

Regional Workshop on Eco-Industrial Clusters: Policies and Challenges

8-11 December 2009
Asian Development Bank Institute
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Summary of Proceedings

Introduction

1. A four-day Workshop on Eco-Industrial Clusters: Policies and Challenges was held at the Asian Development Bank Institute, from 8 to 11 December 2009. This training program looked at the sustainability challenges that industrial clusters face and discussed strategies for transforming industrial clusters into eco-friendly economic zones.
2. The workshop consisted of seven thematic sessions organized in collaboration with Asian Development Bank (ADB), United Nations Industrial Development Organization (UNIDO), United Nations Environment Programme (UNEP), Japan International Cooperation Agency (JICA), Ministry of the Environment (MOE), Ministry of Economy, Trade and Industry (METI), Eco-Industrial Development Council (EIDC), CITYNET secretariat and Kawasaki City.
3. The specific objectives of the workshop were to:
 - (i) Demonstrate the potentials of transforming Small and Medium Enterprise (SME) clusters into eco-friendly economic zones
 - (ii) Identify policy constraints and formulate strategies for boosting cluster based innovation system
 - (iii) Illustrate successful examples of doing eco-businesses within industrial clusters
 - (iv) Cultivate leadership for inclusive and sustainable development of urban-rural fringe areas.
4. The workshop was officially opened by Worapot Manupipatpong, Director, Capacity Building and Training. ADBI designated Messrs. V Anbumozhi, Chettiyappan Visvanathan, Andreas Koenig, Geng Yong, Kyeongae Choe, Teruo Ujiie, Mark Stoughton and John West alternated as Chairpersons for the sessions.
5. The workshop was organized as a series of thematic sessions designed to have different modes of instruction: (i) Plenary session – introducing the concepts and theories of industrial clustering (ii) Learning modules based on case studies, practical examples with worksheets (iii) Field visit to understand the necessary and sufficient conditions for Eco-industrial Cluster (EIC) formulation and (iv) Group discussions for developing credible EIC development strategies & leadership qualities. A total of 10 resource speakers made presentations on the following topics:
 - SME Clusters and sustainability challenges;
 - Industrial clusters as eco-friendly economic zones;
 - Improving environmental performance of industrial clusters;
 - Social capital, technology and financing for EICs;
 - Enabling policies for EIC transformation;
 - EIC as an inclusive business development model

SME Clusters and Sustainability Challenges

6. The last decade's fast economic development and consequent concentration of cluster activities has resulted in water and air quality degradation, and over consumption of natural resources. Consequently, Asian cities are among the most polluted urban areas in the World, although they have been providing great scope for clustered activities. Towards promoting sustainability in Asia-Pacific region, environmental protection must be seriously integrated into development policies, through adoption of eco friendly practices. This approach could be used to find a balance between environment, economic and social objectives. In this regard, there is a growing need for new regulations, restrictions, and policies to address these challenges and opportunities conducive to environmental performance. There is a crucial role of industrial clusters (ICs), in providing an opportunity to integrate environmental protection principles by transforming ICs into EICs.
7. There exists plenty of scope for ICs in converting themselves into EICs, against the backdrop of rapid industrialization in Asian countries on resources consumption and environmental degradation. As the scale of environmental issues are colossal; if industrial production and consumption patterns of today were to continue, by 2050, resources equivalent to two planets would be necessary to source our consumption needs. Our generation has the challenge of addressing sustainable development by integrating environmental protection to balance consumption growth; and there is great opportunity in incorporating industrial ecology principles into IC development and management.
8. Industrial clusters are characterized by a densely located or spatially adjacent small and medium enterprises (SMEs) that are engaged in similar economic activities. These enterprises interact with each other either through sub-contracting or through other specific forms of cooperation. Industrial-clusters have played a vital role in Asian development and generally also in other developing countries, as SME clustering favours innovation and helps local firms to compete globally. Various evidences can be found in Viet Nam, People's Republic of China (PRC), India and Thailand, among others, to show that individual clusters are contributing to the increase in GDP and social development in those countries.
9. In the last few decades this concentrated cluster development activities, apart from bringing benefits of economic development has also resulted in an increasing pressure on the environment. The environmental cost in and around the region of clustered activity has been the accelerated depletion of natural resources and an increase in the discharge of waste materials, mostly untreated. Thus, it becomes important to incorporate environmental principles when planning for economic development, i.e., though SME clusters contribute to economic growth their environmental performance also needs to be optimized.
10. EIC is a community of inter-connected businesses that operates based on the principles of optimized use of resources, promoting reducing-recycling-reusing (the 3Rs), and finding alternative use for the discharged materials, while simultaneously cooperating with the local community. Basically, by applying the principles of competition theory and industrial ecology, EICs aim at efficiently using local resources while decreasing waste production and pollution, achieving economic development targets, and meeting the social demands of the community. One of the keys of EIC development is the inter-firm network; where interaction between firms will then be based on mutual trust, and within the network the goal is to share by-products, wastes and natural resources, including labour.

