Business for Sustainable Society Project

Takashi Gunjima
Acting Project Leader

1. Overview of the project

1.1. Background/objectives

This three-year project's main objective was: "How can business/industry realise a sustainable society?" The two goals for achieving the main objective were: (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.

"Research on Environmentally-Sound Business Models (BM Research)" and the "Research on Environmentally-Sound Local Industry System (LIS Research)" were implemented with these two goals in mind. They were reinforced with associated research to accomplish the goals based on the results of a progress review that was made on completion of the first half of the Third Phase. As a result, the following six sub-research activities were conducted under the project.

BM Research:
    (1) Research on Environmentally-Sound Business Models with Product Service System (BM-PSS Research)
    (2) Research on the Policy Measures to Promote Community Business for the Environment (BM-CB Research)
    (3) Review of Policy Trends in PSS (BM Review)

LIS Research:
    (4) Research on Environmentally-Sound Local Industry System through Examining the Image of Sustainable Local Society (LIS-ISS Research)
    (5) Research on Strategic Approaches for Local/Regional Development through Eco-Industrial Clusters in Urban-Rural Fringe Areas (LIS-EIC Research)
    (6) Review on the Response of Industry/Business in the Kansai Region to Global Environmental Issues (LIS Review)

1.2. Methodology

The above two goals were designed with two complementary approaches: one that arrived at the final objective by applying a micro viewpoint, and the other that fed back to the present by departing from the final objective by implementing a macro viewpoint. In addition to the theoretical approach that has been employed so far, such as in the case of (business model) analysis with PSS (BM-PSS Research) and the examination of the image (local society model) of a sustainable local society (LIS-ISS Research), a practical approach was also taken for the second half of the Third Phase. This included a review of the policy trends in PSS in Japan, Europe and the US (BM Review) and research on measures to promote community business, which is another promising business model besides the PSS (BM-CB Research) for BM Research. There was also research on the strategic application

of eco-industrial clusters in local development (LIS-EIC Research) and a review of locally-specific responses of industry to global environmental issues (LIS Review) for LIS Research was undertaken.

a. BM-PSS Research

This research specifically concerned itself with product-service systems and allied business models. Product-service systems are business models thought to have significant potential in reducing the environmental costs and burdens of many economic activities. In summary, the case-based research methodology was carried out as follows:

A wide survey of the PSS and allied business activity in Japan was conducted and environmentally-promising business models were selected for detailed case studies using a screening protocol developed for the research. The detailed case studies had two parts: an environmental sustainability analysis and a standardised business profile. The resulting case study data set covered business characteristics, policy and market factors, and environmental performance.

This data set was used to support a qualitative and quantitative comparison of the cases. This comparative analysis was the essential basis for policy recommendations. The comparative analysis was supported by a limited number of special studies. These consisted of a literature review and interview research to follow up on critical questions not answered by the case studies, and which examined critical business models in more detail. The policy assessment used a "target factors/options identification/options assessment" protocol to recommend policy actions.

Finally, the comparative analysis identified the policy, market and business factors influencing economic success and the sustainability potential of PSS. By reference to international economic statistics and reports, we preliminary assessed the extent to which conditions for success exist in key Asian economies and thus identified the potential role of environmental PSS.

b. BM-CB Research

CB that uses local resources by and for the local society is gaining attention as a last resort for regenerating local society. CB has see progress in welfare and town development, and is expected to make inroads in environmental issues for example, when building a local material cycle economy or promoting dispersion energy system.

The study organised information on CB for the environment in Japan, such as background, current status and agenda, and policy measures of national/local governments.. We examined the possibility of new CB policy measures from the environmental policy perspectives and formulated a discussion paper.

In order to find theoretical context, literature on ecological movements and social enterprises was collected and analysed. We also gathered information on concrete practices, by conducting field surveys on four cases in Japan. The draft paper was sent to experts to receive comments.

c. BM Review

To reduce levels of material consumption, changes in the structure of the product market are necessary. Thus, PSS cases which provide "services rather than products" are emerging. The social and environmental effects of PSS are not clear yet but research has been conducted in Europe and the USA.on structural change which makes use of PSS potential

This research examined previous PSS research and the current status of policy responses from the viewpoint of "structural change of product markets", prepared a discussion paper and contributed to the further development of policy research.

