Environmental Issues in Asia
University of Kitakyushu
5 December 2012

International Intercity Environmental Cooperation

Hidenori Nakamura, Ph.D.
Institute for Global Environmental Strategies

Outline

- International Intercity Network for Low Carbon Sustainable Development
- International Environmental Cooperation of Japanese Local Governments

Part I: International Intercity Network for Low Carbon Sustainable Development

i. Mutual Learning through Asian Intercity Network Programmes for the Environment
ii. The Surprising Role of Local Governments in International Environmental Cooperation: The Case of Japanese Collaboration with Developing Countries
iii. Enabling Factors Promoting Local Initiatives for Sustainable Consumption in Asia: Potential Roles of Local Governments
iv. Role of the Network Secretariat and Network Design (from *Lessons Learnt from Regional Intercity Networking: To Promote Sustainable Cities in Asia*)
v. International Intercity Collaboration and Its Potential Applications in Low Carbon Development

Part I: International Intercity Network for Low Carbon Sustainable Development

i. Mutual Learning through Asian Intercity Network Programmes for the Environment
ii. The Surprising Role of Local Governments in International Environmental Cooperation: The Case of Japanese Collaboration with Developing Countries
iii. Enabling Factors Promoting Local Initiatives for Sustainable Consumption in Asia: Potential Roles of Local Governments
iv. Role of the Network Secretariat and Network Design (from *Lessons Learnt from Regional Intercity Networking: To Promote Sustainable Cities in Asia*)
v. International Intercity Collaboration and Its Potential Applications in Low Carbon Development

International Platform for Sustainable Cities

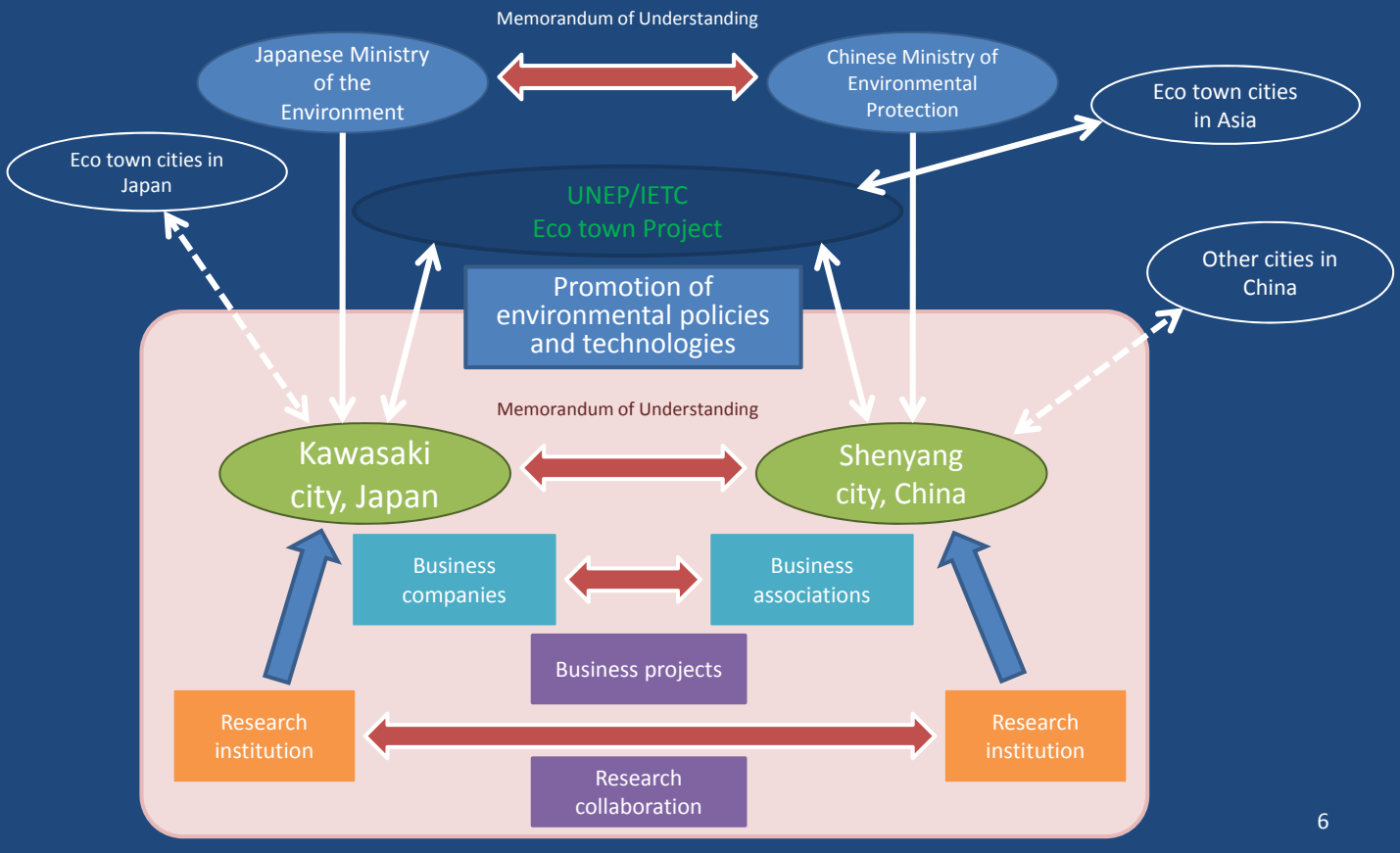
Multi-lateral/bi-lateral intercity relationships

- International intercity network programme (multi-lateral) e.g. Asia-Pacific Eco Business Forum
- City-to-city co-operation (bi-lateral) e.g. Shenyang Kawasaki collaboration

Degree of institutionalisation by the stage of development

- Loose and ad-hoc participation in events and campaigns, to
- Membership and independent secretariat for network programme

Stakeholders of International Platform for Sustainable Cities: Case of Kawasaki - Shenyang



International City Networks for the Environment with Asian Cities

CITYNET
Environment Cluster

ICLEI Local Governments for Sustainability
Southeast Asia
South Asia
Korea
Japan

Kitakyushu Initiative for a Clean Environment
Second Cycle: 2005-2010

CLEAN AIR INITIATIVE for Asian Cities

ANMC21
Asian Network of Major Cities 21
Environment Project

C40 CITIES
CLIMATE LEADERSHIP GROUP

Objectives of International Platform for Sustainable Cities

(4) Developing joint actions
- Local government
- Business
- Research

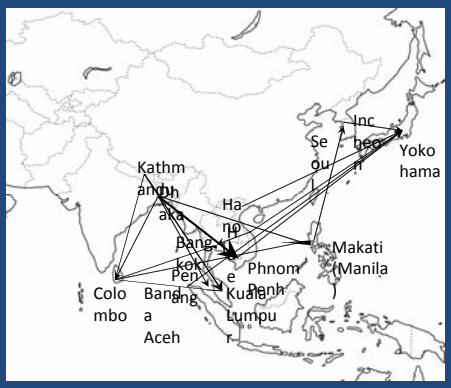
(1) Mutual reference and learning

(3) Advocacy

(2) Environment business promotion

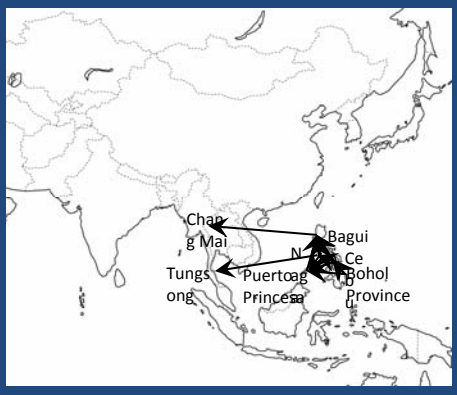
Demonstrated Cases of Intercity Collaboration: (1) Mutual Reference

CITYNET: The Regional Network of Local Authorities for the Management of Human Settlements – Environment cluster



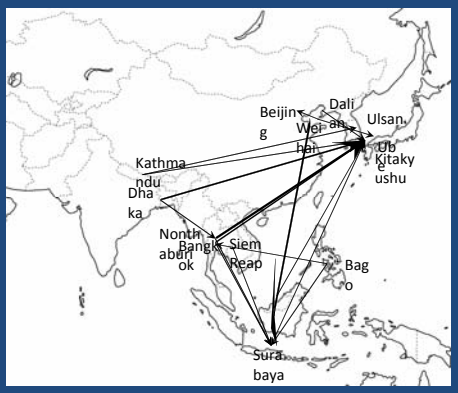
Practices shared
- Solid waste management
- Water and sanitation
- Environmental education

ICLEI - Local Governments for Sustainability – Southeast Asia



Practices shared
- Climate change mitigation – energy efficiency, renewable energy, waste and waste water, transport

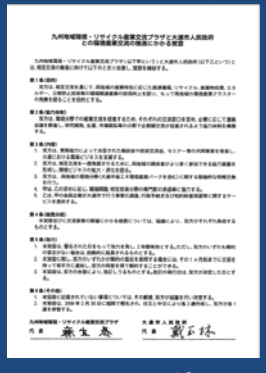
Kitakyushu Initiative for a Clean Environment



Practices shared
- Waste management and composting
- Cleaner production

Demonstrated Cases of Intercity Collaboration: (2) Business Promotion

- Kitakyushu city
  - Supported local environmental businesses' promotion in China
  - Three companies initiated businesses in China
- Kyushu Recycle and Environmental Industry Plaza (K-RIP)
  - Concluded MOU on Environmental Industry exchange with Dalian city government
  - Collaboration extended to Liaoning province in China



Source: Kitakyushu city, K-RIP

Business Promotion: CITYNET Smart Cities

CITYNET provides online portal to connect Asian cities and environmental solution provides in Europe to enhance interaction.

SMART-Cities portal

Green Pages to provide company information

City Pages to provide city information

Demonstrated Cases of Intercity Collaboration: (3) Policy Advocacy

C40 and ICLEI : Copenhagen Climate Summit for Mayors

"Mayors … gathered … to show that we are on the frontline of climate change."

Discussion on Public-Private Partnership

Presentation of city case studies

World Mayors Council on Climate Change (WMCCC)

COP 15 Side Event "Action Now! Mayors Deliver Their Messages to COP15"

"National governments ought to partner with local governments to tackle climate change."

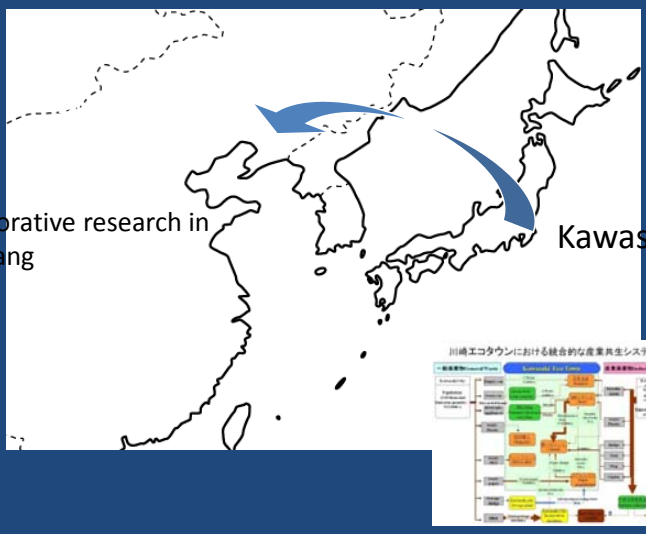
Panel debate

Dialogue

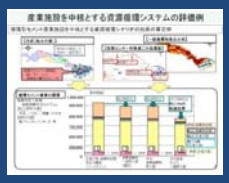
Sources: Climate Summit for Mayors; ICLEI

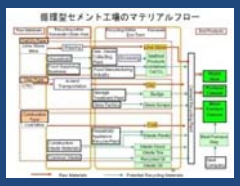
Demonstrated Cases of Intercity Collaboration: (4) Joint Actions

In the field of research, Shenyang Institute for Applied Ecology, Chinese Academy of Sciences (CAS/IAE) and National Institute for Environmental Studies, Japan (NIES) made an agreement on research collaboration, including Shenyang-Kawasaki collaboration project



Shenyang's visit to Kawasaki





Researches at Kawasaki

Sources: Prof Fujita, NIES; Kawasaki city

Demonstrated Cases of Intercity Collaboration: (4) Joint Actions

In the field of local administration and businesses, ICLEI has conducted PROCURA+ (plus) campaign with European cities to promote local governments' sustainable procurement

Procura+ Sustainable Procurement Campaign

Five milestones

Key product groups:
- Buses
- Cleaning products and services
- Electricity
- Food and catering services
- IT products
- Building construction and renovation

Benefits:
- Seminars, conferences, and study tours
- Training and consultancy services with discount

Manual

Source: ICLEI Europe

Demonstrated Cases of Intercity Collaboration: (4) Joint Actions

C40 Cities: International intercity network to tackle climate change with 40 major cities, including London, New York, Tokyo, Hong Kong, Bangkok, Jakarta

Clinton Climate Initiative (CCI) – a foundation- provides support to C40 Cities

Purchasing Consortium

- Polling the buying power of cities to lower the price of energy saving products
- CCI introduces companies to cities

Key product categories

- Building materials, systems, and controls
- Traffic and street lighting
- Clean buses and waste disposal trucks
- Waste-to-energy systems

