

29. Decision Support EST Evaluation System for Sustainable Eco-Industrial Estates and Regions

持続可能なエコインダストリアルパークと地域開発の評価システム

○ Tsuyoshi Fujita, Shung Fung Chiu, Yoshiaki Tsuzuki, Per se Strutz

○ 藤田 壮*, アンソニー・チュー**, 都筑良明***, パーストラッツ****

ABSTRACT: This paper focuses on the application of EST guideline system on integrated urban management policies for sustainable regional growth or environmentally sound urban regeneration. It is to present strategic visions and guidelines for the environmental management for Kawasaki City, Japan, by providing significant and practical recommendations and strategies for Kawasaki City. This paper contains the following contents.

Firstly, planning system and driving schemes for Kawasaki Eco-town Project developments are provided. Relevant legal and financial systems of urban policies for Eco-town Projects are provided as well as project goals including the reduction of GHG for municipal urban programs are also provided. Secondly the research scheme to identify the function of Eco town project as a driving force for circular Kawasaki Metropolises is proposed. Extensive circular ties with neighboring factories; neighborhood metabolism or zero-emission districts, expansion on eco-efficient product chain management and core function for city-scale or waterfront zone circular economies are investigated.

KEYWORDS: Sustainable Regional Management, Environmentally Sustainable Technologies, Kawasaki City, Policy Options, Environmental Indicators

1. Backgrounds

Industrial Symbiosis (IE) is widely considered as one of the most effective policy and business concepts to realize sustainable developments, which are to reduce local and global environmental emission while providing feasible profits and motivations for business sectors, municipalities and citizen groups. While Kalundborg is argued as most advanced IS implementation over decades, a number of Eco Industrial Estates (EIPs) practices are planned and developed all over the world. Most of pursuing projects, unlike preceding Kalundborg case, are based more on their single stream industries or material flows.

2. Japanese Eco-town Schemes

Eco-Town projects have firstly developed in 1997 as subsidies. In 1997, four regions, including Kawasaki City, have approved as Eco-Towns. Nineteen regions have been approved as Eco-Towns up to March 2004. Basic concepts of Japanese Eco-Town projects are Zero-Emission Concept to formation of regional resource recycle type economic society, promotion of industries with emphasizing on environmental industries utilizing the local know-how, and joint cooperation of local governments, citizens and industries. An environmental eco-town plan (sustainable city plan) prepared by local government recognized as a model for

*Professor of Toyo University(2100 Kujirai Kawagoe City Saitama, 350-8585, Japan) 東洋大学工学部環境建設学科

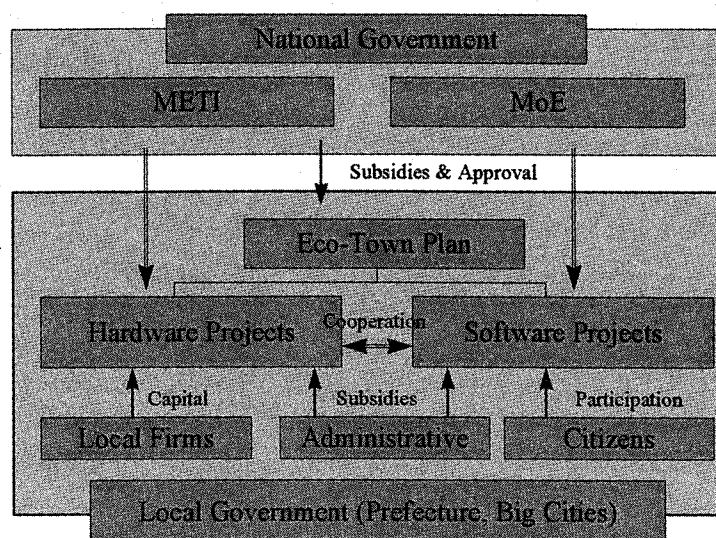
** Professor of De la Salle University (Manila Philippines) フィリピンでラサール大学産業工学科教授

*** Researcher of Chiba Prefecture Museum 千葉県博物館研究員

****Visiting Graduate Student of Tokyo University, 東京大学都市工学専攻訪問研究員

other local public entities and approved both by METI and MoE, will be provided comprehensive and multi-phased support.

Figure 1. Framework of Japanese Eco-Town project



3. Outline of Kawasaki, the Eco-Town Project

One major point to comment on the Kawasaki master plan is that it was made during the last economic “bubble” in Japan. This of course lays a different economical basis for what could be done today as continued growth was expected. Lately the industries in Kawasaki have been going down even if employment is still going up. One of the important goals of the EI-society is to ensure a stabile growing industry. The EI-society offer stabile workplaces. It also offers the possibility of the establishment of several new businesses. To assign value to waste and by-products will also increase the cash flow circulation in the society and make industry, commerce and households more aware of preserving resources. At this stage of the Kawasaki EIP it is important to decide on the long term goals in accordance with the Kawasaki city master plan. The Eco-Town program was initially established by Japanese governments to ensure the revitalization of various industrial areas in Japan. Steps taken to take the EIP into the second generation should include concentrating on a larger part of society by encouraging EIP collaboration on a national scale and concentrate efforts on larger national areas.

