

ISAP 2024 Thematic Track 3 (TT-3)

To Realize Net Zero In Asia

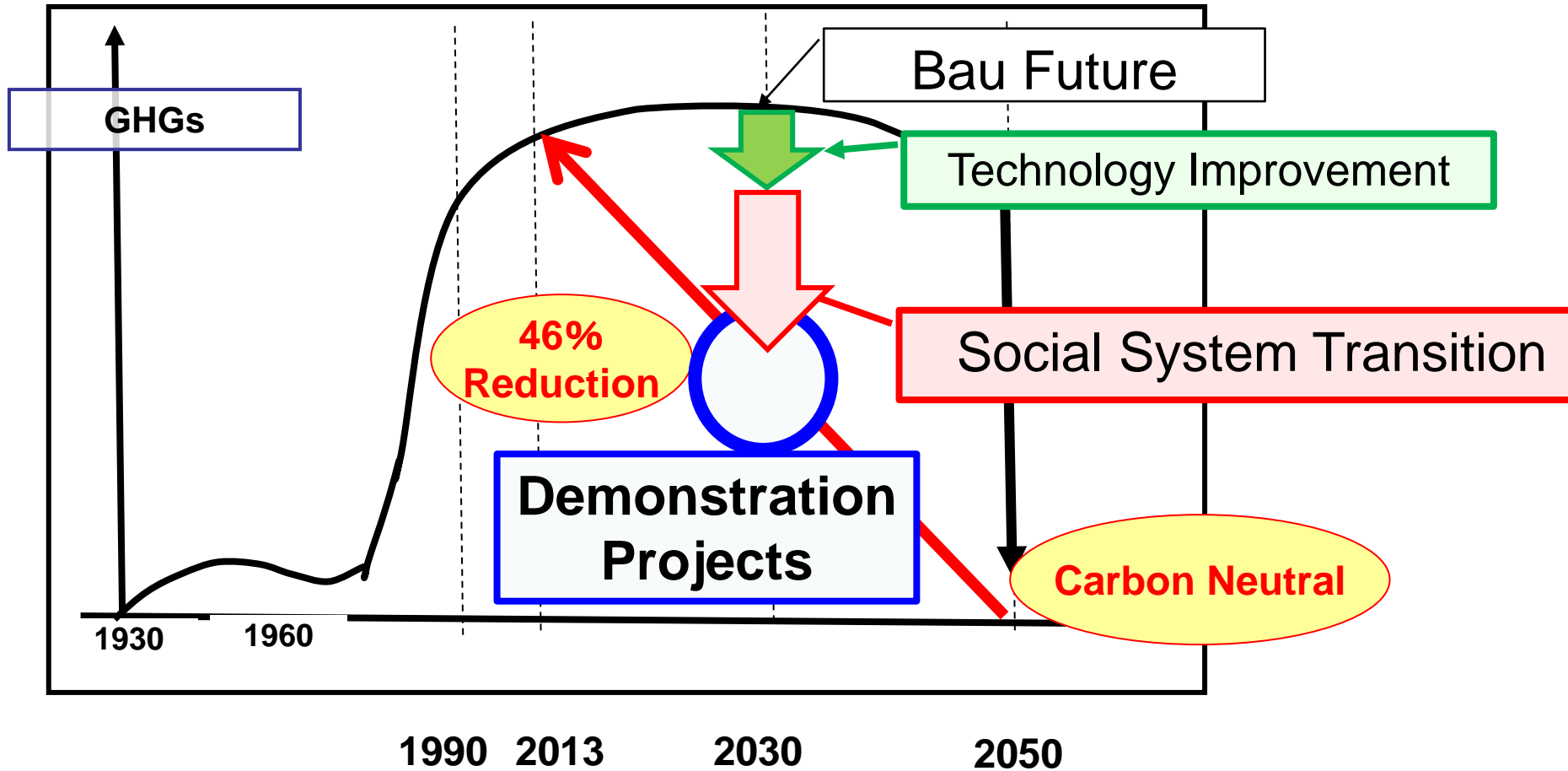
**-Methodologies to Support for Implementing
*Climate Change Mitigation Plans-***

**Regional Innovation Research
Approach toward Carbon Neutral
Regions and Projects**

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Demonstration Projects and Cities for Social Transition



what can we do to achieve the energy security we need while aiming to reach net zero by 2050?

National Basic Research Project for Regional Decarbonization
Ministry of Education, Science and Technology
2021-2025

Development of Regional Planning System of
Green Innovation for a Decarbonized Society
and Establishment of Social Implementation
Network through Regional Coalition Action

Leading Institute University of Tokyo
Project Leader Prof. FUJITA, Tsuyoshi



Univ. Tokyo

Toyo Univ.

Kitakyushu Univ.

seda Univ.

Utsunomiya Univ.

Nagoya Univ.

Gifu Univ.

Policy Scenario Design Process for Carbon Neutral SDGs Model Cities and Regions

Dialogue
with
Local
Govern-
ments

Research
Conso-
rtium

Local Information
Statistics
• GIS Population,
Industries, (500mgrid)
<2010年、2015年>

**Diagnoses of
Cities and
Regions
Goods/ Bads**

**Scoping
Focal Policy
Area /
Pilot Project
Design**

**BAU
Scenarios**

**Future
Scenario
Simulation**



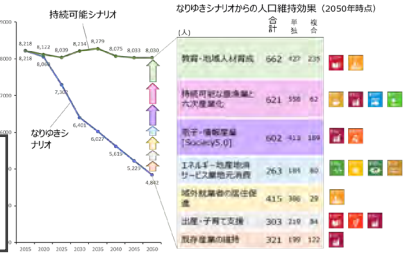
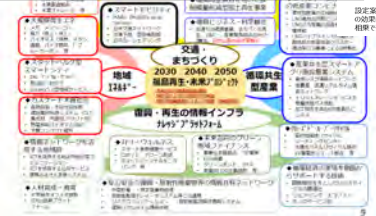
**SDGs Local
Indicators138**

