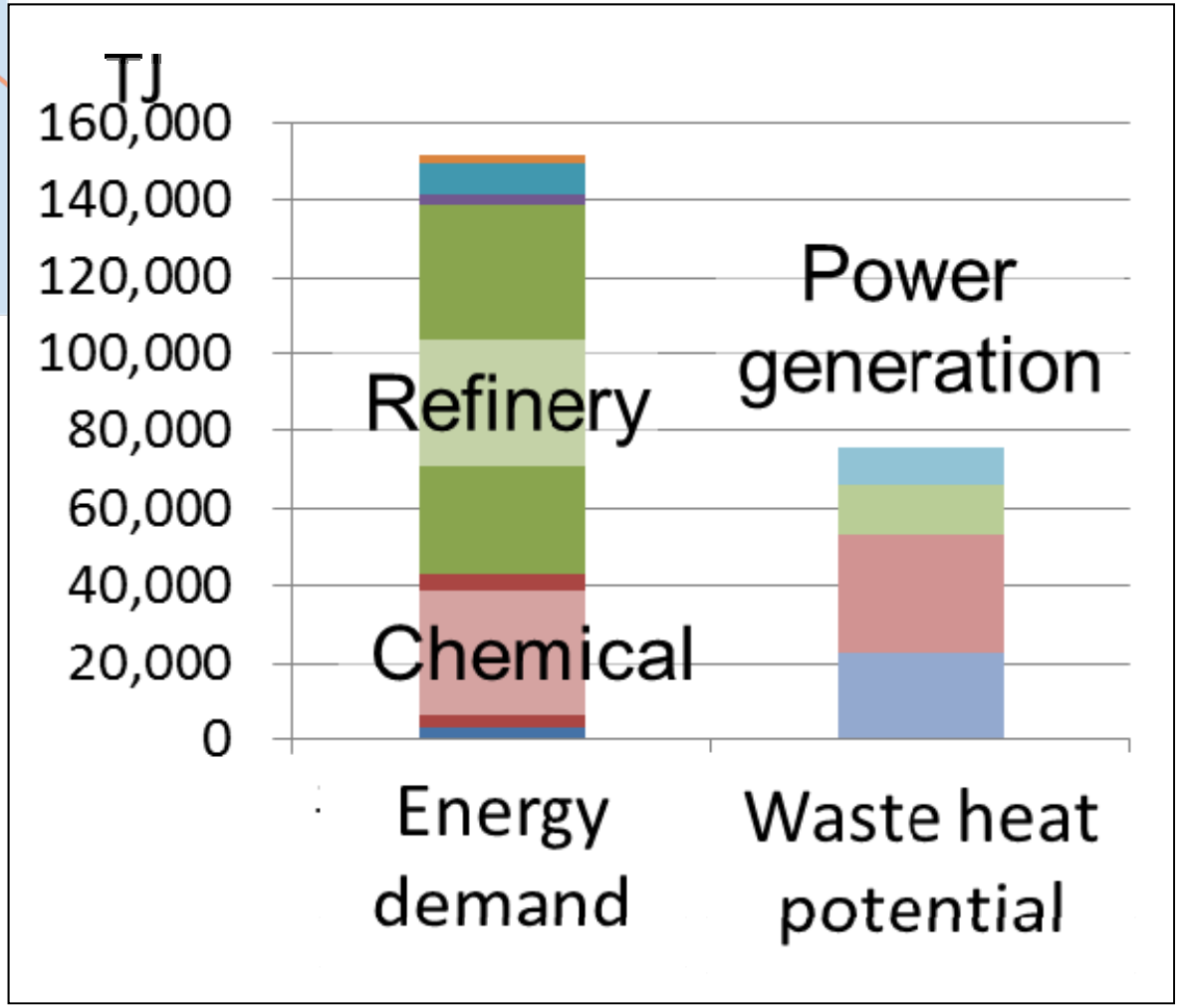
supply side
(waste heat)

demand side
(urban area)



Local hear potential in Kawasaki Eco-town





Discussion
On-going challenges

- **Methodology development**

-to provide optimal network planning as the starting points for stakeholder dialogue