11. EICs not only promote productivity by achieving the effective use of raw and waste materials, adoption of cleaner production practices technology, innovating and developing new eco-products, but also enhancing social and employment opportunities. In Asia, several examples of EICs were identified, such as biomass based industries in Maniwa, Japan, food industry in Chachoengsao, Thailand, fish industry in An Giang, Viet Nam, and sericulture industry in Hosur, India. The environmental gains of these EIC are enormous, contributing to reduction in solid waste and carbon dioxide mitigation.
12. Social capital creation was recognized as an essential step in EIC transformation. Interactions between entrepreneurs, inter-firm networks and strong public-private partnerships are the three main pillars to be addressed while developing the operational strategies of EICs. Collaboration between firms and other knowledge institutes (local universities and research institutes) also become an important aspect, as they assist in developing enabling technologies and diffuse market information. In fact, within an EIC community well-established social networks between clusters, local government and institutions, local community, and knowledge institutions greatly facilitate the inter-firm collaboration and diffusion of new technologies with reduced transaction costs. The diffusion of enabling environmental technologies across firms also benefit clusters as a whole, these include the conversion of waste to energy, wastewater treatment, and use of renewable materials. In this area Asian SMEs need to strengthen their efforts to share relevant technologies among and within clusters, which are simply replicable. To this end, knowledge institutions and research centres may be a helpful vehicle in assisting diffusion of appropriate technologies across firms.
13. To achieve EIC goals of promoting environmental protection and reducing resource consumption, public policies and effective regulatory framework need to be put in place. This could be effectively achieved, for example by implementing environmental regulations, setting product taxes, raising trade barriers, etc. Besides this, there are other ways to promote EIC activity by providing the necessary access to financial resources such as loans, funds or subsidies to enable small businesses to operate fairly in a cluster.
14. Economic Competitiveness of SME Clusters matters for Asia and hence the role of city cluster economic development (CCED) provides the scope of promoting policies and management of resources and developing institutions based on Eco-Industrial Development (EID). It was observed that there has been rapid urbanization in Asia with 20 mega cities evolving, with faster growth especially in South Asia and in medium sized cities. This also throws a challenge to governments in planning for more growth and the stress on the environment. Another aspect of urbanization in Asia is that it is not conventional, and there have been different patterns of cluster agglomeration ranging from: policy centric, regional network of clusters, linear clusters, and mega-cities surrounded by clusters.
15. Solving the growing challenges of industrialization and urbanization requires a more region based resource management, to channel growth and support local communities. Crucial among them is the need to move beyond local and reduce the rural/urban divide especially in terms of jurisdiction. This was essentially required to manage resources more efficiently. In terms of policy, there is an increasing need in identifying comparative advantages of cities, and matching them with resources and infrastructure, especially when financial resources are limited. Stressing that the framework for achieving this would be through economics of scale, especially agglomerated urban-fields to increase economic activity. Also noting that there would be other benefits through the multiplier effect, connecting supply-chain value chains to the local market, and spill-over effects to rural areas. Combined with Prof M. Porter's business cluster concept, industrial growth was considered important to promote job creations, and income opportunities, in other words to also reduce poverty. Identifying industries in clusters and prioritizing infrastructure investments to

increase productivity was the important economic development strategy. Three countries case studies India (Delhi), Bangladesh (Dhaka), and Sri Lanka (Colombo) showed competitive advantage of specific industry clusters in each city. There were also negative externalities observed, like pollution from industries that also require more governmental support and guidance, as it cannot be left to markets alone to solve.

16. The evolution of ideas in this area of developing competitive economies has seen a marked move from comparative advantage to competitive advantage, and more recently to a collaborative advantage to allow cluster networks to form. To maximize on the collaborative advantages there must be more: public-private collaboration, smart systems, openness in governance, and infrastructure development for enhancing clustering. Countries are already realizing the need for an eco-friendly eco-based industrial development. Vertical clusters where CCED (Naturally growing clusters not restricted by spatial form, value-added supply-demand chains) is different from horizontal special economic zone's (tax benefits, boundaries created that do not share benefits and is based on supply-driven agglomeration). CCEDs have been considered to increase efficiency in business, and provide bigger market opportunities.
17. There are successful cases of clustering as in the case of Tirupur Knitwear Cluster in India where it moved from a household industry (from around 20 exporters, with visionary leaders) to a billion dollar export market in 10 years. The cluster now holds 750 exporters with linkages between all the sub-industries of textile and dyeing: creating public school for members of the textile association, institutes to support technical, fashion training to improve technology inputs and export better products. The cluster created its own voice before getting government support. The proactive role of Tirupur Cluster case was that they identified the areas of collaboration:
 - Managing physical infrastructure together – including sewerage systems, water supply, wastewater, road and transport development, inland container depot, industrial complexes
 - Establishing institutions for combined services – including setting up an Apparel Park, Trade Fair Centre, and Institutes for Supervision and Management, technology sharing forums, and schools for employees.
18. Environmental stewardship is required by governments and businesses to promote Eco-Industrial Development. There exist some difficulties such as the complex administrative systems of local - regional governments, and their responsibilities divided in terms of regulation, operation, tariffs, and duties. The difficulty in implementing policies was constrained by the existing compartmentalization of ministries (inherent limitation), where each of them has its own agenda and target. So the urgent need was to create a framework to co-ordinate efforts among ministries, regional/local governments, and businesses. For example, in order to execute policy in the rubber industry clusters in Sri Lanka it required permission and coordination from 7 different ministries, apart from the local and regional governments, where at times there was a duplication of efforts and conflicts in interests.
19. Governments and industries need a catalyst to promote coordination in spite of their current compartmentalized institutional setup. In that regard coordination needs authority, and evidence of combined benefits for all the actors involved. It was observed that even developed countries like Japan have difficulty in coordinating policies; where it took four years to achieve policy objectives at two levels of government and two ministries: MOE and METI in establishing eco-towns. Another case was with India, where there have been many successful industrial clusters, but coordination between Environment and Industrial Ministries have only been gradual.

20. The industrial ecology approach offers opportunities at different levels: where it can range from the micro (cleaner production, eco efficiency, life cycle management, etc), to the macro approach that would involve cross-sectoral resource management and optimization. The key was to map and control energy and waste flow. Specialized management systems were also required to manage the EID. Competition, cooperation, and coordination, were the buzzwords in terms of global ideas that had local application (big buyers who could affect the production standards of small producers), and governments (local and national). This also required research on indigenous resources, and other externalities like job generation and other social benefits were expected to flow.
21. The history of 1st generation of clusters were traced, where in the 1990's backyard factories moved to SMEs clusters in un-zoned area (centre-satellite system that resulted in increasing productivity), a good example being the Japanese just-in-time (JIT) model. The 2nd Generation clustering of SMEs and Multi-National Companies (MNCs) were known as industrial estates or as industrial clusters, science parks, corporate synergy systems, Environmental Management Systems (EMS). With growing negative environmental effects of industrial expansion, eco-industrial development (EID) becomes important strategy with different perspectives: cleaner production, green productivity, eco-efficiency, green economy, green industry, green job, and green growth. Many a times these were also achieved by setting regulations and setting up emission standards; ecology side policing in other words.
22. The well known example of EID's was the town of Kalundborg in Denmark, a successful example as an Ecological Industrial Park (EIP) in providing evidence of what could be achieved through implementing industrial ecology concepts in achieving industrial symbiosis of waste flow. Other major EID's initiatives in Asia have been the Japan's eco-towns (self-funded), and the PRIME Industrial Ecology Module (with UNDP) in the Philippines. Until 2004 the EID initiatives were also implemented and strengthened in other Asian countries including Thailand, Taipei, China, PRC, India, Sri Lanka, Australia, and this then spread to other regions including North and South America and North Africa. The initiatives included reducing by-products, to recycling-oriented society based on knowledge based society, zero-emission goal and eventually creating eco-cities.
23. The four issues were: effective use of raw and waste materials, knowledge and technology, employment generation, complementary eco-product development. Apart from that with a macro level of looking at production systems, waste could be seen as an input in another production system where it could be re-used. There were different ways in which these policies were introduced and in general, with strong government intervention – this was a top down model (as seen in Africa), while there was a bottom up approach in America, and with Asia there was the sideways-in approach with a sharing of information and coordination. Other analytical approaches also included resource use intensity versus the recycling rate promotion.
24. In terms of EIC, there were economic benefits as could be seen in Korea where efficiency and resource utilization largely improved, this lead to better ecological (better living conditions) and social conditions (improving knowledge sharing and management and other spill-over effects). But it was difficult to see how many clusters were to combine and to improve the 3R's (Reduce, Reuse and Recycle) through solid waste management, water use management, and electricity/power use management. A case study of promote fishery (shrimp production) in Bangladesh especially for export was discussed, impediments were identified as the need to explicitly layout benefits (in terms of profit, job creation, etc), as otherwise businesses would not cooperate. Enabling policies, measurable performance indicators, monitoring systems, and supervision capabilities would aid EIC development.