The review was conducted through a literature survey and discussion with experts. PSS research project reports, academic papers, and policy discussion materials on product policies such as Extended Producer Responsibility and Integrated Product Policy were collected and a comparative analysis between Europe, US and Japan was conducted.

Tentative results were presented at the Study Group Meeting on Green Servicising of the Ministry of Economy, Trade and Industry (Chaired by Prof. Gunjima) and also to experts including participants of the IGES-KRC Workshop in FY2004. Various comments on the results were received.

d. LIS-ISS Research

A sustainable local society was re-defined as an environmentally-sound local society in this research with the assumption that an environmentally-sound local society means a society where environmentally-sound technological and social systems are incorporated to severely reduce carbon dioxide emissions.

We developed a simplified computing methodology, which can derive the optimum combination of technological and social systems for a drastic reduction in carbon dioxide emissions. An image of a sustainable local society was derived by applying this methodology to a typical local city in Japan. We examined businesses/industries that were suitable for a sustainable local society based on the image derived above.

In more practical terms, factors hindering the deployment of environmentally-sound technologies and systems were identified by literature review and consultation with experts. Innovative business models that could mitigate those factors were then contrived through intensive discussions with visiting researchers from companies and through a literature review process. Environmental effectiveness and economic/social feasibility of each mitigating business model were investigated through consultation with experts and through simulations.The Monte-Carlo simulation method in particular was adopted to analyze its economic feasibility and business profitability.

e. LIS-EIC Research

Industrial systems aimed at efficient sharing and use of resources, technologies focused on alternative use of discarded materials, and policies envisaging and enforcing the above need time to reduce resource depletion and avert environmental crises. Clustering natural resource-based industrial activities and relocating certain process-based industries from urban to fringe areas reduces the intensity of the environmental impacts. When businesses are moved to the urban-rural fringe areas, easy access to the urban infrastructure is ensured while raw material supply from rural zones is maintained. This can be achieved through the creation of Eco-Industrial Clusters (EIC). Eco-industrial clusters are defined as geographic concentrations of interconnected industries in a specialised field that cooperate with each other to efficiently share resources like energy, materials, water and information. The companies within a cluster are inter-linked and connected in many different ways. The benefits of such eco-industrial initiatives may serve as incentives for companies to improve their environmental performance in terms of management of materials, energy and wastes. The overall objective of this research is to suggest appropriate management, technological,

institutional and policy measures for developing EICs in rural-urban fringe areas as a means of integrated environmental and economic planning. Specific aims include understanding (i) what environmental, economic and social conditions apply when establishing the above-mentioned eco-industrial clusters (ii) what eco-industrial strategies favour formation of such clusters (iii) how to recruit firms and develop green supply chains capable of making the cluster a successful business model both economically and environmentally and (iv) what the environmental gains and socio-economic gains of such eco-industrial cluster formations are

This multi-country research is carried out in the following selected Asian economies; India, Japan, Thailand and Viet Nam. These countries have faced severe environmental crises in recent years but have somehow been successful in developing industrial cluster approaches. The following three-step method was adopted during the implementation of the study:

(i) Establishing fact files on industrial clusters in the target countries. This desk research was done by locating existing clusters, identifying driving forces, analysing their supply and market chains as well as analysing the prevailing macro-policy environment that favours the formation of such industrial clusters in India, Japan, Thailand and Viet Nam.

(ii) Organising stakeholder meetings to collect differing perspectives on the intended benefits of EICs and strategies for transforming industrial clusters into eco-friendly economic zones. These stakeholder meetings held in Bangkok (Thailand), Ho-chi Minh City (Viet Nam) and Hosur (India) had representation from a wide range of business, policy makers at different levels, community-based organisations and local academia.

