Business for Sustainable Society Project Summary Report

June, 2007



Institute for Global Environmental Strategies (IGES) Kansai Research Centre IHD Centre. 1-5-1 Wakinohama-kaigan-dori Chuo-ku, Kobe, Hyogo 651-0073 JAPAN TEL: 078-262-6634 FAX: 078-262-6635 Website: http://www.iges.or.jp/

Table of Contents

Chapter 1: Overview of BSS Research Project	1
Chapter 2: Product Service System (PSS) as Business Model	7
Chapter 3: Community-based Environmental Business (CBEB) in Japan	
	- 11
Chapter 4: What is Product Service Systems (PSS)?	
~A Review on PSS Researches and Relevant Policies~	- 17
Chapter 5: Environmentally-Sound Local Industrial Systems (LIS)	- 21
Chapter 6: Realising the Potentials of Eco-industrial Clusters in	
Urban-Rural Fringe Areas of Asia	- 28
Chapter 7: Environmental Competitiveness of Regions:	
Lessons Learned from Kansai's Response	34

This is the summary report of Business for Sustainability Project which has been implemented by IGES Kansai Research Centre (KRC) from FY2004 to FY2006. Further detail of the research on each chapter is available in other publications made by researchers. We greatly acknowledge and appreciate generous assistance from Hyogo Prefectural Government, and cooperation of private companies, environment related organizations, and other individuals for successful completion of the project.

Takashi Gunjima, Acting Project Leader

(Authors of the summary report with their title is as of Mar.2007)
Chapter 1&2: Choei Konda, Deputy Director for KRC
Chapter 3&4: Yasuhiro Kanda, Senior Policy Researcher
Chapter 5 : Yusuke Matsuo, Policy Researcher
Chapter 6&7: V.Anbumozhi, Senior Policy Researcher
Editing : Naotake Sugiyama, Head, Administrative Department for KRC

Copyright © 2007 by Institute for Global Environmental Strategies (IGES), Japan

Although every effort made to ensure objectivity and balance, the publication of research results or translation does not imply IGES endorsement or acquiescence with its conclusions or the endorsement of IGES financers. IGES maintains a position of neutrality at all times on issues concerning public policy. Hence conclusions that are reached in IGES publications should be understood to be those of authors and not attributed to staff-members, officers, directors, trustees, funders, or to IGES itself. This paper expresses the opinion of the authors, not those of the IGES.

Chapter 1: Overview of BSS Research Project

1. Introduction

The IGES Kansai Research Center (KRC), which was founded in 2001, promoted a 2nd Phase (April 2001 – March 2004) project on Business and the Environment (BE) and followed that with a 3rd Phase (April 2004 – March 2007) project on Business for Sustainable Society (BBS).

Given the IGES mission of conducting strategic researches on global environmental issues with the focus on the Asian-Pacific region, the BSS Project was implemented with support of Hyogo Prefecture where the Center is located, considering the characteristics of the Kansai region.

2. Project Objective and Targets

The ultimate objective of the BSS Project is to answer the question of "how business/industry can realise a sustainable society". In order to attain this objective, two goals were set: (1) to identify promising business models for realising a sustainable society and develop relevant methods to quantify their potential while proposing measures to promote such businesses, and (2) to clarify the conditions of business/industry activities and a direction of local development that are suitable for sustainable local society.

3. Project Research Composition

3-1 Research Composition in the First Half of the 3rd Phase

Research composition for the first half of the 3rd Phase is given below. Two sub-themes were created in line with the two aforementioned goals, and, keeping in mind the building of a "global-warning-free society" (addressing global warming isues) and a "circular-oriented society" (addressing waste issues), which are two important topics for building a sustainable society, Research on Environmentally-Sound Business Models (BM) focused on product service systems (PSS) including business models based on reusing and recycling, while Research on Environmentally-Sound Local Development (LD) focused on global-warming-free business.

I Research on Environmentally-Sound Business Models

(BM Research; BM: Business Model)

This research aims to identify business models based on most promising services, assess their sustainability potentials and investigate the conditions for realizing their potentials.

II Research on Environmentally-Sound Local Development

(LD Research; LD: Local Development)

This research aims to identify business prerequisites in a sustainable society and develop business models or industrial activities that respond to those prerequisites.

III Integrative Research

This new research is to conduct in the third year of the project and aims to deepen discussions of areas where the aforementioned two sub-research fields are overlapped.

3-2 Research Composition in the Second Half of the 3rd Phase

When the BSS Research entered the second half of the 3rd Phase, a progress review was made. The review indicated that it would very difficult to promote the integrative research because of time and human resource constraints. Therefore, instead, associated researches and studies were to be done in order to reinforce the contents of BM and LD researches. More specifically, a research on community business (CB) was added to BM Research as another environmentally-sound business model except PSS, while a research on eco-industrial clusters (EIC) was added to LD Research as another approach for realizing a sustainable local society, and related policy reviews were launched for both. As such, the research composition for the second half of the 3rd Phase is as follows.

The planned research components of both BM and LD Researches to apply into Asia were substituted for doing a comparison study of Japan, USA and Europe and case studies of Asian countries in the above associated researches and studies . Also, the LD title was changed to Local Industrial Systems (LIS).

I Research on Environmentally-Sound Business Models (BM Research)

- (1) BM Research on Product Service Systems (BM-PSS Research)
- (2) Research on the policy measures to promote community business (CB) for the environment (BM-CB Research)
- (3) Review of policy trends in Product Service Systems (BM Review)
- II Research on Environmentally-Sound Local Industrial Systems (LIS Research)
 - (4) LIS Research through examining the images of a sustainable local society (LIS-ISS Research)
 - (5) Research on strategic approaches for local/regional development through eco-industrial clusters (EIC) in urban-rural fringe areas (LIS-EIC Research)
 - (6) Review on the response of industry and business in the Kansai region to global environmental issues (LIS Review)

4. Research Methods

The aforementioned six sub-themes (actually four researches and two studies) are organized to be complementary to one another, as shown in Fig. 1, in that BM Research takes a micro approach to its ultimate objective and LIS Research takes a macro approach that departs from the ultimate objective and heads to the present. Moreover, the associated researches and studies launched in the second half of the 3^{rd} Phase took a practical approach , compared with the researches by a theoretical approach that preceded them

5. Structure for Research Project

This project was spearheaded by a core of four full-time researchers (and one semi-full-time visiting researcher) in support with eight part-time visiting researchers mainly from local companies under the guidance, management and support of the KRC Director, BBS Project Leader (PL) and others.

Figure 2 gives an outline of the transitions in research structure and content. Three researchers were newly hired for this project; one in June 2004 and two in October that same year, while a fourth was seconded by Hyogo Prefecture. Therefore, it was from the second half of the first year that the research staff was built around this core of four full-time researchers and it was from the beginning of the second year that their responsibilities were assigned and the research actually got underway.

Just before the final year, the examination on an image of a sustainable local society (ISS: Image of Sustainable local Society) in the LD Research was settled temporarily and shifted to the examination on business and industry that are suitable for that image. On that opportunity, SPL Takashi Gunjima filled in as Acting PL for the resigned PL Masaaki Naito and promoted the research under a centralized command.

6. Research Outputs and Future Tasks

This project produced the following outputs.

(1) Reports

•Report on BM-PSS Research (Currently under work)

•Report on LIS-ISS Research (Currently under work)

 $\circ Source Book on LIS-EIC Research (Currently under work)$

(2) Policy Briefs (PB) and Discussion Papers (DP)

oPB on LIS-EIC (Currently under work)

oPB on Household ESCO in LIS-ISS Research (Currently under work)

•DP on BM-PSS Research (x 2)

 $\circ \text{DP}$ on BM-CB Research

ODP on BM Review

oDP in relation to BSS Research

(3) Others

oReports on International Workshops and Symposia

(2 a year for 6 in total; most recent one is currently under work)

oContributed articles to "IGES White Paper" and "Top News on the Environment in Asia",

etc.

The above Report on BM-PSS Research is the first real report on PSS from Japan and the results have been highly acclaimed. Moreover, the household ESCO business proposed in LIS-ISS Research as a global-warming-free business was selected as the best proposal in the 2006 NPO/NGO and Company Environmental Policy Proposal Contest of the Ministry of the Environment, and related feasibility studies (FS) are being done in 2007 accordingly. Furthermore, LIS-EIC Research was the only research under the BSS Project to focus on Asia and, not only is it the predecessor to the 4th Phase project, but its results were also presented at the 7th Asia-Pacific Round Table on Sustainable Consumption and Production (APRSCD).

There were several restrictions in implementing this project, but when compared against targets, it is safe to say that results of a notable degree were produced. Nevertheless, one lingering issue

that will be looked at as a future task was that the initially targeted development into Asia was insufficient. On this note, plans are to promote projects from the 4th Phase and beyond under a new approach: not that of applying results from research in Japan to Asia but, from the very beginning, aiming to make policy proposals based on the situation for developing countries in Asia.