Regional Experiences of EICs as Eco-Friendly Zones

Japanese Eco-towns

25. Japan's eco-town program was initiated with two objectives, which were (1) To cope with serious shortage of final landfill sites and (2) Revitalize stagnating local industries under the model and slogan of "zero emissions". This initiative led 26 various Japanese industrial clusters including Kawasaki city and Kitakyushu industrial cluster to transform themselves into eco-towns, which succeeded in reducing the consumption of virgin materials and reduction of carbon emission with a 92% recycle by-product ratio.
26. Collaboration among government institutions, availability of investment subsidies recycle laws, private investment, and industrial synergy were the drivers of the eco-town initiatives, apart from technology, which was already an advantage for Japan. Waste regulation, green purchase, by-product circulation within 100 km (led to more circulation) was seen as improving efficiency and profitability. The motivation for the Japanese Eco-town initiative was to manage solid waste economically and ecologically, a win-win situation that happened with the inter-ministerial coordination of METI and MOE for over 10 years. The driver in converting Kitakyushu City into an eco-town was the scale economy in garbage circulation. While Kawasaki Eco-town was already in the middle of an industrial location and eco-industrial clusters grew organically, with the interactions of traditional industries like steel.
27. Access to significant technological resources from the private sector; product specific targets, and worldwide recognition of the urgency of take action on environmental issues contributed to the success of eco-towns. The major advantage was in terms of the quality of research done, which was based on urban and regional GIS database system with Social Technology - Life Cycle Inventory for circular economy. Recycling industries were essentially the result of the resource crisis that stemmed after 2008, and the market for by-products changed dramatically. Especially with metal and oil prices fluctuating, companies in Japan were more interested in recycling simultaneously using this opportunity to invest in the future and to develop the technology. Japan is keen in developing the Asian Eco-town Initiative, to partner with other Asian countries in developing eco-towns and in sharing the importance of sound policies, regulation and enforcement. Also a key feature of the eco-town success in Japan was that it was largely private sector driven.

Shenyang Eco-Industrial Park

28. The Shenyang EIC was the PRC government's attempt to develop an integral global strategy towards carbon dioxide mitigation, optimizing energy consumption, while collaborating with local communities and firms. Goals of sustainable consumption and environmental awareness were utilized in effective policy-making on a regional level; converting Shenyang into an environmental construction model city in PRC and also as a successful national EIC case study.
29. Planning activities were centralized providing for dialogue and knowledge sharing between relevant clusters in the region, local government and research centres. Needs and priority goals were assessed in order to determine the most promising opportunities in the EIC development. Besides planning, scanning of preponderant and viable conversion technologies was also conducted. The main outputs of the project were related to designing system, using indicators and guidelines to explore the promotion of energy savings and emissions reduction within the EIC. The project also developed a website platform, where information on other case studies were provided to promote local investment by

stakeholders. Another notable event was the memorandum of agreement that was signed between Japanese and Chinese governments to address technology transfer issues.

EIC of Philippines

30. In the Philippines EIPs were evolving as Eco-Industrial Clusters (EICs) and they were actively used to reduce GHG simply by using low carbon technologies. In the Philippines policy in this area was triggered when the Minister in 1995 attended a meeting in India and also saw the developments in Kalundborg. After this, efforts were broadly implemented in two phases, with the: Phase 1: PRIME project (with the UNDP) 1996 to 2001 and Phase 2: UNDP EPIC 2002-04 with governments taking the lead.
31. The modules of industrial ecology were taken through Ministry of Trade, with the creation of the Philippines Eco-Zone Authority that was responsible for setting up for EIPs, and the Industrial Waste Exchange Program 2006. Industrial Parks evolved from a single factory that soon vertically integrated with other firms across cross-sectors with the cooperation of private and public actors. Within these parks 100 locators or tenants worked in the experiment to run the program. These industrial parks were used instead of cities other administrative units, as inter-governmental agencies are ineffective in integrating policy to achieve objectives. The Kawasaki Plant was also used as a case study, to build similar integrated resource recovery systems. The two types of UNDP PRIME Projects included developing new EIPs, and redeveloping existing Industrial parks using EID principles.
32. National Policy on Ecology was based on material flow analyses across different industries, done by sub-contractors. As by then resource use intensity data was already becoming the basis of national economic planning especially in Japan and PRC. It was being realized that action plans were to be based on information, regulatory (by providing incentives) and market based approach, with strong R&D still to be developed. This marked the new phase of the Philippine Eco-Zone Authority established in 1995, where many projects were being implemented at different levels of government with SOP's, EID manual, EID Information management system (although there was no coordinating agency nor platform).
33. The Ministry of Environment in the Philippines is now strict and stringent in following regulations, and does not hesitate in closing factories. But this was regarded to be an issue as just closing factories over has serious social and economic implications. The need for time, warnings (stick) and incentives (carrot) to transform and integrate firms within the EIC was considered as a more viable approach. It was also noted that policy intervention is required to provide incentives or other methods where company's products would be bought using their eco-labelled products as opposed to virgin product, through laws even if prices were higher. MNC's due to international pressure were sometimes seen as greening supply-chain, and it also worked positively as part of their Corporate Social Responsibility (CSR). It was emphasized that the driver for clustering however had to be economic reasons, and the apparent benefits could easily be seen through resource optimization, or environmental pressure.