(iii) Conducting SWOP- Strength, Weakness, Opportunities and Potentials - studies on EICs in select economic sectors to understand the environment – economic and techno-policy linkages. The field studies lasted approximately three months and consisted of an analysis of records and documents of eco-industrial cluster formation, mapping the material flows and inter-firm networks, interviews with key persons and institutions and observation during working hours. The objective of the technical analysis is to determine the environmental soundness of the eco-industrial clusters while the economic analysis focused on identifying the financial feasibility of the business operations. The policy analysis focused on the strengths and weaknesses of past, present and future policies that promote eco-industrial cluster development in urban-rural fringe areas.

The field studies are carried out in close cooperation with regional research institutes, *viz.* Asian Institute of Technology (Thailand), Ho Chi Minh City University of Technology (Viet Nam) and Anna University (India) as well as the Municipal Government of Maniwa, Okayama Prefecture (Japan).

f. LIS Review

Industrialisation has profound impacts on the sustainability of any locality/region as it is directly linked to resource use and socio-economic development. The environmental problems arising from industrialisation are grouped into global (eg. climate change) as well as local (e.g., water pollution, air pollution, waste generation, etc). Significant and systematic industrial behavioural changes, enabling policies, and raising awareness among citizens is essential if a particular region wants to address those environmental problems effectively. In other words, environmental management at local/region level is a process that entails (i) recognition of environmental problems by all stakeholders (ii) public-private commitment to address these problems and (iii) implementation of these commitments. Nevertheless, each locality or region has its own environmental features or identity that tends to be a key factor or a unique way of responding to local or global environmental problems. The objective of

this exploratory research was to understand the nature of policy instruments that reflect the environmental stewardship regions by characterising the role played by different local actors during the industrialisation process.

This comparative research was carried out by analyzing the environmental response pattern of two regions (Kansai and Kanto) within the same economy – Japan. The research was carried out using the following steps.

(i) Reviewing the environmental policies of prefectural governments and action plans of municipal governments.

(ii) Examining the production and process patterns of local industries and their attempt to improve their environmental performance.

(iii) Analysing the role of actors such as NPOs and universities in promoting environmental awareness at local level.

2. Achievements

2.1. BM-PSS Research

Major findings/policy recommendations/media coverage:

(1) The research made clear that certain product-service system (PSS) models have the potential to make substantial contributions to achieving Japan's declared environmental policy objectives and a more sustainable economy. Japan has only just begun to realise the potential of these models.

(2) Prominent among such models were performance-based "outsourcing" PSSs (ESCO, 3PL, water-services and potentially others not yet well implemented in Japan). The high potential of these models derives from the direct relationship in these models between supplier profits, customer savings and improvements in environmental performance.

(3) We developed policy recommendations for seven high-potential models (including a number of performance-based "outsourcing" models). The purpose of these recommendations was to facilitate the growth of these models, thus replacing less efficient business-as-usual practices. The strength of our approach is that the policy recommendations were based on an analysis of PSSs as businesses—that is, their drivers and barriers— and the mechanism by which they delivered environmental benefits.

(4) There is insufficient space here to discuss these recommendations on a model-by-model basis. However, the following general points should be noted:

➢ Performance-based PSSs (ESCOs, 3PL, various water-related services) exhibited strong similarities regarding their drivers, barriers and determinants of environmental performance. Our critical policy recommendation was that a financial incentive mechanism that can apply to all such models should be defined and implemented. Such a mechanism would "leverage" or magnify the savings and profits that derive directly from the emissions reductions or other environmental performance improvements. This reinforces the business case on both supply and demand sides for these PSSs.

➢ Policies to achieve the sustainability potential of these PSSs cannot be limited to traditional environmental policy instruments. Rather, many of our policy recommendations were usually associated with industrial or economic development.

61

> ➢ While our policy recommendations contained a number of industrial policy elements, we do not believe that the most effective role of the public sector is to create or design "green PSSs." Rather, PSSs are best understood as businesses that derive from and reinforce the growth of the service economy. They are not primarily regulatory or policy instruments. The role of policy/the public sector is to help create favourable conditions for the growth of green PSSs.