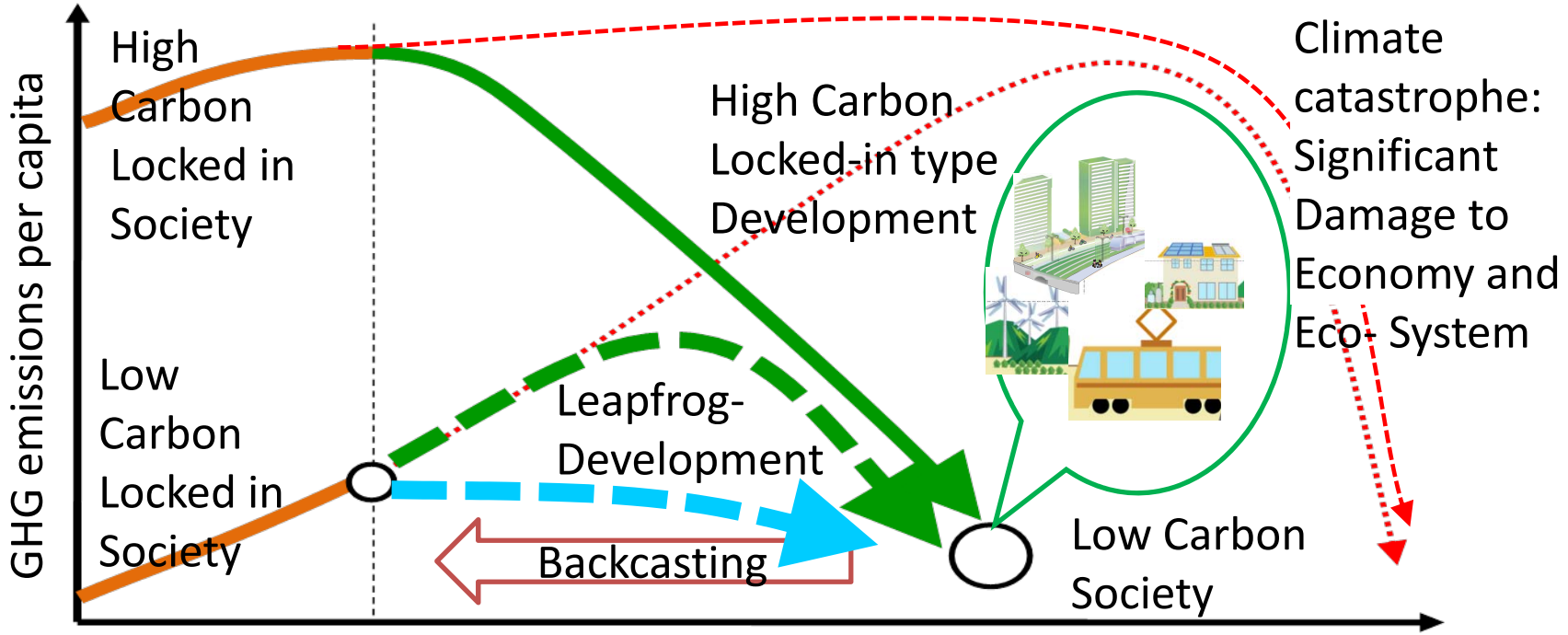
- **Legislative guideline**

- to provide the motivation for local governments and to provide appropriate subsidy by the government

- ***Verification system***

Scenario Approach to Low Carbon Society in Asia

Dr. Mikiko Kainuma, NIES, 2013 Presentations



Development of Asia LCS Scenarios

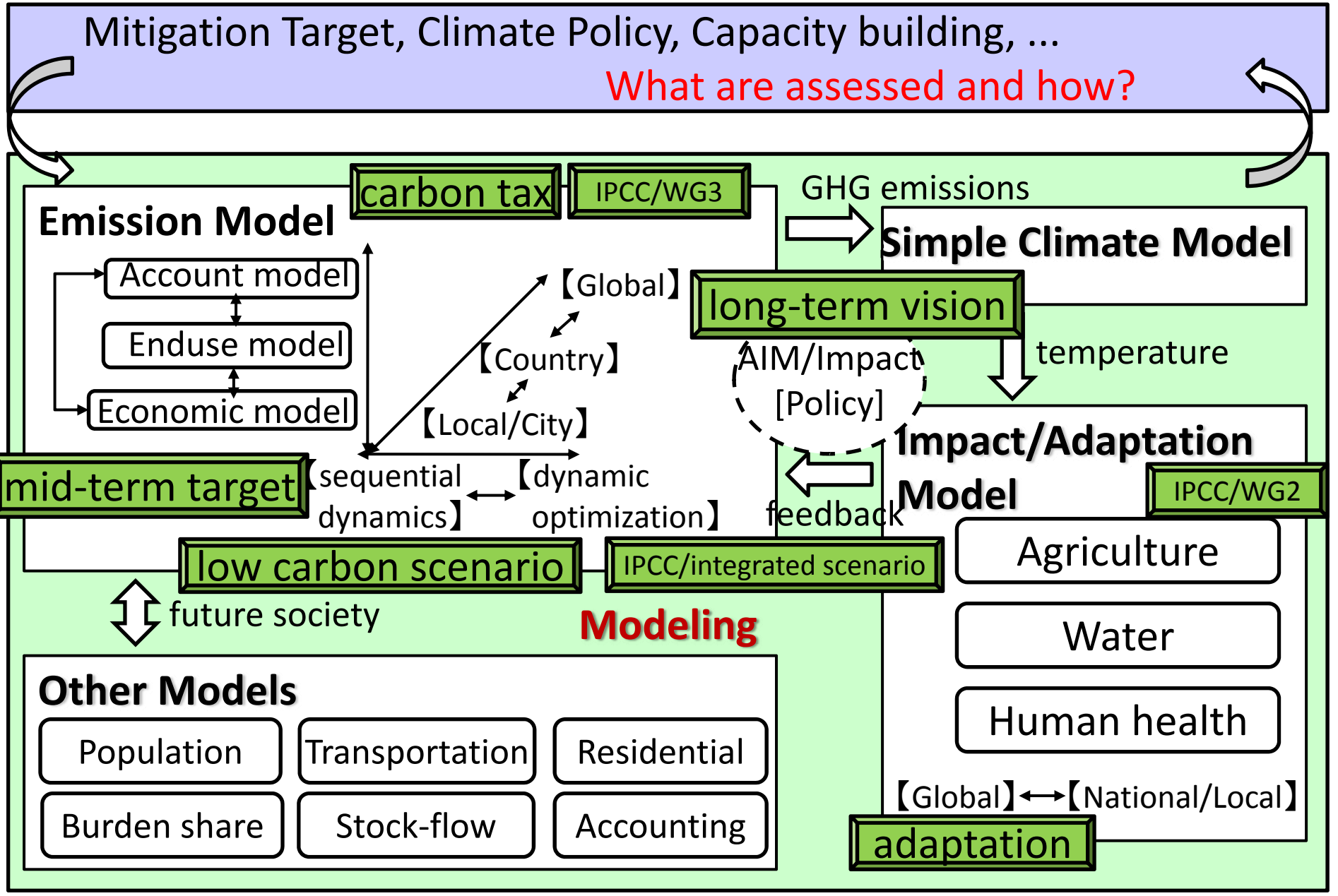
(1) Depicting narrative scenarios for LCS
(2) Quantifying future LCS visions
(3) Developing robust roadmaps by backcasting