Fig. 1 Research Structure of the BSS Project (as of March 2007)

Fig. 2 Transitions in Research Structure and Content

FY2004 FY2005 FY2006 1. Research Guidance, Management and Support Director Prof. Amano Prof. Suzuki Deputy Director Mr. Konda Section Manager Mr. Sugiyama Mr. Yoshida Project Leader (PL) Prof. Naito (PL) Prof. Gunjima (SPL) Prof. Gunjima (APL)

2. BM Research

Researchers: Mr. Horie and		PSS Research (Collection, analysis and evaluation of PSS examples)				
Dr. Stoughton		(Special Research on car sharing)				
Senior Researcher:	Research planning	for the whole BSS Project	PSS Research	CB Research (Promotional policy measures for community business)		
Mr. Kanda		(Related research) Review (PSS Policies)				

3. LIS Research

Researcher:		PSS Research	ISS Research (Presentation of the image of a global-warming-free society by simple simulations		
Mr. Matsuo	(Consu	mer acceptance, etc.)	>> Proposal on global-warming-free business models)		
Senior Researcher:		ISS Research		EIC Research (Local development strategies through eco-industrial clusters)	
Dr. Anbumozhi		(Related cas	e researches) Review (Environmental response of the Kansai economic world)		

Note: To avoid confusion, the names of advisors, visiting researchers and other cooperating persons have been omitted.

Chapter 2: Product Service System (PSS) as Business Model

1. Background

The transition to a more sustainable economy is a critical challenge facing society at the global, regional and national levels. This transition requires viable environmentally sound business models that are compatible with and support substantial reductions in resources mobilized and waste generated by economic activities.

While the sustainability transition has barely begun, a structural economic transition is already well underway in all the developed and advanced developing economies: the growth in importance of services. This service transformation represents a significant sustainability challenge: services do not automatically result in a greener economy. In fact, the growth of services requires growth in environmentally problematic manufacturing sectors.

Therefore environmentally sound business models are needed that specifically respond to the challenge of the "service economy." We must find ways that services can change—for the better—what we make and build, and how we make, build, use and dispose of products.

In principle, product-service systems (PSSs) and allied business models (also called "servicizing" models) have such potential. By strategically combining products and services, these models in principal offer ways to close materials cycles, dematerialize economic activity by the substitution of functional sales for products, create markets for eco-efficiency, and speed adoption of new technologies. That is, PSSs in principle are service-based mechanisms to move towards more sustainable consumption and a "3R" economy.

This potential has been recognized for several years and motivated the significant PSS-related research effort under the 5th European Commission research framework. Following Europe, PSS (or "servicizing") research in Japan has increased significantly, with a number of research efforts recently completed or now underway, including our own research at IGES-KRC.

Our research sought to identify PSSs of high sustainability potential already extant in the Japanese economy and to develop policy recommendations for these models that would help create a market and regulatory environment in which the greenest versions of these models become "business as usual (BAU)" and the environmental benefits they offer are thus maximized. The research is fundamentally policy-oriented and its process is summarized in the diagram below.

1: Case search and selection

Develop representative sample of innovative, potentially green PSS activity in Japan. Select 25 cases using multi-criteria screening method.

2: Case study development (25 cases)

"Micro" (customer or unit-offunction level) environmental. performance analysis & Development & analysis of interview-based <u>business profile</u>

3: Identify models with high "sustainability potential"

Sustainability potential evaluated on environmental performance, environmental significance, social aspects, & market potential

4: Policy analysis & recommendations

For high-potential models only; policy recommendations based on gap analysis between policy "targets" and existing policies and laws

2. Case collection and selection

The first substantive research activity was a search to identify a reasonable sample of the universe of innovative PSS and related business activity in Japan that potentially offers environmental benefits over BAU. In all, we surveyed more than 300 business cases, of which somewhat more than 90 qualified as a PSS or allied business model per our definitions.

The more than 90 "potentially green" PSS cases and models identified were far too many to examine in detail; in addition, PSS scholarship and experience clearly shows that many, if not most, of the PSS cases will have limited sustainability potential. We thus devised and applied a screening protocol to this sample to help identify a promising set of 25 promising cases/models for detailed further study. Case selection criteria were: (1) sustainability potential, as suggested by the screening results, (2) sector and mechanism diversity; and (3) achieving intra-model "case clusters" to facilitate comparison.

3. Case analysis

The case studies for 25 promising cases/models were composed of two parts. The first part of the case studies was a "micro-level" environmental performance assessment which characterized how the environmental performance of each model or case compared to "business as usual" at the level of the individual customer or unit of function. The second part of the case studies was a business profile which, as the name implies, describes the cases as businesses.

(1) Key findings of environmental performance analysis

• All the PSS cases we selected for our detailed study do indeed improve "micro-level" environmental performance over BAU. These improvements occur within particular lifecycle phases; none of the cases improve environmental performance in all lifecycle stages. These improvements are significant (exceeded 20%) in a number of cases.

- Some PSSs do worsen environmental performance in one or more lifecycle stages as compared to BAU. However, even in these instances, the overall result for the case is an improvement in environmental performance over BAU, due to offsetting benefits in other lifecycle phases.
- Overall, the improvements in performance achieved by the cases speak most directly to two environmental policy goals: (1) "dematerialization" and a closed-material-cycle economy; and (2) reductions in greenhouse gas emissions, especially CO2.

(2) Key findings of business profile analysis

- PSSs are strategic responses to business conditions, but not a long-term source of competitive advantage.
- PSSs are not a goal or end in themselves.
- PSSs do not seem to be strong vehicles for driving fundamental innovation in existing organizations.
- Superior cost & convenience compared to BAU are the primary appeal of PSSs, but "green customers" can be a key early adopter group.

4. High potential business models

A key goal of the research is to identify which of the business models underlying our case have high sustainability potential. That is, which models can contribute significantly to achieving a more sustainable economy? We defined "sustainability potential" as combining four factors: 1) "micro-level" environmental performance, 2) market potential, 3) environmental significance, and 4) social considerations. Each of the 4 factors above was assessed for each model; to select high-potential models, we adopted a qualitative approach to integration. Based on this approach, we selected 7 high-potential models as shown in Table.

Case/Model	PSS type	Related environmental issues	
ESCO	efficiency supply CO ₂		
3 rd Party Logistics	efficiency supply	CO ₂	
Water Saving & Water Treatment	efficiency supply	water, chemicals	
Longer-Life Housing	joint use waste, CO2		
Car Sharing	product life extension	CO2, waste	
Tele-Conference	IT dematerialization	waste, CO2	
Florescent Lamp Lease	Lease	mercury	

Table: High potential business model selected

5. Policy recommendations

This research is fundamentally policy-focused. Thus, having identified seven high-potential PSS business models, a key question remains: what policy interventions are indicated to help achieve this potential? More specifically, what role can policy play in creating a market and regulatory environment that helps high-potential PSSs become business as usual, and best assures that the greenest versions of these PSSs are the ones that grow?

We developed a policy recommendations methodology that began with the identification of high-level policy "targets," followed by analysis of the gaps between these targets and existing policies. Policy recommendations were then developed to address the identified gaps. This methodology is summarized in Figure.





6. Conclusions

The followings are final conclusions of particular pertinence to our research objectives based on our policy recommendations derived in the above.

- Some innovative PSSs do have significant potential to help Japan achieve key sustainability/environmental policy objectives.
- As a class, performance-based "outsourcing" models have special potential.
- Environmental performance improvements are most reliable when profits depend on them.
- Common policy and strategy for performance-based PSSs is strongly indicated.
- Achieving the sustainability potential of PSSs requires going beyond narrow definitions of "environmental policy".
- The role of government procurement via green purchasing and PFI is important for responding to supply-side and demand-side policy recommendations.
- Broad-based policy for PSSs presents a significant coordination challenge, but Japan has some key advantages.

Chapter 3: Community-based Environmental Business (CBEB) in Japan

1. Introduction

In recent years, community-based practices such as collecting leftover of school lunch or waste cooking oil, turning them to fertilizer or animal feed through collaboration with local companies etc. and obtaining some revenues through such activities have been evolving in different parts of Japan. Construction of wind power generator through equity investment from citizens is also getting popular in some areas. Moreover, operation of micro-grid, an energy demand and supply system, is being planned by some local communities. Also in the areas of nature regeneration and environmental education, community-based practices that takes business approaches are emerging.

The objectives of this research is to examine the backgrounds and contexts of these CBEB evolved in Japan, and to examine the information of concrete practices and relevant policies in Japan to the world. The research conducted some field surveys on typical Japanese cases, interviewed key persons of each case and examined policy agenda etc.

2. Background and Context of CBEB

The economy is said to have three systems: first system of private companies, second system of national/local governments, and third system that consists of self-reliant mutually beneficial activities with social purposes. CBEB is an activity that contributes to environmental conservation of the community etc., and belongs to social economy or community economy.



Chart 1. Three Systems of The Economy

The emergence of social economy differs widely as it closely related to unique characteristics of each country or local area differently each other. However, a common change of the emergence of "social enterprise" has started to occur in social economy. Social enterprise is activating social economy. The background for this phenomenon is, is development of network society, which can provide small organizations enough management resources through a set of connections. Another

driving force of social economy is that social enterprise is good at dealing with people's diversified needs.