Relevant publications and meetings in which major findings/policy recommendations/media coverage were elaborated on:

Interim findings and progress were presented in a number of forums, including IGES-KRC stakeholder meetings, and specific achievements such as a quantitative method for evaluation of environmental loads in car-sharing and trends in chemical management systems in Japan were also presented in some symposiums.

The primary publication resulting from the research was a final research report (English version).

2.2. BM-CB Research

The research clarified the significance of Community-based Environmental Business, obtained some findings on Japanese practices and identified policy agenda.

(1) The context of Economy & Ecology and the context of Economy & Welfare, which have been discussed separately, started merging with each other since the emergence of a new idea of Social Enterprise.

(2) In Japan, Community-based Environmental Business emerged from citizens' strong concerns regarding local society. It developed the use of social networks in and out of the local area, and grew by open network management.

(3) In order to promote Community-based Environmental Business in Japan, it is necessary to develop business conditions for social enterprises to conduct activities on a business base. The major conditions include a diversified supply of monetary resources, increased self-reliance of local economy and implementation of social audit.

The research culminated in the publication of a discussion paper entitled "Community-based Environmental Business in Japan: In the Emergence of Social Enterprise" in English and Japanese.

In order to contribute to the IGES international symposium, a conceptual examination of system innovation, which could integrate the whole BSS activities, was conducted. It was proposed that Community-based Environmental Business, as well as PSS, needs analysis on structural change in consumption and production patterns.

2.3. BM Review

The review established the following agenda and proposal:

(1) The PSS concept needs to be further developed. PSS has great expectations placed on it for dematerialisation, but previous PSS research projects have not contributed sufficiently to policy making, because there is confusion among research and policy communities. The PSS concept needs to be developed so that it can explain how PSS is positioned in the socio-economic system.

(2) The core concept of PSS is the relationship between producer and consumer. Therefore, the production side and consumption side cannot be discussed separately. The future development of PSS concept needs to be based on this. The revision of the relationship between producer and consumer will incorporate not only eco-efficiency but also sufficiency.

Outputs included the publication of the discussion paper "What are Product-Service Systems (PSS)?: A Review of PSS Research and Relevant Policies" in English and Japanese.

2.4. LIS-ISS Research

(1) The possible direction of "technology systems for low carbon society" was indicated through the simulation.
(2) The simulation showed that a drastic reduction of CO_2 is possible without greatly sacrificing people's various demands if appropriate technologies are widely adopted enough by society.
   * The methodology adopted in this study and its results were utilized by certain local government as a framework for their climate policy formulation.
(3) Possible solutions which adopt innovative environmental business models were proposed for addressing various obstacles to the wide diffusion of identified Environmentally Sound Technology Systems (ESTS).
(4) Feasibility studies on aforementioned environmental businesses were conducted.
(5) Policy recommendations (to both government and business sector) which promote innovative environmental business models were made.
   * Representative examples include 1) Proposing promising business scheme as a policy recommendation to the MOE-J, and to major railway companies in Kansai area. As a result, both recommendations were accepted as prospect policies/environmental business model. The former one will be described in the following item (6) and as for the latter one, internal agreement has been made within the railroad companies to employ and further promote this model in the future.
(6) "ESCO Business Scheme for Household Sector," a prospective business scheme which was elaborated through a collaboration with business sector (Biwako Bank and Shiga Home Appliance Retail Association) as a part of LIS –ISS research project, was proposed to the MOE-J on an occasion of "MOE-J's Environmental Policy Contest 2006"and has been selected as the best policy recommendation. This policy proposal is to be further examined and elaborated with the comprehensive official support (financial, human resource, and information etc) from MOE-J to conduct further feasibility study for actual policy implementation.
   * The presentation on this policy recommendation was given to key executive officials of MOE-J
   * This policy recommendation is now opened to the public through the press releases to various media by MOE-J, and detail information of the policy recommendation is posted on the MOE-J's Website for public dissemination.

Reflecting aforementioned achievement on the LIS-ISS research, following outputs were made.