Policy Packages for Asia LCS

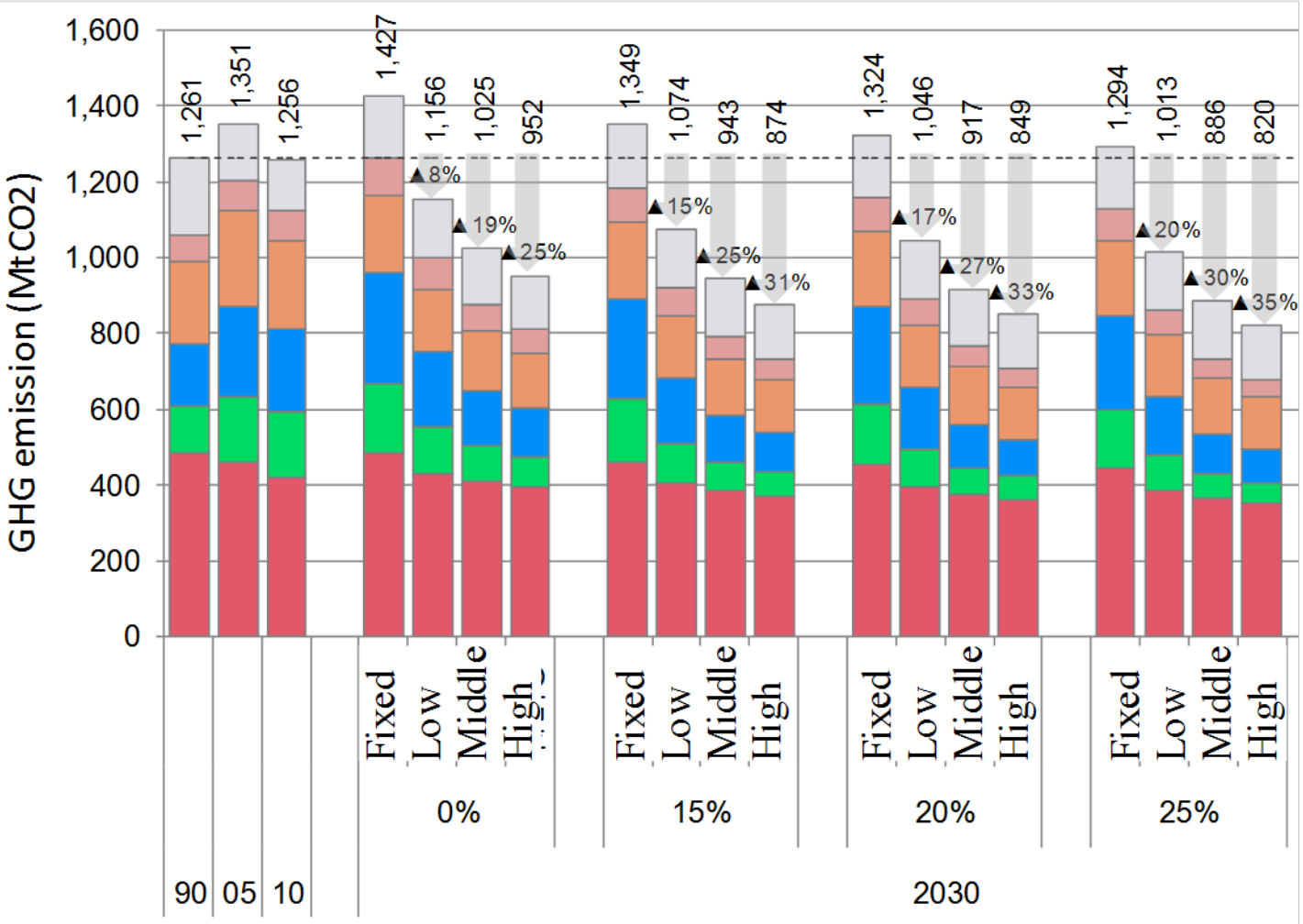
Funded by Ministry of Environment, Japan (GERF, S-6) and NIES