CBEB can be defined by "Community business or social enterprise that deals with environmental issues." The purposes and effects are multiple, and CBEB is related with various issues of local development other than environmental conservation. Integration of Environment, Society and Economy, which is required in local community, is proceeding. The context of coordinating environment with economy, which started in around 1970, is oriented towards community economy. Welfare policy is also shifting from welfare state to local welfare. In these contexts, CBEB is expected to play more important roles.

3. Practice Analysis

Since one of the research objectives is to inform the world of the situation in Japan, practices for analysis were selected among well-known Japanese cases. Three local communities shown in Table 1 were took up and analyzed. The practice under study was set on local community instead of enterprise, because multiple business activities and local community are closely related to each other, and it seemed important to analyze the basis of community collaboration and the relationships of entities and businesses.

Category	Area	Outlines
Urban	Kasumigaura lake watershed, Ibaraki pref. (Asaza project)	An NPO with business model ideas has emerged from citizens group concerned with water pollution of the lake Kasumigaura. It coordinates elementary schools and various organizations in the watershed, and developed "Citizens Public Works Project" in order to "please the lake", by receiving budget from national government etc.
Rural	Kuzumaki town, Iwate pref.	Utilizing local forestry and cattle breeding, the town government is taking initiatives of wind power, photo voltaic power, biomass power generation projects etc. The town is called "An Open Museum of Clean Energy", which is attracting many tourists. Regional network initiative, which surpasses the boundary of the town, is also proceeding.
Small local city	lida city, Nagano pref.	With the initiative of the city government, an organization was established by local companies and conducts "Local Society0wide Environmental Management" activities. A company established by a local NPO, collaborating in and out of the area, conducts business on energy conservation and new energy businesses.

Table1. Outlines of the Field Survey Sites

Table 2 shows the results of practice analysis by visiting each site and interviewing key persons.

	Asaza Project	Kuzumaki Town	Iida City
Basis for Collaboration	Severe water pollution, Network building with schools	Problems on industrial waste disposal, Downturn in agriculture industry	Economic downturn as a core city of the south shinshu area, Flood damage, Massive fire
Entity linkage	An NPO invites diversified entities to the project	Municipal government and public company collaborate with various entities	Municipal government, NPO, study group, investments from nation-wide citizens
Business linkage	Env. education, Nature regeneration, Organic agriculture, Watershed monitoring	Renewable energy, Bio-mass, Green tourism, Env. Education	Env. Management System Certification, Renewable energy, Energy saving,
Linkage with outer area	Tokyo Univ., Ministry of Land, Infrastructure &Transport, NEC	Wood biomass study group, Milky way environmental network	Institute for Sustainable Energy Policies, COLGEI
Driving force	Nature regeneration contract with MLIT, CSR activities, Joint R&D project with companies etc.	National government programs including new energy, energy savings, biomass town, eco-school etc.	National government programs including special zone for structural reform, mahoroba etc.

Table 2. Results of the Practice Analysis

Through examining information comprehensively, the following common points have found in the advanced cases.

- The emergence of CBEB is from mainly seen in the communities that experienced crises of being a local society. With the shared experience as springboard, basis for collaboration has developed over a long time.
- New businesses are born in complex relationships of entities and businesses, which further accelerate the activities.
- The enterprises obtain high level of professional knowledge and know-how through collaboration with entities outside the area.
- There exists leader(s) who has **long-term strategy** or vision, which is penetrated into local society.
- There exists **coordination** in a way that empowers abilities of various entities.
- Short-time strategy especially for **securing economy** incorporates various support measures from the national government etc., and well integrates them into the local society.

4. Examination of Policy Agenda

CBEB related policies extend to a wider area of policies for local development and social economy. In line with the findings of practice analysis, examination of policy agenda was conducted from the three viewpoints: long-term strategy, coordination and securing economy.

(1) Policy agenda on long-term strategy

From the practice analysis, it was found that existence of leader(s) who has a long-term strategy for sustainable development is a major factor for success. Such leaders cannot be made as planned, but it will be necessary to build a basis for such leaders to emerge in local society. So, it is important to promote human development through such prorammes as environmental education or fostering of social entrepreneurs.

It is also necessary for a society to develop long-term strategy and reduce dependency on individual leader. So, it is important to develop sustainability strategy that it is process oriented and creating new values with the involvement of a wide range of stakeholders of the community.

Trends for sustainability, backgrounds of the long-term strategy, need to be maintained and strengthened. They are trends "from government to governance." In concrete terms, they are decentralization of "from national to local" and privatization of "from government to corporation." (There are two types of privatization: one to entrust profit-oriented private companies and one to entrust NPO etc. The latter one should be more focused.) Furthermore, it is important that each concept of environment, society and economy will develop to be widened and multiple purposes can be easily achieved.

(2) Policy agenda on coordination

Practice analysis found that there is coordination that draws out abilities of various entities. This leads to a policy agenda on development of coordinating organizations. "Intermediary" is an organization that is created by the initiatives of local government or NPO etc., and has such functions as matching for community business and fostering of human resources. There are national level intermediaries and local community level intermediaries. In order to support coordinating technical issues and project of relatively large investments, these intermediaries need to be further developed.

Another agenda is to develop information to be shared. With the development of the Internet and web search technology, the volume of shared information in the network space is dramatically increasing. It is important that information on such local resources as natural resources or human resources and information on support programs of governments and companies is developed and shared further more.

In order for various entities to be able to coordinate autonomously, each entity is requested to manage organization in an open way. Local governments are beginning to legislate Local Autonomy Basic Ordinance, and participation and collaboration between government and residents is developing. Companies are requested to conduct more CSR activities. These trends are to be further promoted. New business opportunities can be created out of open and dynamic collaborations.

(3) Policy agenda for a self-reliant local economy

From practice analysis, it was found that the cases tend to depend on financial supports from government etc., although they obtain revenues by selling products or services. In order to cope with this agenda, basis of self-reliant local economy needs to be developed. Concrete measures include raising target value of Renewable Portfolio Standard to secure electric demand for citizens wind power etc. and conducting Public Private Partnership projects by setting up a local community council. Dissemination of local economic tools such as community fund or local money, and construction of mechanisms for evaluation business activities from environmental and social aspects are also important.

Until the basis of local self-reliant economy is developed, various supports should be provided to CBEN initiatives. At present support programs of each ministry are playing an important role in nurturing CBEB. There are criticisms that the budget of the ministry's programs is inherently local societies' one, but in order to develop nation wide models, the support programs will be needed for a while. When the environmental tax reform is conducted, the tax revenue can be forwarded to bottom up activities, which can become a mainstream of coordinating environment with economy. Local government can introduce a participatory budgeting system that secures part of budget of local government for the activities of NPO etc., and residents decide the allocation of the budget.

5. Towards Sustainable Society

CBEB, although it is a small activity, can contribute to a larger objective of achieving sustainable society. In order to achieve sustainable society, it is said that significant level of reduction in environmental loads or of eco-efficiency improvement is needed, and that there should be structural changes and innovations at socio-economic system level (system innovation).

System innovation for sustainable consumption and production has been examined mainly in European research communities on product service systems. They recognize step by step increases of eco-efficiency: product improvement \rightarrow product redesign \rightarrow functional innovation \rightarrow system innovation. They think that system level innovation needs to be achieved in order to reach sustainable level of eco-efficiency, which can be realized by not only product level activities but also introducing Product Service System (PSS) that replaces goods with services and combines multiple innovations.

CBEB is expected to be another driver for system innovation as illustrated in Figure 2. There are various elements in socio-economic system and they are closely related. So, in order for socio-economic system to change, it is necessary for theses elements to interact each other and create autonomous movements. Since CBEB is expected to create virtuous cycles with social capitals and natural capitals etc., CBEB, although each one is a small activity, can change socio-economic framework in a certain direction.



Chart 2. CBEB and System Innovation

In Asia and the Pacific Region as well as in Japan, civil society and environmental NGOs are becoming active and trends for governance can be noticed. Bottom up activities including micro-credit and one village one product movements are also developing. Leading multi-national enterprises have started to develop base of the pyramid market through partnerships with local community.

Increase of community-based approaches, adoption of new business methods, and growing recognition for the environmental protection are becoming clear trends. Since CBEB exactly matches them, it is expected to draw more attentions from now on.

Chapter 4: What is Product-Service Systems (PSS) ? ~A Review on PSS Researches and Relevant Policies~

1. Introduction

A business model of "Not selling goods, but selling services" has received a lot of attention. It is probably because people think that a business model that makes more profits by selling more goods creates incentives for selling more goods, whereas a business model that sells services does not create these incentives. However, providing services is also accompanied by environmental loads. A business model that sells services instead of goods does not necessarily contribute to reducing environmental loads.

Product Service Systems (PSS), which is believed to have a huge potential for reducing environmental loads, has been studied for about ten years mainly in Europe. On the other hand, product policy for reducing environmental loads started to recognize that product itself has potential to cause environmental pollution, and innovative product policies have been introduced mainly in Europe.

How PSS researches and innovative product policies have been related each other? This review examines contexts of PSS researches and relevant policies, proposes future direction for research and tries to find agenda to be tackled. The review was conducted through examining literature materials.