Source: C40 Cities

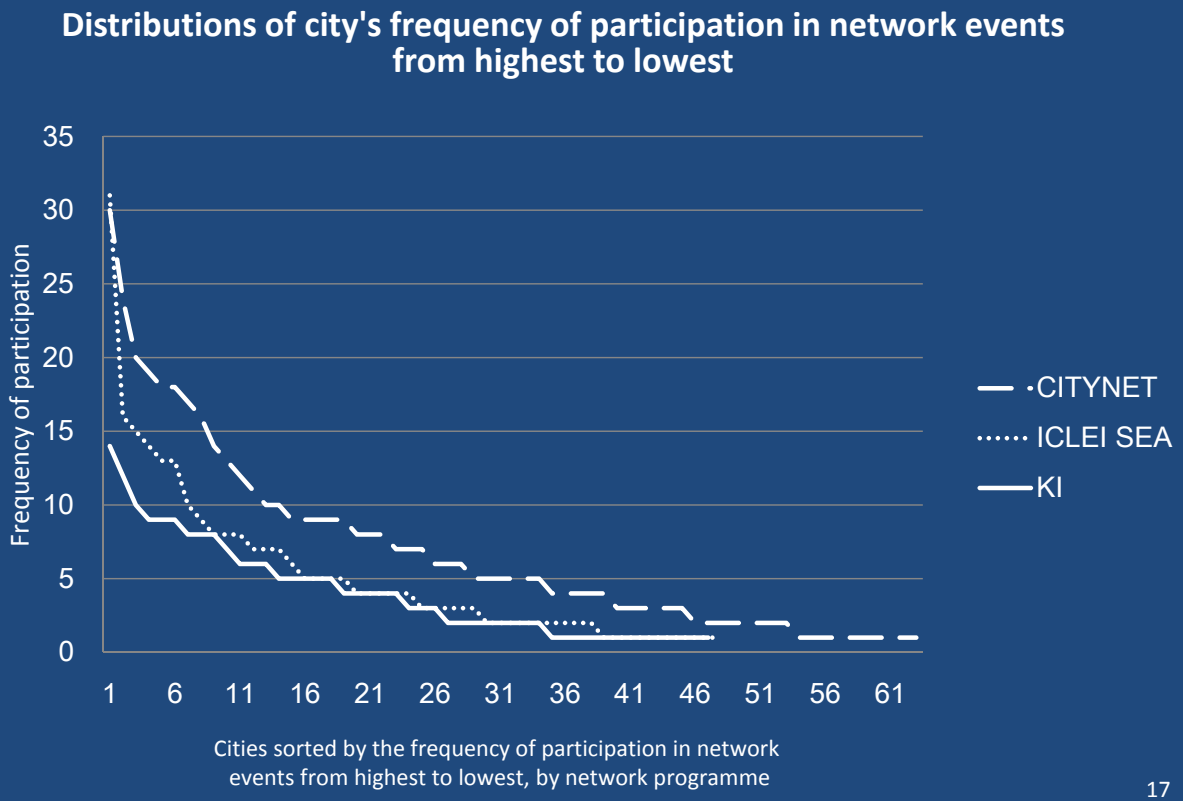
Difficulties

Most of international intercity networks are faced by HR and financial constraints

Network	Secretariat staffs	Funding: Membership fee	Funding: Member cities' contribution	Funding: International organisations; national governments
CITYNET	6	Yes	Yes	Yes
ICLEI Southeast Asia	3	Yes	No	Yes
Kitakyushu Initiative	4	No	Yes	Yes

Ishinabe (2009), author

Limited Number of Cities Actively Engaged in Network Activities



Source: author

Cities' Strategy to Best Use of International Platform

Different purpose at different stage

- Broad scan and survey of appropriate platform(s), program(s), and partner(s)
- Focused partnership and joint project development

Expected benefits of local government other than capacity development

- City promotion
- Obtaining followers, supporters, coalition for advocated polices and practices
  - Political support for sustainable development may not be strong
  - Cities may not have reason to go beyond national policy

Expected Benefits for Business and Research Institutions

Business	• Business development overseas • Market access through network
Research institutions	• Application of research on the field • Data generation through collaboration with local partners • Social experiments in the field

Steps to Start Utilising International Platform

1. Search existing platform
2. Join planned / existing international platform
3. Assess the effectiveness with several trials
4. Propose and create new programmes under the platform
5. Propose and lead the discussion and preparation of new platform

Formulation of Platform

Stages	Actions
1) Forming relationships	a) allocate time to seek out appropriate partners, b) explore common interests that holds network together, c) learn realistic expectations of partner performance, d) develop and apply criteria of membership, and e) extend relationships beyond core membership, in particular donors
2) Organising relationships	a) develop goals, objectives, and work plans of network, b) decide how the network will be managed, and c) explore options for financial resources in particular to support network coordination functions
3) Formalising relationships	a) for members to discuss governance of network, b) begin with finalizing agreement on goals, objectives and principles, c) codify the membership arrangement, d) set decision-making rule regarding what requires consensus, majority vote, or merely input to secretariat, and e) customize the network structure
4) Institutionalising relationships	a) be open to change processes , and b) review all relationships regularly to focus on solid, high performing relationships

Creech and Willard (2001)

Suggestions and Recommendations to Stakeholders

National government

- To make collaborative agreement between governments to support intercity collaboration
- To institutionally support intercity collaborative programmes

International organisations

- To link funding opportunities to local governments with city networks

Secretariats of existing intercity network programmes

- To allow loose network to initiate new activities on specific issues, with external funders
- To review performance and focus on performing activities
- To explore collaboration among networks on specific topics

Other Platforms

Asian Low-carbon Centre

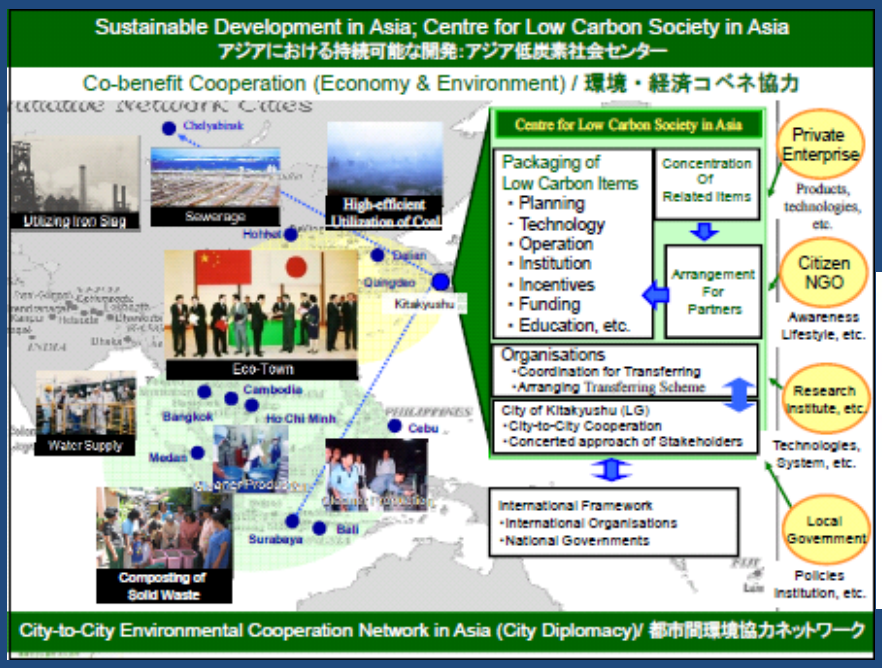
- Kitakyushu city

Clean Asia Initiative - Environmentally Sustainable Cities

- The East Asia Summit (EAS) Environment Ministers Meeting (EMM))

Asian Low-carbon Center

Kitakyushu city of Japan established Asian Low-carbon Center in 2010 to disseminate low-carbon technologies to Asian countries to achieve low-carbon development in Asia



Kitakyushu Initiative Network

Kitakyushu City (2009)

Clean Asia Initiative – Environmentally Sustainable Cities

Initiative under East Asia Summit Environment Ministers' Meeting

Voluntary network of East Asian cities and nations to promote ESC

- Group of cities to show visions, targets and action plans toward ESC
- Identification of barriers and gaps to achieve the targets
- Designing national governments support and international collaboration

Source: IGES Kitakyushu office

Part I: International Intercity Network for Low Carbon Sustainable Development

i. Mutual Learning through Asian Intercity Network Programmes for the Environment
ii. The Surprising Role of Local Governments in International Environmental Cooperation: The Case of Japanese Collaboration with Developing Countries
iii. Enabling Factors Promoting Local Initiatives for Sustainable Consumption in Asia: Potential Roles of Local Governments
iv. Role of the Network Secretariat and Network Design (from *Lessons Learnt from Regional Intercity Networking: To Promote Sustainable Cities in Asia*)
v. International Intercity Collaboration and Its Potential Applications in Low Carbon Development

Forms and Magnitude of International Environmental Cooperation by Japanese Local Governments

Prefecture	Tokyo	Kanagawa	Osaka	Saitama	Hyogo	Fukuoka	Niigata	Mie	Shiga	Toyama
Pop. [1,000]	12,989	9,005	8,840	7,170	5,599	5,067	2,384	1,863	1,402	1,095
Form										
Training in Japan	○	○	○	○	○	○	○	○	○	○
Dispatching experts	○	○	○	○	○	○	○	○	○	○
Partnership with international organisations	–	–	UNEP	–	PEMSEA	UN-HABITAT	–	–	UNEP	UNEP
Hosting international intercity network programmes	ANMC21	20% Club for Sustainable Cities	–	–	–	–	–	–	–	–
Magnitude										
Budget (million yen, FY2009)	NA	410	NA	NA	NA	8.6	NA	4.9	3.6	141
Institutional set-up for international environmental cooperation within the municipal government	–	–	–	–	–	–	–	–	–	–
Hosting international intercity network	○	○	–	–	–	–	–	–	–	–
Set-up of an organisation for international environmental cooperation	–	○	○	○	○	–	○	○	○	○
Average number of trainees trained per	5	NA	31	10	7	1	3	106	53	4
Average number of experts sent per	2	NA	14	13	5	1	5	2	5	2
Period of cooperation [years up to 2009]	20	13	17	14	16	13	12	19	24	13

City	Yokohama	Osaka	Nagoya	Kyoto	Fukuoka	Kawasaki	Kitakyushu	Niigata	Yokkaichi	Kushiro	Ube	Minamata
Pop. [1,000]	3,648	2,651	2,250	1,465	1,442	1,389	985	811	314	189	178	27
Designated city	*	*	*	*	*	*	*	*				
Prefecture the city belong to	Kanagawa	Osaka	Aichi	Kyoto	Fukuoka	Kanagawa	Fukuoka	Niigata	Mie	Hokkaido	Yamaguchi	Kumamoto
Form												
Training in Japan	○	○	○	○	○	○	○	○	○	○	○	○
Dispatching experts	○	–	○	○	○	–	○	○	○	○	–	–
Partnership with international organisations	ITTO, UNU-IAS, etc	UNEP	UNCRD	ICLEI	UN-HABITAT	UNEP	UNESCAP	–	–	Secretariat for Ramsar Convention on Wetlands of International Importance	–	–
Hosting international intercity network programmes	CITYNET	–	–	–	–	–	Kitakyushu Initiative for a Clean Environment	–	–	–	–	–
Magnitude												
Budget (million yen, FY2008)	166	NA	77	6.4	NA	NA	NA	NA	NA	NA	NA	NA
Institutional set-up for international environmental cooperation within the	○	–	–	–	–	○	○	–	–	–	○	–
Hosting international intercity network for the environment	○	–	–	–	–	–	○	–	–	–	–	–
Set-up of an organisation for international environmental cooperation	–	○	–	–	–	–	○	○	○	○	○	○
Average number of trainees trained per year*	20	31	28	NA	15	2	158	NA	106	3	4	NA
Average number of experts sent per year*	13	0	1	NA	6	0	5	NA	NA	1	0	NA
Period of cooperation [years up to 2009]	22	17	NA	NA	10	12	29	9	19	16	11	NA

Abbreviations: UNEP = United Nations Environment Programme, PEMSEA = Partnerships in Environmental Management for the Seas of East Asia, UN-HABITAT = United Nations Human Settlements Programme, ANMC21 = Asian Network of Major Cities 21, ITTO = International Tropical Timber Organization, UNU-IAS = United Nations University Institute of Advanced Studies, UNCRD = United Nations Centre for Regional Development, ICLEI = Local Governments for Sustainability, UNESCAP = United Nations Economic and Social Commission for Asia and the Pacific.
Sources: Respective local governments, GEC, UNCRD, ICETT, ILEC, Ministry of Foreign Affairs of Japan, Shimin Kokusai Puraza [Citizen's International Plaza]
*Most of the training and expert dispatching are funded by external organisations such as Japan International Cooperation Agency (JICA).

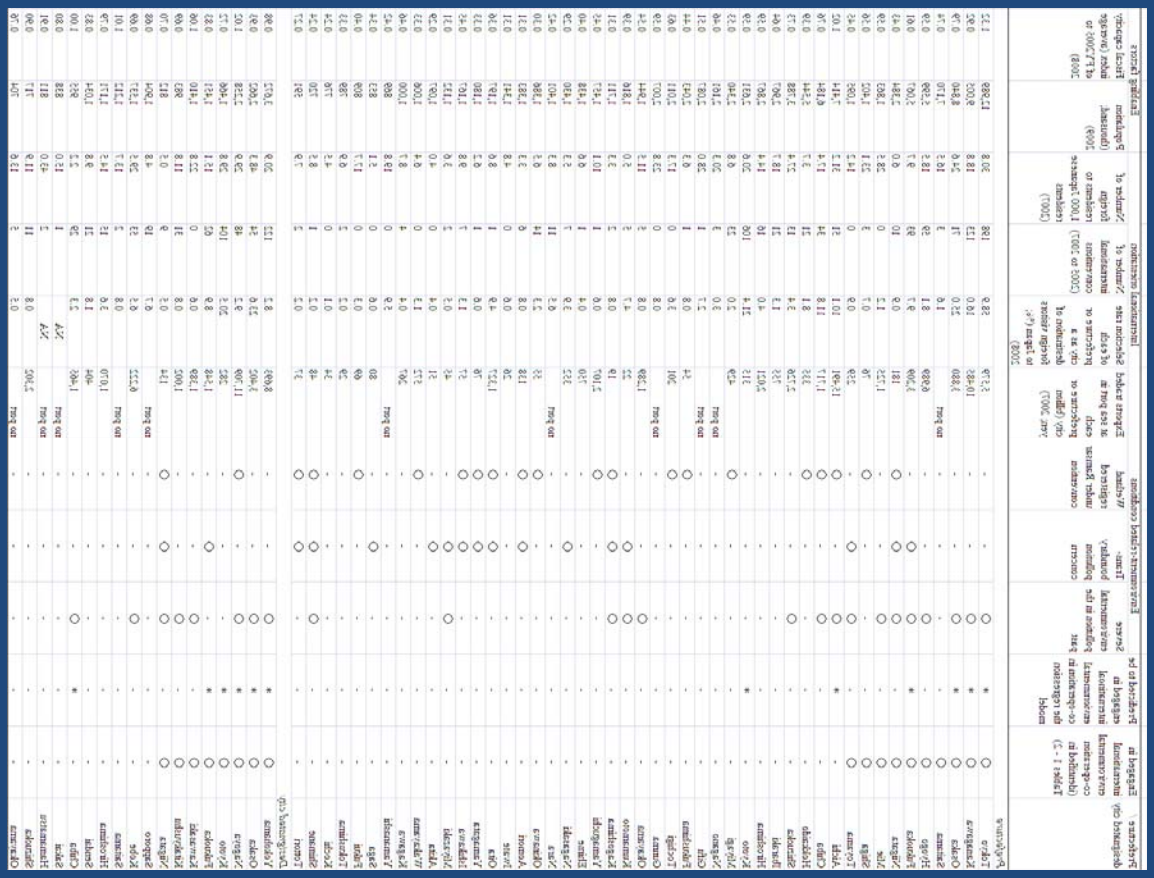
Environment-related Factors Explaining Japanese Local Governments' International Environmental Cooperation