Strategic Issues, Management and Leadership

Improving the environmental Performance of SME Clusters

34. Environmental performance in EICs is important, especially in the context of SMEs in Asia where environmental conditions have deteriorated, mainly due to the rapid pace of industrialization and urbanization. But now the challenge is how environmental

performance will be implemented and evaluated. As during the industrial process the two aspects of production are the technology used to produce a product and what is to be done with the waste generated in the process. Instead of ignoring waste as an end, it is important to look for partners that could possibly use the waste as input in their production system, and that becomes fundamental to any EIC. The issue is how waste generated during and after production can be reused within another production system. Apart from by-product and waste re-use, downstream pollution control measures such as waste water treatment plan, emission standards etc., are becoming acknowledged by countries, and requisite legislations are being put in place. But what is lacking is the upstream resource utilization analysis.

35. Environmental performance and benchmarking also improves industrial competitiveness through efficiently using resources, and reusing waste. Industries in general are only interested in meeting environmental standards, by the cheapest means so as to meet regulation, but do not recognize the other benefits that should become more ingrained, as they provide social, environmental, micro-economic benefits of poverty alleviation and job creation. Industries do not improve upstream resource utilization, unless they are forced by a price increase of these resources or an economic crunch. For example the recycling industries boom in Japan after 2008 was due to a price increase in raw materials.
36. The need is to move beyond a linear approach in handling materials to an upstream resource-efficiency system, based on three concepts: 3Rs, Cleaner Production and EICs. Classical production process is based on a linear system: raw materials – production – consumption – eventually discarding the material by treatment and disposal. This is a crisis prone system as more consumption leads to more natural resource extraction and more waste generation. This linear system is not sustainable in the long term, as resources are limited and only when the crunch comes, countries reduce consumption or reuse, or recycle through treatment. Eco-town is a concept in this direction of recycling to recover the resources back into the system.
37. Cleaner production deals with system re-engineering to achieve resource optimization though in a linear production system. EICs on the other hand are about how multiple industries can integrate to achieve resource efficiency and reuse. Cleaner productions can always be achieved through various methods including changing the technology, end product design, input material, reusing material on the side, and most importantly resource recycling. Depending on the location of the industries, if located in one zone could become an EIC, otherwise clusters and their material flow would have to be looked at a macro-economic perspective. As the opportunity that lie with EICs is that waste becomes a raw material in another industry, but this however has to also be looked in terms of geographical location, so as to reduce transaction and logistic costs. EICs require inter-firm networks, by not only looking upstream resource efficiency, and of reusing the waste not only through eco-service centres but also as an input in another industrial process, leading to better EIC's environmental performance.
38. Geographically EICs have relevance especially when they are located in urban-rural fringe areas. Urban areas already have limitations in terms of available space, and add stress on the land but contrarily they also have demand for consumption. On the other hand rural areas have the natural resources but not enough manpower, industries, nor the demand. So the fringe area is ideally located to complement the rural-urban divide in resource use to meet consumption demands. For example, in the process of producing desiccated coconuts for domestic use and export in Sri Lanka, the intermediate processes of de-husking and de-shelling was ideally located in fringe areas, producing various by-products and waste. The scope of reusing the water, husk, and shell and other material to produce other products made them a good example of eco-industrial cluster located in

the urban-fringe area. It was emphasized that converting IC's into EICs was not about just allowing for an end of the pipe pollution control, through waste treatment or water treatment plant. Instead one more step of attaining resource efficiency, and redesigning industrial systems, by-product minimization, to create sustainable industrial systems was crucial.

39. Though the idea of EIC is attractive, implementation poses challenges. The link between social factors, environmental and business performance although strong is still to be integrated through strong policy, regulations and incentives. Material flow analysis in legislations was recognized as crucial in the future, all though countries are mostly now focused on only standardizing environmental norms (e.g. ISO 14000). Monitoring and enforcement, in terms of actually closing down factories is still not so easy in many countries.
40. While more creative solutions are needed to motivate SMEs to adhere to environmental standards and move beyond resource utilization, and EICs are a good starting point. Apart from downstream pollution control, the possibility to improve legislation to monitor and enforce upstream resource utilization was also discussed. In this regard the pricing of resources was a key factor, as the price of water or electricity is considerably low as they are usually subsidized in developing countries, SMEs and other industries are not pushed to start using resources more efficiently. In other words when resources are not priced correctly, they are not used efficiently. Singapore was observed to be a country with a strong 3R concept integrated into the policy, as it has a resource crunch, waste resource audit is carried out and monitored. Many countries were seen to have environmental and pollution standards and regulations for MNC's and large industries, while for SMEs the standards were only to be voluntarily adhered as monitoring was not economically feasible. Business performance ratings, through colour coding were introduced in Indonesia as a way of empowering the local community to rank the companies' environmental performance.

Social Capital

41. High social capital within the EIC lead to effective use of raw and waste resources, access to knowledge and collaborative networks for introducing cleaner production practices, leading to innovation and eco-product development, enhanced social and employment opportunities.
42. The Japanese wood-Industry cluster in Maniwa is a good example of social capital creation that translated into a successful eco-initiative. Maniwa a small town (100 km from Osaka) was a trade centre for wood for the last 20-30 years. The nature of the land, with 80% forestland and a population of 37,000 consisted of 34 SME timber factories. The challenge was to retain employment, as young people were moving to Osaka for jobs, by revitalizing the wood industries by creating a waste to wealth story. This was done by the active cooperation between the two forest associations, local municipality, and firms. Another challenge to the cluster was introduction of the Dioxin Law; where wood waste burning was banned, moving the waste and putting them in landfills had high transaction costs. Under this circumstance there only existed two options, abandon the cluster, or use it as an opportunity to change the nature of the industry.
43. But Maniwa, in five years reinvented itself by building inter-linkages between timber – wood – forestry – construction - fuel industries by new product creation, and bio-energy production (wood waste converted into pellets) also became a reality. A series of new eco-products developed from these industries included lignin, plaster, polyactic acid, ethanol/fuel, binder moulding. By using the resources wholly and efficiently it became a

zero-emission zone, where no resources were transferred outside. There were two clear streams: energy and resource, although most firms continued their line of business, but co-ordination was greatly enhanced, eventually new firms acquired competency skills to fill in the gaps. In spite of competition being the primary nature of business, the firms within the clusters cooperated.