2. Review of Previous Research on PSS

Concept of PSS has been formulated with the emergence of some concrete business models in the market. It has an incentive structure that both producer and customer would like to decrease use of materials, and is accompanied by behavioral changes of wide range of stakeholders.

In Europe, PSS has been studied as part of dematerialization study. Since Dr. Schmidt-Bleek proposed a concept of Material Input Per Service Unit (MIPS), business models that are expected to have high potentiality of resource productivity have been explored. "Creating Eco-Efficiency Producer Services" is a research project conducted between 1998 and 2001. Seven research institutes participated in the project in order to bring the topic of eco-efficient services into the mainstream of European business and policy making. The kick-off workshops on Integrated Product Policy (IPP) held in 1998, and the green paper of IPP, published in the year 2001, are concurrent with the duration of the research project. The report of the research project included proposal on IPP, and the green paper included potentials of services. However, the next research project called "SusProNet", which was conducted between 2002 and 2004 by 20 research institutes, concluded that "most PSS types will result in marginal environmental improvements at best." After that, product policy has headed for efficiency improvement of tangible service remain off the policy issues.

In the United States, a concept of Servicizing was invented with the purpose of disseminating

the principles of Extended Product Responsibility. Extended <u>Product</u> Responsibility is a substitute of Extended <u>Producer</u> Responsibility (EPR) that U.S. industries declined to accept. Extended Product Responsibility suggests that reducing environmental loads of product is a responsibility of not only producer but also various stakeholders. Servicizing has developed in the context of increase of service economy and service orientation of manufacturing industries in the United States. USEPA took the initiative of practice analysis, but after that industries are taking initiatives on servicizing researches.

United Nations Environment Programs (UNEP) initiated a two year survey in the year 2000 to analyz PSS practices and proposed a concept that examined resource flow in the value chain and among various stakeholders from design point of view. Organization for Economic Cooperation and Development (OECD) also conducted a research project on sustainable consumption, focusing on consumers behaviors, and also a research on performance of contract-based PSS with the purpose of disseminating good practices.

3. Trends of Relevant Policies

PSS is a business model that tries to decrease environmental loads through collaborations of various stakeholders throughout product lifecycle. Policy with this scope is called environment-oriented product policy, which has a huge scope that deals with material flow in Techno Sphere and regards PSS as a policy measure along with regulation, economic measure, environmental label and consumer policy etc. PSS is also regarded as a policy measure in the OECD guidance manual on EPR.

Europe has, from early on, introduced policies that is based on EPR principles, such as directives on packaging (1994) and end of life vehicles (2000). These policy measures set numerical targets such as recycling ratio to secure effectiveness, but there came up a problem that could increase environmental loads from product lifecycle viewpoint, if the efforts cling to the target ratio. The idea of IPP was born in order to cope with this issue and decrease environmental loads effectively at different stages after evaluating the whole lifecycle of product. IPP has been discussed as like a counterpart of PSS research, but gradually scaled down the concept and oriented towards environmental technology. Directive on energy-using products, which is said to be the first concrete policy of IPP, is in the jurisdiction of European Community (EC) – Director General of Enterprises & Industry, not of the Director General of the Environment. Trial to reduce environmental loads through a wider range of stakeholder participation was conducted on just some specific products.

In the U.S., product stewardship, along with the principle of Extended Product Responsibility, has voluntarily produced its practices on various products. Product stewardship calls on all stakeholders throughout product lifecycle such as manufactures, retailers, users, and waste disposers to take its shared responsibility to reduce environmental loads. Since manufactures have incentives to increase resource productivity, cost reduction and development of new market, they can lead other stakeholders in practices. Material recovering or reproducing routes have been

voluntarily constructed on such products as batteries or carpets. The US federal government supports PSS promotion organizations on Chemical Management Services (CMS), and has not taken regulatory measures like EU. Some state governments have put Extended Producer Responsibility on producers.)

Japan has built a legal system of waste treatment, effective resource use, green purchasing and recycling of each product with basic law on sound material cycle society, referring to the German Closed Substance Cycle and Waste Management Act. Despite of the name of Extended Producer Responsibility, producer does not have to take all costs for recycling. The law system stipulates responsibilities of retailer, consumers and local government, and how to share recycling costs is an issue actively discussed . Japan is also developing policy measures to advance product performance such as top runner method, which is said to be a representative of Japanese environment-oriented product policy. Idea of reducing environmental loads from product lifecycle stages have been discussed in a study group of government council, and "collaboration" and "co-creating" among various stakeholders at each product lifecycle were proposed, but little concrete measures have been taken. Japan is still in a stage of collecting and analyzing Japanese PSS practices.

4. Future Direction for Examining PSS Concept

As observed above, PSS is said to have huge potentiality to reduce environmental loads, but it has not been enough utilized to policies. One of the reason is that it is difficult to quantitatively evaluate the environmental loads of the lifecycle of product and service. Another one is that concept of PSS is still vague. So, PSS concept needs to be further discussed based on some basic points proposed as follows:

The concept of PSS, which is expected to produce innovation at socio-economic system level, should not remain at product and service level. It should have scope of socio-economic system level or stakeholder relationships. Effective policies are expected to come out of this kind of discussions. Figure 1 shows an image of PSS concept that stands on design perspectives and importance of mutual relationships between three design levels: product-service, company and socio-economic system.



Fig. 1 Collaboration between three design levels through PSS

Another point is that effectiveness of PSS is not limited to efficiency increase. Figure 2 shows the position of PSS in environmental impact equation. PSS is expected to contribute to the improvement of resource productivity, service intensity and sufficiency. PSS is related to both eco-efficiency of production side and sufficiency of consumption side, and can make proposals for new designs of relationship between production and consumption.



Fig. 2. Environmental impact equation and PSS

5. Future Agenda

In order to develop policies utilizing PSS, both approaches from research side and policy side are needed. Research side needs to clarify basic points of PSS concepts and discuss focusing the relationships between production and consumption in order to effectively find policy implications. On the other hand, policy side had better widen scope from product policy to lifestyle changes. PSS has developed as service economy grows. Economy keeps further changing in the contexts of open source etc. The important thing is having viewpoints not on the idea of simply replacing goods with services, but on the new designs of the relationships between production and consumption.

Chapter 5: Environmentally-Sound Local Industrial Systems (LIS)

1. Introduction

It is plain and obvious that, to establish a sustainable society, it will be important to prevent a large portion of the climate changes that are threatening society. Recently, large reductions in greenhouse gases (GHS) have been indicated to solve this problem, and it is becoming common understanding that industrialized nations in particular must reduce emissions as much as 70~ 80% in the mid to long-term. However, if you take a look at the situation surrounding GHG emissions in Japan and other industrialized nations, you can easily find that emissions actually continue to increase though the awareness of the problem is growing across all of society. The action taken in Japan goes beyond assigning direct responsibility for the rise in GHG concentrations, as it constitutes a primary factor in determining what all of Asia will be doing to reduce GHG in the future because of the influence Japan can have on the future activities of other Asian nations and territories. Accordingly, to fulfill its responsibilities in Asia and serve as a model of climate change prevention for other Asian nations, it is imperative that Japan get out of this situation as quickly as possible.

To resolve this intrinsic problem and attain a reduction of GHG of some 70 ~ 80% in the mid to long-term, Japan needs to develop a clear vision and implement the strategically formulated policies that will make country achieve the developed vision. Given this background, this research project is studying ways to build a low carbon society via the "business perspective"; the theme of Kansai Research Center.

2. Overview of Research and Methodology

This project basically searched for solutions to the climate change from a business perspective and adopted a back-casting approach to research. More specifically, an image of technological and social systems that achieve a drastic reduction of GHG (hereinafter referred as "vision of low carbon society") was identified as a first step. As the second step, the various obstacles to building a low carbon society were identified and, then, as the third step, business models that could remove these obstacles and help materialize a low carbon society were positioned as "Solution business for climate change" and studies were done into their feasibility and policy support. Figure 1 gives the research flow and primary methods of research.



Fig. 1 LIS research flow

3. Studies on low carbon Society

As the first step in using a back-casting approach to study solution business for climate change, brief studies were conducted on technological and social systems that would attain a large reduction in CO_2 . More specifically, several technological and social system options (i.e., diffusion of highly insulated homes and highly efficient equipment, use of renewable energies, systematic changes to life styles via "Cool-biz" measures, etc.) that would help reduce CO_2 were systematically collected Then, simulations¹ were run using these options on several typical local cities in Japan to see if CO_2 emissions could be greatly reduced or not. These simulations focused on the household, office, and transportation sector because of the marked increase in CO_2 emissions in recent years and the pressing need for real action. Table 1 and Fig. 2 provide an overview of the low carbon society obtained from these simulations.

¹ In the brief simulations, demand (cooling, heating, transportation demand etc.) was estimated and an 80% reduction in CO_2 emissions was set as a constraint. Combinations of options that maximize the rate of fulfillment to the demands were obtained within the scope of constraint, using such as linear programe, etc.