The Kawasaki Eco-Town project aims to create a zero-emission industrial park in which the activities of all stakeholders will be coordinated in an environmentally friendly manner. The zero-emission industrial park will be a resource-recycling industrial park. The individual industrial firms within the industrial park will not only reduce their own emissions, but also will effectively utilize or recycle the emissions from other facilities located there as usable resources. The firms also will collectively integrate their energy use to improve overall energy efficiency. In connection with all these efforts, the firms will strive to continually reduce the environmental impacts caused by their operations. It is intended that the zero-emission industrial park will serve as a hub of a resource-recycling society, from which zero-emission activities will spread across the entire region.

The goals of the Kawasaki New Age 2010 Plan include 1) transformation of land use of 130 ha, 2) employment increase of 18 thousands persons, and 3) private investment of 3.4 billion Japanese Yen.

Kawasaki City's coastal area, on which the Project To Make Kawasaki City Environmentally Harmonious centers, is broadly defined to include almost the entire stretch of the coastal area of Kawasaki City to the south of the JR Tokaido Line. This area is divided into four zones: a Residential Zone, to be located between the railway and Industrial Road; the First Coastal Zone between Industrial Road and the internal canal; the Second Coastal Zone, to encompass Ukishima-cho, Chidori-cho, Mizue-cho, and Ohgi-machi; and the Third Coastal Zone, to consist of the reclaimed land beyond Ohgishima, Higashi-Ohgishima, and Ukishima-Cho. The project concentrates on the area covering the First, Second, and Third Coastal Zones (the narrowly defined coastal area)

with due consideration being given to the broadly defined coastal area.

4. Eco-Industrial Park Research Proposal

This research project is proposed to contemplate the integral environmental and economic impacts of EIEs with the following procedures. Firstly, disaggregated area-scale material database are established on Geographic Information System (GIS) by integrating the statistical database and mapping data supplemented by assembling 'Eco Industrial Estate Reports' by interviewing companies from arterial business sectors to recycling industries and waster management sectors. Secondly, area-scale material flows are estimated for primary materials and products such as plastics, woods, organic woods, and non-ferocious metals based on the spatial distribution of industries and management sectors. Thirdly, an evaluation system to identify suitable symbiotic loops among different product streams as well as single loop stream loops are established and alternative new symbiotic loops are identified as extensive project development options by applying the evaluation system on case study EIEs, namely Kawasaki Eco-Town in Japan. Alternative additional loops are evaluated and compared for their effect to reduce environmental emission and direct business costs. Finally the further evolution of EIPs into multi-industrial symbiotic urban environmental management drivers is designed and their comprehensive effects are evaluated. Local symbiosis among EIPs and neighboring urban activities are considered, followed by the investigation of regional networking of the spatially contiguous EIPs.

(1) Design of Integrated Scheme for Disaggregated Material Flow Analysis of Industrial Symbiotic Accumulation

Database Platform, based on integrated Geographic Information System technology that provides natural, geological, demographic, socio-economic and industrial information. Platform systems are shared among different business sectors and municipal governments with GIS work as strong decision support tools essential for planning and management for extensive industrial symbiosis projects.

(2) Design of Eco-Industrial Estate Reporting System

Eco-Industrial Park Reporting System will be designed as practical and material flow and stock reporting system for business sectors and municipal governments and urban neighborhoods. The information in the Reporting should include each sector's Material Flow Inventory consists of the following information;

