Eco-Industrial Park (EIP) Initiative in Korea

2014.2.19

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What is KICOX & Industrial Parks?
Korea Industrial Complex Corporation : KICOX
(Established by Korean Ministry of Trade, Industry and Energy)

51 Core Industrial Parks (47,000 Co.s) Supported by KICOX

Impact in Korea (‘10): 34% in Domestic Product, 39% in Export, 23% (0.8 mil.) Labors

National Industrial Complex  General Industrial Complex  Foreign Investment Zone  Rural Industrial Complex

Seoul  Namdong  Osong  Bukpyeong
Banwol Sihwa  Gunsan  Gunsan  Gumi
Gwangju  Yeosu  Daejeong  Ulsan
Gumi  Noksan  Changwon
**What does 1,009 Industrial Parks(I.Ps) mean to Korea?**

1,009 Industrial Parks(78,228 Companies)
make 58% Production/74% Export/43% Employment

- **Industrial complex Role in Korea(2012)**

<table>
<thead>
<tr>
<th>INDUSTRIAL COMPLEX</th>
<th>NUMBER</th>
<th>AREA (MILLION M²)</th>
<th>COMPANY (THOUSAND)</th>
<th>EMPLOYMENT (THOUSAND)</th>
<th>PRODUCTION (BILLION $)</th>
<th>EXPORT (BILLION $)</th>
</tr>
</thead>
<tbody>
<tr>
<td>National</td>
<td>41</td>
<td>567</td>
<td>48</td>
<td>1,120</td>
<td>637</td>
<td>267</td>
</tr>
<tr>
<td>Regional</td>
<td>510</td>
<td>481</td>
<td>23</td>
<td>681</td>
<td>289</td>
<td>151</td>
</tr>
<tr>
<td>Urban</td>
<td>11</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Agricultural</td>
<td>447</td>
<td>71</td>
<td>6</td>
<td>145</td>
<td>46</td>
<td>11</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>1,009</td>
<td>1,121</td>
<td>78</td>
<td>1,947</td>
<td>973(58%)</td>
<td>430(74%)</td>
</tr>
</tbody>
</table>

* GNP in Korea : As a Pillar of Industry, Change $87 In 1964 ➞ $23,700 in 2011
“Making Manufacturers in Industrial Parks have a Dream”

Korea Industrial Complex Corporation’s Goal

1. Upgrade I.P. (H/W · S/W Upgrade)
   - Driving QWL (Quality Working Life) Valley

2. Upgrade Customer-wanted I.P.
   - Customizing I.P. development
   - Factory lots analysis & control

3. Upgrade Companies’ Sustainability
   - Co’s Assist by Clustering Method
   - Eco-Industrial Park

4. Upgrade Infor. & Consulting Service
   - Factory Infor. & Consulting Service
   - Research & Development for I&P.
   - Society contribution Biz
Eco–Industrial Park Initiative in Korea
What is EIP?

**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
- Focused on raw material, products, & by-products, waste heat
- Reuse and recycle
- Minimal/zero quantity
- Eco-friendly industry
- Community friendly

**Integrated Producing Center**
- Raw Material
- Energy
- Waste
- Heat, Waste, Water, Air etc.

**Optimising Resource & Energy Efficiency**
- 3R + Tech
- Zero Emission

Korea Industrial Complex Corp.
# Summary of Korean EIP Project

## Legal basis
Act on the Promotion of the conversion into environment-friendly industrial structure Article21

### Responsible authorities
- Ministry of Trade, Industry and Energy (MOTIE)
- Korea Industrial Complex Corporation (KICOX)

## Project period

<table>
<thead>
<tr>
<th>Phase</th>
<th>Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st Phase</td>
<td>2005. 10 ~ 2010. 05.</td>
</tr>
<tr>
<td>2nd Phase</td>
<td>2010. 06 ~ 2014. 12.</td>
</tr>
</tbody>
</table>

## Target

<table>
<thead>
<tr>
<th>Phase</th>
<th>Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st Phase</td>
<td>5 regions, 5 complexes</td>
</tr>
<tr>
<td>2nd Phase</td>
<td>9 regions, 46 complexes</td>
</tr>
</tbody>
</table>