Target sector	Solution	Environmental performance	Assumptions
Homes			
	HEMS	5% reduction in heating demand, 10% reduction in cooling/power demand	100% introduction except for single person households
	Acquisition of solar heat	10% reduction in heating demand	50% adoption by detached homes and 50% by apartment buildings
	Thermal insulation	55% reduction in heating demand	80% adoption
	High efficiency air-conditioning	Assuming COP6. 50% reduction in cooling-heating energy demand.	All air-conditioning high efficiency
	Use of wind power	10% reduction in cooling demand	50% adoption by detached homes and 50% by apartment buildings
	Blocking of sunlight	25% reduction in cooling demand	100% adoption by detached home and 50% by apartment buildings
	Heat retention bathtubs	18% reduction in hot water demand	80% adoption by detached homes
	Natural cooling-heating heat pump boilers	Assuming COP4.55. (Approx. 80% energy-saving effect for existing gas boilers)	
	High efficiency home appliances (Lighting included)	40% energy efficiency improvement of each appliance (2000 level base)	100%
Office			
	BEMS	5% reduction in heating demand, 10% reduction in cooling/power demand	100% diffusion
	Cool biz	17% reduction in cooling-heating demand	100% implementation
	Warm biz	10% reduction in heating demand	100% implementation
	Thermal insulation	30% reduction in heating demand	100% adoption
	High efficiency air-conditioning	Assuming COP6. 50% reduction in cooling-heating energy demand.	All air-conditioning high efficiency
	Natural cooling-heating heat pump	Assuming COP4.55. (Approx. 80% energy-saving effect	
	boilers High efficiency office equipment (Lighting included)	tor existing gas boilers) 40% energy efficiency improvement of each appliance (2000 level base)	100%
Fransportation	for travel		
	Compact cities	54% reduction in travel demand	Assuming population density of Tajimi equal to Gifu downtown
	Teleworking	6.5% reduction in travel demand	Assuming employees work 4 days week at home
	Vehicle fuel consumption improvement (HB)	50% improvement over 2000 level	100% of vehicles used
	Bus fuel consumption improvement	30% improvement over 2000 level	100% of buses used
	Train fuel consumption improvement	10% improvement over 2000 level	100% of trains used
	Introduction of electric scooters	9.7 g-CO2/1,000 persons (When using power source units of 2000)	
	Change in distribution rate of transportation means (Vehicle >> Walking or bicycle)	Shift to transportation of low CO2 unit	Approx. 5% distribution rate of walking and bicycles (Tajimi)
	Change in distribution rate of transportation means (Vehicle >> Electric scooter)	Shift to transportation of low CO2 unit	Approx. 35% distribution rate of electric scooters (Tajimi)
	Change in distribution rate of transportation means (Vehicle >> Public transportation)	Shift to transportation of low CO2 unit	Approx. 42% distribution rate of public transportation (Tajimi)
Freight transpo	rtation		
	Compact cities	45% reduction in freight demand	Assuming population density of Tajimi equal to Gifu downtown
	o o nip dor onior		
	Load matching system	Approx. 24% fuel consumption improvement via improved loading efficiency (Tajimi)	Assuming 50% reduction in airfreig
	Load matching system Truck fuel consumption improvement	Approx. 24% fuel consumption improvement via improved loading efficiency (Tajimi) 23% improvement over 2000 level	Assuming 50% reduction in airfreig 100% of cargo trucks

Table 1 Technological and social systems in Low carbon society and their diffusion rates

Fig. 2 Rough image of Low carbon society



4. Identification of Obstacles to Global Warming-Freed Society

There are a number of issues and topics concerning the materialization of the global warming-freed society obtained from the simulations. In order to create a blueprint for materializing such a society from a vision, it is necessary to identify obstacles thereto and look for solutions to them. In this research project, the primary obstacles to the main solution options required to materialize a low carbon society were identified via document searches, workshops with researchers who have expert knowledge and interviews with experts. For example, widespread diffusion of solar power systems and high efficiency, energy-saving equipment are very important towards building a global warming-freed society, but the high initial costs are an obstacle to diffusion. Table 2 gives the primary solution options for building a global warming-freed society and obstacles thereto.

Solution option	Sector	CO2 reduction effect	Degree of difficulty	Issues concerning introduction/diffusion
Solar power generation	Energy	15.80%	Middle	Not a stable power supply
Solar power generation	Energy	15.80%	Middle	Weakened by competitive products because of cost competitiveness
Home appliance efficiency improvement	Private	11.42%	Low	Initial costs
Home appliance efficiency improvement	Private	11.42%	Low	Weakened by competitive products because of cost competitiveness
Boiler changes	Private	10.99%	Middle	Initial costs
Boiler changes	Private	10.99%	Middle	Weakened by competitive products because of cost competitiveness
Grid power improvements	Energy	9.34%	Middle	Technological issues
Compact cities	Transportation	8.85%	High	Requires long period of time
Compact cities	Transportation	8.85%	High	Requires change in urban development.
Heating equipment changes	Private	7.64%	Middle	Initial costs
Heating equipment changes	Private	7.64%	Middle	Weakened by competitive products because of cost competitiveness
Change in distribution rate of means of travel	Transportation	7.05%	High	Looses door-to-door attribute
Change in distribution rate of means of travel	Transportation	7.05%	High	Not all-weather-ready
Change in distribution rate of means of travel	Transportation	7.05%	High	Inconvenient for freight transport
Thermal insulation	Private	6.41%	Middle	Initial costs
Thermal insulation	Private	6.41%	Middle	Weakened by competitive products because of cost competitiveness

Table 2 Main technological and social options and their major obstacles

5. Studies into Solution business for climate change and their feasibility

Investigations were made into business models that would provide solutions to the obstacles to the primary solution options of the previous section and were positioned as "solution businesses for climate change". Via interviews with experts and workshops with visiting researchers belonging to the business sector, six business models that would solve problems were selected: ESCO business scheme for household sector, community rent-a-cycle system, waste treatment and biogas business based on local production and consumption, forest biomass management and supply business, Load matching business and green energy supply business. Of these, four promising businesses, which, though not currently established (at least in Japan), had the potential for CO_2 reduction as business models, were selected and studies were done into their feasibility and promotional policies.

Fig. 3 business model though process based on simulation results and proposed business models



Here following are given overviews of the four selected businesses models and results of corresponding feasibility studies.

ESCO Business Scheme for the Household Sector

The objective of this business scheme is to overcome the high initial cost obstacle that prevents the introduction and diffusion of energy-efficient equipment and solar panels, by applying ESCO principles that are widely used in the industrial sector to the household sector. To solve the "profitability" issue of ESCO operators, which prevented ESCO from being introduced in the household sector, core services of the ESCO are provided free of charge not by ESCO operators but via partnerships between financial institutions, appliance retailers and governmental agencies. As for the feasibility of this business scheme, forward-looking results were obtained from simulations into the profitability of participating parties, but further detailed studies are needed because, as a pretext, the scheme requires the collaboration of multiple parties and not enough is known about whether individual households would accept this scheme or not.

Community Rent-a-Cycle business

This is a community rent-a-cycle business model for a flexible "last 1 mile" transportation that improves the "door-to-door" mobility that is missing in public transportation. Although there have been many rent a cycle system implemented, community rent a cycle business model proposed here has an articulate advantage in comparison with conventional one. It solves the traditional problems of conventional scheme of low usage rate and user etiquette by adopting sophisticated IT management system. Installation of advertising media to the bike station secures a stable source of revenue which enables the system to adopt the sophisticated IT system as mentioned. It draws the line from the conventional rent-a-cycle businesses that previously failed in Japan. From Monte Carlo simulations into business profitability and identifying risk factors that could affect income, the possibility of a revenue surplus in a given year resulted high and the possibility of payout one's initial investment in eight or less years was strong, therefore it shows to be promising as a business.

Waste Treatment and Biogas Business Based on Local Production and Consumption

The biogas business based on local production and consumption gasifies organic waste generated in the area and uses that gas to supply a carbon neutral energy in the area. Natural energy from biogas is generally more costly than conventional fossil fuel energy sources, but this business model addresses the cost issue by ensuring two sources of revenue: one from waste treatment and the other from sales of biogas obtained from waste treatment. To examine the feasibility of this project, a Monte Carlo simulation was done into profitability as with the community rent-a-cycle model, from which business resulted profitable and there was a strong possibility of recovering one's initial investment in ten years or less. Therefore, it would be promising as a business.

Forest Biomass Management and Supply Business

Japan's forests have a comparatively large amount of untapped resources (wood from thinning, remnants of a logging operation, etc.), but for cost reasons (cost of collection and use is greater than revenue from such use), much is not effectively utilized. This forest biomass management and supply business is a scheme aimed at maximizing use of these untapped resources by combining forest management and corporate forest protection activities, and making the use of these untapped resources as an energy source a business. Though not as clear as the aforementioned rent-a-cycle model and biogas business, results from Monte Carlo simulations into feasibility indicated a high possibility of business success as long as revenue and expenditure conditions are good such as capital flow from corporations into forest management as a CSR activity.

6. Policy Implications of Research into Global Warming Prevention Business

This research examined and devised business models that could contribute to the building of the low carbon society. In short, the proposed business models themselves are part of the "policy recommendation / proposal" both to the business and the government.