**Global SDGs
Indicators**

**SDGs Policy
Key
Indicators**



**Policy
Inventory**

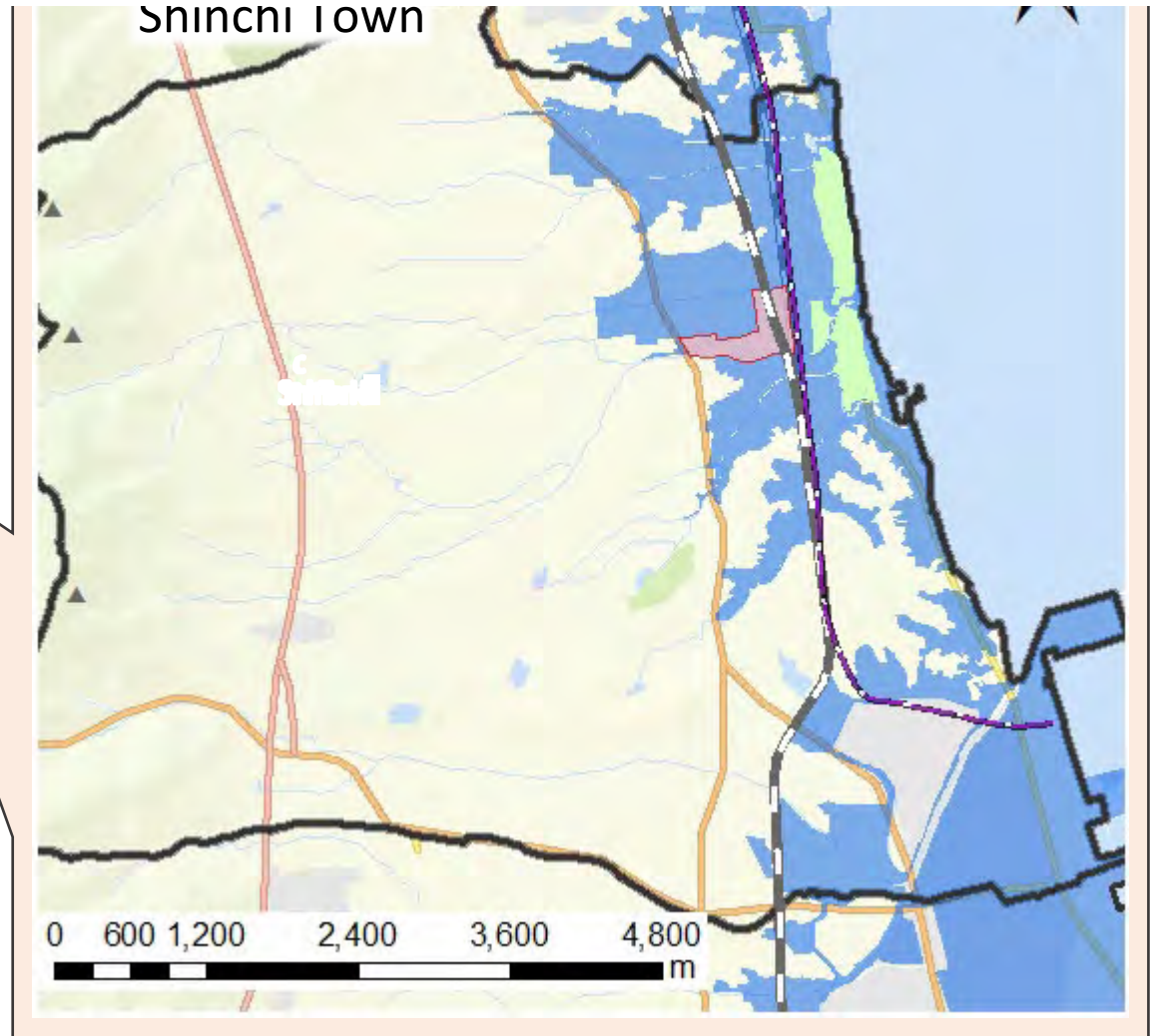




Shinchi Town, Soma-Futaba Region, Fukushima Prefecture

Population: 8,247 / Households: 2,754 / Area: 46.35 km²

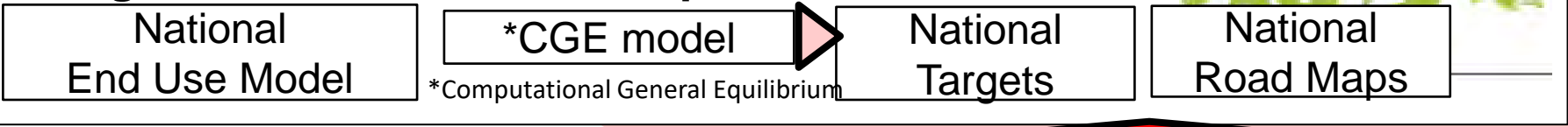
(As of Jan. 1st, 2017)



Development of Regional Integrated Models (Regional AIM) and Spatial Planning Model to design sustainable regions and cities

Integrated Model (AIM)

Design of Vision and Road Map for *National Scale*

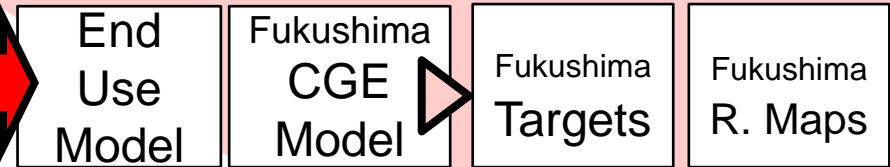


Regional Rebuilding Parameter

- 【Population】 Policies for aging
- 【Industries】 Policies for low carbon
- 【Bio-Sys】 Natural habitat restoration
- 【Land Use】 Compact city Policies

Regional Parameters

Analysis for Fukushima Pref. Scale



Spatial Planning Model

Eco Growth Modules

- Local Heat/Energy Management
 - Low Carbon Industrial System
 - Strategic Spatial Zoning System
 - Forestry Eco System Service Model
- 

Spatial Policy/ Tech. Process Packages

Planning for Local Scale



Local Statistics and Project Data

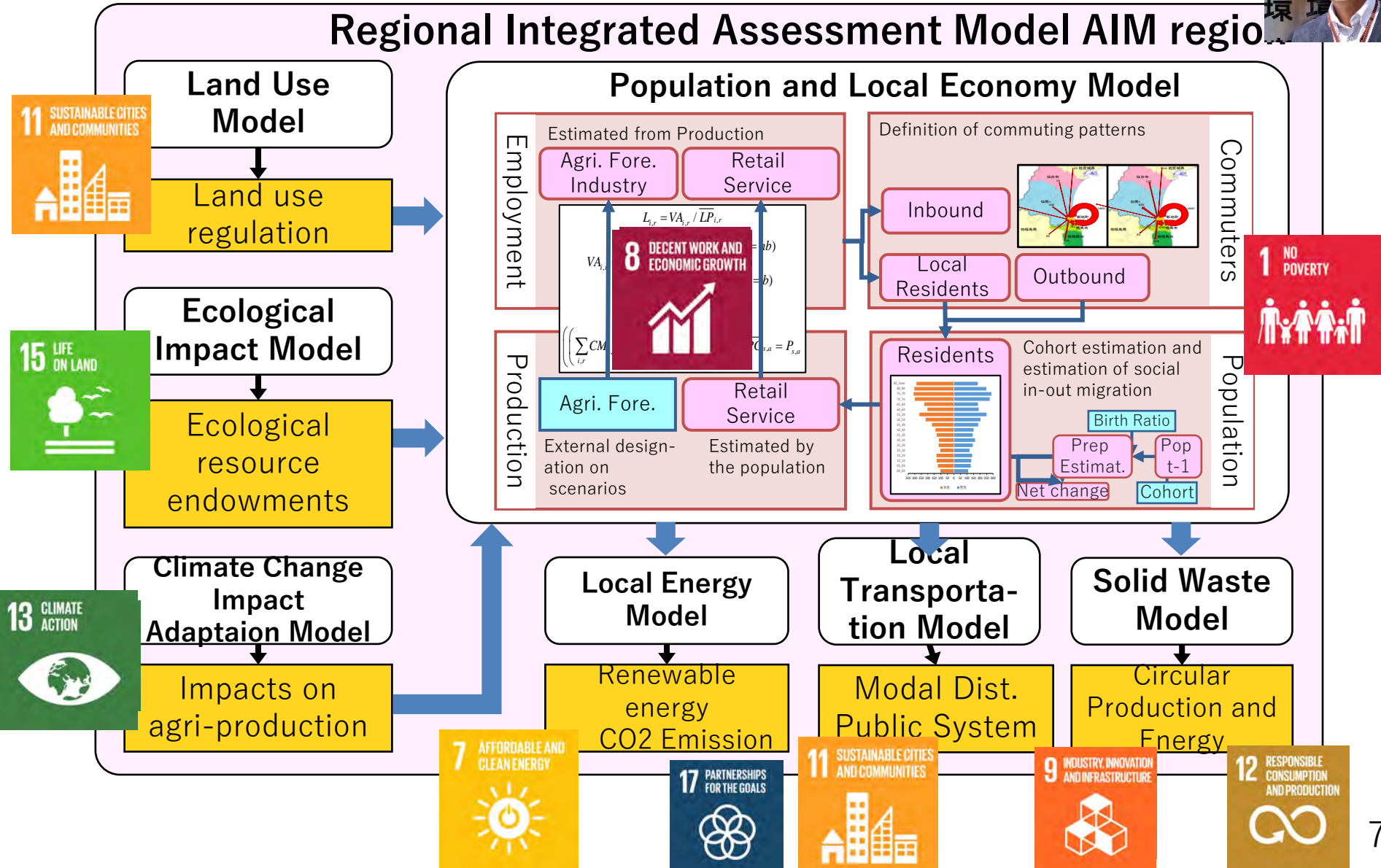
- Buildings
- Industries
- Agriculture/ Forestry
- Life Style