## 2nd Phase Project budget

<table>
<thead>
<tr>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Central gov.</td>
<td><strong>45.00</strong></td>
<td>7.50</td>
<td>7.77</td>
<td>7.38</td>
<td>7.74</td>
</tr>
<tr>
<td>Local gov.</td>
<td><strong>12.00</strong></td>
<td>2.68</td>
<td>2.55</td>
<td>2.37</td>
<td>2.22</td>
</tr>
</tbody>
</table>

* 2005 ~ 2013 ➔ $60 million gov. support + $11.7 million local gov. support

- Currency Exchange Rate (W1,000=$1) was applied
EIP Management System

Assessment committee
- Project evaluation,
  Review of key issues

KICOX (Headquarter)
- Planning & budget management,
  Evaluation of performance of regional offices

External assessment
- EIP project annual progress evaluation

Regional advisory committee
- Review, advise and recommendation for Regional projects

Regional EIP Center

Ministry of Trade, Industry and Energy
- Establishment of general policy

Assessment committee
- Project evaluation,
  Review of key issues

Regional advisory committee
- Review, advise and recommendation for Regional projects

Participating companies
- Tenant companies

Participating institutions
- University,
  Research institute

Cooperation organization
- Local government
Korea EIP Master Plan: (’05~’19)

- **2005. 11** 1st Phase: **Pilot** EIP with 5 industrial complexes
- **2010. 06** 2nd Phase: **Diffusion** on 46 industrial complexes with a Standard EIP model (EIP design project for Bangladesh Chittagong Economy Processing Zone: ’12)
- **2015. 01** 3rd Phase: **Edge Tech.** EIP Model including all industrial complexes

**1st phase Pilot period**
- 2005.11~2010.5
- Pilot on 5 industrial complexes

**2nd phase Diffusion period**
- 2010.6~2014.12
- Diffusion on 46 industrial complexes

**3rd phase Completion period**
- 2015.1~2019.12
- Construction of national EIP network
Korean EIP Initiative: R&BD IS Project

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

✓ Process
Identification ➔ Feasibility study ➔ IS business Implementation

- Top-down proposal
- Assessment board (project selection for funding)
- Research funding (within 75% of necessary budget)
- Support for project management
- Budget for EIP projects
- Technology fee (10~40% of government funding)
- Research funding (10%)
- Research funding (20%)
- Local Gov.
- University/Research institute/Company
- KICOX
- Main Co.
- Motie
- Finding: I.S. Project
- Select based on Feasibility Potential
- Commercial Design
- $$$ Profit Sharing Negotiation among Co’s

Select based on Feasibility Potential: I.S. Project
Industrial Symbiosis Network Development Process

**Identification**
- Expert Forum: clustering
- Coordinator Scheme
- Material & Energy DB
- Regulation Relaxation
- Bottom up types
- Companies’ Network consulted by objective C,D,s

**Feasibility**
- Offer: Investment plan
  - Green R&BD: BAT
  - Facility Network
- Cost Effective plan etc

**Implementation**
- Actualization of Benefits
  - Auditing Network companies’ input
  - Reasonable Profit sharing
  - Marketing & Contracting
  - Regulation matters

Supply Company

by-product energy

Catalyst Company
(3R)

by-product energy

Demand Company
Benefits of EIP Initiative

**For the society**
- Developing a bond of sympathy and spreading awareness of effective use of resources in industrial complex and prevention of environmental pollution
  - Expanding participating companies and complexes
  - Building network in domestic/abroad industrial ecology

**For the government**
- Contributing to low carbon green growth and maximizing the project result by building network between companies
  - Reducing GHGs and waste
  - Strategy against Climate Change
  - Attracting private investment and making new job openings

**For business**
- Improving environment and creating added value by participating resource recycling project
  - IS Implementation by equipment investment after supporting projects
  - Saving costs of material and disposal, increasing sales

**For industrial complex**
- Improving the image of industrial complex
  - Attracting new business by fundamentally eliminating pollution
  - Supporting for training, seminar, PR, business consulting
EIP Outcomes and Excellent Cases
Input (Initial Investment)
- Facility investment: steam and CO₂ pipe (total 3,872m) the cost of equipment: $22.0 mil.