Moreover, though each individual business model requires policy support in order to be realized, what is common to all of them is that they either directly or indirectly reduce GHG. On that point, as long as appropriate economic considerations can be made for the GHG reduced by these business models, the feasibility of these models should increase and their range of diffusion should spread far and wide.

There are two conclusions to make here: one, business vitality can be utilized for developing the low carbon society, and, two, in order to activate the solution businesses for climate change, it is necessary to make an appropriate assessment of GHG reduction and create an appropriate economic value to that. This latter is very important towards developing the climate business and a policy is needed to create markets where the GHG reduced by the various business models can be

appropriately measured, verified and traded.

7. Policy Proposal and Information Dissemination Activities

As a part of this research project, various activities are being done to provide these research results to private businesses and governmental agencies in a proper manner. From that, the idea of the Household ESCO business was selected by the Ministry of the Environment Japan as the best proposal in their environmental policy contest and will further be examined from 2007 onward with the intent of making it into policy. Moreover, the community cycle business and biogas business based on local production and consumption were proposed to related businesses, which have lead to concrete action and business activities such as businesses launching further studies into implementation or adopting the ideas as corporate projects. Plans are to continue to release research results by publishing reports and other means.

Chapter 6: Realising the Potentials of Eco-industrial Clusters in Urban-Rural Fringe Areas of Asia

1. Introduction

Asia is currently facing the consequences of rapid industrialisation, explosive population growth and urbanisation, resulting in a lack of resources due to ever-rising consumption. Changes in local industrial production processes and domestic consumption patterns have also meant a considerable increase in waste generation. Ample evidence exists to argue that industrialised urban areas of Asia are the centres of resources consumption, whereas physical resources like bios, and human capital like labour come from rural areas. A numerous types of environmental, economical and social linkages exist between urban and rural areas. New industrial systems aiming at efficient sharing and utilisation of resources, technologies focusing on alternative use of discarded materials and policies envisaging and enforcing the above are needed to reduce resource depletion and avert environmental crises. In that sense, urban-rural fringe areas in many countries, irrespective of the development status, are the hosts for natural resource-based activities, and could play an important role in eco-restructuring of rapidly industrializing Asia. Clustering the bio-resource based rural industries and relocating appropriate process industries to fringe areas providing equal access to both the rural and urban reduces the intensity of environmental issues. When businesses are moved to the urban-rural fringe areas, easy access to the urban infrastructure is ensured while raw material supply from the rural is maintained. Central to this is the conservation of environmental quality in the urban while providing equal employment and social opportunities to rural communities. This can be achieved by creating clusters and developing inter-firm networks within them.

The overall objective of this research is to examine appropriate management and technological elements as well as institutional and policy measures for developing eco-industrial cluster in urban-rural fringe areas as a means of integrated environmental and economic planning. This multi-country study was carried out in India, Japan, Thailand and Vietnam– the economies that have faced severe environmental crisis as well as social development challenges. The study comprised of three phases (i) establishing country fact files on industrial clusters (ii) selection of case study clusters and SWOP (strength, weakness, opportunities, potentials) analysis (iii) organizing stakeholder consultations in respective countries. The bio-based case study clusters selected for the research are sericulture in India, Forestry in Japan, Paddy and Livestock in Thailand and Fish processing in Viet Nam. Environmental problems, locational advantages, resource threats, economic contributions, social disparities prevailing in the sectors and regions were the primary criteria in choosing the clusters.

2. Key Foundations of EICs Located in Urban-Rural Fringe Areas

Eco-Industrial Clusters are defined as: "a community of business; geographic concentration of interconnected companies in a specialized field that cooperate with each other and with the local community to efficiently share resources (information, materials, energy, water, infrastructure, finance, etc), leading to improved environmental quality, economic gains, and

equitable enhancement of human resources for both the business and local community." Essentially, an Eco-Industrial Cluster (EIC) aims at efficiently using local resources while achieving economic development targets and meeting the social demands of the community. As one of the applications of industrial ecology principles and business competition theories, EICs can become an emergent venture of integrated environmental and economic planning. The cornerstone of an EIC is inter-firm networks for the optimised use of both direct and derived resources. Recycling, reusing and finding alternate use for discarded materials are essential characteristics of such networks. Thus the emphasis of an eco-industrial cluster is rather a closed material cycle than a linear chain of material flow in the region. Promoting the concept of eco-industrial clusters in urban-rural fringe areas represents an ideal focusing mechanism for eco-restructuring of industrialization at regional level.

The industrial clusters studied in selected economic sectors in India, Japan, Thailand and Viet Nam, have a variety of drivers from response to environmental regulation, the strategic intent of an Official Development Assistance (ODA) policy to economic dislocation and spontaneous response to international market opportunities (Table 1). In each case-study cluster it appears that for small business

	Countries and Industrial Clusters							
Key Factors	India	Japan	Thailand	Vietnam				
Rey racions	Sericulture, Hosur	Wood, Maniwa	Rice, Chachoengsao	Fish, An Giang				
Production firms	120	72	60	175				
Nature of Market	Supply–led, mainly secondary towns	Demand-led, domestic exports		Demand-led, mainly export, limited domestic				
Key Players	Producers & Lead firms Development Assistance Policy Policy Lead firms & Environmental Policy		Large Firms & Social Development Policy	Foreign Buyers & Industrial Policy				
Evidence of Inter-firm Networks	Weak bilateral linkages.	Extensive multilateral cooperation focussed on supply chain	Effective horizontal linkages	Extensive subcontracting.				
Key Benefits	Product/marketZero-emission,diversification,Eco-productEmploymentdevelopment		Waste management, Income generation	Improved water quality, Employment generation				
Role of Community & Support Institutions	Limited. Disabling labour market pooling	Significant. Positive intermediate input effects	Important. Potential for significant technology spill over	No local but some central institutions; Improved market access				
Major Constraint	Social Capital	Policy Conflicts	Enabling Technology	Policy conflicts				

Table 1. Summary of findings from multi-country study on EICs in Asia

to develop into competitive forces, links with large firms, ties with external market agents, and the presence of local support institutions have been of great significance. National policies can also have strong impact. The state's role as a facilitator and an enabler for fully functional EIC cannot be underestimated in light of continuing technological, social and policy constraints. Regardless of

the origin or sector, however, the following characteristics are identified as key foundations of eco-industrial clusters located in urban-rural fringe areas.

Inter-firm networks: Successful EICs are made up of enterprises that constantly seek inter-firm networks, not only to minimise waste and reduce pollution, but also to look for all types of innovation to improve zero emission processes and develop new eco-products. Agreements based on mutual trust within a network aim to share by-products, wastes and physical and natural resources including labour. Such networks can generate markets, logistics and cluster management. Active cultivation of such inter-firm networks apparently contributed to the growth of new enterprises. It is also important to recognize that joint action by firms has its costs. The opportunity costs of bilateral or multilateral associational activities and time involved for building vertical and horizontal networks are probably the most obvious example. However, the environmental, economic and social benefits gained through such inter-firm networks are immense. All the four clusters studied have substantial form of horizontal and vertical inter-firm networks along with significant innovation capabilities which are particularly evident in Japan and Viet Nam cases.

Enabling technologies: It is not sufficient for individual companies to form inter-firm networks in order to become environment friendly; EICs also require a range of technologies available within their reach to do so. Environmental technologies for conversion of waste to energy, wastewater treatment and use of renewable materials have to spread easily among the companies to benefit the cluster as a whole. This is an area where Thailand and Indian EICs need intervention to strengthen existing inter-firm networks enabling to share relevant technologies among clusters firms. Academic institutes like universities or research institutes, such as Universities of Tokyo and Okayama in Japan's case and the Hosur Sericulture Training Institute in India's case, that focus some of their research within the EIC are found to be helpful in diffusion of appropriate technologies among the firms and induce eco-innovations within the clusters.

Social capital: Well-established social networks and a trusting relationship between cluster firms, academic institutions and community-based organisations greatly facilitate inter-firm collaboration as well as diffusion of new technologies. The creation of social capital in the sericulture industry in India through the formation of an eco-industrial cluster would help the industry reach its full potential. Japanese EIC is a good example where high social capital that includes the relationships, attitudes and values governing the interactions among people, businesses and institutions, facilitated the sharing and development of ideas and pertinent market information thus reducing the transaction cost for businesses operating within the EIC. While the concept of mutual trust among competitors is not the norm among businesses, the evidence from Japanese and Indian EIC cases indicate that it can be built through progressive action by community-based cluster players like local Non-Profit Organizations (NPO).

3. Making the Business and Markets Work for EICs

EIC provide new roles for business to connect rural resources to urban markets through forward and backward linkages (Fig). This context which is critical to the performance of individual firms, should be important to the growth and development of EICs. The nature of products coming out of the clusters obviously has an important impact on the way they are marketed. It was



found that some of the eco-products are of inferior quality for which demand can be expected to fall as consumer income increases in the long run. Such products like bio-cosmetics (India), bio-ethanol (Japan), rice-bran oil (Thailand), bio-diesel (Vietnam), have different markets and require different marketing strategies. The relationship between production process and the acceptable quality is another consideration for international markets. Some products can be equally made well by employing modern technologies. The point to be emphasized here is that efflux of eco-products products and environmental performance of clusters directly depends on the technology, which has direct bearing on whether a cluster is likely to be highly successful or not.

