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Urban Symbiosis as Innovative Actions for SDGs

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A sustainable development is a:

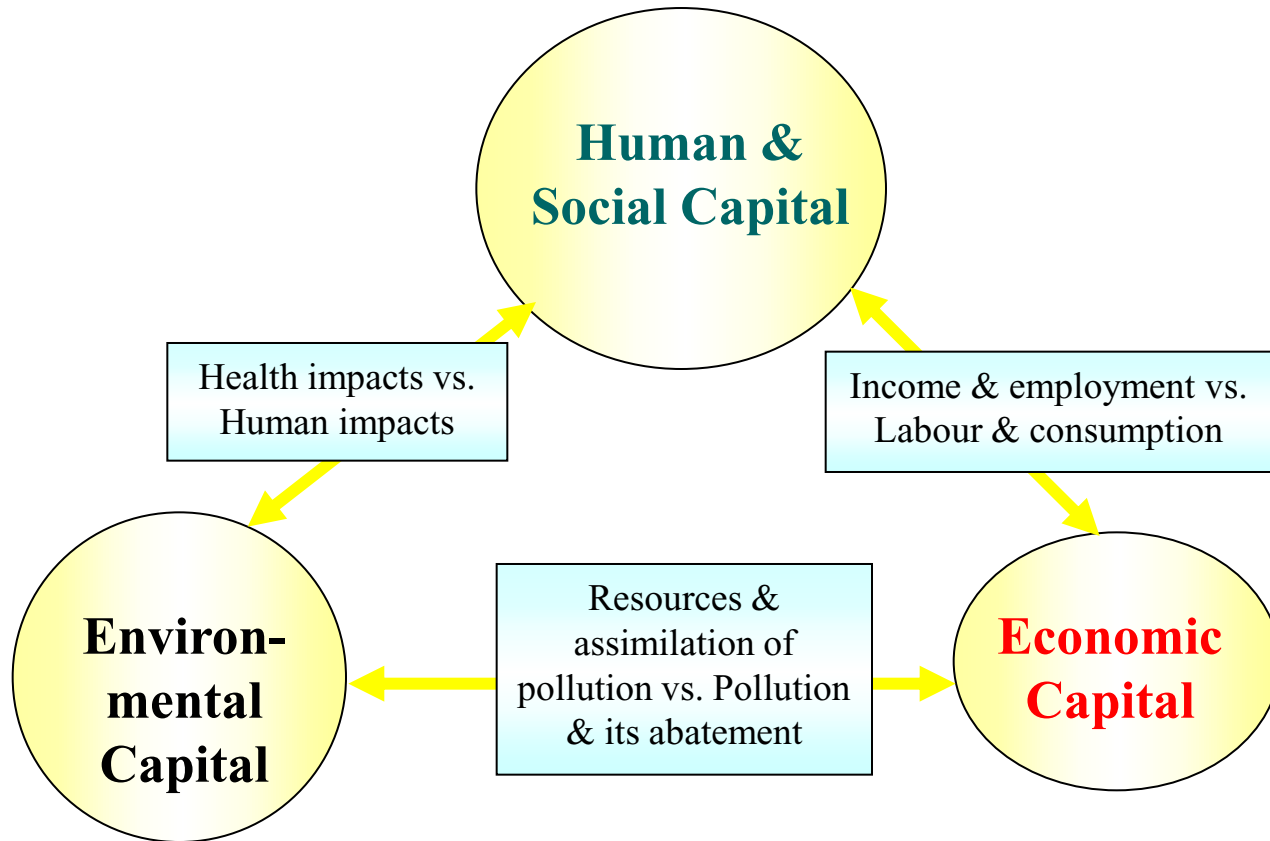
"development that meets the needs of the present without compromising the ability of future generations to meet their own needs."

(Our Common Future, by the World Commission on Environment and Development, 1987).

Why SD ?

- The world's population is now at 7.6 billion, and estimated to grow to 9 billion in the next 20 years.
- Since 1971, global energy use has increased by 70% and is expected to rise 2% per year in the next 15 years. This will increase greenhouse gases by 50% over current levels.
- Natural resources (e.g. soils, forests, fish aquatic habitats) continue to decrease in quantity due to fires, pollution and human influences
- In the developing world, one in every five persons lives in extreme poverty and many associated social problems result: disease, disintegration of family, crime and use of drugs.
- Life supporting ecosystem such as water, soil and air have been degraded due to high pollution levels.