Prefecture	Tokyo	Kanagawa	Osaka	Saitama	Hyogo	Fukuoka	Niigata	Mie	Shiga	Toyama
Factors										
Contribution based on local experience and local human capital experienced in environmental management	○	–	○	○	○	○		○	○	–
Creation of overseas business opportunities	–	–	○	–	○	–	–	–	–	–
Response to trans-boundary pollution	–	–	–	–	–	○	○	–	–	○
Wetland registered under Ramsar convention	–	–	–	–	–	–	○	–	○	–

City	Yokohama	Osaka	Nagoya	Kyoto	Fukuoka	Kawasaki	Kitakyushu	Niigata	Yokkaichi	Kushiro	Ube	Minamata
Factors												
Contribution based on local experience and local human capital experienced in environmental	–	○	–	–	○	○	○	–	○	–	○	○
Creation of overseas business opportunities	–	–	–	–	–	○	○	–	–	–	–	–
Response to trans-boundary pollution	–	–	–	–	○	–	○	○	–	–	–	–
Wetland registered under Ramsar convention	–	–	○	–	–	–	–	○	–	○	–	–

Sources: Respective websites of municipal governments; database on ordinances and plans, Law and Policy Department, Faculty of Law, Economics and the Humanities, Kagoshima University; database of wetlands under Ramsar convention, Ministry of Environment, Japan

Environment-related Conditions, International Orientation and Enabling Factors for All Prefectures and Designated Cities



Sources: Japan Customs, 2008; Japan National Tourism Organization, 2009, 2010; Ministry of Internal Affairs and Communications, 2010; Okayama Prefecture, 2010; each local government statistics

Hypotheses Relating to Japanese Local Governments' International Environmental Cooperation

Prefecture	Tokyo	Kanagawa	Osaka	Saitama	Hyogo	Fukuoka	Niigata	Mie	Shiga	Toyama
Environment-related										
Contribution based on local experience and local human capital experienced in environmental management	○	–	○	○	○	○		○	○	–
Creation of overseas business opportunities	–	–	○	–	○	–	–	–	–	–
Response to trans-boundary pollution	–	–	–	–	–	○	○	–	–	○
Wetland registered under Ramsar convention	–	–	–	–	–	–	○	–	○	–
*International orientation**	○	○	○	–	–	○	–	–	–	–

City	Yokohama	Osaka	Nagoya	Kyoto	Fukuoka	Kawasaki	Kitakyushu	Niigata	Yokkaichi	Kushiro	Ube	Minamata
Environment-related												
Contribution based on local experience and local human capital experienced in environmental management	–	○	–	–	○	○	○	–	○	–	○	○
Creation of overseas business opportunities	–	–	–	–	–	○	○	–	–	–	–	–
Response to trans-boundary pollution	–	–	–	–	○	–	○	○	–	–	–	–
Wetland registered under Ramsar convention	–	–	○	–	–	–	–	○	–	○	–	–
*International orientation**	○	○	○	○	○	–	–	–	NA	NA	NA	NA

* International orientation only applies to designated cities

Part I: International Intercity Network for Low Carbon Sustainable Development

i. Mutual Learning through Asian Intercity Network Programmes for the Environment
ii. The Surprising Role of Local Governments in International Environmental Cooperation: The Case of Japanese Collaboration with Developing Countries
iii. Enabling Factors Promoting Local Initiatives for Sustainable Consumption in Asia: Potential Roles of Local Governments
iv. Role of the Network Secretariat and Network Design (from *Lessons Learnt from Regional Intercity Networking: To Promote Sustainable Cities in Asia*)
v. International Intercity Collaboration and Its Potential Applications in Low Carbon Development

Selected Enabling Factors for Local Initiatives

Case study	Selected enabling factors				
	Coordinating role		Relevance to local issues	Support by local government leaders	External support
	Local government	NGO			
Case 1: Energy (China)	x		x	x	x
Case 2: Energy (Philippines)	x		x	x	x
Case 3: Energy (Thailand)	(x)		x		x
Case 4: Energy (Thailand)	x		x	x	x
Case 5: Energy (Indonesia)		x	x		x
Case 6: Transport (Indonesia)		(x)	x		x
Case 7: Transport (Philippines)	x		x		x
Case 8: Food (Japan)	x		x	x	
Case 9: Food (Philippines)	x		x		x
Case 10: Waste (Bangladesh)		x	x		x
Case 11: Waste (Philippines)	x		x	x	
Case 12: Waste (Indonesia)	x	x	x		x
Case 13: Waste (Thailand)	x		x	x	
Case 14: Waste (Japan)	x	x	x	x	

Note: In Cases 3 and 6, the (x) in parentheses under the coordinating role indicates that inadequate coordination hindered the progress of the respective initiatives.
Source: Authors

Part I: International Intercity Network for Low Carbon Sustainable Development

i. Mutual Learning through Asian Intercity Network Programmes for the Environment
ii. The Surprising Role of Local Governments in International Environmental Cooperation: The Case of Japanese Collaboration with Developing Countries
iii. Enabling Factors Promoting Local Initiatives for Sustainable Consumption in Asia: Potential Roles of Local Governments
iv. Role of the Network Secretariat and Network Design (from *Lessons Learnt from Regional Intercity Networking: To Promote Sustainable Cities in Asia*)
v. International Intercity Collaboration and Its Potential Applications in Low Carbon Development

Key Factors in the Roles of the Network Secretariat and Network Design

	CITYNET	ICLEI Southeast Asia	Kitakyushu Initiative	UNEP Eco-Town Project
Nurturing ownership	√	√		
Replication mechanism			√	
Local coordinator	√	√		
Local research institutes				√

Part I: International Intercity Network for Low Carbon Sustainable Development

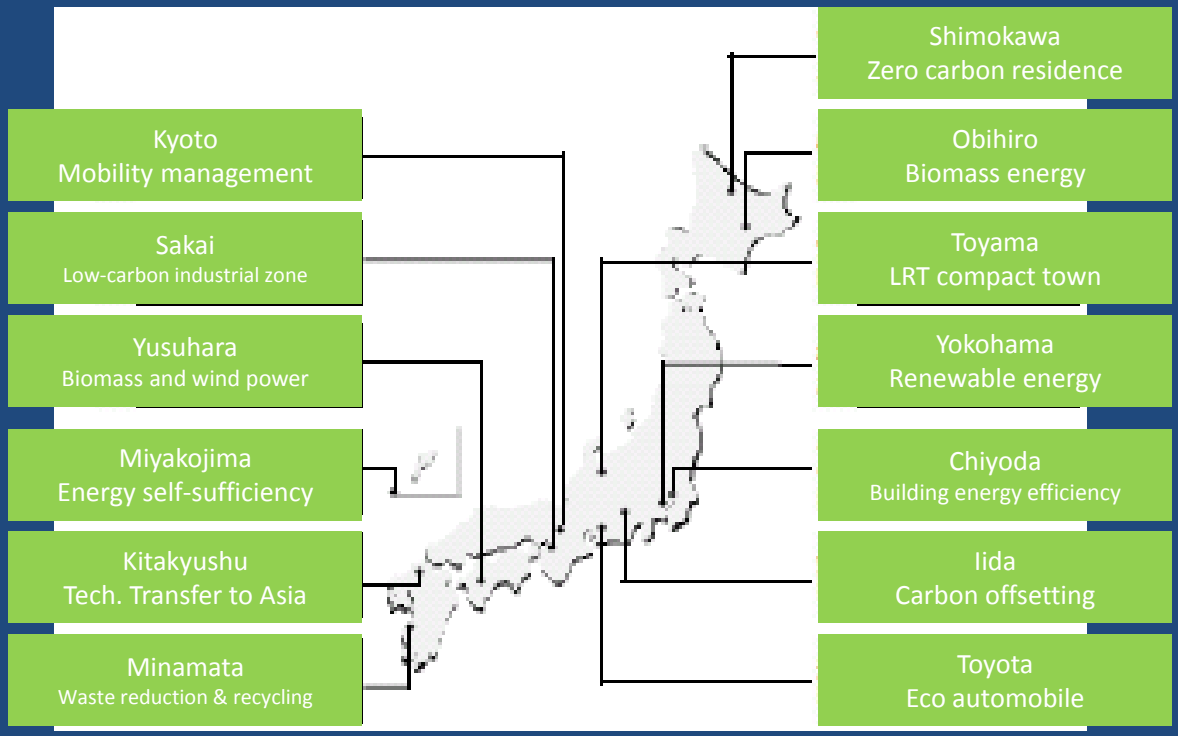
i. Mutual Learning through Asian Intercity Network Programmes for the Environment
ii. The Surprising Role of Local Governments in International Environmental Cooperation: The Case of Japanese Collaboration with Developing Countries
iii. Enabling Factors Promoting Local Initiatives for Sustainable Consumption in Asia: Potential Roles of Local Governments
iv. Role of the Network Secretariat and Network Design (from *Lessons Learnt from Regional Intercity Networking: To Promote Sustainable Cities in Asia*)
v. International Intercity Collaboration and Its Potential Applications in Low Carbon Development

Japanese Policy towards Asian Low-carbon Development

- Recognition of necessity of GHG emissions as well as diverse issues such as poverty and environmental pollution due to economic growth in Asian developing countries
- Japanese international co-operation policy
  - Hatoyama Initiative*, Cool Earth Partnership**
  - Clean Asia Initiative (MOE)***, Co-benefit approach in development assistance (JICA)****
- Low-carbon technology transfer by local governments and international intercity network
  - Asian Low-carbon Center (Kitakyushu city, 2010-)
  - Asian Environment City Organisation***** (Kitakyushu)
- Environmental business promotion in Asia (METI, JETRO)

MOE: Ministry of the Environment, JICA: Japan International Cooperation Agency,
METI: Ministry of Economy, Trade and Industry, Japan, JETRO: Japan Export and Trade Organization
*: December 2009, **: January 2008, ***: June 2008, ****: June 2008 ("Guideline"), *****: Provisional name

Japanese Eco-model Cities' Initiatives towards Low-carbon Development



LRT: Light rail transit
Source: Murakami (2009)

Current State of Low-carbon Development Policy in Japanese Local Governments

- Even in leading environmental cities in Japan, low-carbon development policies and practices are at the stage of learning-by-doing
  - Achievement of environmental pollution management and 3R (reduce, reuse, recycling)
  - Trial and error in low-carbon development including monitoring and evaluation of GHG emissions and policy / practice effects
- Some Japanese local government officials see low-carbon development is an idealistic goal
- Yet stronger pressure on local governments is expected
  - National GHG emissions reduction goals
  - Progress of climate change
  - Concerned citizens

1. Technical Co-operation for Asian Local Governments

- Japanese local governments could provide technical assistance to complement national-level international co-operation
  - Policies and practices in household, offices, transport, waste management
  - Knowledge dissemination on Eco-Model Cities to overseas
  - E.g. JICA technical co-operation between Bangkok, Thailand and Japanese cities
- It is recommended that Japanese government provide institutional support for Japanese local government's technical assistance regarding low-carbon development
  - Training programme development
  - Needs assessment of Asian cities
  - Financial assistance

Experiences of Japanese Cities That Could Be Shared with Asian Cities

- Demonstration through daily operation and projects
  - Practices and techniques in waste management, water supply, wastewater treatment, etc.
  - New market / demand creation effect
- Local policy
  - Development of incentive mechanisms to change behaviour and mindset
  - Ways of communication and mobilisation of local residents
  - Promotion of appropriate technology
- Office management and organisation to mainstream low-carbon development policies
- Estimation and monitoring of GHG emissions and effects of policy implementation (Future consideration)

GHG: Greenhouse gas

2. International Joint Campaigns for Low-carbon Practices

- Joint campaign of low-carbon practices
  - Promotion of energy efficient appliances
  - Eco car
  - Energy efficient buildings / eco residents
- Collaboration among cities with similar economic development
- Utilisation of international intercity network or sister city relationship
- Possible benefit of boosting policies in participating cities, gaining follower cities and like-minded cities

Demonstrated Case of Joint Campaign in Europe

In the field of local administration and businesses, ICLEI has conducted PROCURA+ (plus) campaign with European cities to promote local governments' sustainable procurement

Procura+ Sustainable Procurement Campaign

Five milestones

Key product groups:
- Buses
- Cleaning products and services
- Electricity
- Food and catering services
- IT products
- Building construction and renovation

Benefits:
- Seminars, conferences, and study tours
- Training and consultancy services with discount

Manual

Source: ICLEI Europe

3. Joint Project Development for Carbon Credit

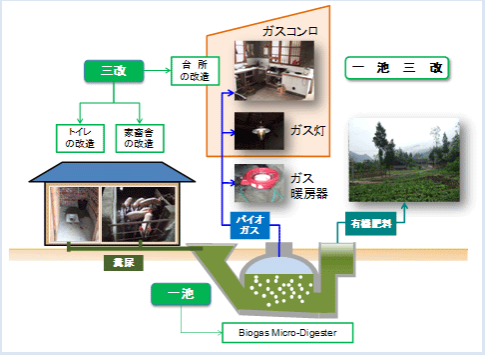
- Additional development of programmes and projects of Asian local governments that would reduce GHG emissions and would generate carbon credits
- Once Japanese local governments have their own mandate to reduce (cap) GHG emissions, they may want to start collaborative low-carbon development project formulation with Asian partners, including local governments, with the aim of obtaining carbon credit
- Two possible patterns
  - Co-benefit type local development programme
    - Residential energy efficiency
    - Waste management
    - Wastewater gas utilisation
    - Rural electrification by renewable energy
    - Energy efficiency at local businesses
  - Local governments' offices and projects
    - Building energy efficiency
    - Waste management
    - Street lighting energy efficiency

Joint Carbon Project: Identification of Co-benefit Projects

Theoretical carbon scheme for Japanese local government

Low-carbon development projects in cities in Asian developing countries

Japanese local government



Benefits of development and GHG emissions reduction

Carbon credit

Carbon credit purchasing under GHG emissions target (cap)

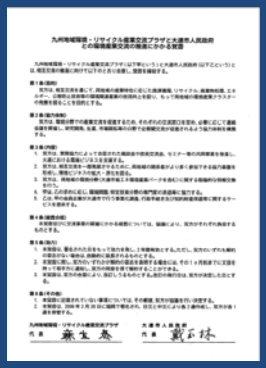
Finance

Financing low-carbon programmes and projects, including those in Asian developing countries, through Local Environmental Tax

Source of the figure : PEAR Carbon Offset Initiative

4. Environmental Business Promotion in Asia: Japanese Interest

- Kitakyushu city
  - Supported local environmental businesses' promotion in China
  - Three companies initiated businesses in China
- Kyushu Recycle and Environmental Industry Plaza (K-RIP)
  - Concluded MOU on Environmental Industry exchange with Dalian city government
  - Collaboration extended to Liaoning province in China

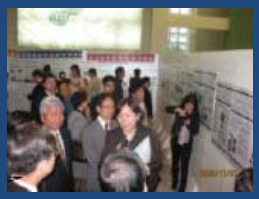


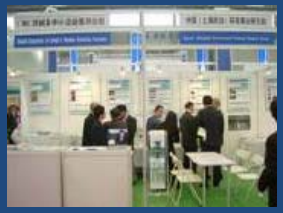
Source: Kitakyushu city, K-RIP

Asian Environmental Business Promotion

Kansai Asia Environment – Energy Efficiency Business Exchange Promotion Forum
(2008-)
A.Seminar, information provision
B.Overseas mission, exhibition
C.Networking, MOU

Osaka prefecture, Hyogo prefecture, etc.





