Collaborative approaches to Green Economy of Industrial Sector: Eco-Industrial Park case

presented by Mi Hoon JEONG

14 March, 2018
Industrial Locations

- Industrial locations refer to spaces where industrial activities are performed

  - Planned Locations: Industrial locations developed by governments, public organizations or private enterprises in accordance with plans by selecting the locations with excellent conditions for the purpose of establishing and promoting a cluster factories.

  - Unplanned Locations: Industrial locations which are located at the areas other than industrial complexes and purchased and individually approved as factory sites according to individual enterprises’ needs and intentions including business conditions, geographical factors and land prices.

Purposes of Industrial Park Development

Systematic operation of the national land development programs including the industrial park development program

1) Regional development (UK) – developed countries
2) Industrialization (S. Korea) – successfully achieved industrialization in a short time through industrial park development – developing countries

(Source: Korea Industrial Complex Corporation (KICOX))
Problems of Industrial Complex

- **Pollution**: Air/Water/Waste problems, Odor, traffic Jam etc.
- **Industry**: Resource and energy cost raise etc.
- **Finance**: Real Estate cost etc.
- **GHG**: Strong Regulation on GHG/Certified Emission Reductions(CERs) etc.
- **Health Safety**: Hazardous wastes, heavy metal/explosive/Chemical materials etc.
- **Circumstance**: Qualities of life/Potential Crime (Nobody in complex at night/weekend) etc.

Industrial complexes: Complexes accommodating factories, industrial facilities and backward support facilities (such as residential and healthcare facilities)

Source: Dr. Dukgyu Han / KICOX
Circular Economy and Korean Eco-Industrial Park Initiatives

**EIPs?** Environment friendly industrial parks whose mission is to maximize resource efficiency and to minimize environmental concern by utilizing by-products from A company for resources/energy to B company.

**Conventional industrial parks**
- Economic benefit
- Focused on raw material, products
- Disposed by individual or groups
- Large quantity
- Causes pollution
- Environmental conflict

**Eco industrial parks**
- Economic & Environmental consideration for products, & by-products, waste heat
- Reuse and recycle
- Minimal/zero quantity
- Eco-friendly industry
- Community friendly
(EIP case) - Denmark Kalundborg

(http://www.symbiosis.dk/en/)

ASEM SMEs Eco-Innovation Center
(EIP case) Korea EIP - Industrial Symbiosis maps

EIP project 3rd Phase 12 EIP centers (5 Divisions), 105 EIPs

Metropolitan Division

Chungcheong Division

Honam Division

Dongnam Division

Daegyeong Division

ASEM SMEs Eco-Innovation Center
For 11 years, 1,831 companies participated, 66.2% (235) among 355 feasibility studies supported by EIP program went into businesses.

<table>
<thead>
<tr>
<th>Economic effects</th>
<th>Environmental effects</th>
<th>Social effects</th>
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<tbody>
<tr>
<td><strong>Cost cut from Raw Material Purchase &amp; Waste Treatment</strong>&lt;br&gt;Added Revenue from New Product Sales</td>
<td>Energy Saving (reduction of energy consumption)&lt;br&gt;<strong>Reduction of Greenhouse Gas</strong>&lt;br&gt;Reduction of Waste Discharge&lt;br&gt;Reduction of water consumption (Water saving)&lt;br&gt;Reduction of SOx, Nox emission</td>
<td>Promotion of new investment to recycle facility&lt;br&gt;<strong>Job Creation</strong></td>
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<table>
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<tr>
<th>Cost cut</th>
<th>Revenue</th>
<th>Sum</th>
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<tr>
<td>KRW 943 billion</td>
<td>KRW 1,479 billion</td>
<td>KRW 2,423 billion</td>
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<thead>
<tr>
<th>Energy</th>
<th>CO₂</th>
<th>1.73 million toe</th>
<th>8.54 million ton</th>
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<tr>
<td>Water</td>
<td>Air</td>
<td>6.85 million ton</td>
<td>11.09 million ton</td>
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<tr>
<th>Investment</th>
<th>KRW 761.3 billion</th>
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<tr>
<td>Job Creation</td>
<td>992 persons</td>
</tr>
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*KRW 1 billion ≈ USD 0.92 million<br>USD 1 million ≈ KRW 1.08 billion (March-02-2018)*
Small and Medium-sized Enterprises (SMEs)

- SMEs
  - “Industrial SMEs represent more than 99% of the total aggregated number of companies in most countries.
  - (EC 2007) In the EU-25, some 23 million SMEs provide around 75 million jobs.
  - (European Commission 2011) SMEs provide two out of three of the private sector jobs and contribute to more than half of the total value-added created by businesses in the EU. Nine out of ten SMEs are actually micro enterprises with less than ten employees.”