AIM Regional Model to Quantify the SDGs Accomplishments

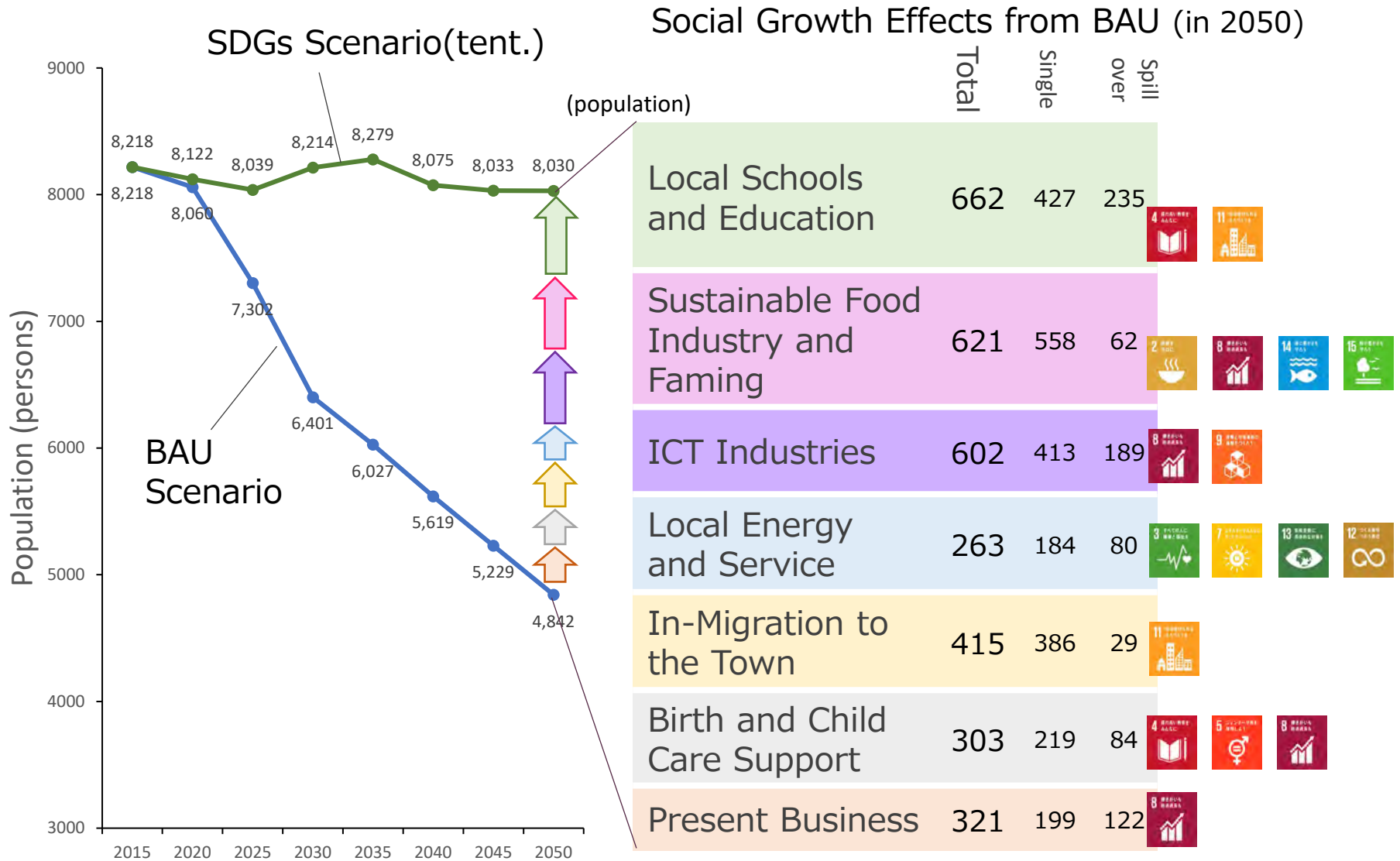
Dr. Gomi NIES



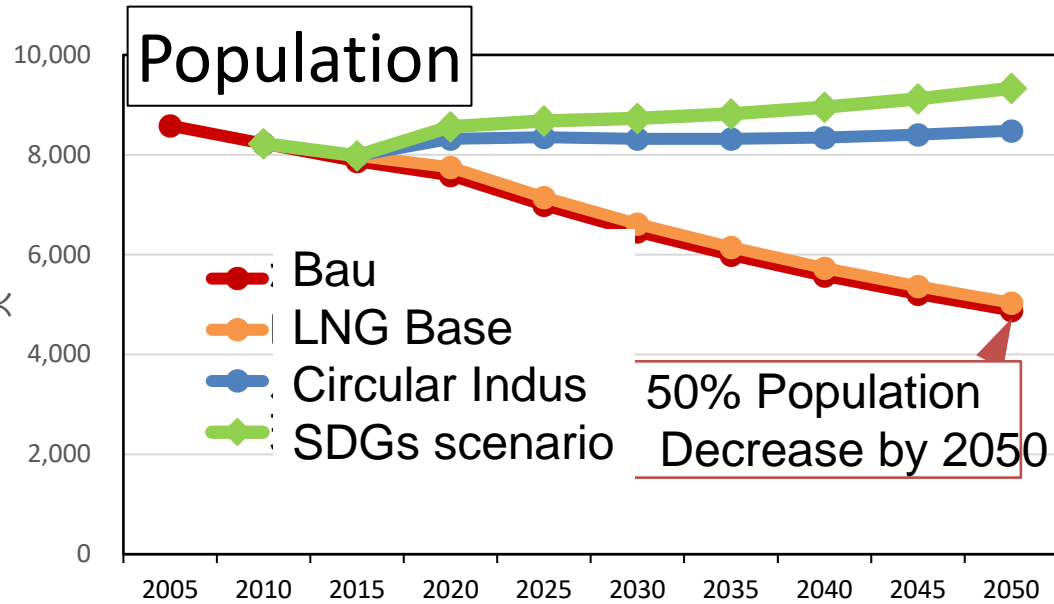
Regional Integrated Assessment Model AIM regio



Socio Economic Environmental Forecast of Future Scenarios



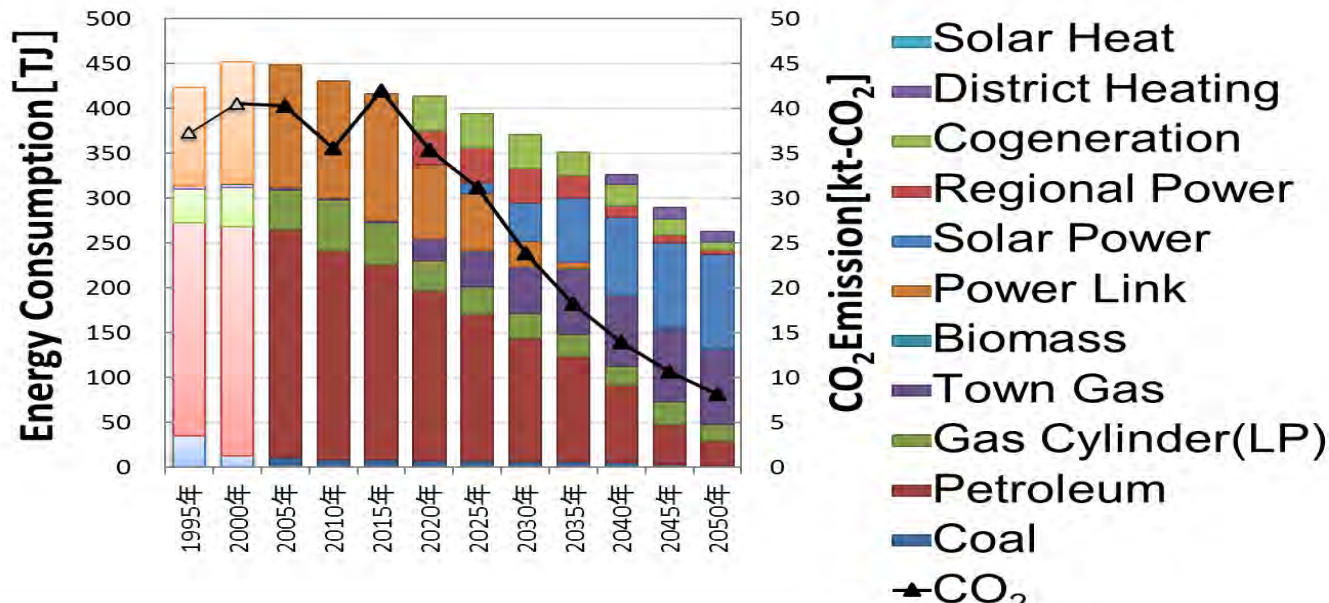
Macro-scope Simulation for the Future Scenario of Population and Production