1) Final report on the whole LIS-ISS research.
2) Draft of Policy Brief on Household ESCO business scheme.

2.5. LIS-EIC Research

(1) The major findings from the country fact files were as follows:

- Industrial clusters do exist in Asia. They don't exist in all industries, but around half of them are in the small and medium-sized manufacturing sector that is also in peri-urban areas.
- The failure of governments to create a robust information base and the inability to develop an environmental monitoring framework for such local industrial clusters is of grave concern from the sustainable development perspective.
- Driving forces behind such clusters vary from locational advantages to technology factors and market inducements.
- Policies that favour the formation of such clusters include industry, agriculture, natural resource conservation, pollution control and tourism .

(2) The major findings from stakeholder consultations and SWOP analysis of select EICs were as follows:

- Local industrial clusters are located at the intersection of environment and economic development. Development of well-functioning EIC in rural-urban areas is one of the essential steps in moving towards sustainable regional development.
- Inter-firm networks are the main strategy to make the clusters environmentally friendly.
- Integrated policy guidance, focused business leadership with clear objectives and good market orientation are essential for the success of such inter-firm networks.
- The potentials are high but EIC strategies may take a long time to reach the mark because it has to be accompanied by social capital creation.
- Local industrial clusters are the better targets for rapid diffusion of best environmental technologies/practices because of their capacity and capability for coordination among firms.

(3) Research outreach included the following:

- IGES/K-FACE Global Environment Seminar on "Business towards Sustainable Local Society: Eco-Industrial Clusters in Urban-Rural Fringe Areas", Yokohama [30 November 2006]
- IGES/KRC "Business and the Environment" [9] International Workshop on Eco-Industrial Clusters Leading to Sustainable Local Development, Kobe [26 October 2006]

(4) Publications resulting from this research include:

- "Eco-industrial clusters in Urban-Rural Fringe Areas: Towards unleashing the synergy between environment and regional economic development". An draft of IGES Policy Brief
- "Strategic Approaches for Eco-Industrial Cluster Development : Lessons from India, Japan, Thailand and Viet Nam". [presentation made for the 7th Asia-Pacific Round Table on Sustainable Production and Consumption, Hanoi, Viet Nam; April 2007]
- IGES Source Book on Eco-industrial Clusters

(5) Media outreach:

The stakeholder meetings in India and Viet Nam, which were attended by local policy makers and business people and which were reported on by local language media. An Giang News (Viet Nam) 29 July 2006; Kalaikathir (India) dated 6 August 2006

2.6. LIS Review

The preliminary findings of this explorative research are summarized as follows:

(1) The extent and speed at which the local governments and industries responded to environmental problems varied from region to region. Achieving the requisite reductions on the part of local industry in energy consumption and pollution intensities of business activities required wide ranging changes in product and process technologies and patterns of production. Proximity to core political circles or to the central policy making community was also a factor that could induce business behavioural changes！as response to global environmental problems. The policy adjustments and development of industrial restructuring processes tended to be gradual in both regions but appeared to be slightly faster in Kanto.

(2) 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 regions. However, significant differences were observed between the regions. Environmentally distressed, politically isolated localities have a unique way of responding to environmental challenges. Robust models such as the one available in Shiga for water quality preservation, the Osaka air quality improvement plan and the Hyogo-led coastal environment programmes were uncommon in Kanto.

(3) Local institutions like universities, media and environmental NPO networks provided the vehicle and platform for eco-innovations to take place at industrial level. The strength of these local actors varied tremendously from region to region as well as within regions. Private sector supported activities were found to be more vibrant in Kansai, the industrial basin of Japan.

The research outreach events included disseminating information on the research progress in a study group on 'Local Initiatives for Environmental Empowerment in Kansai' – a private sector research activity carried out by the Osaka-based Global Environmental Forum (GEF), Kansai.

Publications resulting from this research include an IGES/KRC research paper entitled 'Competitive Advantages of Regions: Lessons from Kansai's Response to Environmental Challenges'.