Kanto Environment Capacity Business Forum
(2008-)
A.Feasibility study
B.Seminar for awareness raising
C.Mission for business matchmaking
D.Consultation

Kawasaki city, Saitama prefecture, etc.

Source of pictures: METI (2009)

Case of Business Match Making: CITYNET Smart Cities

CITYNET provides online portal to connect Asian cities and environmental solution provides in Europe to enhance interaction

SMART-Cities portal

Green Pages to provide company information

City Pages to provide city information

5. Joint Actions: Purchasing Consortium

C40 CITIES CLIMATE LEADERSHIP GROUP

CLINTON FOUNDATION | CLINTON CLIMATE INITIATIVE

C40 Cities: International intercity network to tackle climate change with 40 major cities, including London, New York, Tokyo, Hong Kong, Bangkok, Jakarta

Clinton Climate Initiative (CCI) – a foundation- provides support to C40 Cities

Purchasing Consortium

- Polling the buying power of cities to lower the price of energy saving products
- CCI introduces companies to cities

Key product categories

- Building materials, systems, and controls
- Traffic and street lighting
- Clean buses and waste disposal trucks
- Waste-to-energy systems

Source: C40 Cities

Local Initiatives by Sectors towards Low-carbon Development in Asian Developing Countries

Preliminary collation

City (Country)	Dalian (China)	Chongqing (China)	Bangkok (Thailand)	Chiang Mai (Thailand)	Surabaya (Indonesia)	Yogyakarta (Indonesia)	Ho Chi Minh (Vietnam)	Baguio (Philippines)
Pop. (1,000)	6,200	28,200	5,700	150	2,900	500	7,300	250
GDP($-PPP)/cap	8,462	4,880	8,225 (national)	8,225 (national)	3,440 (national)	3,440 (national)	2,500	3,546 (national)
Climate change mitigation plan	Long term environment plan		Climate change action plan				Climate change countermeasure plan	
Building sector	Eco house complex		Building energy efficiency					
SMEs sector	Corporate energy efficiency guidance						Corporate energy efficiency	
Household and waste		Biogas digester	Bio-fuel from waste		Organic waste composting		Waste reduction	
Transport sector			Public transportation	Bio-fuel		Street lighting energy efficiency		Auto-tricycle regulation

GDP: Gross domestic product, PPP: Purchasing power parity, SME: Small and medium size enterprise
Source: Hori (2009), Author

Perspectives of Local Governments in Developing Countries vs. Views from Developed Countries

Local governments in developing countries:

- Contribution to solve local issues
  - GHG emissions reduction is co-benefit of development
  - Contribution to resources constraint and attractiveness of cost reduction differs by economic development level
- Roles and authority of local governments needed
- Alignment with national policy, in particular support to local government
- Opportunities of financial/technical in-flow

Developed countries:

- Monitoring GHG emissions reduction when supporting low-carbon projects in developing countries

Source: Koyanagi (2010), Author

International Collaboration Mechanism to Support Low-carbon Development in Developing Countries

- Establishment of integrated system from GHG emissions reduction estimation, monitoring, to financial assistance of development
  - Seeking both local developmental benefits in developing countries and verification of GHG emissions reduction through co-operation
  - Promoting existing developmental programme by GHG emissions reduction effect. Same idea of that of clean development mechanism (CDM)
  - Emphasizing development of mechanism for measurement, rather than lower cost of emissions reduction
- Identification of appropriate programmes in sectors such as building, SMEs, household, waste and transport, contributing to low-carbon development among existing programmes, estimating GHG emissions reduction, and linking with international financial/technical assistance
  - Sector-specific technical co-operation by Japanese local governments, when applicable
  - Third party technical support on *simplified* measurement and reporting; linkage with CDM capacity development programmes

Intercity Networks as Vehicles of Low-carbon Development

International city networks for the environment with Asian cities

CITYNET

Environment Cluster

ICLEI Local Governments for Sustainability

Southeast Asia
South Asia
Korea
Japan

Kitakyushu Initiative for a Clean Environment
Second Cycle: 2005-2010

CLEAN AIR INITIATIVE for Asian Cities

ANMC21 Asian Network of Major Cities 21

Environment Project

C40 CITIES CLIMATE LEADERSHIP GROUP

How to Use Japanese Cities' Experiences for Other Cities in Asia

Develop a mechanism for Japanese cities to be engaged in low-carbon development in other cities in Asia

- Designated national support to Japanese local governments in terms of finance and human resources
- Identification and understanding of different needs of Asian cities
- Knowledge production to make Japanese experiences those that could be shared
- New findings through networking
- Coordination by designated body

Promote leadership towards low-carbon development both in Asian cities and Japanese cities

- Supporting planning and monitoring achievement in each city
- Self assessment and confidence through achievement
- Mutual benefits

Part II: International Environmental Cooperation of Japanese Local Governments

i. Japanese Citizens' Perspectives on Municipal Governments' International Cooperation for the Environment: Implications on International Intercity Collaboration on Climate Change
ii. Climate Change Mitigation in Developing Countries through Interregional Collaboration by Local Governments: Japanese Citizens' Preference
iii. Japanese Citizens' Preferences Regarding Voluntary Carbon Offsets: An Experimental Social Survey of Yokohama and Kitakyushu
iv. Are Local Government Subsidies More Than an Economic Incentive? Case of International Carbon Offsetting by Citizens in Kitakyushu, Japan
v. Funding International Intercity Environmental Cooperation through Eco-point Programs: Japanese Citizens' Attitudes toward Donating Eco-points

Purpose of the Study (Part II)

This study aims to assess the possibility of providing **global** public goods for the environment

- by Japanese **local** governments' international environmental cooperation with developing countries

- from the viewpoints of **citizens' support**

- focusing on

  - **market based** policy (carbon credits and individual voluntary carbon offset) and

  - **non-market based** policy (technical assistance and eco-point programme)

Policy Background

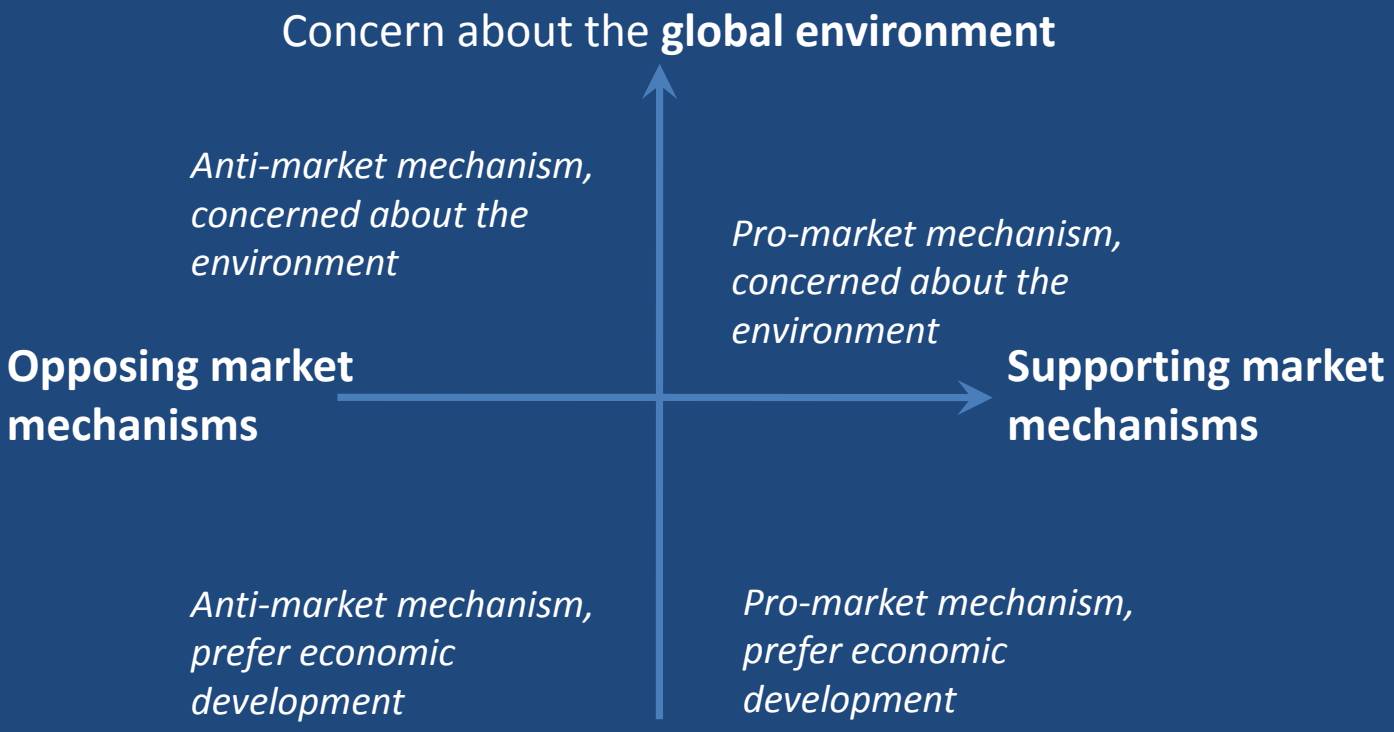
- Difficulties in national level collaboration between developed and developing countries on climate change mitigation
- Expected roles of local governments, to contribute to intercity collaboration (East Asia Summit)
- Japanese local governments' international environmental cooperation since 1980s
- Things to be considered
  - **Financial constraint**
  - **Market-based collaboration**

Market-based and Non Market-based International Collaboration at the Local Level

	By local government	With citizens engagement
Market-based	Carbon crediting by local governments	Individual voluntary carbon offset
Non market-based	Technical assistance	Donation through Eco-point programme

Eco-point programme: Money-like rewards for environmentally friendly actions

Typology of the Attitudes towards the Environment and Market Mechanisms



Research Questions: Typology and Citizens' Support

- Are the citizens supporting their local governments' international environmental cooperation?
- What are the distribution of ***typology for citizens' attitudes towards global environment and carbon crediting***?
- What is the relationship between such attitudes and the degree of their support for local governments' international environmental cooperation?

Research Questions: Carbon credit

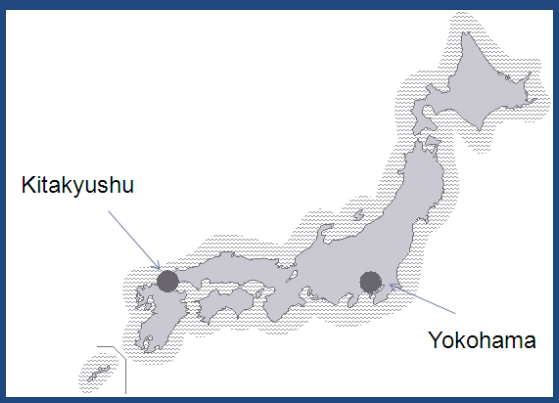
- Do the citizens support the idea of international and/or domestic ***carbon crediting*** to meet the ***city***'s target to reduce GHG emissions?
- What are the ***reasons*** of consent and discontent?
- How much of the ***financial flow*** would be anticipated?

Research Questions: Individual Carbon Offset and Eco-point

- Are the citizens interested in international environmental cooperation through ***individual voluntary carbon offset*** and donation from ***eco-point programme***?
- What are the ***reasons*** of potential participation and non participation?
- How much of the ***financial flow/fund*** for international environmental cooperation could be obtained?

Methods of Verification and Simulation

- Collect stated preference/choice experiment data through social survey in two large Japanese cities **Yokohama** and **Kitakyushu**
- Two **advanced cities** among around 20 Japanese local governments conducted rather extensive cooperation since 1980s



Overview of Social Survey

	Target adult	Response rate
First wave (Chaps 3, 5, 6)	1,757 (Yokohama) 1,757 (Kitakyushu)	38% (Yokohama) 39% (Kitakyushu)
Second wave (Chaps 4 & 5)	539 (Yokohama) 590 (Kitakyushu)	23% (Yokohama) 24% (Kitakyushu) [against original target]

Part II: International Environmental Cooperation of Japanese Local Governments

i. Japanese Citizens' Perspectives on Municipal Governments' International Cooperation for the Environment: Implications on International Intercity Collaboration on Climate Change
ii. Climate Change Mitigation in Developing Countries through Interregional Collaboration by Local Governments: Japanese Citizens' Preference
iii. Japanese Citizens' Preferences Regarding Voluntary Carbon Offsets: An Experimental Social Survey of Yokohama and Kitakyushu
iv. Funding International Intercity Environmental Cooperation through Eco-point Programs: Japanese Citizens' Attitudes toward Donating Eco- points

Citizens' Attitudes towards Carbon Crediting at the National Level and International Environmental Cooperation at the Local Level

Questions

- Are the citizens supporting their local governments' international environmental cooperation?
- What are the distribution of ***typology for citizens' attitudes towards global environment and carbon crediting***?
- What is the relationship between such attitudes and the degree of their support for local governments' international environmental cooperation?