Market size - the number of firms, intermediaries and geographical spread of consumers, is also critical to eco-industrial cluster development and the large process of sustainable regional development which it is a part. EICs can give rise to successive rise of product and service specialization provided that the over all scale of demand grows. By this measure, markets in rural areas are small and access to international markets are difficult, controlled by supplier environmental standards. Small population, low incomes, poor infrastructure, and trade barriers are among the reasons cited for existing small markets. The lack of large well-functioning wholesale system, or where such system exist, their bias towards the products of large industry faces many micro and small scale enterprises to sell their products to retailer on non-competitive terms. This problem of small domestic markets is one that has to be faced squarely by individual enterprises and EICs as a whole, but it is not insurmountable. Two broad based strategies are available, firms can extend market geographically, or they can attempt to capitalize on the smallness of the market they face. The first option may involve expanding within the domestic market or entering international markets. The choice will depend on number of factors, including the nature of product, but generally speaking, broadening small markets coverage is easier for smaller clusters than exporting. Barriers to entry into foreign markets include problems with products themselves such as poor quality, under developed infrastructure, lack of information flow, red tape and corruption, which necessitates focussed policy interventions and new governance measures. Nevertheless, business can utilize the distinctive but mutually reinforcing approaches to connect EIC and local communities as well as bring income generating activities.

4. Strategic Steps in Transforming Industrial Clusters into Eco-friendly Economic Zones

Strengthening the key foundations and formulation of operational strategies of EICs should include three hierarchical steps. The interaction between the local entrepreneurial attitudes and activities and their characteristics are an important starting point for the evolution of eco-industrial clusters in any region. This



leads to a spatial concentration of firms that maximise the use of local resources. Firms to be targeted, include those previously operated in isolation owing to variations in markets, resources, manpower, technology and products. Inter-firm networks and community collaboration are the second essential part of eco-industrial clusters development. A local industrial cluster is upgraded or transformed into an EIC through more organised cooperation or informal agreements between companies and within clusters, stimulated by mutual trust, norms and community conventions. Besides cooperation within firms, collaborations between clusters and other knowledge institutes (KI) like local universities or research institutions and community-based organisations help to develop enabling technologies and diffuse environmental market information. Thirdly, strong public policy support is needed to upgrade EICs in urban-rural fringe areas into specialised eco-friendly economic zones. Government should develop integrated policies to attract more businesses into the clusters and make them more innovative in terms of environment as well as effective in terms economics.

Current institutional frameworks and policies that favour the existence or emergence of EICs in the studied countries are fragmented and uncoordinated; not as a result of negligence, but due to inconsistent strategies for developing urban-rural fringe areas based on a sound understanding of the potential of EICs to be eco-friendly economic zones. Government should develop integrated policies, which should also aim at public-private partnerships that stimulate the propensity of the EICs as an innovative incubator space to start new firms and thus to enhance regional development. Affordable technologies and accessible infrastructure should be provided to attract companies into urban-rural fringe areas. Creating synergies between different sectoral policies like industry, agriculture, energy, international trade, etc and avoiding policy conflicts becomes a necessary condition.

5. Conclusions

The research into the operations of industrial clusters located in the rural-urban fringe areas of India, Japan, Thailand, and Vietnam has brought to limelight their capacity to alleviate environmental, economic and social issues faced by communities. Evidently, it showed eco-industrial clusters can be a vehicle for integrated environmental and economic planning at regional level. In spite of the finding that EICs, are located at the interaction of local environmental preservation and economic development, the knowledge on how best they can be used as better targets for rapid diffusion of environmental technological systems and new governance mechanisms is missing or not available. It is hoped that a further study, will more thoroughly examine those aspects and identify important forms of public-private partnerships. Until recently most of the environmental protection programs and developmental policy instruments are focused more on the manufacturing industries concentrated in urban areas. Accelerating the private sector initiatives through an integrated policy framework is the promising way for these disinvested isolated regions to be reconnected to more vibrant markets in a sustainable way.

Chapter 7: Environmental Competitiveness of Regions: Lessons Learned from Kansai's Response

1. Introduction

In Japan, regional level industry responses, environmental policies and institutions have gone through major changes during the last decades in response to increasing public awareness of environmental issues. Even though, Japan is in the forefront of this evolutionary process in Asia, these responses within the country, the speed at which this response occurs differs from region to region, between localities within a single region, and also between industries within those localities. There is also growing recognition among the public that the existing environmental protection framework of certain regions are inadequate, as they face different levels of environmental and natural resources challenges, which has to be responded in a competitive way. This raises the question of whether regions are quipped with a regional level policy framework and instruments/initiatives capable of delivering the quality environment, society and economy that is a desire for the future. This study examines the response of two regions Kansai --industrial basition and Kanto - the political power house in Japan as basis of informing other Asian regions in their considerations of planning alternate policy models to address environmental issues at regional level. A comparative observation is made on the environmental measures of constituent prefectural governments, action plans of municipal governments; the process pattern of local industries, and other community level initiatives taken by other local actors such as NPOs, universities and media in promoting environmental awareness. The survey is mainly implemented by analyzing the information available in the internet and informal non-structured interviews. The scope of this study was also primarily limited by time and human resources, with the topics selected from author's perspective. Two significant foci are given to the analysis viz (i) quantitative comparison of Kansai response with Kanto region (ii) qualitative observation of Kansai's response and its implication for other similar regions in Asia.

2. Overview of Environmental Responses in Kansai and Kanto and its Variability

The summary of the statistical information that compares the regional level environmental policy responses, industrial reactions and community actions are illustrated in Tables and Figs presented in the last page. The extent and speed at which the local governments and industries respond environmental problems shows certain form of variability between Kansai and Kanto. While data and method of survey precludes definitive findings regarding the precise measurement of regional level environmental performance, this research provide much helpful and suggestive evidence. In both the regions, it was found that the local level environmental stewardship is often characterized by slow and incremental changes which continuously evolve as various players – governments, industries, environmental activists and research institutes learn their roles, and gain confidence in the legitimacy and fairness of the environmental governance process rather than simply emulating other models, evolved somewhere. Faced with dearth guidance from the central government, devolved model of environmental responses are also emerged in both the regions. As prefetural level responses, more than 200

governmental and quasi-governmental ordinances were promulgated in Kansai. Many new governmental agencies, company departments and environmental NPOs were evolved, which are collectively responsible for responding to both local and global environmental issues. In addition, over 300 statues and several sets of subsidiary systems were evolved at municipal level in Kansai, which are comparable to Kanto in quantity and quality. The policy adjustments and development of industrial restructuring process tend to gradual in both regions but little faster in Kanto.

Public awareness of industry related environmental problems and pressure on political decisions played a strong role in the emergence of environmental policy instruments in both the regions. However, significant qualitative differences are observed between Kansai and Kanto regions. The absorption of governmental, corporate and financial resources into Kanto, that started from the Meiji era, could also be a reason for accelerated temporal order of responses and the efficiency in Kanto. On the other hand, private sector supported responses activities were found to be more entrepreneurial in Kansai. This may be due to the socio-cultural characteristics of the regions. Thus far, the response of Kansai has primarily, could be linked to a neo-liberalistic management frameworks, which ensures that environmental adjustments to industrial development are consistent with, and contribute to, the continued wealth creation of the region and growth of new environmental related industries. This neo-liberalistic characteristic of the Kansai region is often portrayed as one that follows its mercantile instincts, which could also be seen as a more pragmatic and down to earth model. Kanto region on the other hand is often perceived as delivering sophisticated and speedy responses in keeping with its status as a home for national capital and the largest metropolis. However, environmentally distressed, politically isolated localities have unique way of responding to environmental challenges. Robust models such as one available in Shiga for water quality preservation (1972) and Osaka air quality improvement plan (1973) and Hyogo led inland sea protection program (1977) are uncommon in Kanto. The local institutions like universities, media and environmental NPO networks in Kansai provide the vehicle and platform for eco-innovations to take place at industrial level. Substantial regional diversities continue to enrich the response rates at municipal level in both the regions. Pioneering approaches evolved in Kansai shall include local environmental management system models such as KES, collaborative and strategic approaches in long term planning, delegation of beyond compliance process to industries, and community based initiatives.

Despite fundamental differences in response rates between Kansai and Kanto, many of the features like allocating appropriate roles among different tiers of government, private sector and community based organizations, principles of flexibility and industrial efficiency, democracy and transparency, are common to both the regions. The summary of other factors, as revealed from the interviews that could arguably contributed for variable rates of responses, levels of success, path dependency and pioneer setting approaches by the regions, shall include political will of the sub-national level governments, leadership and vision at senior level, competence skills of the industries, a culture of good planning, awareness or education in environmental subjects, pressures from local communities.

3. Creating a framework for Environmental Responses from the Experiences of Kansai

From the late 1960s, driven by rapid industrialization and growing free-market ideology, inspired leaderships, the widespread desire to protect environment, and an overly due to complex pressure from communities, Kansai undertook a massive effort to rationalize its environmental framework. To date, Kansai response to environmental concerns can be characterized as simultaneous steps in multiple directions by different stakeholders with a national level guidance. The overall response of Kansai shall also be characterized as a regional design to create effects based system in which environmental bottom lines were established that could not be compromised by local governments. It was generally made with the conjunction of national level policy guidance. The system allowed local governments and self-regulating community greater flexibility in achieving environmental outcomes as long as they operated the above bottom line.