44. The crucial component for such cooperation was believed to be social capital, where it was inherently becoming important to retain and augment: local community culture, openness to new ideas, flexibility of permitting easy entry of firms, local leadership, deliberate cooperation and joint actions by cluster members to identify common problems, and find and implement common solutions. This was done under the stewardship of a group called the 21st Century Maniwa which was concerned about the future of the cluster. It performed the role of a catalyst, to network and connected Maniwa to the market through symposiums, and seeking alliances. As evident there were multiple stakeholders: firms - demand side moderators and customers - supply side moderators were connected to ensure business performance. The new business strategy for eco-business was then based on a cluster focus, indirectly linking local residents to jobs, new supply-chain relationships, so that products could be sold outside the region.
45. EIC's just cannot evolve in a policy vacuum. In Maniwa, it was the Dioxin Law, which made the cluster to be innovative considering the past practice of incinerating wood waste. Simultaneously there was more coordination, and Ministry of Industry supported by the Japan Development Bank (JDB) could fund SMEs in the agriculture and forestry industries, while New Energy and Industrial Technology Development Organization (NEDO) provided funding for research and development, and Ministry of Education allowed alliances of universities with businesses for eco-innovations. Okayama Prefecture was also made into the customer niche market to support eco-products produced and promoted through the Maniwa NPO through their Eco-vision 2010.
46. The Maniwa case was an example of how fragmented efforts in a cluster can transform itself by gaining benefits through macro-level policy integration. While the local governments expectations were high, industrial clusters were the best target for rapid diffusion of environmental technologies and best practices, because of their capability to co-ordinate between firms. It was becoming clear that inter-firm networks could be used as a main strategy to make clusters environmentally friendly, but high social capital was a pre condition for that.
47. A focused business leadership with clear objectives and good market orientation, based on a continuous consultation process, supportive educational networks and outreach activities, would promote eco-innovations at cluster level. The strategy was to build around existing social capital such as trust, norms, and networks that would bind resources, technology, business and people. By investing in these assets through integrated policies and linking them to broader economic objectives would further create more commercial opportunities. This is a promising way to connect disinvested and isolated regions to the national and international markets in a sustainable way. Other good examples include Denmark's Kalundborg.
48. Businesses looking at using their social capital to promote cross-sectoral policy coordination, however sometimes require some kind of triggers. This would especially require able leadership within the government, which could put in place the needed legislations. Here there are parallels with the cross-functional teams (CFT) that were implemented by Nissan and inter-ministerial dialogue that would eventually promote business partnership and help the sector grow. Nissan although innovatively had to come

up with the CFT, the primary driver was the crisis.

49. There was an evident trap, where low social capital would only allow low environmental performance. Social dialogue process could be used to enable social capital growth and that would lead to higher environmental performance. There is a social aspect that would become the pre-requisite for other factors to add value. Raising awareness, through firm level dialogue and policies to improve both environmental and economic performance to reach higher levels would eventually drive the formation of policy communities and social dialogues within clusters and sectors to influence national development policy.

Technological Systems

50. Technology innovation is essential when shifting from unsustainable mass production systems to eco-technology processes. EICs require a range of green technologies that not only foster resources recovery and reduce waste flows, but also incorporate indigenous knowledge and local context when adapting new technologies in specific regions. Since in developing countries technology is not usually readily available, environmentally friendly technologies need to be transferred between firms or internationally introduced. Diffusion of appropriate technologies may be facilitated by independent entities that promote knowledge transfer between firms and stimulate trustful relationships among clusters. Training programs also play an important role, helping to build capacity building to achieve development objectives.
51. Before addressing international technology transfer, planners should focus on local and indigenous knowledge of a particular region. In fact, international technology transfer needs to be carefully adapted to guaranty successful local implementation. Thereby all intervenient stakeholders, including local government and local communities should be involved and social and cultural factors should be taken under consideration.
52. A successful EIC launched in urban-rural fringe area in Thailand - Chachoengsao shows the importance of technology transfer at different levels. This EIC involved agriculture and rice industries, small power producers and livestock holders. All these industries shared waste materials and developed new production chains, creating job opportunities, and enhancing pollution reduction through biomass power and biogas systems. This was a successful case study, however it was empathized that sometimes the lack of appropriate technologies prevent full resources recovery and complete reuse between the existing networks.
53. In order to realize technology transfers, governments should join with catalyst institutes to promote knowledge transfer. Adoption of green technologies is hampered by conservative attitudes prevalent in SMEs, who are reticent to adopt innovative technologies. But it was becoming evident that if clusters do not change their technology and become innovative, they could lose their international competitiveness, where they could lose to other clusters in another country. But on the other hand, the high costs of technology shift were also identified as a drawback of technology penetration in developing countries.

Financing Eco-Initiatives in SME Clusters

54. Although most often policy intervention is necessary to make EICs possible, most SMEs fail during the start up “death valley”, where financing becomes particularly difficult. The initial challenge is to get an engineering system in place, and obtaining start up funds. But once the business runs, there are more established forms of funding, including micro-credit and

venture capital. Once the businesses model is successful the firms can go and secure bank and capital market financing. This suggests that the “death valley” could be largely overcome by various financing channels: innovative micro-financing models, project financing, non-banking financial institutions, and the banking sector’s interest in promoting social development through industrial clusters, backed up by government regulations. But the trouble is that the market is not social or environmentally conscious, and financing is only concerned with profit.

55. When it comes to EIC financing, it also depends largely on how clusters form, whether they can come up organically or through government induced policy. When they come up organically, more private, non-bank financing options might sometimes be necessary. Where commercial banks are obviously profit oriented, they are also risk averse, or tend to minimize risks. The asymmetry of information in identifying credible clients, face adverse selection, and is a moral hazard. The huge cost involved, from actualizing ideas to making a viable product that sells, is a risk that banks usually want to avoid. So venture capital or micro-finance has a larger role to play here.
56. Microfinance is innovative and could become workable solution in financing start-ups, as it runs on informal finance based on social networking. Micro-finance as of recently is a new yet innovative approach to financing, yet interest rates are usually higher in order to cover up for the higher transaction costs, higher risk involved in lending without collateral. Micro-financing is driven by micro-financing institutions (MFI) innovative lending methodologies to reach poor or micro clients, with micro-loans, informal finance where banks have difficulty lending. The typical characteristics of micro-lending is that it is: short term, working capital loans, lending based on character, rather than collateral, sequential loans -starting small and increasing, group loan mechanism as collateral substitute, quick cash-flow analysis of businesses and households, especially for individual loans, prompt loan disbursement, frequent repayment schedules to monitor borrowers. This usually works to offsets the risks at the early phase of financing small and medium scale firms that are ideally within EICs. But the government needs to coordinate due to risks market failure and also to reduce disparity of income and poverty.
57. Usually during the start-up period, requires the government to assume risks. As banks and firms are both profit oriented, it largely depends on governments to promote initiatives, in coordinating policy, providing viability funding, and subsidizing technology adoption to improve environmental performance. Governments are crucial in bringing all the different institutions and stakeholders so that they can assess risk and address their appetite for financing. There are many replicable examples including the PURA as a development model in Namakkal eco-town in India, SEEDS in Sri Lanka that provided financing for solar lighting.
58. Banks are slowly entering into the micro-finance market, that could finance SME’s in a eco-cluster, especially in three ways: through NGO’s, creating specialized subsidiary microfinance arm, expanding their reach to cover poorer groups. But there are clear advantages of commercial banks entering into the microfinance market, as they would introduce: more stringent regulations (financial disclosure, capital adequacy, and financial prudence), their depository institutions (more funds), physical infrastructure (branch network), and internal controls (better administrative and accounting systems).
59. Micro-finance can be important to promote entrepreneurial activities, based on social networks to manage risk, this would also enhance the role of social capital required to promote EICs. The role of government is important as private sector and banks will not take the social and environmental issues into account; and the government can better judge the trade-off between profit and cost of adopting cleaner and efficient technologies and the