Population recovery by green growth

Population keeping with industrial locations

Limited population effects by LNG base



Estimation of Alternative Future Spatial Scenarios

Alternative Spatial Scenario

Quantification of Impacts and Costs

BAU



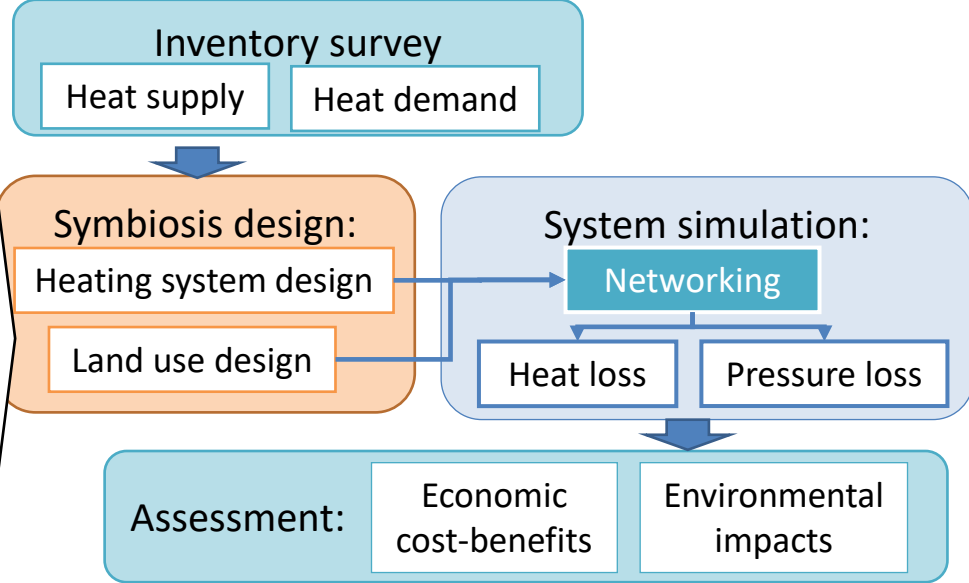
+Compact City



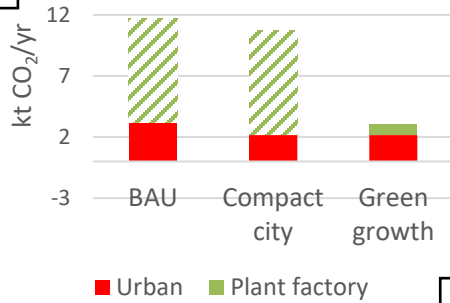
+Green Growth



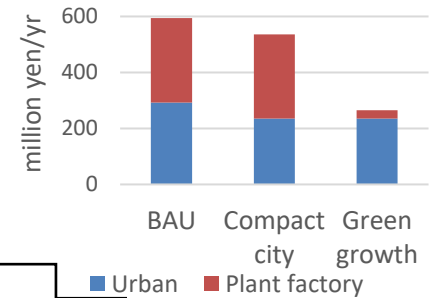
Effects of Local Energy Management



CO₂ emission comparison:



Fuel cost comparison:



Green growth can bring significant co-benefit of CO₂ emission reduction and fuel saving.

Local Energy Based Urban Rebuilding Project in Fukushima

Sustainable rebuilding projects through collaborative planning among town planning, industrial development and local energy system

施設農業



Multi sectoral energy management
/housing/commercial/agriculture

Strategic land
use transition
targets

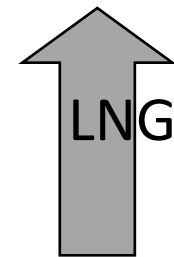
都市

Energy Center

- Smart thermal and electricity management

熱
電氣

Efficient local energy
management for a
local scale system

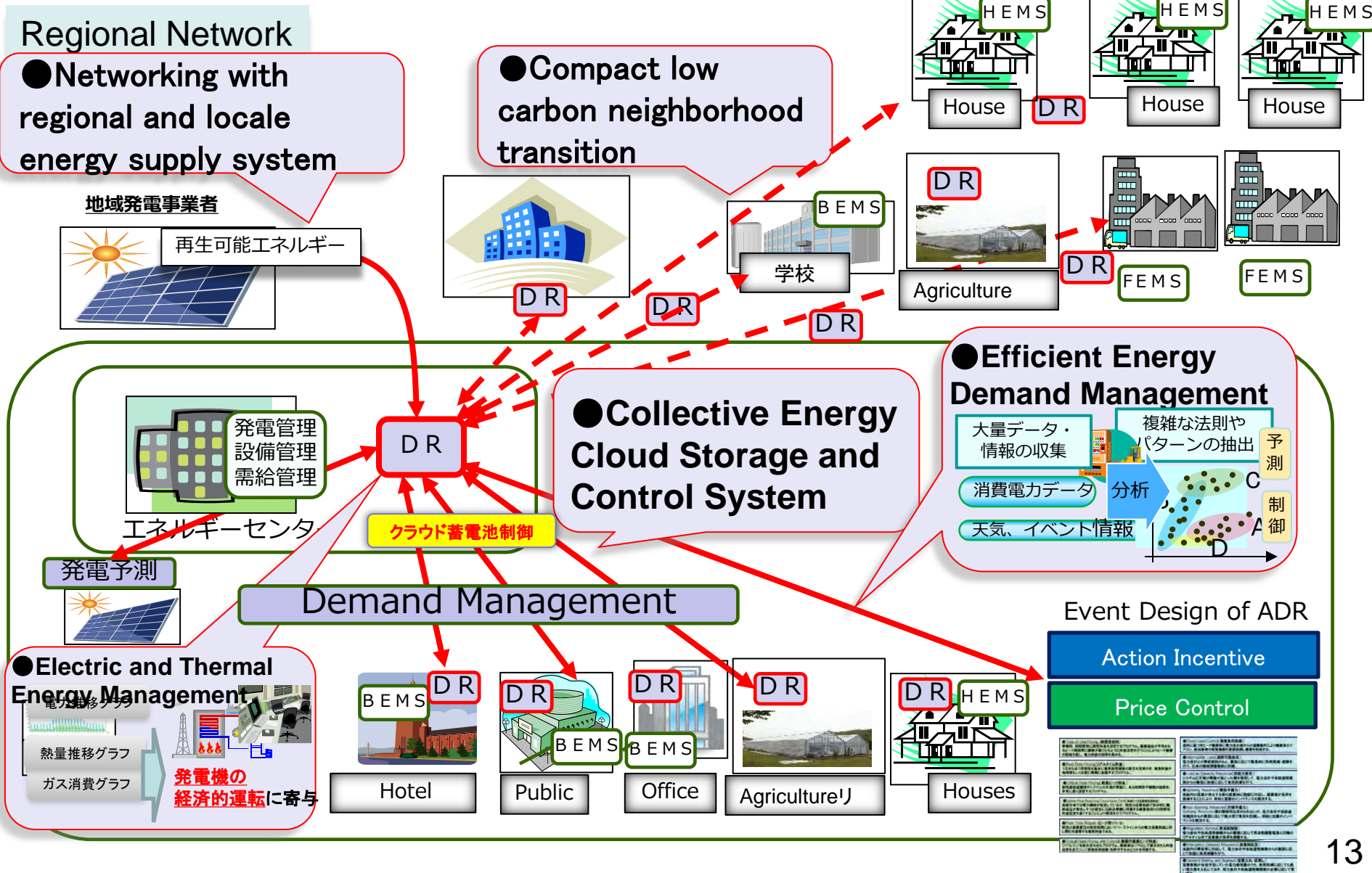


LNG Plant

Shinchi Smart Energy Center as a Symbol of Fukushima Rebuilding as of Oct. 2018



Toward Smart Urban and Industrial Energy Management (Smart Electric and Thermal Demand Management System)