At municipal level, environmental response is founded upon the subsidiary principle, where the power of decision making rests as closely as possible in collaboration with communities. Some district governments of Hyogo, Osaka and Kyoto were instrumental in making national government promulgating policy statements that served as the pinnacle of strategic environmental planning at national level. In the case of preserving water bodies like Seto-inland sea and Lake Biwa, cross-prefecture regional concerns created a momentum and regional policy statements and plans identifying the issue facing their region are designed through an extensive consultation process. Then goals and method for achieving integrated management consistent with other international standards is set by the central government. Lastly district and city governments were asked to create local environmental management plans consistent with both prefecture and central government policies. This hierarchy essentially required prefecture government, while delegating the part of responsibility and enforcement to local governments.

These kind up bottom up process based on subsidary principles called by all stakeholders to get involved in large scale consultation and also public participation in the form of working groups, seminars etc. Limitations on the availability of experts within the regional level to comment on a proposed policy initiatives/management plans were virtually eliminated by this process. It is through the lens of this, the Kansai regions's experience is analyzed as implicative lessons for other similar regions in Japan or Asia.

Observation 1: Initiating an environmental response

Kansai's rationalized responses has resulted in greater government accountability in decision making, as well as a governance framework that is more efficient and easily understood by regulated community and industry. A happened in Osaka Big plan, Seto Inland sea protection program, Kyoto Environmental Standards, common set of procedures governing permitting, planning and public participation that applies across the region has created some form of consistency which allowed for efficiency gains by industries.

Lessons for Asia: While daunting an environmental challenges, regions must begin the process of rationalizing both its government and private sector. A modest first step would be to initiate a wide-scale, participatory review to identify opportunities for rationalization that would increase efficiency and effectiveness while providing better, or at a minimum level of environmental protection assurance across administrative boundaries. An extensive consultation process, stakeholder outreach campaigns would be an effective strategic mechanism to ensure that a new environmental initiatives survives. Stakeholder expectations create an insurance mechanism that protects long term policy reform initiatives from changes in elected governments.

Observation 2: Integrating the responses to tackle emerging issues

The local initiatives evolved in Kansai and associated support mechanisms provided by municipal and local and prefecture governments set a solid framework for integrated management of environmental media. The formation of community entities along watershed boundaries with some authority for air and water management facilitated decision making that result in cross-media responses. While Kansai response effectively dealt with the management of local environmental media and has been struggling tackle the bigger environmental challenges such as global warming, and waste reduction.

Lesson for Asia: In other regions, the efforts should be undertaken to explore potential mechanisms for linking its various regional level authorities and local bodies, such as air districts, regional water boards, councils of prefectural governments for tackling global environmental issues. At regional level, integration of environmental decision making should be one of the central purpose of environmental bureaus towards this task.

Observation 3: Facilitating flexibility to industry level responses

Although a voluntary agreement by industry has many alluring aspects that can address the shortcomings of a command and control, activity/actor based responses; the Kansai response has shown that it alone is not panacea. Expectations that the incentive based approaches would be cost-effective for industries have not attained desired targets in right time. Moreover, industry actors support the flexibility virtue of such responses, perhaps due in part to a degree of naiveté regarding the implications of uncertainty attached to such environmental issues as global warming.

Lessons for Asia: While performance/effects based innovation programs at plant, process and product level hold promise for achieving higher levels of environmental protection by business sector, regions should be realistic about the gains and uncertainties that accompany them. The optimal system of environmental response for industries in the region may, in fact, involve the combination of different approaches. It would also serve to reflect the degree of scientific understanding available with regard to effects, with regional level intervention approach serving as the default when information is lacking.

Observation 4: Accountability of academia and other actors

Kansai response illustrates significant organizational and social capital in the region as displayed while establishing forums such as GEF-Kansai by the industries. Together, these local industries

supported establishment of such institutions as Kansai Science City, IGES, APN Center, EMECS center, ADRC, GEC, RITE, making Kansai as a hub for environmental research and development.

Lesson for Asia: Regions must develop knowledge institutions necessary to act as a catalyst for system thinking, which can track progress of responses towards long-term environmental goals. A robust environmental curricula, and a common research agenda will be essential for those institutions to monitor whether the region's environmental responses are truly improving the sustainability of its resources, economy and society. Without active academia, media and community based actors and their critical observations to serve as the compass, a region can not know whether the environmental responses it made are truly advancing it towards its destination.

4. Epilogue

Kansai region's response to local and global environmental concerns is not a dull success story. As a whole, several visionary attempts are being made to create an all encompassing sustainability framework for the region, with numerous elements that hold promise for other regions in Japan or Asia. Numerous shortcomings could have hindered the performance of major stakeholder groups in Kansai – prefetural governments, local governments, industry, academia – and inhibited the full realization of a path setter within Japan. But its experiences do offer valuable lessons. This study does not purport to be a comprehensive assessment of every aspect of the environmental responses in Kansai and Kanto. Important historical factors and elements relating to the local level ordinances, initiatives, industrial responses, and community pressures are not looked in detail. It is hoped that a future study, following this, will more thoroughly examine those aspects. For any region like Kansai – the home for 642 out of Japan's 1,069 cultural treasures and 5 of the 12 world heritage sites, the journey towards environmental sustainability will not be without obstacles and setbacks, but it can be made smooth, if the efficiency and deficiencies are looked more in depth.

Policy Initiatives

Pogion &		District				
prefectures	Ordiances & comprehensiv e plans	Waste	Global warming	Air Quality	Water and Land	level initiatives
Kansai						
Hyogo	9	4	3	4	5	98
Kyoto	18	2	9	6	2	40
Nara	14	2	3	3	2	26
Osaka	4	3	4	8	4	70
Shiga	22	7	7	3	3	52
Wakayama	13	2	1	-	-	33
Total	80	20	27	24	16	319
Kanto						
Chiba	10	4	6	3	6	119
Ibaragi	13	7	3	2	3	54
Kanagawa	7	1	5	7	8	110
Saitama	11	7	11	4	5	114
Tochigi	6	3	1	3	1	89
Tokyo	9	6	16	7	7	127
Total	56	28	42	26	30	613

Environmental education at teritiary level

Decien	National/pref.	No. of of g	idents spec	
Region	Univ	Masters	Doctoral	Year of est
Kansai				
Huogo	Kobe univ.	37	-	2003
пуодо	Pref. univ	24	6	2004
Kuoto	Kyoto univ	114!	77	1995
NYULU	Pref. univ	23	5	1997
Oaaka	Osaka Univ	76	15	1968
Usaka	Pref. Univ	18	6	2005
Kanto				
Chiba	Chiba Univ	78		2002
Ibaragi	Ibaragi Univ	112	10!	1977
Tokyo	Tokyo Univ	171	115	1995
TUKYU	Metropolitan U	94	24	2006

Environmental operation of large size business

Sector	Company base in Kansai & Kanto	No. of employees	Capital (100 million yen)	Year of ISO certificatio n	Year of Envi/CSR report
Stool	Kobe Steel	8,425	2,181	1998	1999
Sleer	Nippon Steel	21,449	4,195	1996	1998
Dowor	KEPCO	22,482	4,893	2000	1993
Power	TEPCO	38,510	6,764	1999	1992
Caa	Osaka Gas	5,570	1,321	1997	1994
Gas	Tokyo gas	8,447	1,418	1997	1994
Transport	JR-West	31,210	1,000	1999	-
	JR-East	66,207	2,000	1999	1996
Airport	Kansai	433	7,886	-	2002
	Narita	786	1,000	-	1996

University - Industry Partnership

Linivorcitios in	No. of patanta	joint-
Universities in	No. of paterits	Project
Kansai	290	147
Kanto	500	233

Environmentally certified enterprises

	ISO14001	Eco action	Local EMS
Kansai			
Hyogo	674	18	241
Kyoto	375	4	436
Nara	133	9	5
Osaka	1,903	75	122
Shiga	360	24	34
Wakayama	109	5	1
Total	3,554	135	839
Kanto			
Chiba	431	15	6
Ibaragi	373	14	43
Kanagawa	1,099	76	10
Saitama	824	25	7
Tochigi	320	17	3
Tokyo	2,673	73	59
Total	4,916	191	79

Environmental NPOs

Region &	Jurisdiction		Total
prefectures	Cabinet office	Prefecture	lotai
Kansai			
Нуодо	12	229	241
Kyoto	21	195	216
Mie	5	143	148
Nara	4	69	73
Osaka	33	424	457
Shiga	5	141	146
Wakayama	1	95	96
Total	81	1,296	1,377
Kanto			
Chiba	30	260	290
Ibaragi	7	103	110
Kanagawa	42	281	323
Saitama	26	179	205
Tochigi	2	71	73
Tokyo	486	1,244	1,730
Total	593	2,138	2,731

Ministers/DGs of Envi. Ministry



Best award for TV commercial on Envi