Output (Business scale: steam 50~80 ton/hr, CO₂ 50 ton/hr supply)
- Reduction of greenhouse gas emission: CO₂ 63,643 ton/yr (about $0.7 mil./yr)
- Cost Cut from raw material & waste reduction: $6.6 mil./yr
Industrial Symbiosis Network in Practice—Example 2

Waste-to-Energy and Fertilizer Networks among Rural, Urban and Industrial Sectors

Bio-Gas Facility
(Bio gas 9,000m³/day generated)

50 ton/day Animal Manure
100 ton/day Food Trash

Before after

Steam 91.2 ton/day

HanKuk Paper Co.

Steam

B–C boiler

ChengRim Bio Co.

Steam

Fertilizer 8.8 ton/day

✓ Input
Facility investment : $1.2 million

✓ Output
Reduced greenhouse gas emission : 4,757ton/yr
Energy saving : 2,037TOE/yr
Steam sale and cost cut from energy saving : $1.8 million/yr

Korea Industrial Complex Corp.
Steam Highways for industrial competitiveness and energy efficiency

- **Expectation:**
  - (Economy) $19.7 million/year energy supply & cost cut
  - (Environment) 48,470 ton GHG (CO₂) Reduction /year

- **IS PPP:**
  - (Public sector) invested a steam pipeline (highway) with several entrances and exists, to facilitate steam networking among companies in the area
  - (Private sector) participated in the network development to reach their own facility
Outcomes (by 2013)

Project: 452 Found ➔ 296 Supported ➔ 205 Completed ➔ 118 are in Business
(57.6% among completed IS R&D projects are in business)

Economic effects
- Cost cut from Raw Material & Waste Reduction
- Added Revenue from New product Sales

Environmental effects
- Reduction of energy consumption
- Reduction of greenhouse gas emission
- Reduction of solid waste emission
- Reduction of water consumption
- Reduction of SOx, NOx, emission

Social effects
- Promotion of new investment to recycle facility
- Job creation

'13 Outcomes From New Project (USD$ Million/yr)

<table>
<thead>
<tr>
<th>Cost cut</th>
<th>Revenue</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>34.0</td>
<td>20.3</td>
<td>54.3</td>
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</tbody>
</table>

Outcomes ('07~'13) including previous projects

<table>
<thead>
<tr>
<th>Energy</th>
<th>CO₂</th>
<th>By-product</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>55Ttoe/yr</td>
<td>734TTOE</td>
</tr>
<tr>
<td></td>
<td>190Tton/yr</td>
<td>3,298Tton</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Water</th>
<th>Air</th>
</tr>
</thead>
<tbody>
<tr>
<td>45Tton/yr</td>
<td>2,541Tton</td>
</tr>
<tr>
<td>48Tton/yr</td>
<td>568Tton</td>
</tr>
<tr>
<td></td>
<td>774Tton</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Investment</th>
<th>Job creation</th>
</tr>
</thead>
<tbody>
<tr>
<td>117.3</td>
<td>108</td>
</tr>
<tr>
<td>376.5</td>
<td>514</td>
</tr>
</tbody>
</table>

* Currency Exchange Rate (₩1,000=1$) was applied
BM learning → Sharing BM

Global network for capacity building activities

1. Bangladesh (Dhaka, Chittagong)
2. Indonesia (Cikarang, Lippo)
3. Denmark (Copenhagen)
4. China (Kuangchou)
5. Japan (Kawasaki)
6. India (Mumbai)
7. China (Nanjing)
8. Thailand (Bangkok)
9. United Arab Emirates (Abu Dhabi)
10. Denmark (Kalundborg)
11. Germany (Munchen)
12. Republic of Korea (Ulsan)
Global network for capacity building activities

ISIE 2013
Participants

65

400+ Participants

1 38 Countries
Korean EIP project aims at the collective innovation of the industrial complexes by *reduction, reuse* and *recycle* of resource and energy by developing innovative *industrial symbiosis* networks.

The EIP project in Korea is benchmarked by the international society. Now it is striving to share the philosophy of EIP with international community for greening the world.

Technological innovation alone is not sufficient to fulfill the objective. *Social, cultural and mindset innovations* often play key role during symbiosis development.
Thank you!