Fukushima Shinchi Tablet Network as a Social Monitoring and Activity Support System

Local Energy Assist

Electricity sensor: sensor networked with server and tablets

distributor



Real time monitoring



Incentives for efficient energy saving activities



Dual Direction ICT Communication System



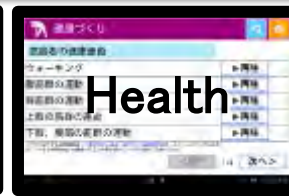
役場 (Town Office)



Local Life Assist



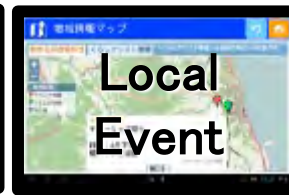
Emergency



Health

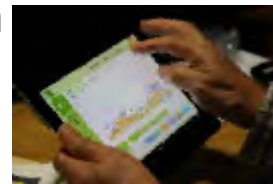


Public Service



Local Event

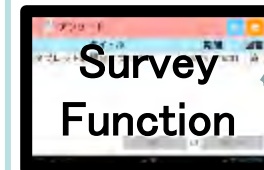
Dual-direction information sharing system



Community Information Assist



GIS Maps



Survey Function



Bulletin Board

Multi user information sharing system
Frequent questionnaire system
Information sharing among uses

Electric Message Board

Localization of Models by Social Monitoring


- Conventionally, local scenarios are developed with limited statistical data and “default” parameters from national or international information.
- Our approach combines monitoring of local activity and modeling so that we can propose the most suitable mitigation scenario and Action plans for the city/region.

Statistical information

Current environmental initiative

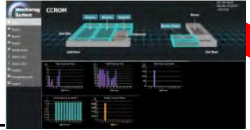
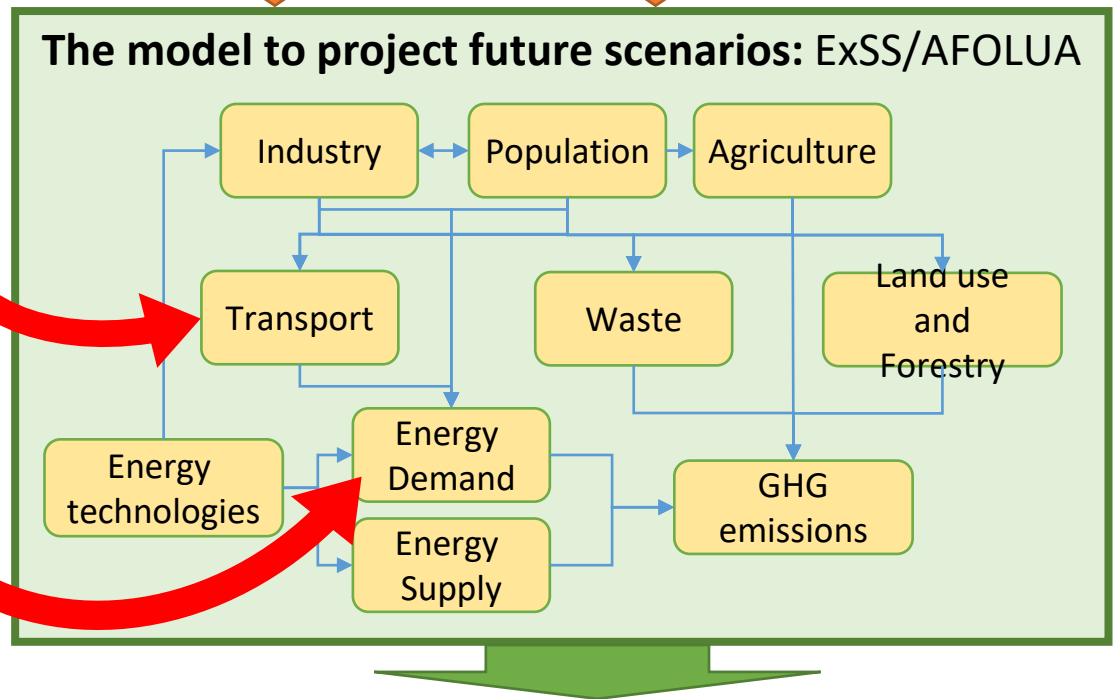
Transport Monitoring

- Transport structure
- Vehicle speed
- Fuel efficiency etc.



Energy Monitoring

- Current and future energy consumption pattern
- Energy saving potential

Locally suitable mitigation scenarios



Scenario	Contribution to emission reduction (ktCO2eq)
Conversion of Fuel Oil to Gas for Public Transportation	2100
City Of Park	1700
Bus Rapid Transportation System, Pedestrian Facilities and Bicycle Track	2000
LED for Street Lamp, Green Building Concept and Eco-campus	2400
Renewable energy	2000
Waste collection and recycling	CM
Industry energy efficiency improvement	4700

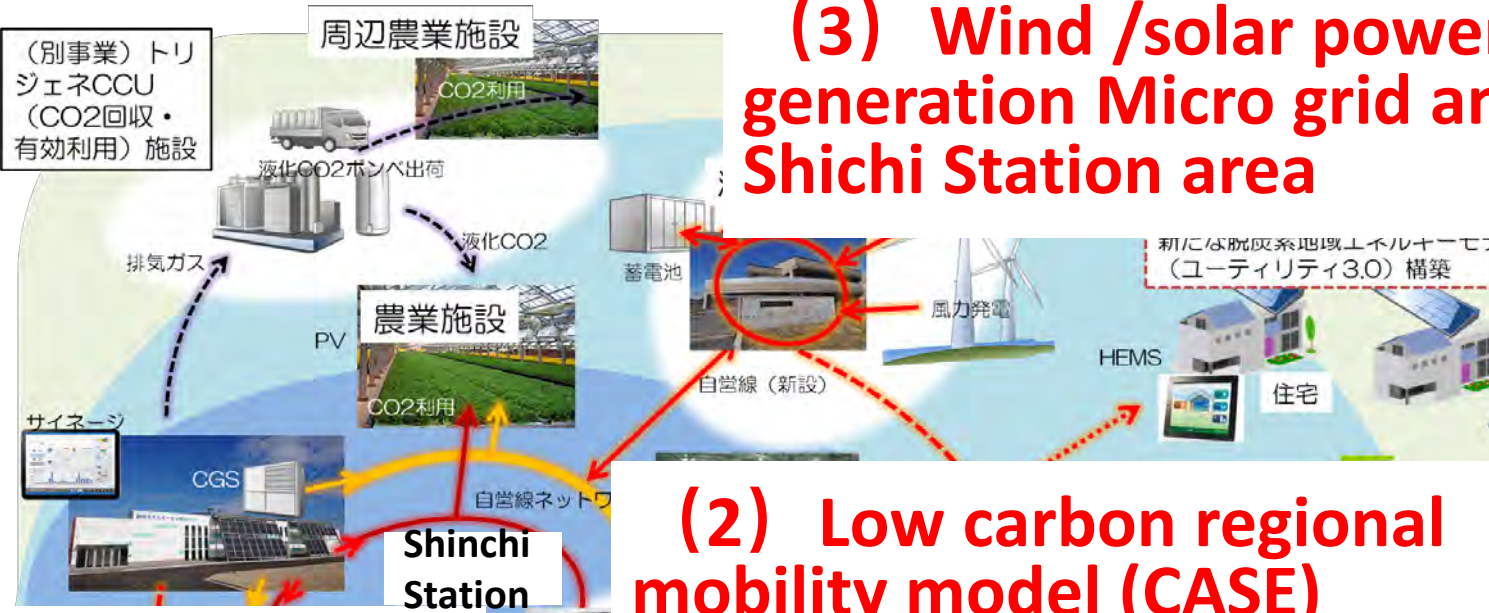
Mitigation potential in 2030

Actions to introduce the measures in 2030

Roadmap and investment towards 2030

Future Design for Fukushima Circulating Ecological Sphere

(3) Wind /solar power generation Micro grid and use in Shichi Station area



(2) Low carbon regional mobility model (CASE)