Structure of AIM

Dr. Mikiko Kainuma, NIES, 2013 Presentations



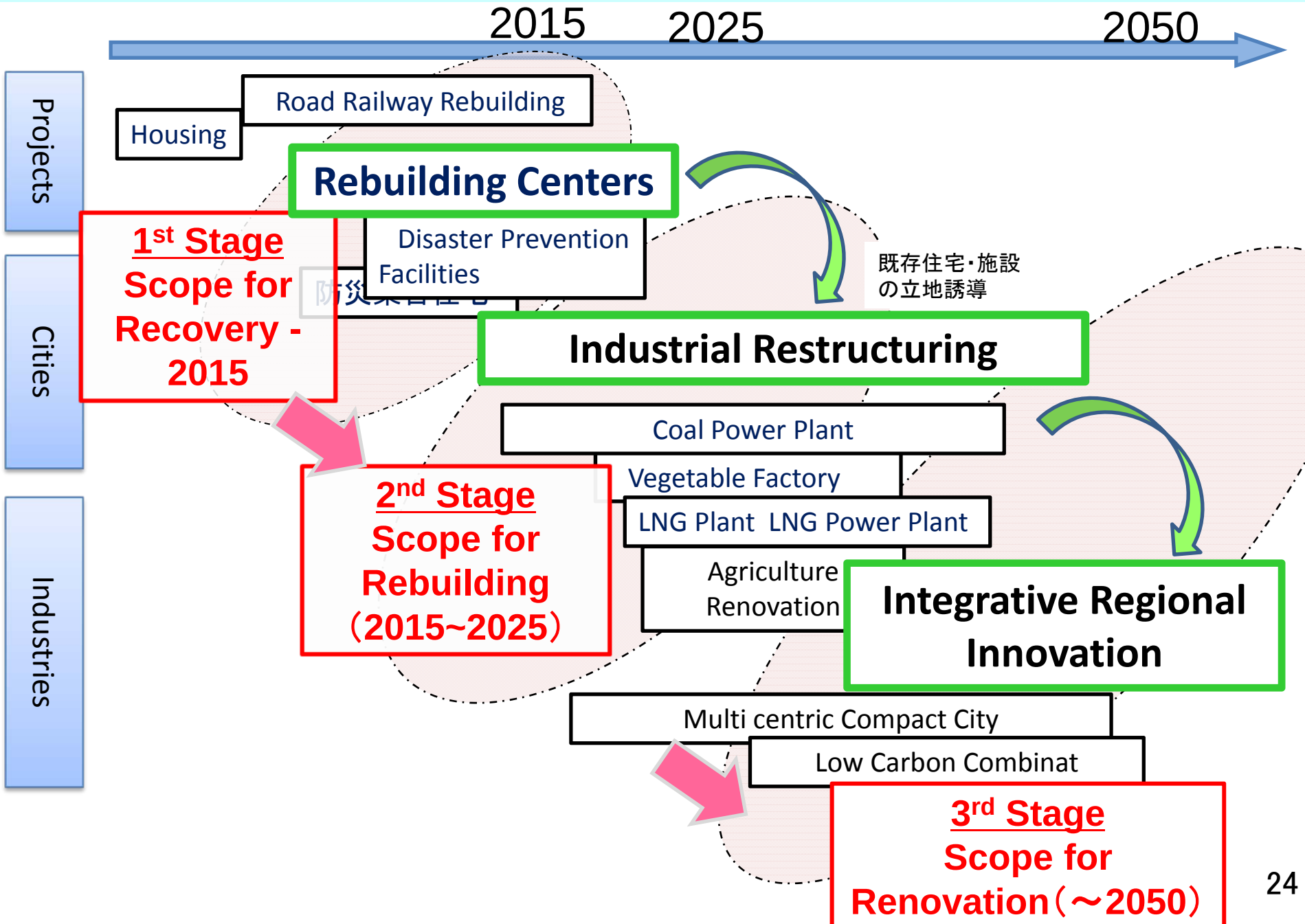
Contribution to Climate Policy in Japan



mitigation options
share of nuclear

GHG emissions in 2030, Low growth case

Technology and Policy Packages in a Short Run, a Long Run for Rebuilding and Renovation



Smart Symbiosis Initiatives for Eco town Innovation

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

Energy and consumption demand control system for urban sectors

Information support for optimizing local and regional material and energy circularization

Smart industrial complex supported by synergetic information network among industries