Method of Verification

The study analyses the relationship between

– **the degree of the support** of local government's further international environmental cooperation,

and

– the citizens' **typology** classified by the attitudes towards

- global environment,

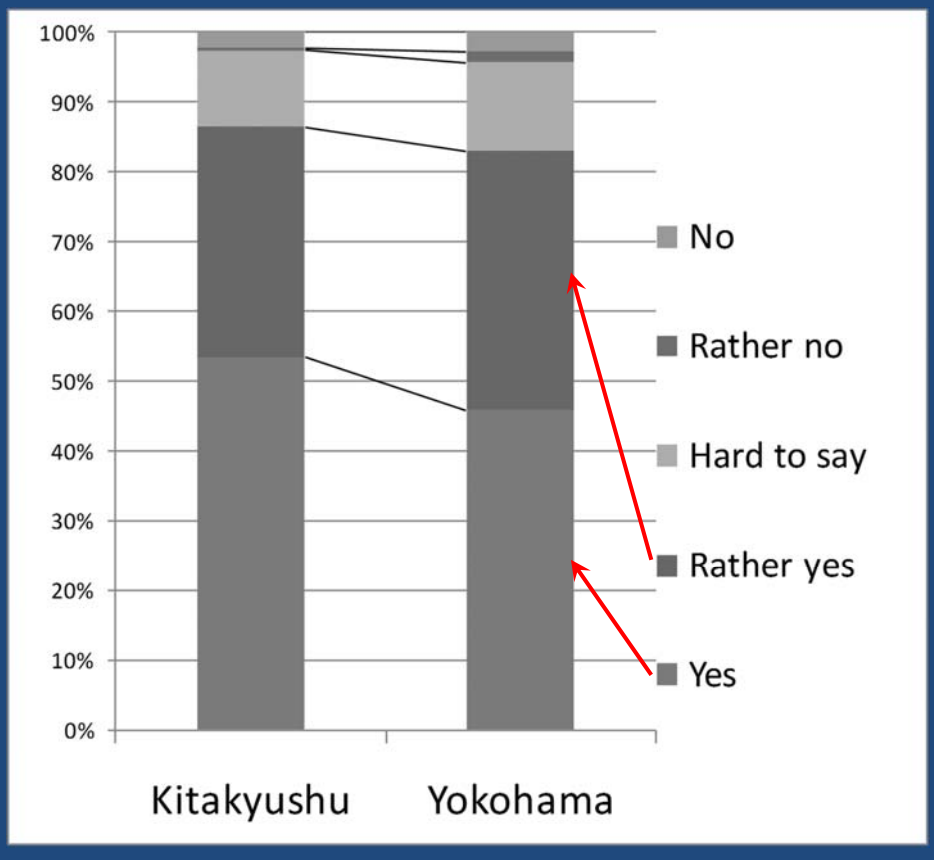
and

- utilisation of **carbon credits** from developing countries by Japanese national government

Citizens' Support: Survey Questions Related to International Cooperation by the City

- The status of **support** for the promotion of future international environmental cooperation by the city in which they reside
- **Five-level scale**
  - disagree
  - somewhat disagree
  - neither agree nor disagree
  - somewhat agree
  - agree

Support of Further International Environmental Cooperation by Local Government of Residence



Citizen Typology: Survey Questions Related to Global Environment

- Concern on climate change (Five-level scale)
- Concern on international development (Five-level scale)
- Number of climate change mitigation actions in daily lives
- Volunteer experience
- Donation overseas
- Visiting developing countries
- Living in developing countries

- Selection of carbon offset as remuneration

Citizen Typology: Survey Questions Related to National Level Carbon Crediting

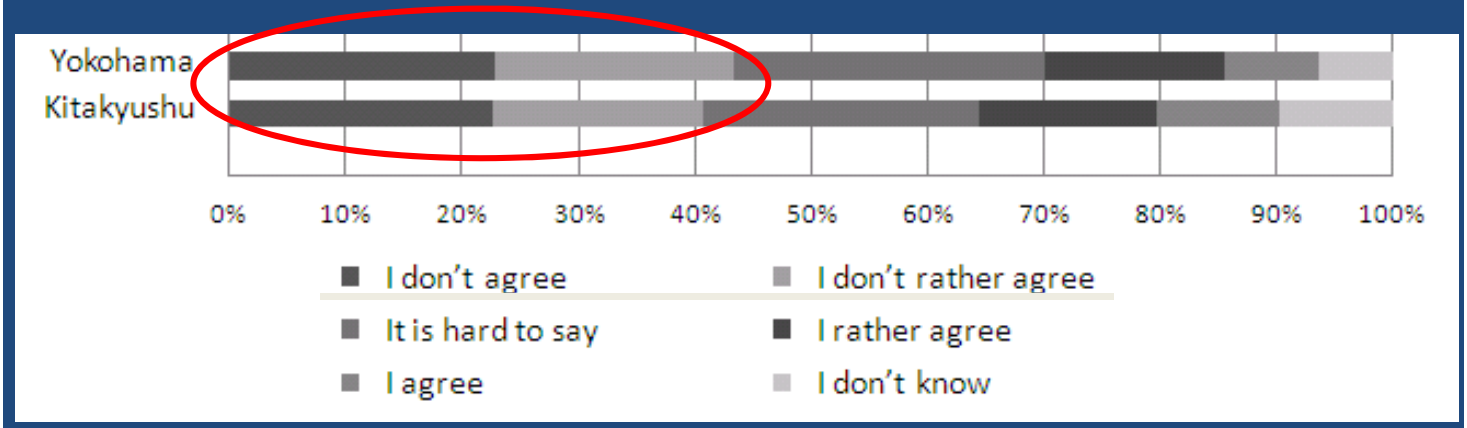
Five-level scale answer (disagree – agree) for each idea:

- Tax shall be used for domestic mitigation actions for ***Japanese economic development***
- It is desirable since it is ***cost effective****
- It leads to ***overseas market*** development of Japanese environmental industry in the long term
- It is ***avoidance of Japanese obligation*** to reduce GHG emissions
- Useful for GHG emissions reduction ***technology diffusion*** in developing countries

* Reductions in developing countries are assumed to be settled at 30% of the cost of reductions domestically.

Citizen Typology: Ideas on the Use of Carbon Credits Produced in Developing Countries

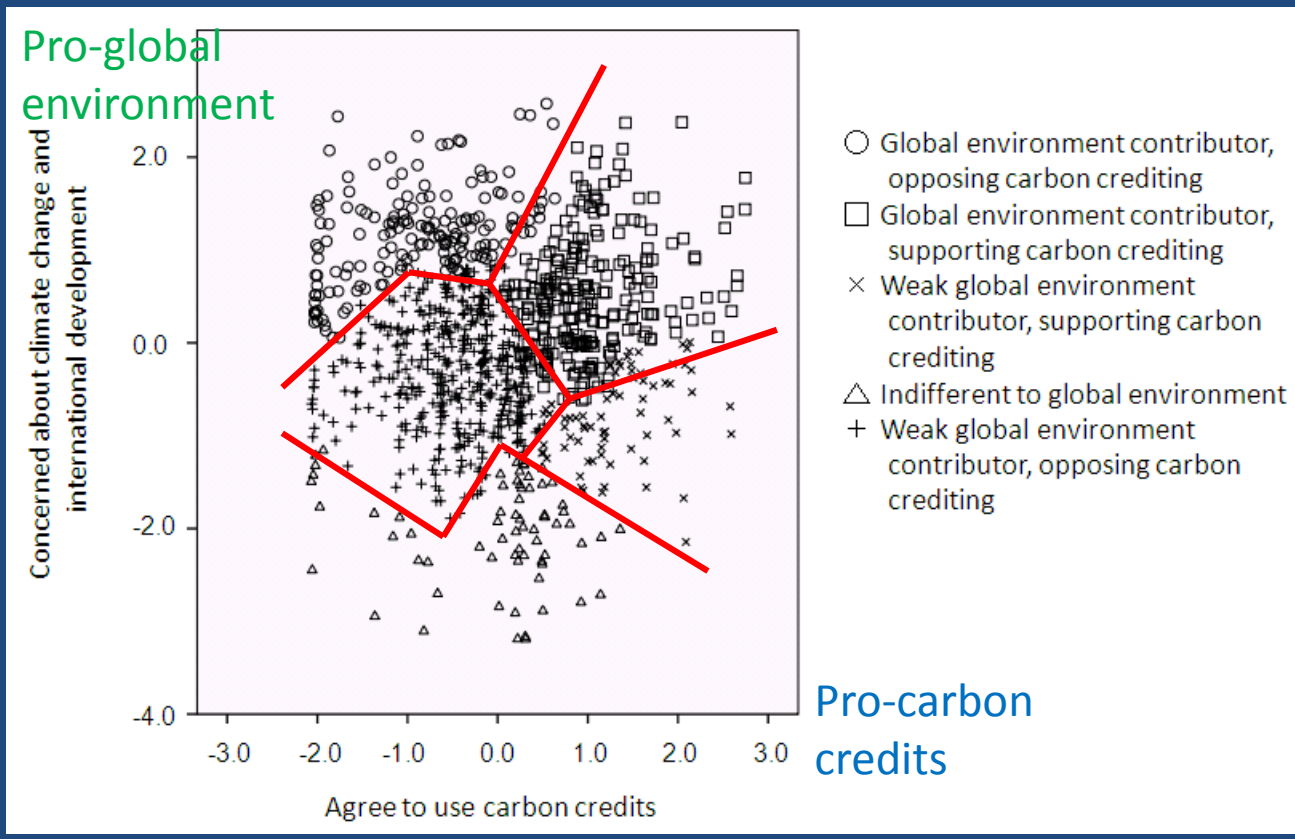
"It is desirable to use tax to purchase credits from developing countries to achieve Japanese reduction target since it ***requires less cost****"*



Citizen Typology: Principal Component Analysis of Attitudinal Variables

	Component				
	1	2	3	4	5
	Supporting carbon crediting	Concerned about international development	Overseas experienced	No offset and overseas donation	Volunteering
Carbon crediting supports overseas business development	**0.81**	0.07	0.02	0.22	-0.11
Carbon crediting is cost effective	**0.81**	-0.05	-0.09	0.20	0.06
Carbon crediting supports technology transfer	**0.78**	0.10	0.05	0.21	-0.08
Carbon crediting contradicts national obligation	**-0.66**	0.14	0.04	0.26	-0.12
Tax shall be used to domestic project rather than carbon crediting	**-0.63**	0.15	0.07	0.36	-0.09
Concerned about international development	0.03	**0.74**	0.08	0.02	-0.06
Concerned about climate change	0.00	**0.71**	-0.11	0.10	-0.37
Number of daily climate protection actions	0.01	**0.55**	-0.42	0.17	-0.04
Resided overseas	0.09	0.27	**0.64**	0.07	0.11
Visited developing countries	0.04	0.33	**0.64**	-0.06	0.34
Chose offset as remuneration	0.12	0.21	-0.03	**-0.71**	-0.35
Donated overseas activities	0.03	0.37	-0.13	**-0.45**	0.37
Did volunteer works	-0.04	0.26	-0.42	0.10	**0.66**
Eigen values	2.79	1.84	1.22	1.09	1.01
Accumulated % of variance explained	21.5	35.6	45.0	53.4	61.2

Citizen Typology: Scatter Chart



Characteristics of Groups

- Age*
  - ***60 years and over*** ⇔ "global environment contributor, opposing carbon crediting" (52.9%) and "global environment contributor, supporting carbon crediting (42.8%)
  - ***30 years and younger*** ⇔ "weak global environment contributor, supporting carbon crediting" (39.4%) and "indifferent to global environment" (42.6%)
- Gender, Household income: No significance

* Chi-squared test, P<0.01*

Citizen Typology: Estimation in Population

	Global environment contributor, opposing carbon crediting	Global environment contributor, supporting carbon crediting	Weak global environment contributor, supporting carbon crediting	Indifferent to global environment	Weak global environment contributor, opposing carbon crediting	Total	Adult population (As of January 2010 for Yokohama, September 2009 for Kitakyhushu)
Yokohama	20.0%	24.4%	8.5%	5.9%	41.3%	100.0%	2,989,384
Kitakyhushu	14.4%	27.8%	6.5%	9.0%	42.2%	100.0%	805,662

Ordered Logit Regression Analysis between Support of Coop. and Individual Attributes

	Model 2	
Variable	Coefficient	p-value
Constant	3.790	0.000
Global environment contributor, opposing carbon crediting	1.171	0.000
Global environment contributor, supporting carbon crediting	0.763	0.000
Weak global environment contributor, supporting carbon crediting	0.473	0.062
Indifferent to global environment issues	-0.960	0.000
Kitakyushu city	0.514	0.000
Household income	0.286	0.034
Women	-0.234	0.074
Age	-0.051	0.239
Threshold parameter		
k0	0	(Constant)
k1	0.458	0.000
k2	2.129	0.000
k3	3.953	0.000
Sample size	913	
AIC	1933	

- Two groups of "**global environment contributor, opposing carbon crediting**" and "**global environment contributor, supporting carbon crediting**," are more supportive in this order
- Citizens with **high household incomes** are more supportive
- Citizens in **Kitakyushu** are more supportive than those in Yokohama

Part II: International Environmental Cooperation of Japanese Local Governments

i. Japanese Citizens' Perspectives on Municipal Governments' International Cooperation for the Environment: Implications on International Intercity Collaboration on Climate Change
ii. Climate Change Mitigation in Developing Countries through Interregional Collaboration by Local Governments: Japanese Citizens' Preference
iii. Japanese Citizens' Preferences Regarding Voluntary Carbon Offsets: An Experimental Social Survey of Yokohama and Kitakyushu
iv. Funding International Intercity Environmental Cooperation through Eco-point Programs: Japanese Citizens' Attitudes toward Donating Eco- points

Domestic and International Carbon Crediting at the Local Level

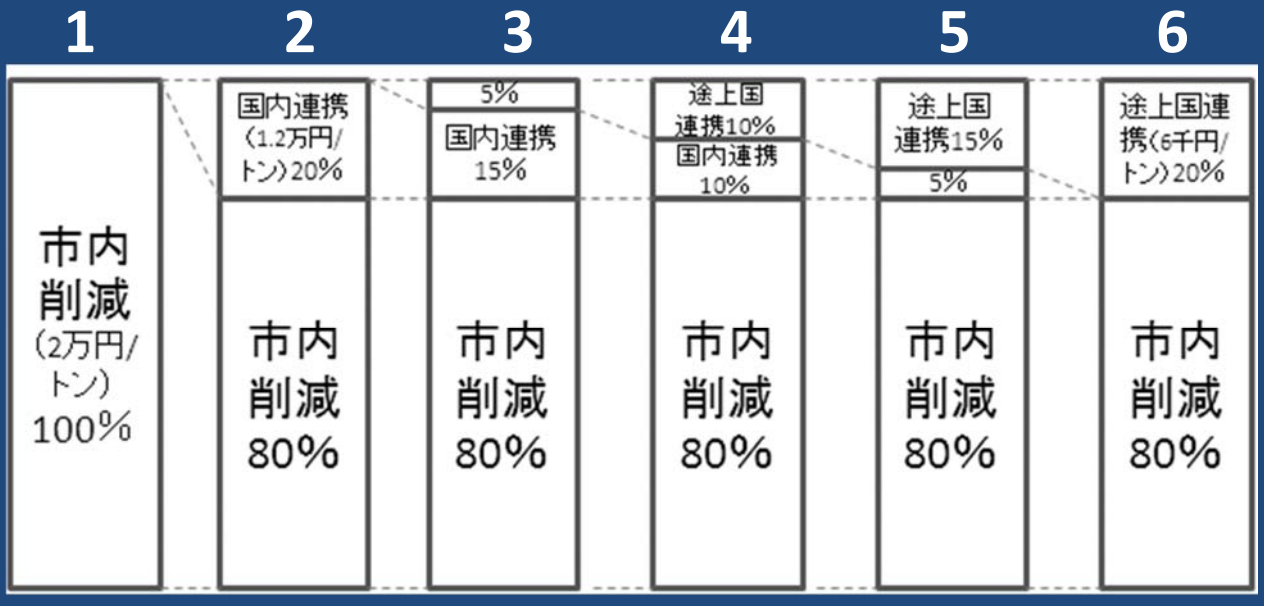
Questions

- Do the citizens support the idea of international and/or domestic ***carbon crediting*** to meet the ***city***'s target to reduce GHG emissions?
- What are the ***reasons*** of consent and discontent?
- How much of the ***financial flow*** would be anticipated?