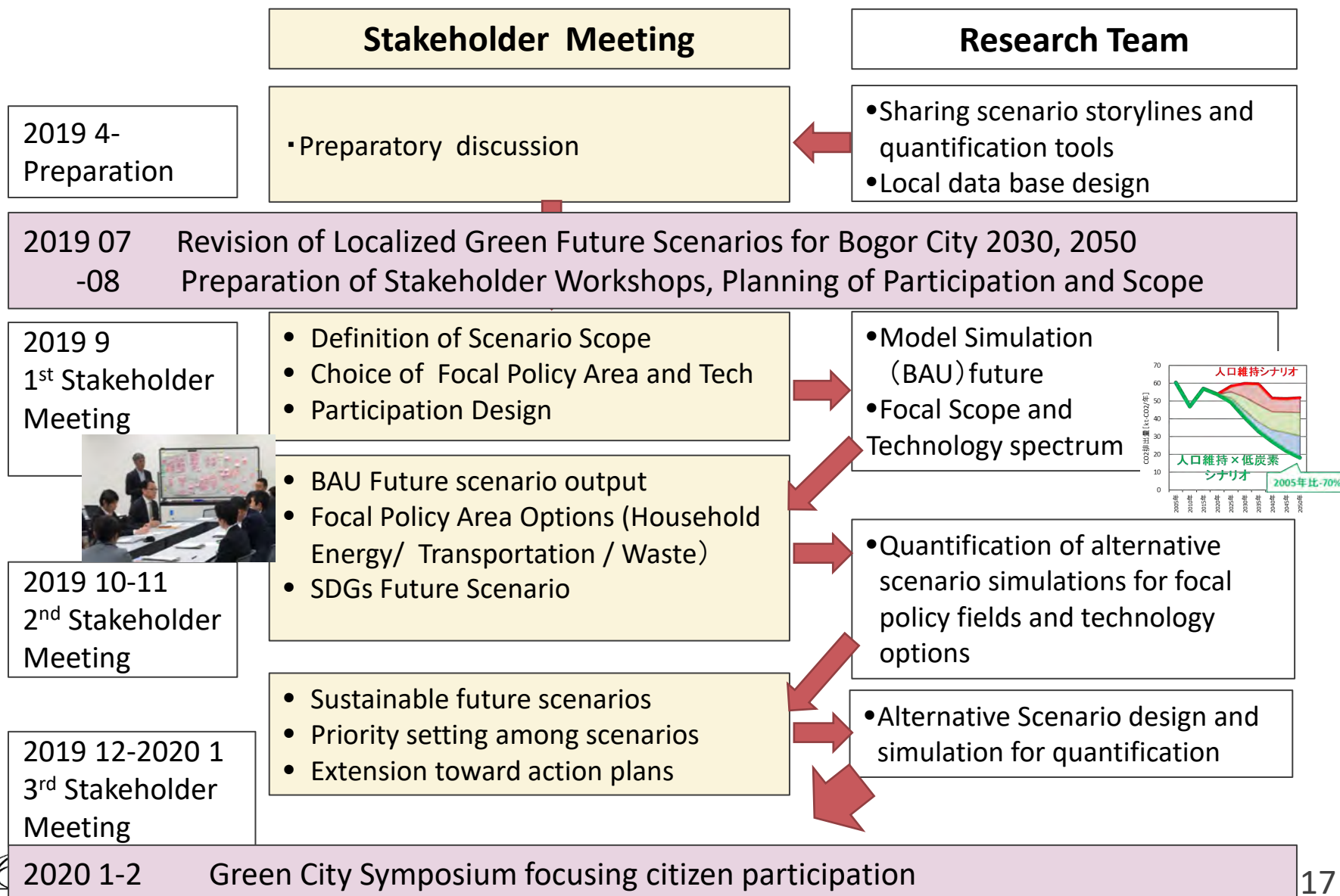


(1) CEMS with AI support Demand Optimization Energy System

Shinichi Energy Center

Discussion materials for Interactive Simulation

Interactive Scenario Simulation in Fukushima



Circulating Ecological Regions; SDGs from Japan

Transportation Town planning

Regional Energy

Circular Economy

Information infrastructure of regional circulation symbiosis Knowledge platform

2030 2040 2050
Shinchi future revival project
 • Future-oriented environment creation recovery
 • Zero CO2 emissions due to fossil removal
 • Population recovery by regional innovation
 • Local revitalization

◆ Cloud EV city
 • Hydrogen station compact town development
 • EV cloud storage

◆ Hydrogen energy
 CO2 free hydrogen production
 Hydrogen production base
 Hydrogen storage etc

◆ Large scale Renewable energy
 • Mega, meso solar
 • Wind power (land/ocean)
 • Biomass (forest, methane, algae) Blue carbon etc.

◆ Start based smart city
 • DR, digital grid
 • Thermal energy network
 • Society 5.0 type regional service

◆ Cascade woody society
 Wood sorting technology
 Construction material utilization system (CLT, laminated wood, interior material, craft material)
 Cogeneration biomass energy
 Woody compact city

◆ Regional group that utilizes information network
 Inter-district communication using CT
 Public services that utilize ICT
 Remote Hometown Support System

◆ Human resource and education
 • University base office invitation
 • SDGs Policy Platform

◆ Hybrid Transportation
 • Automatic operation network
 • Personal mobility, barrier-free walking network

◆ Smart mobility
 • MAAS (Mobility-as-a-Service)
 • Public transport network
 • Traffic congestion prediction, traffic control
 • Public car sharing

◆ Smart wellness
 Smart longevity health service
 Robot, drone delivery
 Smart personal monitoring etc

◆ Safe and secure regional environment information sharing network
 • Cooperation with environmental information telemeter system etc.
 • Risk communication · Environmental awareness improvement information system
 • Local circulation symbiosis business real time information sharing

◆ De-fossil type compact network
 Compact zoning and network services from a long-term perspective
 Formation of urban industry symbiosis district

◆ Regional circulation symbiosis type land conversion that utilizes local resources, materials

◆ Reconstruction business, science tourism
 • Ecotourism, town development regeneration, network tourism of energy, industrial development base, natural park

◆ Future-oriented green area finance
 Commercialization support base TIF bonds etc.
 ESG investment
 Green Bond, Funance
 Real RE 100 company invitation

◆ Climate change Adaptation
 Strategic urban area downsizing
 Regional Adaptation Consortium
 Disaster prevention infrastructure construction

◆ Low carbon complexes in energy intensive industries
 Wide area base of material type industry
 LNG base cold energy business
 Local production and consumption cogeneration in LNG thermal power plant
 Decompression distributed supply in LNG pipeline
 Zero carbonization by highly efficient CCS business