気象情報

発電量予測

Local Data Collection Center

Local energy supply and demand

Smart community

Renewable energy

Smart industrial complex

High value

Local symbiosis

Urban Waste

Smart Recycle Center

substitutive

By-product information

Power plant
Steel
Cement
Chemical

Energy demand information

Energy demand response

incineration

methane

Demand

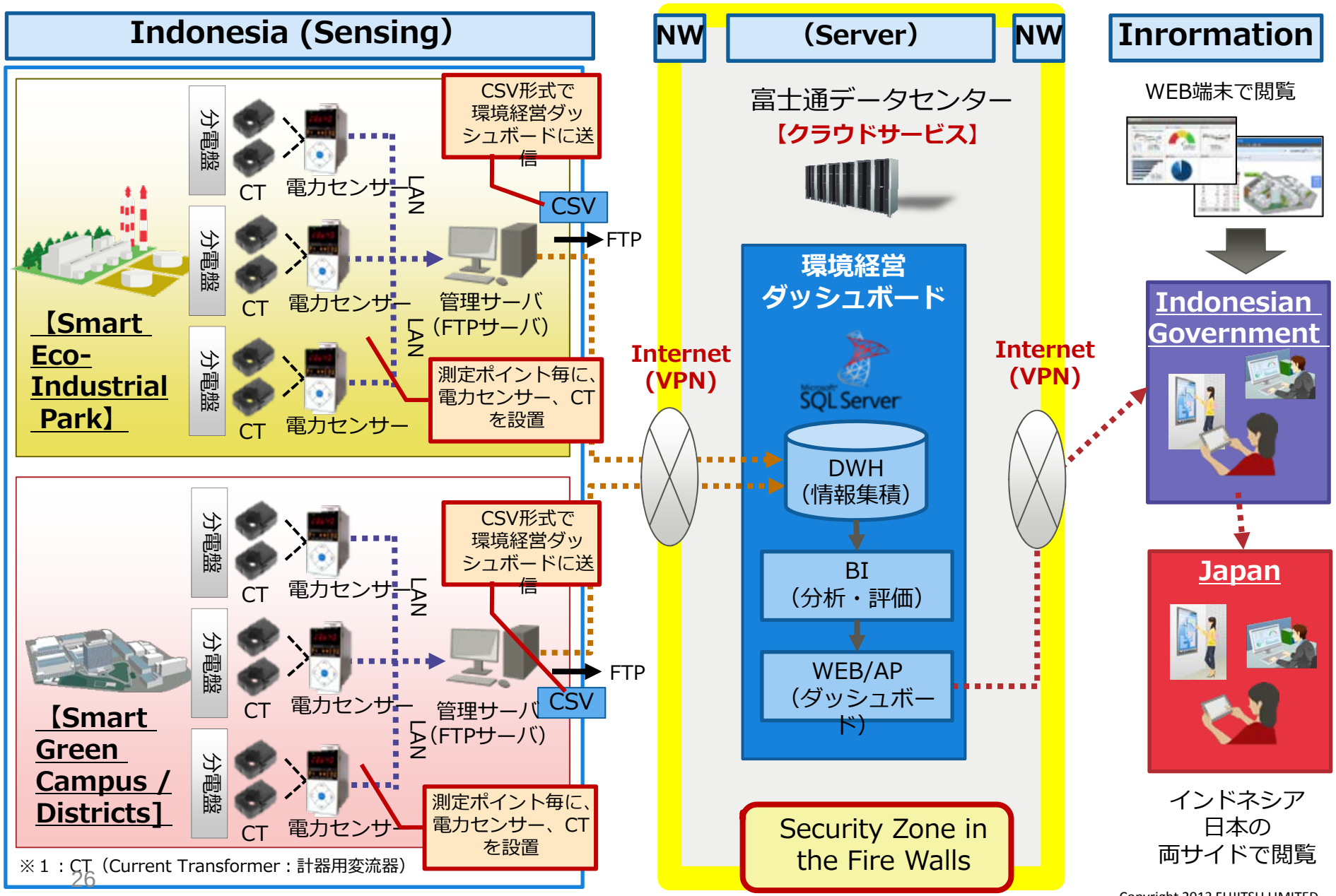
Operation information

Urban and Regional symbiosis

Waste and material

Energy

Tentative Research Scheme with Technology Sectors ex. Proposal from Fujitsu



Life Assistant TAblet System (LATAS) in Fukushima

本年度は100世帯を対象に電力計測メーターを設置、タブレット型端末を配布し試験的運用を行う。

Ⅰ．省エネ活動の支援

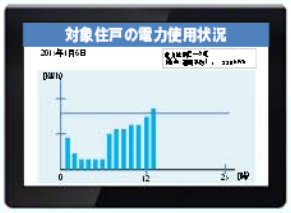
住民が主体となった省エネへの取り組みによって地域全体の省エネの実現を支援

電気使用量計測　ガス、灯油の使用状況の計測・登録

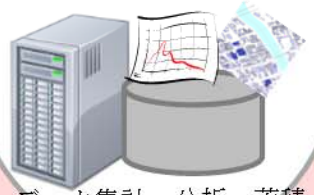
電力使用量の表示

CO2 排出量の表示

電力使用ピーク時の情報発信



スマート
ハイブリッドセンター
（データセンター機能）



データ集計、分析、蓄積

省エネランキング表示

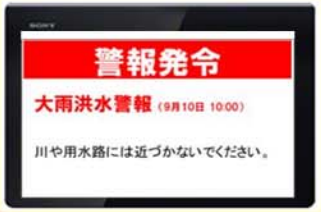
Ⅱ．復興の生活支援情報の提供

地域住民が便利に情報取得や発信できる環境を提供し、地域の絆を強めて復興に向けた生活を支援

地域情報・イベント情報の提供

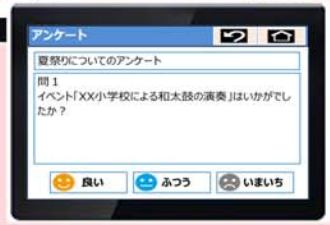
復興活動支援・交流情報の提供

気象・災害情報の提供



Ⅲ．暮らしやすく快適な新地のまちづくり

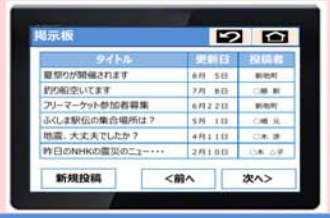
双方向通信機能を活用した、住民参加型のまちづくりの支援



生活・環境アンケート

住民の移動パターン把握

各種計画に利用



生活情報掲示板

Life Assistant TAblet System (LATAS) in Fukushima Demonstration Projects from 2014

Tablet monitor

- 主な用途
  - エネルギー消費関連情報の閲覧・登録
  - 生活情報、地域情報の閲覧
  - アンケート、掲示板への書き込み
  - タブレット携帯時の移動ルート取得