Method of Verification

- Ask citizens about the **desirable carbon crediting with other regions of Japan** or **developing countries**, so that the city meet the GHG emissions reduction target
- **Two cases** of different **unit cost of GHG emissions reduction**
  - Carbon crediting is less expensive than reduction with in the city (Cases 1 and 2)
  - Carbon credit *from developing countries* is less expensive than credits from other regions of Japan in Case 1, and is equal in Case 2

Alternatives for Ratios of Collaboration in Terms of GHG Emissions Reduction



削減総量	23万トン	23万トン	23万トン	23万トン	23万トン	23万トン
削減総費用	46億円	42億 3,200万円	41億 6,300万円	40億 9,400万円	40億 2,500万円	39億 5,600万円

Example of Case 1 for Kitakyusu city

Reasons for Selection of Alternatives on Collaboration in GHG Emissions Reduction

Multiple choices allowed

- The city ***should achieve*** its emissions reduction target ***without collaboration*** with other regions
- Collaboration is ***cost effective***
- Collaboration encourages mitigation ***technology transfer*** to developing countries
- Collaboration contributes to ***ambient environment improvement*** in developing countries
- ***Domestic reduction*** of emissions is priority
- ***City tax*** shall be used domestically
- ***Balance*** between domestic and international collaboration matters

Types of Questionnaire and Mitigation Projects Described for Each Type

Random assignment of different types of questionnaire

Questionnaire type	Concrete **explanation** of mitigation projects	Example of mitigation project for **domestic** collaboration	Example of mitigation project for **international** collaboration
Type 1	Yes	Utilisation of **forest** resources	Utilisation of **stockbreeding waste**
Type 2	Yes	Utilisation of **forest** resources	**Composting** of municipal organic waste
Type 3	Yes	**Wind** power generation	Utilisation of **stockbreeding waste**
Type 4	Yes	**Wind** power generation	**Composting** of municipal organic waste
Type 5	**No**	NA	NA

Example: Questionnaire Type 1

国内の他地域との連携では削減事業を通じて連携先の地域再生も図れる事業を行います。
また途上国との連携では温暖化対策技術の移転や生活環境の向上を通じて途上国にも役立つ事業を行います。

	国内連携事業の例	途上国連携事業の例
イメージ	 森林資源のエネルギー利用	 畜産廃棄物・し尿のエネルギー利用
事業内容	• 豊富な森林資源をいかし、間引いた立ち木などから木質燃料を生産し、ストーブなどに活用する • 燃料の生産と利用による事業収入により山村の地域活性化を図る	• 農家が飼育している豚などの糞尿と人糞を発酵させてガスを発生させるタンクを普及させ、そのガスを炊飯、暖房、室内灯に利用する • 石炭購入費を節約し、室内空気汚染をなくして途上国貧困地帯の生活向上を図る

Choice Results in Cases 1 and 2

Case 1

Case 1: Unit costs of GHG emissions reduction for within the city, domestic collaboration, and collaboration with developing countries are 20,000, 12,000, and 6,000 [yen / tCO2e], respectively.

Alternative	1	2	3	4	5	6	Total
Ratio of reduction within the city	100%	80%	80%	80%	80%	80%	-
Ratio of reduction with domstic collaboration	0%	20%	15%	10%	5%	0%	-
Ratio of reduction in collaboration with developing countries	0%	0%	5%	10%	15%	20%	-
Total cost of GHG emissions reduction, normalized by that of alternative 1	100%	92%	91%	89%	88%	86%	-
Frequency	87	65	89	220	84	119	664
Percentage	13.1%	9.8%	13.4%	33.1%	12.7%	17.9%	100.0%

Case 2

Case 2: Unit costs of GHG emissions reduction for within the city, domestic collaboration, and collaboration with developing countries are 20,000, 12,000, and 12,000 [yen / tCO2e], respectively.

Alternative	1	2	3	4	5	6	Total
Ratio of reduction within the city	100%	80%	80%	80%	80%	80%	-
Ratio of reduction with domstic collaboration	0%	20%	15%	10%	5%	0%	-
Ratio of reduction in collaboration with developing countries	0%	0%	5%	10%	15%	20%	-
Total cost of GHG emissions reduction, normalized by that of alternative 1	100%	92%	92%	92%	92%	92%	-
Frequency	80	76	75	257	50	79	617
Percentage	13.0%	12.3%	12.2%	41.7%	8.1%	12.8%	100.0%

Distribution of Reasoning for Selecting Appropriate Combinations of GHG Emission Reduction Ratios

Case 1

	Reduction within city	Cost efficiency	Technology transfer	Environmental improvement	Domestic reduction	Domestic expenditure	Balance between domestic and international collaboration
Frequency	196	184	319	250	144	76	286
Percentage	29.5%	27.7%	48.0%	37.7%	21.7%	11.4%	43.1%

Note: The number of subjects is 664.

Case 2

	Reduction within city	Cost efficiency	Technology transfer	Environmental improvement	Domestic reduction	Domestic expenditure	Balance between domestic and international collaboration
Frequency	170	96	278	230	137	79	282
Percentage	27.6%	15.6%	45.1%	37.3%	22.2%	12.8%	45.7%

Note: The number of subjects is 617.

Logit Model for Choosing Different Combinations of Carbon Crediting

The observable component of utility functions for logit model

$$V_1 = \alpha_0 + \alpha X \quad \text{(A-1)}$$

$$V_{i\,(i=2,\ldots,6)} = (\beta_r + \theta_r X)\, r + \beta_{rr}\, r^2 + \beta_c\, c \quad \text{(A-2)}$$

where r is ***ratio*** of GHG emissions reduction through ***collaboration with developing countries (0 – 20%)***,
c is total cost of GHG emissions reduction normalised by that for the case in which reduction is achieved without collaboration,
X is a vector of ***individual reasoning of selection***, and
α_0, α, β_r, β_{rr}, β_c and ϑ_r are coefficients to be estimated

Note: r^2 is used to represent the peak of collaboration ratio

Logit Model Results

	Model 1		Model 2	
Variable	Coefficient	p-value	Coefficient	p-value
No collaboration	-6.004	0.020		
x Household income			-0.410	0.017
x Reduction within the city			3.327	0.000
x Technology transfer to developing countries			-2.660	0.000
x Environmental improvement in developing countries			-1.955	0.001
x Reduction within Japan			-3.106	0.000
x Tax expendicture within Japan			-1.987	0.000
x Balanced collaboration			-3.712	0.000
Ratio of collaboration with developing countries	16.009	0.000	38.541	0.000
x Reduction within the city			-3.633	0.039
x Cost efficiency			15.654	0.000
x Technology transfer to developing countries			6.864	0.000
x Environmental improvement in developing countries			8.601	0.000
x Reduction within Japan			-25.841	0.000
x Tax expendicture within Japan			-18.575	0.000
x Balanced collaboration			-7.133	0.000
Ratio of collaboration with developing countries, squared	-80.546	0.000	-184.330	0.000
Total cost of GHG emissions reduction	-6.821	0.015	-2.717	0.000
Sample size	1296		1242	
Log likelihood function	-2254.7		-1534.6	
Akaike Information Criterion	4517.3		3103.1	

- Utility function peaks at r = 0.105 (***Balanced ratio***)
- Respondents to support ***reduction within the city*** prefer ***no collaboration***
- Respondents with ——— prefer alternatives with ***higher ratio*** of collaboration with developing countries
- Respondents with ——— prefer alternatives with ***lower ratio*** of collaboration with developing countries
- Citizens prefer an alternative with a ***lower total cost***

Estimation Results of logit Model on the Effects of Project and Co-benefits Information

	Model 3		Model 4	
Variable	Coefficient	p-value	Coefficient	p-value
No collaboration	-10.306	0.082	-0.455	0.969
x Questionnaire type 1	6.172	0.436	-3.612	0.820
x Questionnaire type 2	1.816	0.825	1.571	0.927
x Questionnaire type 3	3.699	0.664	-8.910	0.639
x Questionnaire type 4	9.743	0.250	-4.328	0.806
Ratio of collaboration with developing countries	13.104	0.000	18.956	0.000
x Questionnaire type 1	6.021	0.004	1.745	0.721
x Questionnaire type 2	2.168	0.305	8.124	0.125
x Questionnaire type 3	2.567	0.236	-6.378	0.246
x Questionnaire type 4	5.501	0.013	3.773	0.503
Ratio of collaboration with developing countries, squared	-82.221	0.000	-109.130	0.000
Total cost of GHG emissions reduction	-11.457	0.075	-2.561	0.843
x Questionnaire type 1	6.014	0.485	-4.330	0.802
x Questionnaire type 2	2.195	0.805	1.332	0.943
x Questionnaire type 3	4.695	0.611	-8.544	0.679
x Questionnaire type 4	10.344	0.260	-5.345	0.780
Sample size	1296		306	
Log likelihood function	-2240.9		-463.1	
Akaike Information Criterion	4513.7		958.1	

- Model 3 includes variables of all ***questionnaire types*** in the cross-terms (type 5: reference)
- Model 4 is the result of Model 3 when it is applied for respondents who are considered to have a ***sense of environmental responsibility***, i.e. those who selected the reasoning of reduction within the city and did not select the reasoning of tax expenditure within Japan

Findings from the Model to See the Effects of Information Provision

- Model 3
  - Information on ***project descriptions and co-benefits*** provided in questionnaire types 1 and 4 increases the choice of an alternative with a ***higher ratio of collaboration with developing countries***
- Model 4
  - For respondents with a ***sense of environmental responsibility***, information about project description and co-benefits, as well as total cost of GHG emissions reductions, ***does not*** affect their choice of alternatives on collaboration

Simulation of Financing Carbon Crediting: Case of Kitakyushu City

Assumption in Case 1: Unit costs of GHG emissions reduction for within the city, domestic collaboration, and collaboration with developing countries are **20,000**, **12,000**, and **6,000** [yen / tCO_2e]

- Preferred rate of collaboration with developing countries: **9.5%** (among 0-20%)
- **193 million yen** a year (**4.3%** of city's budget for climate mitigation in fiscal 2010: 4.4 billion yen)

Part II: International Environmental Cooperation of Japanese Local Governments

i. Japanese Citizens' Perspectives on Municipal Governments' International Cooperation for the Environment: Implications on International Intercity Collaboration on Climate Change
ii. Climate Change Mitigation in Developing Countries through Interregional Collaboration by Local Governments: Japanese Citizens' Preference
iii. Japanese Citizens' Preferences Regarding Voluntary Carbon Offsets: An Experimental Social Survey of Yokohama and Kitakyushu
iv. Funding International Intercity Environmental Cooperation through Eco-point Programs: Japanese Citizens' Attitudes toward Donating Eco- points

Individual Voluntary Carbon Offset and International Environmental Cooperation

Questions

- Are the citizens interested in international environmental cooperation through ***individual voluntary carbon offset***?
- What are the ***reasons*** of potential participation and non participation?
- How much of the ***financial flow*** for international environmental cooperation could be obtained?