- Status of Korean SMEs
  - No. of Enterprises : 99.9%
  - Employment : 87.9%
  - Export : 37.5%

(Source: Improving Energy Efficiency in Industrial Energy Systems)

(Source: Korean Ministry of SMEs and Startups)
SMEs and Energy/Resource Efficiency

- **Some Challenges**
  - A lack of knowledge and information about new and modern technologies and measures in the field
  - A little investment capital for research and development as well as buying new technologies.
  - Limitations on Economies of Scale in resource circulation and industrial symbiosis

- **Energy efficiency measures for SMEs**  
  (Source: Improving Energy Efficiency in Industrial Energy Systems)
  - dominantly support processes for non-energy intensive industries

<table>
<thead>
<tr>
<th>Measures related to Support processes</th>
<th>Heavily capital-intensive production processes</th>
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</thead>
<tbody>
<tr>
<td>The processes needed to support the production processes but not directly needed for production</td>
<td>The processes needed to produce products</td>
</tr>
<tr>
<td>Soderstrom(1996) defined (11 production processes) decomposition, mixing, cutting, joining, coating, forming, heating, melting, drying/concentration, cooling/freezing, and packing</td>
<td>(7 support processes) lighting, compressed air, ventilation, pumping, space heating and cooling, hot tap water, and internal transport</td>
</tr>
<tr>
<td>-Implemented at an operational level</td>
<td>More closely concern Strategic activities</td>
</tr>
<tr>
<td>-Such as ventilation, space heating, lighting</td>
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ASEM SMEs Eco-Innovation Center
<Practice 1> Energy Efficiency for Surface Processing Industry

- Eco-Industrial Park project (Korea)

**Background**

- **Social problem**
  - Recognized as 3D and environmentally harmful industry
  - Poor working environment

- **Environmental problem**
  - Poor countermeasures for enforcing environmental regulation
  - Aging of processing facilities

- **Economic problem**
  - Rising costs for raw materials and energy
  - Increase in environmental processing costs

- 17 plating clusters in Ansan/Siheng Smarthub parks (222 enterprises in 2010), Electric energy efficiency is low (37%)

- Reduction of production cost and enhancement of company competitiveness by co-operation of environmental treatment facilities based on resource conversion through collecting of plating and PCB industry, utilization of alternative energy of electric power, establishment of fire prevention and clean process production

Source: Dr. Dukgyu Han / KICOX
<Practice 1> Energy efficiency Surface Processing Industry (continued)

Before after

Daeil Development (waste incineration company)

Incineration Steam 3,000 ton/year

Eco Green Center (26 small plating, PCB companies)

Electricity

Steam

Partly recycled

Waste Heat

Integrated wastewater treatment plant newly being operated

Quality Working Life (QWL) Project

Daeil Development (Incineration Plant)

Eco Green Center

P&P Cluster

KICOX*

ESCO funding

STX Energy (Power Plant)

Eco Green Center II

KEA*

MOTIE*

Private Sector funding

ESCO funding

KICOX provided land unoccupied

EIP constructed waste heat network

Electricity generation

Waste Energy

Waste Energy

*: public sector

Source: Dr. Dukgyu Han / KICOX
<Practice 2> Utilizing Waste Heat of Dyeing Industry
- Eco-Industrial Park project (Korea)

Source: Dr. Dukgyu Han / KICOX
Identified Potential Case: Steel company to neighboring paper companies (Vietnam)
Implications

- Economies of Scale
- Facilitator
- Creating Success stories and dissemination
- Government and International Societies’ support
Thank You for Your Attention.