social benefits. While MFIs will eventually be important in providing better monitoring and screening services, this could be enhanced by government oversight and policy design through regulation and provision for subsidies. But once EICs get their business model and financing in place the externalities and spill-overs of clustering activities are huge both socially and environmentally. But the future is full of potential as many international banks are introducing green funds and there is a general trend in greening portfolios of banks lending through regulation.

Enabling Policies

60. Japanese policy experiences stressed the importance of a sound material cycling (SMC) based on the 3R – Reduce, Recycle and Reuse principles to promote sustainable development. An overview of the Eco-town projects that became successful EICs in Japan was achieved through policies that also foster development of environmental industries.
61. Japan had legislated different environmental laws to control solid waste, establishing SMC's, effective utilization of resources, and it had established its SMC plan, which fuelled SMC industries and eco-clustering activities. Other regulations that were introduced related to governing specific items according to their nature of environmental degradation, these including: container and packaging, home appliances, construction materials, wood waste, and end-of-life vehicles. The government's sustainable society policy was based on addressing climate change through creating a low-carbon society through reduction of Green-House Gases (GHGs), and the introduction of SMC through 3Rs. These policies were to become the basis of protecting the ecosystem and reducing the environmental load, and the SMC indicators for Japan suggest that there were tremendous improvement in resource productivity, cyclical use rate, and final disposal amounts in the last 15 years. Japan has had two SMC plans, and the 2nd SMC plan 2000-2015 aims at 60% increase in resource productivity, and 40-50% in cyclical use rate, and final disposal amount to be reduced by 60%. The market size of SMC business grew from 20.8 trillion yen to 29.7 trillion yen between 2000 and 2006 with a number of staff expanding from 530,000 to 630,000 for the same period.
62. The primary driver in Japan's EIC activities has been focused on recycling and establishing SMC's, in that regard the procedure for establishing eco-towns was explained. Eco-towns are initiated at the municipality level; where municipalities develop their eco-town plan, and they are sent for approval by METI and MOE and then financial support is given through these ministries. Many examples were provided including "The Coden Project" in Akita prefecture that sought to recycle small household appliances, e.g. phones, digital cameras, video cameras, headphones, game machines, portable radios collected at public facilities, and then sent for recycling. In Shiogama city, a unique project to collect cooking oil and producing bio-diesel fuel was implemented, which was then used by public vehicles owned by the local cooperative associations and their officials.
63. Promoting waste reduction, recycling, and SMC through EICs has also important at the international level, where Japan, Korea, and PRC already have an environmental dialogue at a inter-ministerial level. Though the problems are different, collaboration between stakeholders improves resources efficiency. Public awareness needs to be promoted, and this was a major reason Japan could reduce its industrial waste dramatically. As in Japan the private sector and local government were interested and integrating their efforts, similar ideas are believed to have potential also in the implementation efforts in PRC. Restricting the use of exhaustive resources has been an issue, and SMC has worked well in that regard. There were also discussions about the cost-effectiveness of exporting waste, but that also depends on the material, as this could lead to the emergence of recycling and

material refining hubs in different parts of the world.

64. Reduce, Reuse, and Recycle (3R) are important for business operating in EICs. Presently Japan has successfully implemented the 3R concept and maintains “zero emission” zones such as Kawasaki eco- town and Kita-Kyushu eco-town. It is a paradigm shift from an economic society based on mass-production, mass-consumption and mass-disposal to a sound material-cycle society aiming to achieve sustainable development by harmonizing environmental and economic goals. This is essential, in order to overcome resource constraints, environmental constraints and constraint on waste disposal.
65. Industry specific laws and regulations gave rise to eco-industries and establishing a sound material-cycle society through 3Rs, apart from regional development. Japan had developed an eco-town plan with the collaboration of local government, METI and MOE, and financial support for acquiring the hardware for these projects was also provided by the government. As of December 2009 there were 26 regions, which were approved as eco-towns. It was stressed that the future plans of the government was to build a recycling network in Asia, to that effect Japan has held policy dialogues and forums with Asian counterparts related to 3R policies. Japan–PRC Policy Dialogue on Resource Recycling, Japan-PRC Forum on Energy Conservation and the Environment and Green Aid plan policy dialogue with some Asian countries are some of the achievements.

Good Practices in Kawasaki Zero-Emission Industrial Complex

66. Kawasaki Zero-Emission Industrial Complex located in the Kawasaki coastal area, was promoted as a part of the city building plan established since FY 1999 and came into operation in 2001. The Industrial Complex Cooperative Corporation is comprised of 12 enterprises -metal processing, paper mill, plating, forging, and press work and other companies- that are all transforming themselves into social companies based on principles like LOHAS -Lifestyle of health and sustainability-. The complex aims at achieving the cyclical use of resources through reduction of emission and waste and reuse and recycling of such waste so as to minimize environmental impact. The operation of the facilities is characterized by the use reclaimed water, effectively utilizing electricity, and the use natural gas for transport among others.
67. Interesting details about the facility includes the fact that:
 - Environmental parameters were checked by the Environmental Bureau of Kawasaki City,
 - The cost of the reclaimed water was 1/10th of the actual cost of water from other sources,
 - Each company has its own ‘only one’ technology compliance requirements; even if one company does not comply it cannot be a zero-emission facility
 - It was evident that becoming a zero-emission facility was in fact very difficult, but it was mainly due to the fact that these companies were motivated as social companies.
 - The companies were subsidized, and were allowed to borrow at low interest rates (2.1%) with a 20-year repayment schedule.
 - Where Kawasaki was considered as extremely polluted around 40 years ago, the city has been able to change its image by creating such a zero emission complex and is geared for the future through the cyclical use resources.