3. Self-evaluation

3.1. BM-PSS Research

a. Relevance

- The role of "Servicizing"/product-service systems in achieving more sustainable production and consumption, and implementing 3R principles in the economy are receiving increasing attention in Japan. Indeed, the topic remains highly current internationally. For example, the Ministry of Economy, Trade and Industry recently completed its "Green Servicizing" study group. Chaired by Prof. Gunjima, this group aimed to examine promotion policies for these green servicizing businesses which have the potential to make social innovations and change society based on collection and evaluation on existing cases. METI's research contractor, MRI, sought our assistance in its own case-based research. The study group will continue its activities, focusing on consumer acceptance issues in B to C models. The results of this research should be complementary to our research, as we were not able to focus on consumer acceptance issues.

- Our research also made clear that Japanese environmental and industrial policy had already been heavily engaged with PSSs in the areas of product take-back, ESCOs 3PL, and so on. (However, these policies are not connected: Japan has had no unified "PSS strategy.") As discussed above, a clear result of the research was that certain product-service systems have the potential to make substantial contributions to achieving Japan's declared environmental policy objectives, and our policy recommendations were directly focused on means to achieve this potential.

b. Effectiveness

The original research objectives have been consistent since the research was initiated, and the research achieved these objectives. The research methodology was designed to meet these objectives, which emphasise the assessment of PSSs' sustainability potential and the development of policy recommendations to achieve this potential.

c. Efficiency

The research group consisted of the PL, one researcher and one part-time visiting researcher. Despite its small size, the group carried out various research activities including a literature review and actual case-based research both from business and environmental perspectives. The research also covered a variety of business models and industries and aimed to become the first extensive case-based research in Japan.

3.2. BM-CB Research

a. Relevance

The research results were presented at the "Second World Forum on China Studies in Shanghai" with participation from Chinese policy makers and leading scholars and the "IGES International Symposium in Kobe" attended by Japanese government officials.

b. Effectiveness

The research activities were conducted as planned. Both theoretical aspects and concrete practices in Japan were examined, and a discussion paper was prepared targeting audiences drawn from both the research community and from practitioners.

c. Efficiency

The research took about a year and half and obtained the participation of two visiting researchers. The research took four field trips in Japan. Each trip was well arranged to meet key persons, and brought up valuable information to substantiate the research.

3.3. BM Review

a. Relevance

The research results were presented at METI's Study Group Meeting on Green Servicizing and at a meeting of the Kansai Council in which local government officials and companies participated.

b. Effectiveness

The research activities were implemented as planned. They systematically overviewed relevant policies in Europe, the US and Japan, and accurately identified the PSS study agenda.

c. Efficiency

The research was conducted intensively in six months and featured contributions from a visiting researcher.

3.4. LIS-ISS Research

a. Relevance

- Studies on low carbon society were conducted by various research institutes such as NIES and other overseas research institutes. They attracted major attention from national and local governments, NGOs and the public. However, research on ways to bring about a low carbon society was not well examined. In view of the current situation, this research studied innovative business models overcoming various obstacles to create a low carbon society. The outcome of the research could have been actual measures for developing a low carbon society as well as ideas to provoke discussion on how to create a low carbon society.

- Simulations focusing on local level activities followed these various studies.

b. Effectiveness

- Although there were unexpected problems in the research, such as the resignation of the Project Leader and personnel reassignments, the team produced a series of outputs including a vision of ESTS in a low carbon society, innovative business models and relevant policy recommendations. Some stakeholders in KRC, namely local governments and business organisations based in Kansai area, expressed their interest in the research outputs. In addition, some of the business models are considered "environmentally sound, economically feasible, and socially attractive" by stakeholders and are expected to be further examined for materialisation. The research has certainly been effective in achieving the original research goal of producing beneficial policy proposals to local government and business organizations, .

c. Efficiency

- The reassignment of researchers and resignation of the Project Leader caused certain inefficiency in the research.

- There was only one proper researcher engaged in this project. However, the research made maximum use of the visiting researchers' expertise, which contributed to producing significant output.