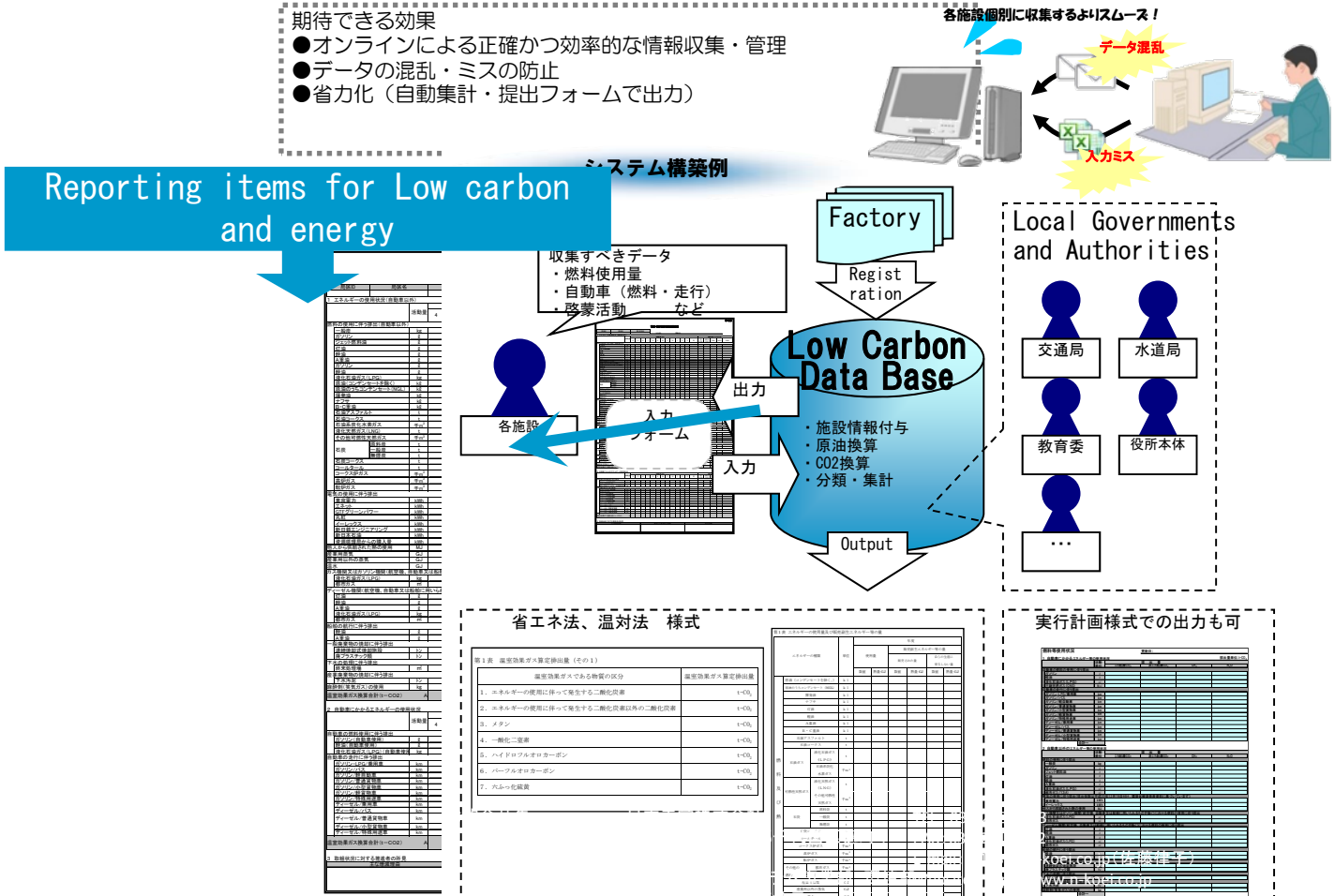
Smart Electricity Sensor

- 用途
  - 電気配線の系統ごとに使用電力を計測
  - インターネットを通じ、管理システムに計測値を送信・処理

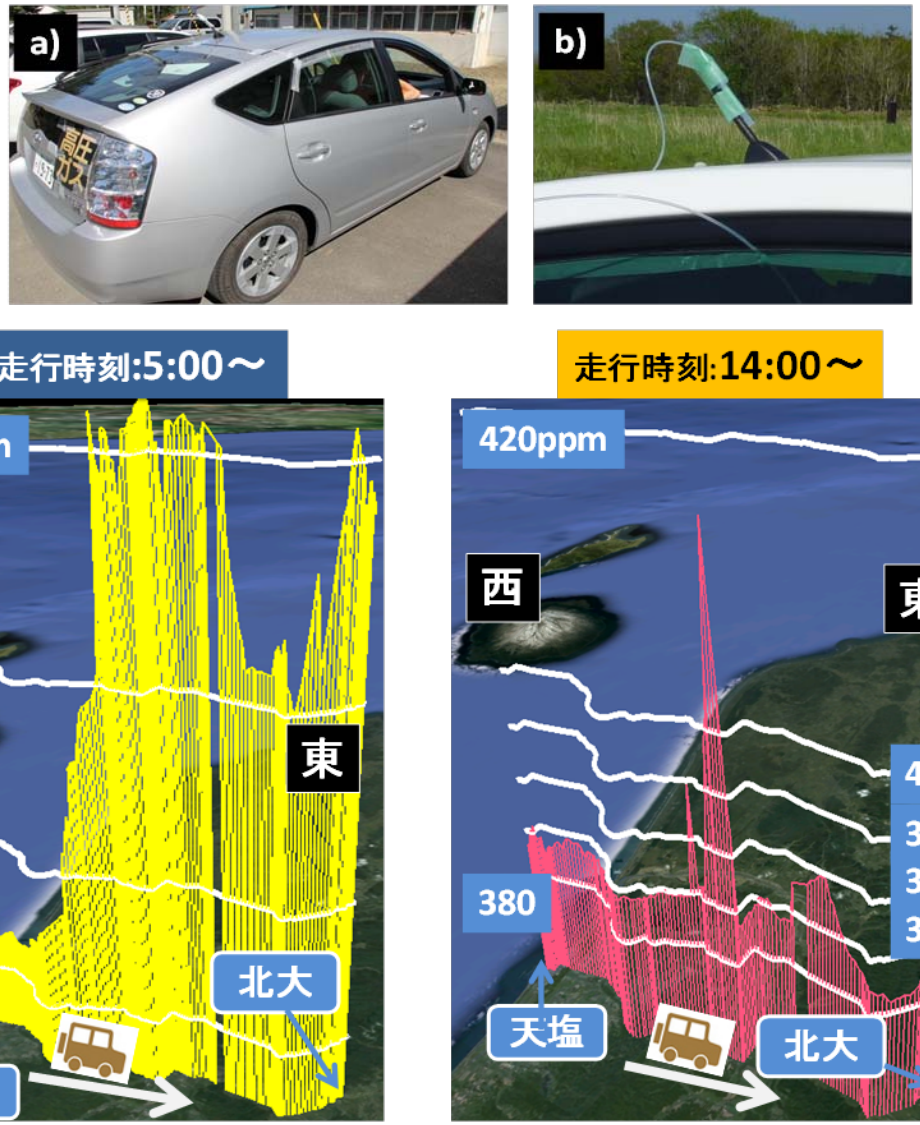
収納ボックス

On line Carbon Emission Reporting System

Provision and customization of low carbon reporting system in Japan. Into Indonesian cities and eco-industrial parks. Default system was developed for Yokohama City as a pioneering on-line reporting system and their