Doing Business within Clusters

Innovations in EIC

68. Innovative eco services in IC are critical in IC transformation. While eco services are defined as the business-to-business services that replace traditional procurement of environmentally problematic goods and services, they have the potential to increase customer's resources efficiency. Typical efficiency services models include: Green Third Party Services, Chemical Management services, Resources Management Contracting, and Energy Services Companies.
69. The role that eco-services could play in transforming IC's into EICs, by bringing in environmental performance gains are many. Eco-services can transform the procurement of environmentally problematic goods and services into performance-based service arrangements that incentivize the service provider to increase the customers' eco-efficiency. Silicon Valley is an example where chemical management services could help transform IC's into EICs. In this model inter-firm network were critical in efficiently building awareness of eco-services and that EIC formation facilitator work via trade associations/clusters networks to build awareness of eco-services and provide trusted 3rd party information.
70. The policy implications were that there should be strong eco-services provider sector that should be able to disseminate and implement environmental best practices and build industrial ecology relationships. Eco-services success is dependent on risks attached to poor environmental performance. The success of eco-services depends in the customer's ability to understand total cost of environmental externalities. There exist effective strategies to maximize recycling materials flows within ICs in Asian countries which to a great extent depends on the costs involved with eco-services.

Adaptation and Scaling

71. Adaptation and scaling up issues are important for high tech sectors like biotechnology. It was found that government's crucial role in supporting these clusters, and environmental challenges that would need to be faced in order to convert these IC into EICs. Although biotech clusters were mostly located in the west and south of the India, Bangalore as a city had the largest biotech cluster in the country, as it provided favourable environment for scale up. The city is gaining prominence in the bio-tech industry apart from already being the IT hub in the country. The State of Karnataka where Bangalore is located already has premier institutes and has a single point contact to access the industries in the state, networked by the government.
72. Apart from a national policy, the state government has also been crucial in developing this cluster. The Millennium Biotech Policy of the state had already established the vision to start leading the country in the biotech revolution, and also has set up specific infrastructure for the development of biotechnology, by developing biotech corridors. The biotech industry has evolved by integrating the fields of biology, chemistry, and engineering and offering solutions in application oriented bio related industries (e.g. bio-pharma, bio-agri sectors). The biotech clusters in Bangalore are based on an association of hospitals, agricultural businesses, IT and other manufacturing industries, universities, research institutes, and government agencies. Thus forming a diamond of businesses of scale and environment with: context (policy, infrastructure, etc), factor input conditions (Natural resources, HR, and R&D, etc), Related and supporting industries (IT, Logistics), and demand conditions (market) as the four vertexes.

73. With biotech industry growing at really high growth rates, the industry is expected to raise environmental challenges in the foreseeable future. For example the solid wastes in bio-clusters in Bangalore is 2500 tons/day, of that 75% being compostable matter. The environmental challenges of biotech clusters are pollution, emissions, and waste management. With growing environmental regulations in India, it will become more important to manage waste, and control pollution. It was stressed however that most of the biotech clusters already have their own water recycling and solid waste treatments plants, where solid waste is incinerated and ashes later disposed. This was done according to international standards, and these facilities also had to conform to client requirements. Smaller firms still face difficulties in treating solid waste, water and government coordination in the future for eco-services could be necessary. But the government has been greatly successful in not only promoting cluster development in the IT industry but it is now developing Biotech clusters, but the environmental issues will be a challenge that require appropriate measures to be taken.

Networks

74. Business networking is important for effective resources utilization. The basis on which Maniwa wood EIC was created was through sustainable regional industries especially of wood resource for future and to develop wide-area industrial network on wood resource utilization. By involving business networks it was able to boost revitalization of the region and to boost competitiveness of the wood industry by active promotion of industry-academia-government collaboration.

75. The success of Maniwa EIC could be attributed primarily to the partnership and collaboration of industries, governments and academia who engaged their R&D to come up with innovative solutions. Business networking was crucial when it developed over several phases through study meetings, working group activities, research analysis and application, and pilot study with regional government involvement, in supporting recycling and managing waste in the cluster. The wood cluster was able to convert the huge amount of wood wastes such as wood shaving, wood pellet, chips, bark etc. into resources for new industries; resulting in the creation of new eco-products including lignin products, wood concrete, bio-plastics, coal and fuel etc. Moreover, it was stressed repeatedly that inter-firm collaboration was a must for human resource development, which in turn is pivotal in achieving sustainable development through EICs.

EIC as an Inclusive Business Development Model

76. The issues of inclusiveness, creating business incentives to get IC's into the 'green performance' mode, and the potential for developing eco-services and incentivizing 'green performance' continues to be a challenge for any EIC. Inclusiveness was seen to have direct employment benefits where the clusters were located, and other indirect benefits could be noticed (e.g. new supply-chain interactions). ICs also had direct social benefits, especially when they were located where there was a socially underprivileged section of the population, and through greening IC performance locals would reap environmental benefits. Otherwise clusters could, although be socially inclusive but in the end they would add to the risk of pollution and industrial waste affecting the livelihood of local population. It was identified that the main way to make businesses in ICs to consider 'green performance' was when production was localized, and there was a mechanism to socially evaluate whether they were adhering to environmental standards.

77. Environmental issues should not be regarded independently from social and economic

performance, as in the long run it would add cost and burden; the way forward would be to provide incentives to SMEs to use environmentally friendly production facilities, to successfully convert them into EICs. The realization of firms to protect the ecology of the area surrounding the industries would be a driver, and the benefits of a cleaner environment would benefit the locals. As the location of industries will allow benefit sharing among locals, it would require developing networked businesses, creating public-private nexus, through facilitators (NGOs and academia), improved technology deployment, enforcement of regulation (law and order), identifying available labour resources (development and training), and then environment would then become a business opportunity. Most crucial of all is the government support that would be provided through regulation, policy, finance, and infrastructure.