Method of Verification

- First survey: Respondents are asked if they conduct **actual carbon offset** to offset their daily GHG emissions by 100 kg of CO_2 equivalent, which is around 5 % of average annual GHG emissions of Japanese household, using the remuneration of gift certificate that values 500 yen
- Follow-up survey: The survey asked if they conduct **carbon offset in hypothetical settings**, and state **reasoning**

Characteristics of Japanese Offset Provider

- Using most credible **Kyoto credits** under the United Nations
- Accounting of Kyoto credits
  - Cancelation (offset beyond Kyoto target; **contribution to the world**)
  - Retirement (use for part of Kyoto target; ***contribution to Japanese government***)
- Most of Japanese providers use “Retirement”
- No ***incremental increase*** of financial flow to low carbon development projects in developing countries

Survey Design: Real Payment

- Select one compensation (equivalent with 500 yen) after explanation of carbon offset
  - Gift certificate
  - Carbon offset (Contribution to Japanese government)
  - Carbon offset (Contribution to the world)

100kg CO2-eq

Certificates were sent to respondents who selected carbon offset

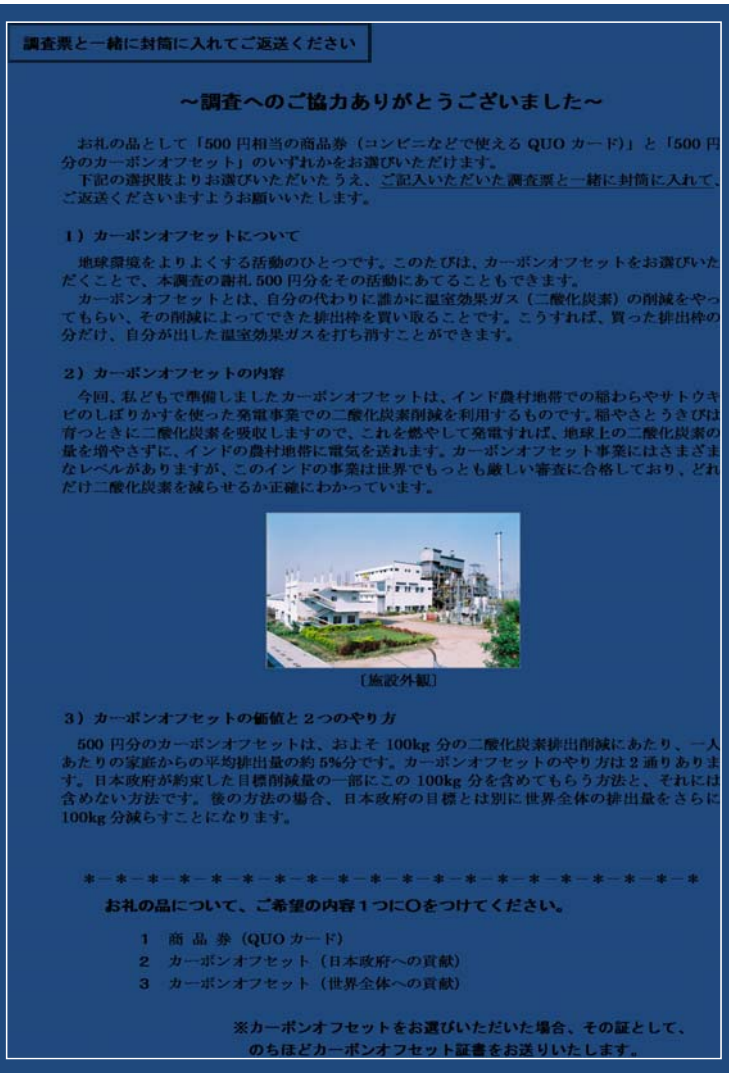

PEAR CARBON OFFSET

カーボンフットプリントオフセット証明書

Certificate for Offsetting Your Carbon Footprints

100 kgCO_2

Explanation of Offset: Real Payment


調査票と一緒に封筒に入れてご返送ください

～調査へのご協力ありがとうございました～

お礼の品として「500 円相当の商品券（コンビニなどで使える QUO カード）」と「500 円分のカーボンオフセット」のいずれかをお選びいただけます。
下記の選択肢よりお選びいただいたうえ、ご記入いただいた調査票と一緒に封筒に入れて、ご返送くださいますようお願いいたします。

1）カーボンオフセットについて

地球環境をよりよくする活動のひとつです。このたびは、カーボンオフセットをお選びいただくことで、本調査の謝礼 500 円分をその活動にあてることもできます。
カーボンオフセットとは、自分の代わりに誰かに温室効果ガス（二酸化炭素）の削減をやってもらい、その削減によってできた排出枠を買い取ることです。こうすれば、買った排出枠の分だけ、自分が出した温室効果ガスを打ち消すことができます。

2）カーボンオフセットの内容

今回、私どもで準備しましたカーボンオフセットは、インド農村地帯での籾わらやサトウキビのしぼりかすを使った発電事業での二酸化炭素削減を利用するものです。籾やさとうきびは育つときに二酸化炭素を吸収しますので、これを燃やして発電すれば、地球上の二酸化炭素の量を増やさずに、インドの農村地帯に電気を送れます。カーボンオフセット事業にはさまざまなレベルがありますが、このインドの事業は世界でもっとも厳しい審査に合格しており、どれだけ二酸化炭素を減らせるか正確にわかっています。

［施設外観］

3）カーボンオフセットの価値と 2 つのやり方

500 円分のカーボンオフセットは、およそ 100kg 分の二酸化炭素排出削減にあたり、一人あたりの家庭からの平均排出量の約 5%分です。カーボンオフセットのやり方は 2 通りあります。日本政府が約束した目標削減量の一部にこの 100kg 分を含めてもらう方法と、それには含めない方法です。後の方法の場合、日本政府の目標とは別に世界全体の排出量をさらに 100kg 分減らすことになります。

＊－＊

お礼の品について、ご希望の内容 1 つに○をつけてください。

1 商 品 券（QUO カード）
2 カーボンオフセット（日本政府への貢献）
3 カーボンオフセット（世界全体への貢献）

※カーボンオフセットをお選びいただいた場合、その証として、
のちほどカーボンオフセット証書をお送りいたします。

Survey Questions: Hypothetical Choice

Asked after explanation of carbon offset

1) When **payment of 500 yen** to offset 100 kg CO_2e is required
   - Select one of three options
     - No offset
     - Carbon offset (Contribution to Japanese government)
     - Carbon offset (Contribution to the world)
   - State reasoning
2) When offset (100 kg CO_2e) is available **free of charge**
   - Select one of three options
     - No offset
     - Carbon offset (Contribution to Japanese government)
     - Carbon offset (Contribution to the world)
   - State reasoning

Selection Results of Compensation and Actual Carbon Offsetting: First survey

Around 40% of respondents selected carbon offset

Choice	Gift certificate	Offset contributing to Japanese government	Offset contributing to the world	Total
Number of observations in Yokohama	317	110	114	541
Ratio in Yokohama	58.6%	20.3%	21.1%	100.0%
Number of observations in Kitakyushu	356	118	91	565
Ratio in Kitakyushu	63.0%	20.9%	16.1%	100.0%

Selection Results of Hypothetical Carbon Offsetting with Payment: Follow-up Survey

Around 60% of respondents selected carbon offset

Choice	Gift certificate	Offset contributing to Japanese government	Offset contributing to the world	Total
Number of observations in Yokohama	154	110	120	384
Ratio in Yokohama	40.1%	28.6%	31.3%	100.0%
Number of observations in Kitakyushu	168	113	126	407
Ratio in Kitakyushu	41.3%	27.8%	31.0%	100.0%

Selection Results of Hypothetical Carbon Offsetting Free of Charge: Follow-up Survey

Around 70% of respondents selected carbon offset

Choice	No offset	Offset contributing to Japanese government	Offset contributing to the world	Total
Number of observations in Yokohama	98	139	143	380
Ratio in Yokohama	25.8%	36.6%	37.6%	100.0%
Number of observations in Kitakyushu	100	137	162	399
Ratio in Kitakyushu	25.1%	34.3%	40.6%	100.0%

Major Reasoning for No Offset and Selection of Offset Types: Follow-up Survey

Choice	Reasoning	Frequency	Ratio
No offset	Because I should reduce the GHG emissions by means of my actions	125	20.9%
	Because mitigation of my emissions shall not be purchased; mitigation shall not be a business	33	5.5%
Offset contributing to Japanese government	Since it is natural to start from contribution to Japanese government; since I am a Japanese	65	10.9%
	To contribute to Japanese government's achieving the target	44	7.3%
Offset contributing to the world	Since this is a global issue which cannot be solved by mitigation of only one country	142	23.7%

Distribution of Respondents' Ideas on Two Types of Carbon Offsetting: Follow-up Survey

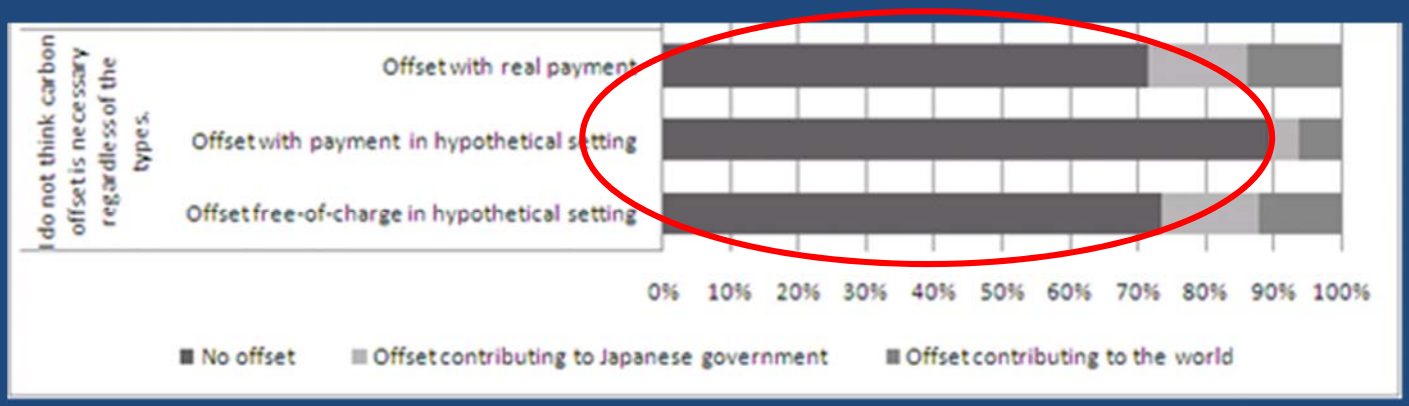
Around 30% understood the different, Around 30% did not tell

Choice	"I realised soon which carbon offset was desirable for me."	"I realised soon which carbon offset is more useful for climate change mitigation."	"I did not know the difference of two carbon offset types."	"I do not think carbon offset is necessary regardless of the types."	"Others"	Number of effective respondents
Number of observations in Yokohama	97	115	110	71	65	372
Ratio in Yokohama	26.1%	30.9%	29.6%	19.1%	17.5%	100.0%
Number of observations in Kitakyushu	105	125	121	97	49	402
Ratio in Kitakyushu	26.1%	31.1%	30.1%	24.1%	12.2%	100.0%

Note: Multiple choices allowed

Relation between Ideas on Carbon Offset and Carbon Offset Choices

More than 70% of the respondents who ***do not think that carbon offset is necessary*** regardless of types chose "***no offset***"



Regression Analysis of Carbon Offset Choice with Individual Attributes

1. No offset
2. Offset contributing to Japanese government
3. Offset contributing to the world

The fixed term of the utility function for **no offset V_1** is defined as zero while the fixed terms of the utility function for two types of offset are defined as follows,

$$V_2 = \beta v + \theta_2 X \quad (5\text{-}3)$$

$$V_3 = ASC_3 + \beta v + \theta_3 X \quad (5\text{-}4)$$

where v is a dummy variable indicating ***carbon offset***,
X is a vector of ***individual attributes***,
β, ϑ, and ASC_3 are coefficients and constant to be estimated:

Results of a Multinomial logit Model with Individual Attributes

	Offset with real payment				Offset with payment in hypothetical setting				Offset free-of-charge in hypothetical setting			
	Model 1b		Model 1c		Model 2b		Model 2c		Model 3b		Model 3c	
Variable	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value
Carbon offset	-4.098	0.000	-2.822	0.000	0.051	0.947			0.595	0.473	0.350	0.000
Offset contributing to Japanese government												
Female	0.055	0.741			-0.188	0.322			0.043	0.835		
Age	0.257	0.000	0.271	0.000	0.208	0.001	0.164	0.001	0.016	0.808		
Household income	0.289	0.002			0.103	0.312			-0.029	0.792		
Kitakyushu city	0.115	0.492			-0.112	0.557			0.033	0.873		
Concern about climate change	0.207	0.103			-0.005	0.969			0.126	0.394		
Concern about international development	0.067	0.460	0.302	0.001	-0.315	0.002	-0.263	0.000	-0.302	0.007		
Number of climate protection actions	-0.010	0.768			0.036	0.316			0.040	0.297		
Offset contributing to the world												
Alternative specific constant	-1.674	0.090	-1.921	0.001	-2.820	0.002	-1.925	0.000	-2.138	0.007	-1.241	0.000
Female	0.272	0.138			-0.043	0.820			0.263	0.192		
Age	0.250	0.000	0.237	0.000	0.107	0.084			-0.049	0.467		
Household income	0.452	0.000	0.471	0.000	0.013	0.893			-0.064	0.548		
Kitakyushu city	-0.049	0.785			0.044	0.816			0.305	0.129		
Concern about climate change	0.280	0.052			0.197	0.183			0.233	0.123		
Concern about international development	0.336	0.002	0.382	0.000	0.340	0.003	0.421	0.000	0.187	0.113	0.349	0.000
Number of climate protection actions	-0.063	0.080			-0.018	0.613			-0.036	0.345		
Sample size	1020		1053		727		768		717		757	

Findings from logit Model Results with Individual Attributes

- **Concern about international development** increases the probability of choosing carbon ***offset contributing to the world*** (real payment, hypothetical)

- The **older** a respondent is, the more respondents choose ***offsetting*** regardless of the types of offset (real payment, hypothetical with payment assumption)
- The higher the **household income**, the more respondents chose ***offset contributing to the world*** (real payment)

Estimation of Possible Funding for Individual Voluntary Carbon Offsets

- Selection rates of carbon offset (100 kg CO_2e, 500 yen): **59.9%** (Yokohama), **58.7%** (Kitakyushu)
- Adult population in Yokohama: 2.99 million, 806 thousand for Kitakyushu

➡ One-time purchase of carbon offset service for 0.1 tCO_2e each leads to

  - **179 thousand tCO_2e** GHG emissions reduction and total amount of **895 million yen** of carbon credit purchasing in Yokohama
  - **47 thousand tCO_2e** reduction and **236 million yen** in Kitakyushu

➡ Corresponds to **53%** (Yokohama) and **21%** (Kitakyushu) of **annual GHG emissions reduction target** to achieve the official goal by 2025 (Yokohama) and by 2030 (Kitakyushu)

Part II: International Environmental Cooperation of Japanese Local Governments

i. Japanese Citizens' Perspectives on Municipal Governments‘ International Cooperation for the Environment: Implications on International Intercity Collaboration on Climate Change
ii. Climate Change Mitigation in Developing Countries through Interregional Collaboration by Local Governments: Japanese Citizens' Preference
iii. Japanese Citizens’ Preferences Regarding Voluntary Carbon Offsets: An Experimental Social Survey of Yokohama and Kitakyushu
iv. Funding International Intercity Environmental Cooperation through Eco-point Programs: Japanese Citizens‘ Attitudes toward Donating Eco- points

Funding International Environmental Cooperation through Eco-point Programme

Questions

- Are the citizens interested in international environmental cooperation through donation from ***eco-point programme***?
- What are the ***reasons*** of potential participation and non participation?
- How much of the ***fund*** for international environmental cooperation could be obtained?