management experiences will be shared with Indonesian experts.

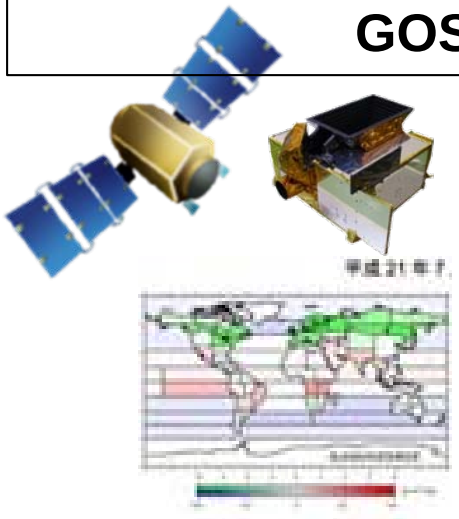


Mobile Monitoring System



Innovative Monitoring and Reporting, Verification System in Asian Countries

Greenhouse gas Observing SATellite GOSAT



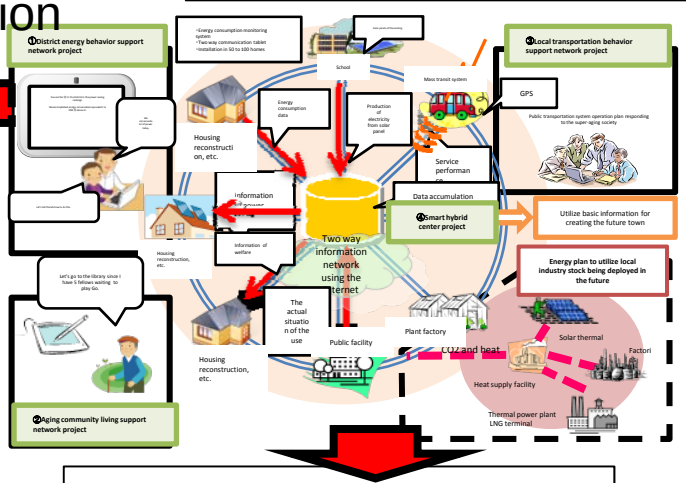
Ground Monitoring System of GHG

Validation

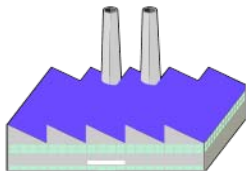
Smart Monitoring Network System for Eco Cities