78. There were many examples where capacity building, infrastructure development, and education provide incentives to localize technology deployment in EICs. Practically speaking the fact is that most countries do not have an EIC framework for industrial development, so there is a need to understand the challenges in building EICs. Where market forces used for profit oriented products, but non-profit oriented businesses could become a social phenomenon like lifestyle products that would create their own market niche. It was considered safer when businesses also drive the organic formation of cluster development, where the location is justified in terms of resource availability, which will gradually call for product innovation, tax exemption, assess local need and demand, and infrastructure development. Promotion and dissemination of the idea of EICs as opposed to ICs was being realized as crucial, this could arise from networking in Asia that would expedite areas like clean development mechanism (CDM) financing.
79. The role of government and national planners in promoting EICs is critical for augmenting social capital, and realizing the full potential of urban-rural fringe areas. Social capital is important in catalyzing innovation, just by simply enhancing communication and allowing for more coordinated efforts. Local governments are especially important in this context, as they understand the local needs of societies the most. They can also promote a discussion forum to drive people, firms, and themselves to incentivize eco-services and also promote knowledge and public awareness on the area of EICs. The need to diffuse local stock in terms of technology and capacities first was emphasized as the priority before importing foreign techniques that could ignore applicability to local conditions. In fact a combination of local and foreign know-how, especially in a phase-by-phase manner was considered as a possibility to improve efficiency in resource utilization and in reducing waste.
80. Urban-rural fringe areas are ideal for EICs, but the difficulty arose as to how governments could incentivize clusters to form and how to produce what. Governments are important in allocating responsibility to concerned agencies to explore business potentials; this was explored using the case study of mushroom cultivation using rice straw in Thailand. Diffusion of green technologies and foreign technologies through foreign direct investments (FDI) also considered as sometimes pivotal, all though it cannot be done unconditionally and indefinitely. Thailand's 'One Village One Product' initiative was considered a successful example. Other policy options to encourage EICs included identifying suitable urban-rural fringe areas, establishing zones, buy-back guarantee's so that products from these EICs will be bought even if prices are higher, and offering subsidies.
81. Finance is critical to operationalizing EICs. There are common issues in obtaining the required finance and the feasible strategies to incentivizing EIC creation. The risks and the impediments are lack of government and private sector coordination, institutional barriers, lack of local and foreign partnership, credit guarantees, political instability (high risk) and corruption, as well as transparency in policy implementations. The feasible strategies include reducing risk (political risk, environmental risk, etc): by matching grants,

state-owned banks (soft loans), tax incentives, technology tax breaks, coordination between private banks and micro-financing institutions, and venture capital for linking SME finance to environmental performance.

82. The role of larger companies/clients within the EICs, such as MNC and the role of Multilateral Development Agencies are also critical. The role of larger firms in an EIC could be crucial in linking finance to environmental performance/compliance, which would strengthen management capabilities in that direction. Moreover, complementing micro-finance, SMEs seeking to take advantage of the economic “opportunity zone” created by clustering and can also support essential house hold social capital creation, such as education. As environmental problems affect the poor more, it is emphasized that the role of government is very important to set up EIC, and stressed the government commitment to reduce regulations to promote private investment, provide infrastructure facilities, assume risk of investment, and coordination problems in finance between state and federal governments.

Policy Challenges, Risks and Opportunities

83. Investment and technology transfers in promoting eco-industrial services between advanced economies and the rest of Asia is a challenge. The way forward is to focus on the local government involvement and private sector investment. To identify and select the best technologies, with recommendations for a bottom-up approach, in which local governments assess and analyze pros and cons of a certain technology and evaluate if it can be successfully implemented in their respective countries. Even in countries like Japan, the private sector involvement is the key, as eco-towns could only be created through the heavy investment not only from governments, but also by businesses.

84. SMEs have limited human, technological, financial and capital, and information resources, therefore the necessity of introducing EIC is crucial to support a nation’s long-term development goals. Official Development Assistant (ODA) institutions like JICA, provides two-step loans and technical assistance mainly to energy efficiency projects in SMEs, apart from providing financial and technical assistance in capacity building, calculating energy saving, CDM projects, and to network and cluster enterprises. There is a need for further enhancement of such technology transfer process, and JICA assists in awareness building amongst SMEs. The importance and role B2B interactions is significant, as at the end of the day a profitable business model is required to make EICs successful, complemented with the right policy mix and public sector involvement.

85. A lot can be done in terms of streamlining operations, so that businesses can easily integrate environmental standards and cooperate with governments. Although many countries already have put in place the environmental laws and regulation, and there also exist the tools (like System Approach in Europe and Circular Economy Law in PRC), the logistics and technology is still hampering environmental performance. Countries by and large have been approaching EIC, from an ‘industry and environment’ standpoint through EIP’s and Eco-industrial Networks, and in terms of ‘urbanization and environment’ through eco-city and eco-communities. Profitable business models, and incentives for eco-services are required, under the larger vision of sustainability; this becomes requisite in the wake of looming pressures like a future water crisis, especially when most industries are water intensive.

86. There are concerns in promoting EICs, such as: lack of knowledge, unavailability of adequate technologies and absence of best practice sharing, inadequate or non-availability of the specialized human resources to address environmental problems, local community

awareness, and involvement of private sectors and research centres. Creating a platform is crucial for knowledge transfer, so that past country and sector experiences among Asian countries could be shared, to promote dialogue among governments of developing countries.

87. The key factors that must be addressed by local and central governments during the policy-making process to promote EICs include resource identification, their effective utilization, and finding economic value from final disposal waste. The function of governments becomes invaluable in offering the necessary financial and legislative support to improve efficiency and environmental performance based on a sound material cycle, through policy dialogue among stakeholders (industries, Community based organizations, experts) and developing a governmental action plan.
88. EICs could be a development strategy for many countries in the way they grow and develop their industries. It is now being acknowledged that environmental issues are affecting growth and individual welfare, affecting agricultural and manufacturing competitiveness, public health, as a result of pollution is a grave concern as the poor get affected most. When it comes to business and development, there are many strategies like the flying geese and value-chain theories, but unfortunately none of them actually involve the environment. EIC offers a new virtual cycle, where each cycle enables growth that improves living standards. Another issue identified was that it is not only the policies and the legislation, as many countries already have the policy, private and public partnerships in place, but it is the operability and the results that matter. EIC can become a platform, in mobilizing social capital to cover environmental risks and it can provide vision in also improving economic indicators.
89. There is a need to use existing institutions and processes to create EIC as business opportunity. Kawasaki, Shenyang, and Bandung experiences show that urban-fringe areas have immense potential. The steps in EIC formation include conceptual definitions, vision statements, policy frameworks, and finally the action plans. The Asian lessons learnt from UNEP's experience was that the focus should be on the private sector as the core and create a constellation of stakeholders that support them including local governments, universities, citizen groups, customer groups, investors and banks. Apart from this a policy package was to be developed, through governance (regulation, laws), with education (awareness building) and technology provision. This will need to be done using business principles and vocabulary (e.g. cost-saving, reducing long-term costs) to encourage cooperation with and among firms.