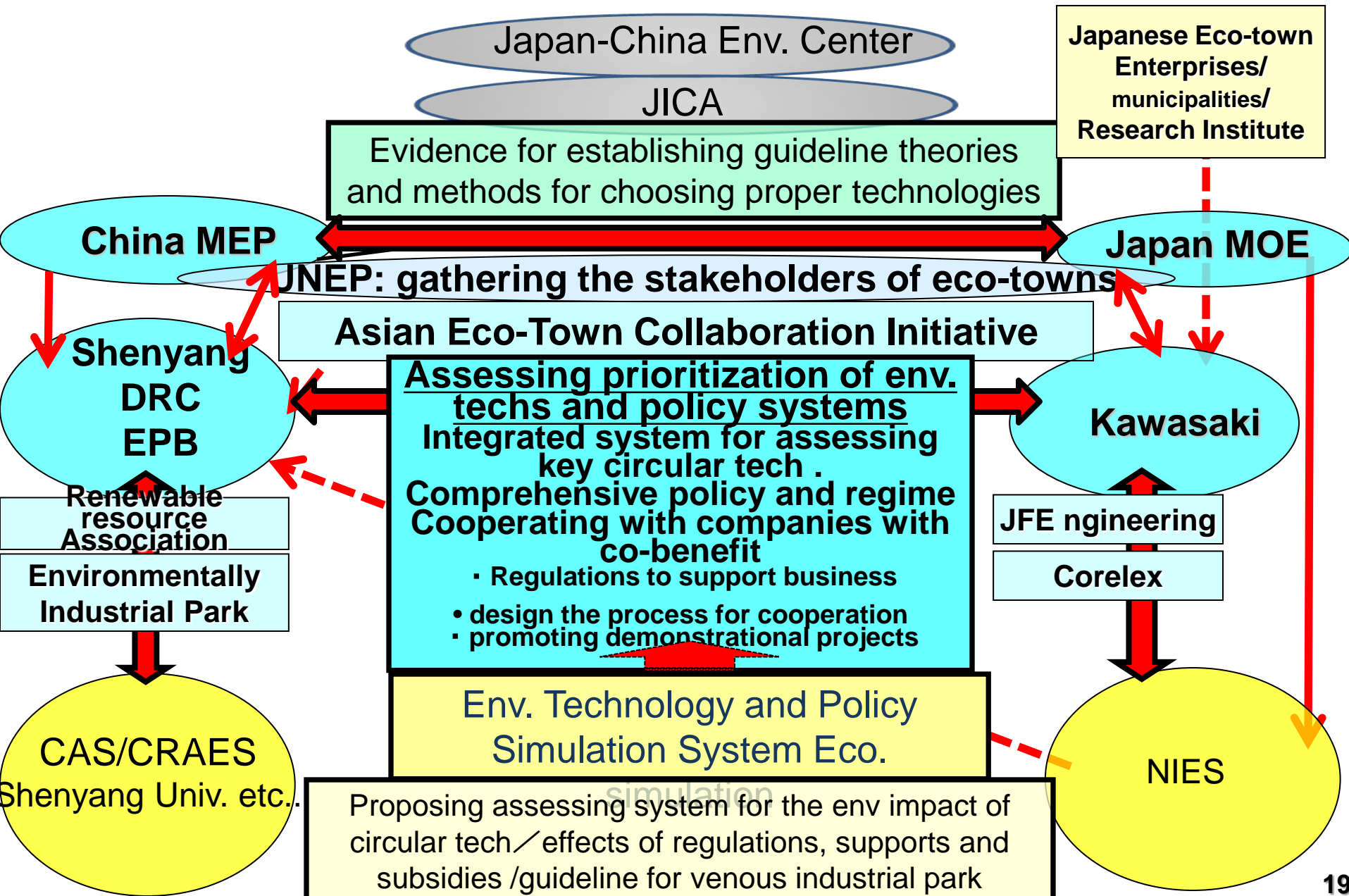
◆ Industry symbiosis type smart agri facility and system
 Development Risk Information Network
 Consumer, distribution real-time information network
 Thermoelectric carbon dioxide supply by trigeneration
 Sixth industrialization business including processing sales

◆ Closed loop recycling
 High added value recycling
 Sorting center
 Solar panel recycling base EV storage battery reuse base etc

◆ Technologies that support the realization of circular economy
 • Logistics optimization mainly for venous logistics
 • Sharing economy
 • Service of goods

Research on Env. City Technology and Policy Simulation System

The Material to Japan-China Cooperation



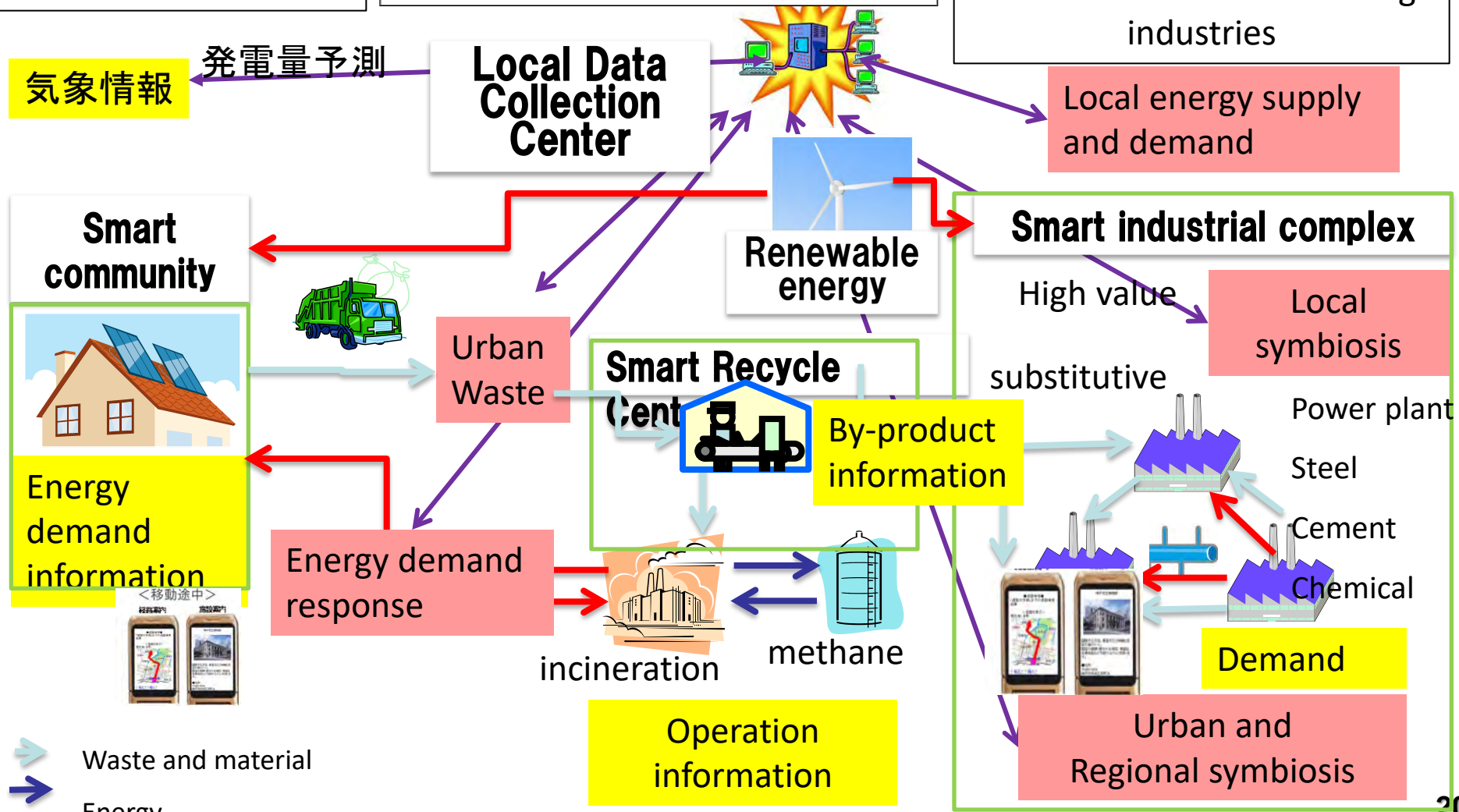
Smart Symbiosis Initiatives for Eco town Innovation