Verification

Joint carbon Credit Mechanism Projects

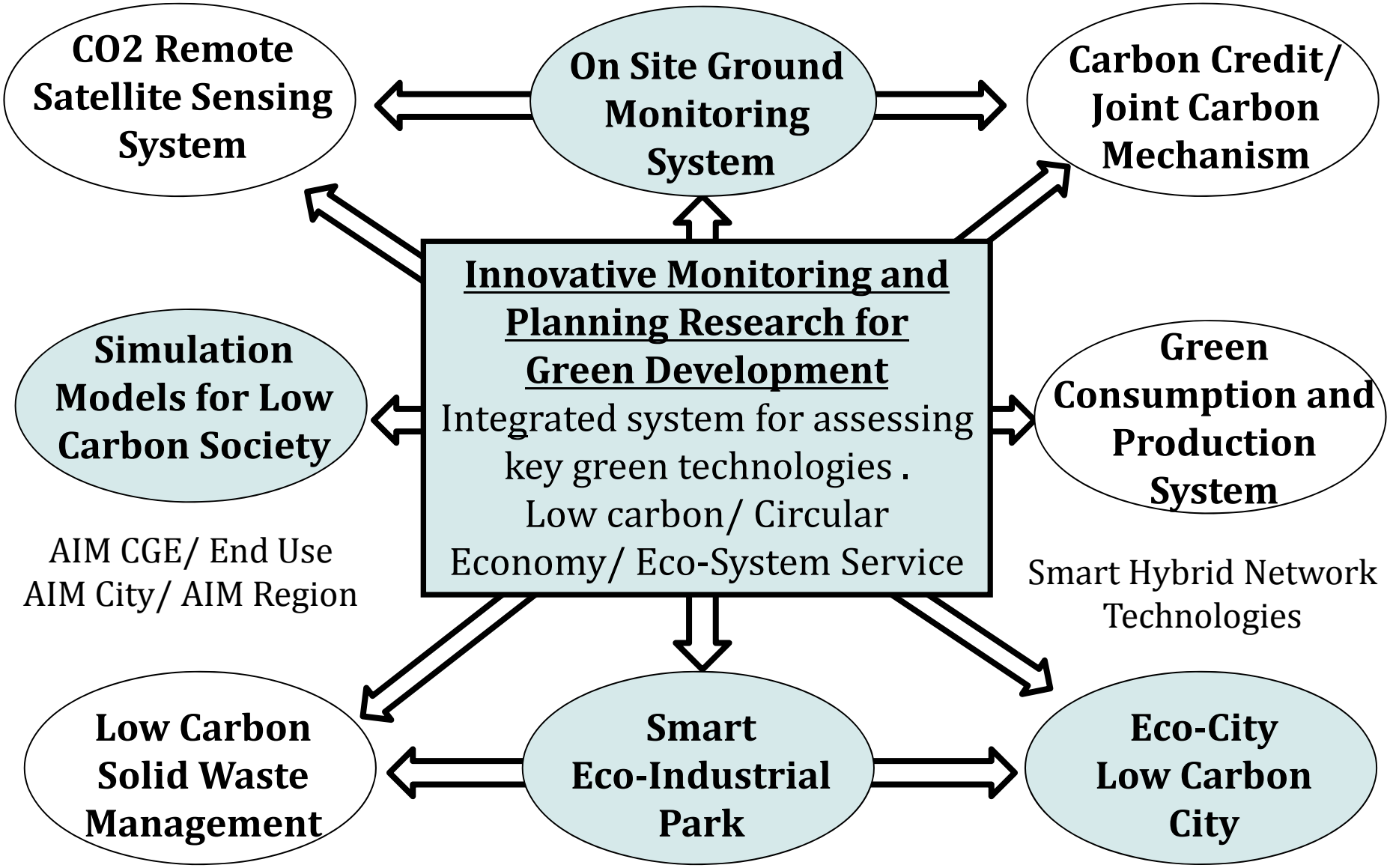


International Financial System for Low Carbon City Development



Eco-city Evaluation and Validation

Innovation of Environmental Technologies for Green Development



Related Publication

Xudong Chen, Tsuyoshi Fujita, Yoshitsugu Hayashi, Hirokazu Kato, Yong Geng ; Determining optimal resource recycling boundary at regional level: A case study on Tokyo Metropolitan Area in Japan, European Journal of Operational Research, Available online 19 February 2013, http://dx.doi.org/10.1016/j.ejor.2013.01.054,

Satoshi Ohnishi, Tsuyoshi Fujita, Xudong Chen, Minoru Fujii ; Econometric Analysis of the Performance of Recycling Projects in Japanese Eco-Towns, Journal of Cleaner Production, Vol.33(1), pp.217-225, September, 2012

Minoru Fujii, Tsuyoshi Fujita, Xudong Chen, Satoshi Ohnishi, Naohisa Yamaguchi ; Smart Recycling of Organic Solid Wastes in an Environmentally Sustainable Society, Resources, Conservation and Recycling, Vol.63, pp.1-8, June, 2012

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

Minoru Fujii, Tsuyoshi Fujita, Xudong Chen, Satoshi Ohnishi, Naohisa Yamaguchi ; Smart Recycling of Organic Solid Wastes in an Environmentally Sustainable Society, Resources, Conservation and Recycling, Vol.63, pp.1-8, June, 2012

Yong Geng, Tsuyoshi Fujita ,Xudong Chen; Evaluation of Innovative Municipal Solid Waste Management through Urban Symbiosis: A Case Study of Kawasaki, Journal of Cleaner Production, Vol.18, pp.993-1000, 07,2010

Shizuka Hashimoto, Tsuyoshi Fujita, Yong Geng, Emiri Nagasawa ; Realizing CO2 Emission Reduction through Industrial Symbiosis: A Cement Production Case Study for Kawasaki, Journal of Conservation and Recycling, Vol.54(10), pp.704-710, 08,2010

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

Thank you for your attention

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Collaboration Scheme

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Ministry of Env. Indonesia
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Ms. Emma Rachmawaty Mr. Tsutsui (MOEJ)

UNEP

UNIDO(RECP)
Cleaner and Sustainable Production Unit; Chief Dr. Berkel

METI

BAPENAS

DNPI National Council on Climate Change

NIES
Center for Social Env SR
Center for Global ER

Nagoya Univ.
Tokyo Institute of Tech.
Tokyo Univ.
United Nations Univ.

Institute of Tech. Bangdung
Center for RE Cleaner Production

Bogor Agri. Univ.
Prof. Rizaldi
President

Fujitsu
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Pasco
JFE Engineering

IGES
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Mr. Izuhara (JICA)

Indonesian Business

JICA