3.5. LIS-EIC Research

a. Relevance

An Giang Province of Viet Nam and Municipal Government of Maniwa, Japan, expressed strong interest in the project and actively supported the field studies. Governmental Agencies like the Industrial Estate Authority of Thailand, and the Small Scale Industrial Development Board of Tamilnadu, India, were very much looking forward to receiving the final research product recommending key policy interventions/action plans. To date, other than 7th Asia-Pacific Round Table on Sustainable Production and Consumption, this research did not yet reach the international policy arena.

b. Effectiveness

The goal of the research was to suggest appropriate management and technological, institutional and policy measures for developing EICs in rural-urban fringe areas as a means of integrated environmental and economic planning. The objective was ambitious, the research approach was good but the time and economies covered were limited. The socio-economic pattern and industrial structure of Asia differ widely from country to country as well as from sector to sector. Each EIC experience analysed during this research was contextual and heterogeneous, making it to difficult to produce a generic integrated framework. Moreover, it was unrealistic to make pragmatic policy recommendations based on a short, one-year research period with limited geographical/stakeholder consultations. Hence, an extension for three more years and the inclusion of more regional economies as well as more international stakeholders were recommended for the Fourth Phase of IGES research.

c. Efficiency

As a multi-country study, a partnership was needed with local research institutes and this was established after finalising the research protocol. BSS prepared a Terms of Reference, budget estimates and a research schedule for collaboration with research partners in Thailand, Viet Nam and India. Thereafter, a team of five researchers and a research associate (based in AIT, Bangkok), and a part-time research assistant (based in KRC, Kobe) started working under the guidance of BSS. The Japanese part of the research task on Eco-industrial Clusters was conducted by IGES/KRC in cooperation with visiting researchers. This was an efficient way of implementing a cross-regional study with the limited human resources available at IGES. Free flow of communication in the form of e-mails, telephone and research partners' meetings were designed and coordinated by IGES. As a component of the contract agreement, in cooperation with research partners, BSS organised stakeholder meetings in Thailand, Viet Nam, and India. In addition, as an observer, BSS participated in a stakeholder meeting in Okayama, Japan. This research culminated in an IGES International Workshop on 'Eco-industrial clusters leading to sustainable Local Development of Asia' in Kobe, financially supported by Hyogo prefectural government.

3.6. LIS Review

a. Relevance

Industrialised economies like Japan face similar environmental problems presently seen in many parts of rapidly industrialising Asia. Cross-regional comparisons revealed the factors that shaped the

fundamental local responses on management of their environment, and differences in the administrative styles and industrial behaviour. The experience will be useful for local/national governments in Asia when designing their environmental management systems.

b. Effectiveness

This was an explorative study designed to identify regional differences in national responses to environmental problems. Most of the desk review was done through internet-based literature searches, interviewing key industrialists and discussions with local academia. If this had been combined with structured questionnaire surveys and interviews targeting higher level policy makers and business leaders, this would have resulted in more precise outcomes. IGES should conduct a fully-fledged survey, in partnership with the private sector and local governments, to fill the knowledge/information gaps. A possible tie-up with GEF-Kansai is recommended.

c. Efficiency

This entire research was done with the support of a part-time assistant on an intermittent basis. As most of the data, information and reports were only available in the local language, it took considerable effort and time for the researcher to understand and later analyse the information.

4. Conclusions

Various environmentally-sound business models towards realising a sustainable society were examined, elaborated on and proposed in this project. They are PSS business models for eco-efficient business activities in BM-PSS Research, community business models for corporate-community partnership in BM-CB Research, innovative business models for low carbon society in LIS-ISS Research, and eco-industrial cluster business models for local development in Asia in LIS-EIC Research. Although there is still a long way to go to attain the main objective of this project, the two goals were almost accomplished and the outcomes of the project could provide a sound base for the next project on business and environment.

4.1. BM-PSS Research

Some new/innovative PSSs do have significant potential to help Japan achieve key sustainability/environmental policy objectives. We believe it is clear that as a class, performance-based "outsourcing" PSSs have high potential. This potential derives directly from the direct relationship between the basic profit mechanism and improvements in environmental performance. However, Japan has no "performance-based services" strategy. In our view, the key challenge and the single most important element of such a strategy is defining and implementing a financial incentive mechanism that can apply to all such models. We view this as our most important policy recommendation.