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



Monitoring sites of Bogor City in 2014-2015

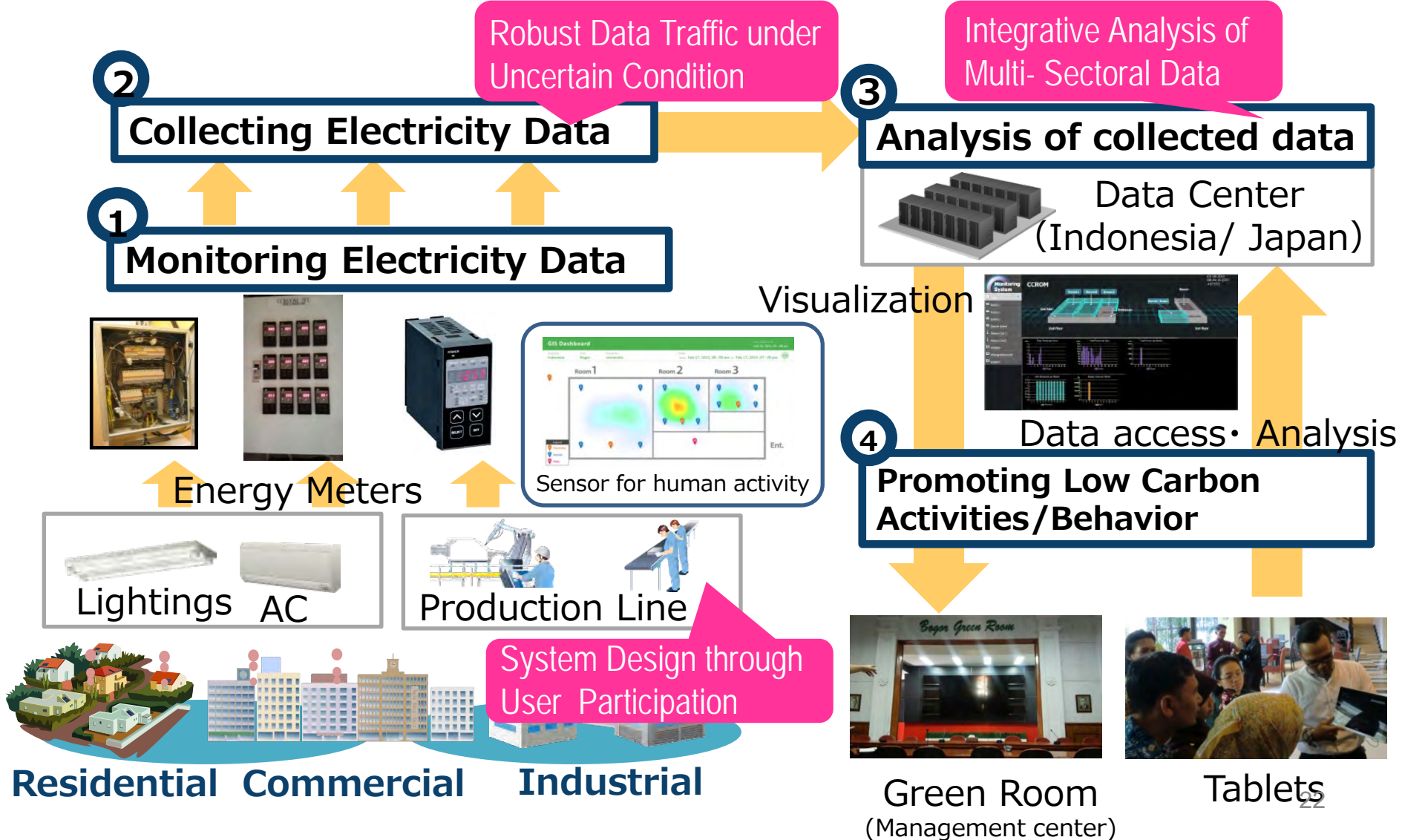
Shopping mall is targeted in 2015FY
50 monitoring points in Bogor city



Sector	Number of facilities	Number of point
Government building	3	30
Residential house	3	12
Commercial facilities	2	8

Action framework of urban monitoring system in Asia

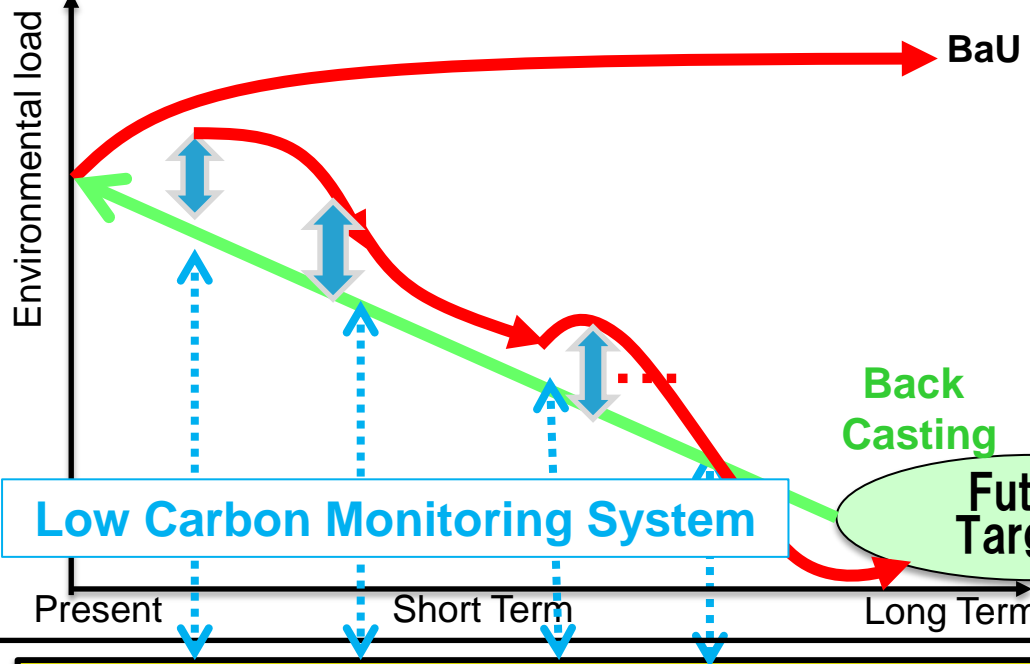
- Advanced internet security technologies effectively manage and protect the data
- Excellent recovery data collection capability
- Relationship analysis between human behavior and energy use



Innovative Modelling and Monitoring Research Project

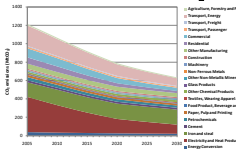
Low Carbon Solutions on Local Contents

Technology and policy Solution Design Adapting to Local Characteristics

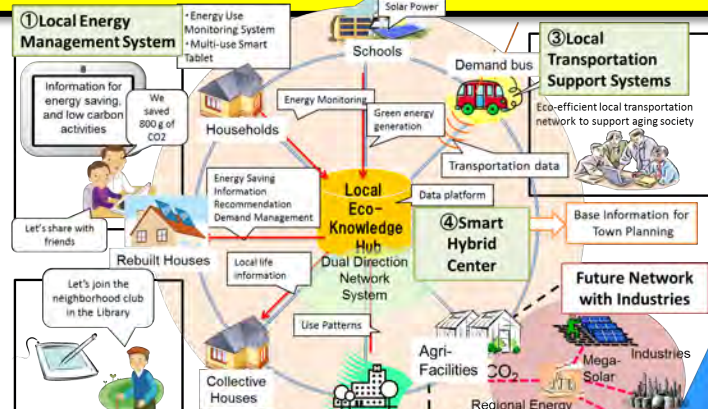


Integrated Model for Future Vision

Normative Targets by General Equilibrium Model



Dual Direction Low Carbon Monitoring Information System



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