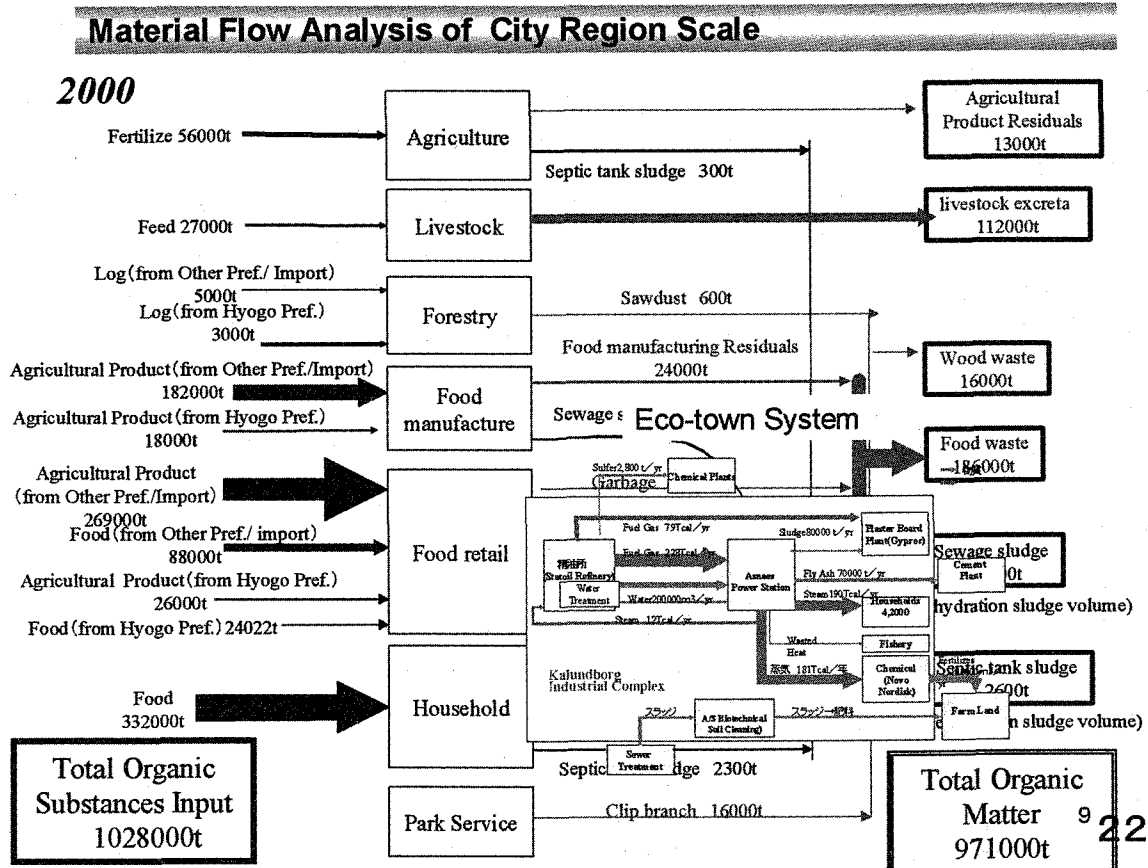
Reporting system should be provided with neutral, confidential, and beneficial schemes business sectors and municipal governments as well as citizens who will participate in the interview survey. Supervision from UNEP-IETC experts are incorporated into the reporting system and it will be preliminary experimented through implementation survey with core business members. Eco-reporting survey will be commenced with innovative recycling firms such as a cement maker, steel furnaces company, plastic recycling factories so that additional expansion of material recycling and expansion of collection boundaries are identified.

Eco-Industrial Reporting

- Quality and quantity and value, non-financial issues,
- Locational data, origin of inputs and destination of products and by-products
- Confidential annual reports initiated by research center frames or rules
- Experimental Survey of Company Material Flow Inventory in Kawasaki
 - Product, t, Yen/ day, month
 - Dominant Inputs t, Yen/ day, month
 - Five heaviest inputs in ton or inputs heavier than 10% of products, value, impacts
- Dominant by-products
 - Steel, Non-steel metal (particularly Pb, As)
 - Woods, Wet organic garbage
 - Plastics (PP, ABS, PVC, 5 categories as total)
 - Waste water (COD)

(3) Material Flow Analysis of Kawasaki Eco-town and Its Environmental Impacts on Surrounding Area

Based on the spatial distribution data base of material consumption and wastes and emissions, aggregated district-scale and city scale material flows are evaluated for carbon flow, nitrogen flow and water flows. Environmental impacts to apply alternative environmental policies on eco-towns such as accepting urban household wastes in addition to the current industrial wastes, enhancing green procurement in the surrounding urban and industrial sectors, implementation of innovative environmental technologies. Environmental impacts such as carbon dioxide and landfill garbages are evaluated as well as implementation costs.



5. Research Prospect

Research projects are driven under collaboration among municipal governments, industrial sectors, academic institutions, and governmental officials. The reporting system itself as well as tentative simulation results of implementing policy option will be provided.

NOTE This paper is based on the contribution of Global Environmental Center Foundation.

Reference

- Clinton J. Andrews; Industrial Ecology and spatial planning
- Draft Monograph, 2003 UNEP-IETC; Cities as Sustainable Ecosystems
- Judy Kincaid and Michael Overcash; Industrial Ecosystem Development at the Metropolitan Level
- Robert L. Axtell, Clinton J. Andrews, and Mitchell J. Small; Agent-Based Modeling and Industrial Ecology
- L.W. Baas and F.A. Boons; An industrial ecology project in practice: Exploring the boundaries of decision-making levels in regional industrial systems
- Christian Ludwig, Stefanie Hellewig and Samuel Stucki; Municipal Solid Waste Management –Strategies and Technologies for sustainable Solutions (Chapters 1,2,7,8)