Method of Simulation: Fund Raising through Eco-point programme

- Simulation of the amount of the fund that could be accumulated from citizens' participation in **eco-point programme** with donation for international environmental cooperation at local level
- Stated preference data obtained from social survey in Kitakyushu City: **Choice experiments and conjoint analysis**
- **Participation rates and corresponding sum of donation** calculated for various ratios of donation for international environmental cooperation

Eco-point Programme in Kitakyushu

Existing programme

Do not use plastic bags when shopping 20 times, obtaining 20 Eco-points → Rewarded 50 yen discount when shopping

Hypothetical new programme

Do not use plastic bags when shopping 20 times, obtaining 20 Eco-points →
- Rewarded (50-*X*) yen discount when shopping
- Contribution of *X* yen for environment projects within the city / overseas

Conjoint Type Questions Regarding Eco-point Options with Possible Donations within the City/Overseas

Sample question

Suppose that there are two types of Eco-point programme for next fiscal year and that you are able to participate in one of them. Please select the best alternatives for you and put ○ on it, (ommitted) including no participation. Please note that you cannot change the programme during the next fiscal year once you select the type of the Eco-point programme.	
(ommitted)	
1	Donation overseas and within the city (Donating 25 yen for environmental projects both overseas and within the city after collecting 20 Eco-points)
2	Discount (50 yen discount at shoppoing after collecting 20 Eco-points)
3	Do not collect Eco-points when the programme is either of the above types.

Conditions of eco-point options

- ***Shopping discounts***: 0 yen, 10 yen, 25 yen and 50 yen
- ***Contributions overseas and within the city***: 0 yen, 25 yen, 40 yen and 50 yen
- ***Sum*** is fixed at 50 yen

Conditional logit Models

The fixed terms of utility for first two options with eco-point programmes:

D_{1i} and D_{2i} are the amount of contributions overseas and within the city, respectively. γ_1 and γ_2 are coefficients to be estimated

$$V_{i(i=1,2)} = \gamma_1 D_{1i} + \gamma_2 D_{2i}$$

The fixed term of utility for the third option (no collection of eco-points):

γ_3 is the coefficient to be estimated

$$V_3 = \gamma_3$$

Eco-point Options

Independnt variables	Kitakyushu				Yokohama			
	Model 1		Model 2		Model 3		Model 4	
	Conditional logit		Nested logit		Conditional logit		Nested logit	
	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value
Amount of donation overseas	-0.286	0.000	-0.148	0.001	-0.293	0.000	-0.205	0.000
Amount of donation within the city	0.001	0.949	0.006	0.566	-0.074	0.000	-0.048	0.017
No participation	-1.367	0.000	-1.470	0.000	-1.627	0.000	-1.645	0.000
λ	-	-	0.496	0.001	-	-	0.683	0.000
Sample size	2621		2621		2534		2534	
Averaged log-likelihood	-0.948		-0.946		-0.951		-0.950	
AIC	4975		4966		4824		4823	

Note: λ in nested logit model is defined for the first two alternatives.

- *Shy away from eco-points with overseas contributions, both in Kitakyushu and Yokohama*
- *Significant tendency to avoid eco-points with large contributions within the city, but not in Kitakyushu*

Logit Models with Individual Attributes

Fixed term of the utility for first two options (with eco-point):

X is the vector *for individual attributes* and ϑ_1 and ϑ_2 are coefficient vectors of individual attributes

$$V_{i(i=1,2)} = (\gamma_1 + \theta_1' X) D_{1i} + (\gamma_2 + \theta_2' X) D_{2i}$$

The third option:

ϑ_3 is a coefficient vector for individual attribute

$$V_3 = \gamma_3 + \theta_3' X$$

Results of logit Model with Individual Attributes

- **Older, concerned about problems in developing countries**, and **calling for the promotion of international environmental cooperation** tend to ***select*** eco-point programmes that make large **contributions overseas**
- **Collecting eco-points in existing programmes**, demonstrate a tendency to ***avoid*** those eco-point programmes that make large **contributions overseas**

	Kitakyushu				Yokohama			
	Model 5		Model 6		Model 7		Model 8	
Independent variables	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value	Coefficient	p-value
Amount of donation overseas	-0.727	0.000	-0.633	0.000	-1.189	0.000	-1.064	0.000
Amount of donation within the city	-0.193	0.049	-0.128	0.001	-0.792	0.000	-0.449	0.000
No participation	1.084	0.032	1.337	0.000	-0.829	0.222	-0.739	0.046
Overseas x Gender	0.002	0.931			-0.033	0.324		
Overseas x Age	0.034	0.002	0.023	0.002	0.058	0.000	0.059	0.000
Overseas x Household income	0.122	0.005	0.111	0.002	0.009	0.809	-	-
Overseas x Number of actions to mitigate climate change	-0.004	0.386	-	-	0.005	0.465	-	-
Overseas x Participating in existing programme	-0.096	0.003	-0.086	0.002	-0.201	0.004	-0.165	0.002
Overseas x concern in international development	0.087	0.000	0.069	0.000	0.067	0.001	0.061	0.000
Overseas x Knowledge of international cooperation projects	-0.045	0.195	-	-	0.077	0.050	0.084	0.011
Overseas x Promoting further cooperation	0.037	0.036	0.027	0.029	0.082	0.001	0.056	0.002
Within the city x Gender	0.029	0.262			0.030	0.374		
Within the city x Age	0.044	0.000	0.033	0.000	0.053	0.000	0.057	0.000
Within the city x Household income	0.096	0.025	0.088	0.008	0.061	0.126	-	-
Within the city x Number of actions to mitigate climate change	-0.002	0.675	-	-	0.015	0.027	-	-
Within the city x Participating in existing programme	-0.090	0.005	-0.085	0.002	-0.064	0.282	-	-
Within the city x concern in international development	0.011	0.415	-	-	0.024	0.180	-	-
Within the city x Knowledge of international cooperation projects	-0.036	0.293	-	-	0.100	0.020	0.121	0.001
Within the city x Promoting further cooperation	0.006	0.706	-	-	0.036	0.067	-	-
No participation x Gender	0.216	0.136			-0.176	0.295		
No participation x Age	0.073	0.187	-	-	0.255	0.000	0.265	0.000
No participation x Household income	-0.005	0.985	-	-	-0.407	0.059	-	-
No participation x Number of actions to mitigate climate change	0.024	0.366	-	-	0.059	0.067	-	-
No participation x Participating in existing programme	-1.054	0.000	-1.034	0.000	-1.358	0.000	-1.111	0.000
Within the city x concern in international development	-0.373	0.000	-0.418	0.000	-0.104	0.223	-	-
No participation x Knowledge of international cooperation projects	-0.461	0.031	-	-	-0.107	0.628	-	-
No participation x Promoting further cooperation	-0.198	0.013	-0.240	0.000	-0.355	0.000	-0.498	0.000
λ	0.544	0.000	0.476	0.000	0.735	0.000	0.769	0.000
Sample size	2354		2354		2290		2294	
Averaged log-likelihood	-0.875		-0.878		-0.873		-0.883	
AIC	4176		4162		4056		4080	

Note: λ in nested logit model is defined for the first two alternatives. Household income is measured in the unit of 10 million yen.

Estimation of Selection Probability of New Eco-point Options

Averaged selection probability of each option among three (new type, existing type, and no participation) for different cases of new option

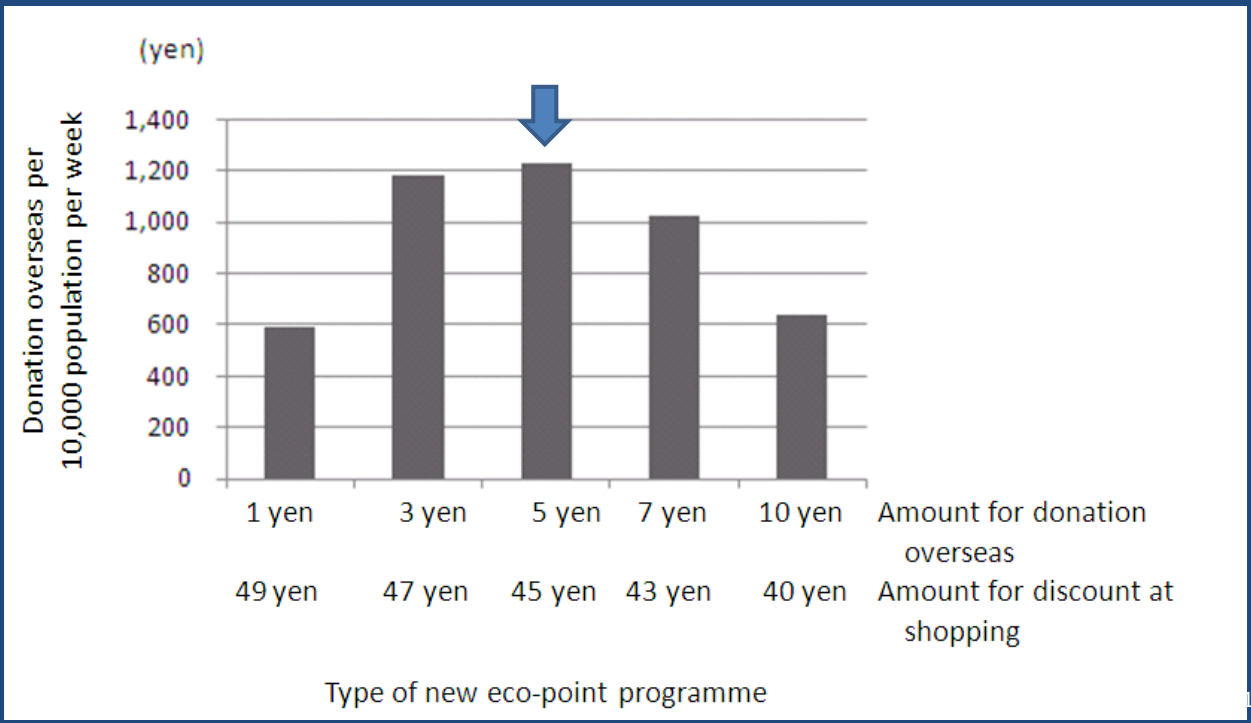
Kitakyushu			
Types of new Eco-point programme	Selection of the programme		
	New type	Existing type	No participation
Donating overseas 1 yen, discount at shopping 49 yen	36%	49%	15%
Donating overseas 3 yen, discount at shopping 47 yen	24%	59%	16%
Donating overseas 5 yen, discount at shopping 45 yen	15%	68%	17%
Donating overseas 7 yen, discount at shopping 43 yen	9%	73%	18%
Donating overseas 10 yen, discount at shopping 40 yen	4%	78%	18%

Yokohama			
Types of new Eco-point programme	Selection of the programme		
	New type	Existing type	No participation
Donating overseas 1 yen, discount at shopping 49 yen	38%	51%	12%
Donating overseas 3 yen, discount at shopping 47 yen	25%	62%	13%
Donating overseas 5 yen, discount at shopping 45 yen	16%	70%	14%
Donating overseas 7 yen, discount at shopping 43 yen	9%	76%	15%
Donating overseas 10 yen, discount at shopping 40 yen	4%	80%	16%

Note: Existing type indicates “50 yen discount at shopping”

Simulation of Fund Raising through Eco-point with donation: Case of Kitakyushu

The most overseas contributions are collected when the amount of overseas contributions for the new seals is set at 5 yen



Estimated Amount for Kitakyushu Population (20-74 years old)

- When new seals (5 yen for overseas contributions, 45 yen for shopping discounts)
  - ➡ A total of **4.39 million yen per year** can be collected
- Estimated **participation rate** is 83%. The **number of points issued** would be approximately 7.3 million per month
  - ➡ Larger than the current participation rate of 50% found in the study and the 1.76 million seals issued per month on average in FY 2009
- International environmental cooperation fund adjusted by *participation rate* is **2.58 million yen per year**, and that adjusted by *number of points issued* is **1.76 million yen per year**

Eco-point Contributions Reflecting Age Effect: Case of Kitakyushu

Logit model results with age effect

	Coefficient	p-value
Amount of donation	-0.205	0.000
Amount of donation within the city	-0.094	0.002
No participation	-1.485	0.000
Overseas x Age	0.017	0.007
Within the city x Age	0.026	0.000
λ	0.471	0.000
Sample size	2607	
Averaged log-likelihood	-0.940	
AIC	4915	

Correction by age effect

- The total sum for overseas donation was **4.19 million yen a year**
- If the *participation rate* in the eco-point programme remains at 50%, the amount collected would total **2.46 million yen a year**
- If the *number of points issued* per month is 1.76 million, it would be **one million yen**

Conclusions (Part II)

Conclusion: Citizens Support of International Environmental Cooperation by the City

- ***More than 80%*** of respondents in the cities of Yokohama and Kitakyushu ***supported international environmental cooperation by the city*** of residence
  - Citizens labelled "global environmental contributor, ***opposing carbon credit***" support city's international environmental cooperation much ***stronger*** than other groups

Conclusion: Domestic and International Carbon Crediting by the City

- ***Around 75%*** of respondents preferred ***use of carbon credits*** from developing countries to meet city's GHG emissions reduction target by 5 to 20%, given the lower cost
  - Citizens with a ***sense of environmental responsibility*** opposed utilisation of carbon credits even if it is less costly and has benefits of technology transfer and local environmental improvement

Conclusion: Individual voluntary carbon offset

- ***Around 40%*** (Real payment) and ***60%*** (Hypothetical payment) of respondents selected to ***conduct carbon offset*** (100 kg CO_2e, cost of 500 yen); ***half of them*** are for ***contribution to the world***
  - ***Around 25%*** of respondents do not use offset since they believe that ***they should reduce their GHG emissions by changing their behaviour*** and that ***it is not desirable*** to spend money so that third parties carry out reductions for them

Conclusion: Eco-point programme

- ***15% of citizens of Kitakyushu*** would participate in ***eco-point programme with option to fund international environmental cooperation*** (5 yen donation with 45 yen cash-back)
  - The estimated annual sum for Kitakyushu City, which has a population of 1.0 million, is ***between 1.00 million and 4.19 million yen***, depending on the participation rates of citizens in the eco-point programme

Conclusion: Implications

- Citizens with a ***sense of environmental responsibility***, possibly senior (60s and older) citizens, may prefer to continue traditional ***technical assistance***
- They would contribute to ***funding for international environmental cooperation through new type of eco-point programme***, without harming their sense of environmental responsibility