Policies to achieve the sustainability potential of these PSSs cannot be limited to traditional environmental policy instruments. Rather, many of our policy recommendations are usually associated with industrial or economic development. This follows directly from the basic premise of policy-making in this area: the purpose of policy is to create an environment that supports the growth of the greenest versions of these PSSs so that they become BAU. In so doing, they replace the

traditional, less eco-efficient ways that their functions are delivered in the economy. Efficiently and effectively supporting the growth of green businesses models necessarily means weakening business barriers and reinforcing business drivers. Barriers and drivers are not exclusively environmental; the recommendations go beyond traditional environmental policy. We do not believe that the most effective role of the public sector is to create or design "green PSSs." Rather, PSSs are best understood as businesses that derive from and reinforce the growth of the service economy. They are not primarily regulatory or policy instruments. The role of policy/the public sector is to help create favourable conditions for the growth of green PSSs.

4.2. BM-CB Research and BM Review

The community-based approach has long been proposed by ecological movements. The community has also started to play a role in solving social issues such as unemployment as both government failure and market failure become apparent. The two contexts tend to have been discussed separately. However, this research showed that with the emerging concept of social enterprise, the two are expected to collaborate with each other and account for a significant part of economic activities. Community-based businesses are emerging across the world. This research is valuable for informing the situation in Japan to the world.

4.3. BM Review

PSS practices have been developed mostly by companies. So, present PSS practices can be seen as business models. However, in order for PSS to bring up system innovation as expected, it is necessary to have a wider scope to include consumers' roles. Products can be regarded as potential environmental loads. Although environment-oriented product policy has started developing, policy measures that can influence the roles of producer and consumer need to be further devised.

4.4. LIS-ISS Research

As stated above, the research encountered some confusion on its research direction at the initial stage and faced some destabilisation in its research organisation. In spite of those adverse factors, through appropriate re-designing and re-scheduling of the research as well as effective collaboration with visiting researchers, the research could produce a series of outputs that were fairly relevant to the research goal: to propose and/or identify innovative environmental business models based on ESTS for s low carbon society. Fortunately, some of these research outputs have attracted business and local government's attention and interest and there is expected to be further research on the actual utilisation/ materialisation of the research output.

4.5. LIS-EIC Research

The research results and the concept of the Eco-industrial cluster (EIC) should be looked at as a new market-based integrated environmental and economic approach for sustainable regional development that offer new roles for governments, business, and community-based organisations. In this context, EIC possesses significant potential to become an area for policy intervention. Essentially, EICs are about the relationship between companies that share common inputs and similar

technologies and draw their workforce directly from the community and hence EICs have! important implications for business too.

As indicated in Section 3, in order to propose a pragmatic policy mix and identify business strategies, it becomes important for IGES/KRC to continue this research as a part of the Fourth Phase. Expanding and conducting the research with both field work and desk review components increases the chances of exploring all opportunities for eco-industrial development: from business support to policy support, domestic market forces to international forces and both local and regional development. With readily available research protocols and research partnerships already in place, the geographical focus of the Third Phase research shall be expanded to include four more economies, *viz*, China, Korea, Philippines and Sri Lanka. The Third Phase research results from India, Thailand, Viet Nam and Japan, when combined with similar results from the Fourth Phase, will ultimately result in the IGES Guide Book on Eco-Industrial Clusters – A Planning Guide for Policy Makers and Business Investors.

4.6. LIS Review

In Japan and elsewhere, local level industry responses, environmental policies and institutions have gone through major changes during the last five decades in response to increasing public awareness of environmental issues. Industrialised economies like Japan are at the forefront of this evolutionary process in Asia, but these responses within the country and the speed at which this response occurs varies from region to region. While data and method of survey preclude definitive findings regarding the precise measurement of regional level environmental performance, this research provides much helpful and suggestive evidence. It was found that the regional environmental stewardship is often characterised 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 else.