Mi Hoon JEONG

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<Annex> Planned Locations vs. Unplanned Locations

<table>
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<tr>
<th>Items</th>
<th>Planned Locations</th>
<th>Unplanned Locations</th>
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<tr>
<td><strong>Strength</strong></td>
<td>Diverse tax and financial support</td>
<td>Acquisition of lands at lower prices</td>
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<tr>
<td></td>
<td>Easing of regulations on building area ratios and floor area ratios</td>
<td>Timely selection of locations at right places</td>
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<td></td>
<td>Favorable SOC conditions including industrial infrastructure</td>
<td>Easier disposition and expansion of factory sites</td>
</tr>
<tr>
<td><strong>Weakness</strong></td>
<td>Difficulties in timely acquisition of lands at right places</td>
<td>Complicated approval and permission procedures related to factory establishment</td>
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<td></td>
<td>Higher prices compared to unplanned locations</td>
<td>Lack of diverse incentives including tax support</td>
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<td></td>
<td>Restrictions of types of businesses of resident enterprises</td>
<td>Lack of support facilities like SOC, educational and cultural facilities</td>
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<tr>
<td><strong>Opportunities</strong></td>
<td>Minimization of environmental problems (clustering of factories)</td>
<td>Easing of regulations on corporations</td>
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<td></td>
<td>Synergy effects like promotion of clusters</td>
<td>Reinforcement of local governments’ support measures</td>
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<td></td>
<td>Job creation and ripple effects (combined complexes)</td>
<td>Easing of regulations on locations</td>
</tr>
<tr>
<td><strong>Threat</strong></td>
<td>Oversupply amid easing of regulations</td>
<td>Instability in real estate markets (fluctuations in land prices)</td>
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<td></td>
<td>Increase of financial costs for long-term residency</td>
<td>Increase of civil complaints about factory establishment</td>
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<td></td>
<td>Lack of flexibility due to fixed locations</td>
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(Source: Korea Industrial Complex Corporation)
<Annex> EIP project contributors (participants) in Korea

✔ Funding Source

Central Gov. (70%) & Local Gov. (20% : matching), Private Co. (10% : technology fee)

✔ Stakeholders

MOTIE
Budget for EIP projects
Technology fee
(10~40% of government funding)

Support for project management
Assessment board
(project selection for funding)

Finding : I.S. Project
Top-down proposal

Select based on Feasibility Potential
Bottom-up Project suggestion

Commercial Design
Profit Sharing Negotiation among Companies

EIP Centers

KICOX

Main Companies

Project Co.

Research funding (within 70% of necessary budget)

Research funding 10%

Research funding 20%

University/Research institute/Company

Local Gov.

Finding : I.S. Project

Select based on Feasibility Potential

Commercial Design

Profit Sharing Negotiation among Companies

Stakeholders

ASEM SMEs Eco-Innovation Center
<Annex> International Efforts of Eco-Industrial Park & Industrial Symbiosis

- **Basic EIP** (Korea EIP project)
  R&D based industrial symbiosis focusing on energy, water, by-products circulation in/for industrial parks
  - Economic effects (cost cut, revenue increase), Waste/wastewater reduction, GHG reduction, Job creation and related new investment

- **Industrial Symbiosis** in industrial parks and also elsewhere (urban, orchard..)
  - Industrial symbiosis not only limited to energy, water, material resources issues
  - Industrial symbiosis not only limited to for industrial parks
  - Eco-Industrial Park and Urban symbiosis

- **Sustainable Industrial Zone**
  - The basic EIP component and also other sustainable issues in Industrial Parks
  - ex) guidelines, industrial competitiveness, renewable energy, energy efficiency, waste management, water management, smart factories, other targeted issues
Annex: Data survey for Industrial Zone level Comprehensive Assessment

Examples of necessary data for data survey:
1. Zone layout, zone’s industrial overview
2. Energy, water, resource supply system
3. Wastewater and solid waste treatment system
4. Individual companies’ information
   - production, resource consumption, discharge

Some Criteria for selecting target companies:
1. High energy/water/resource consumption
2. Association of similar industries
3. Facilities affecting the zone level such as waste collecting and treatment, wastewater treatment system, power plant and incineration Plant