SD means optimum use of Economic, Social & Environmental Capital



Some Interactions Between Economic, Social and
Environmental Capital

From MDGs to SDGs



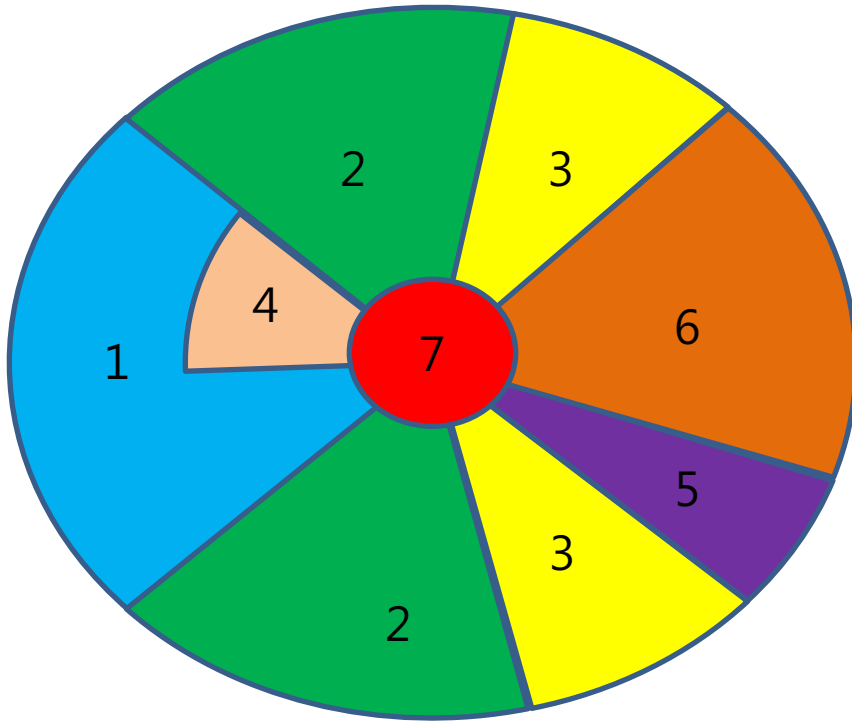
Our Cities, Our Homes

- Cities are now home to more than half of the world's population and by the year 2020 it is estimated to reach 80% of the total population;
- Cities drive economic development and deliver many public services such as education, healthcare and transportation; but they are also associated with environmental degradation, congestion and economic and social exclusion
- Today cities account for more than 80% of the world's greenhouse gas emissions and the cost of adaptation to climate change estimated around 80-100 billion per year

Four major trends in Cities

- Proportion of global population living in urban areas is increasing
- Number and size of urban areas is mushrooming
 - **Megacities, hypercities**
- Urban growth slower in developed countries
- Poverty is becoming increasingly urbanized; mostly in developing countries

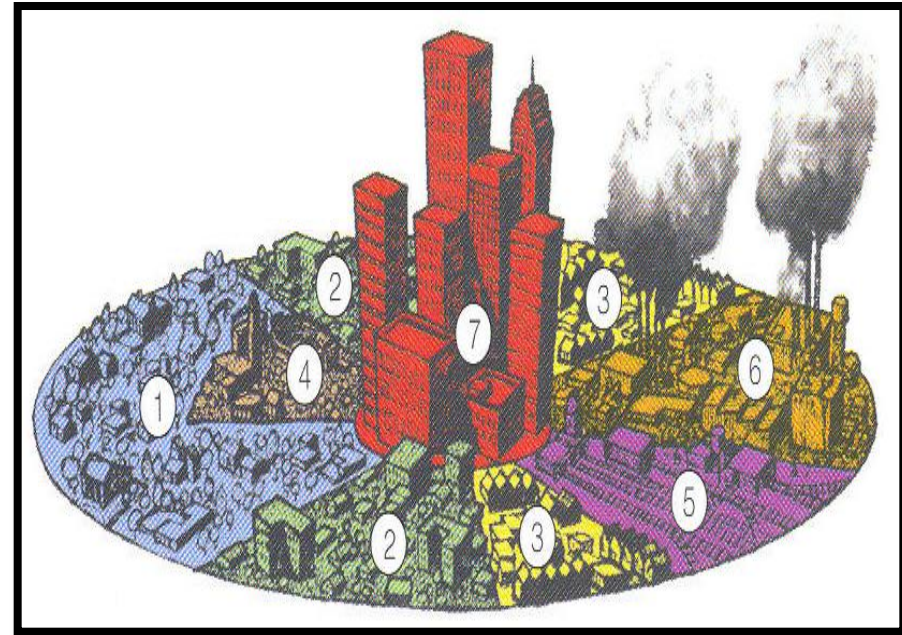
Cities: Complex Organisms



1 High-rent Residential

2 Intermediate-rent Residential

3 Low-rent Residential



4 Education and Recreation

5 Transportation

6 Industrial

7 Central Business District

Cities: Complex Metabolic Organism

Resource Inputs

*Population &
Human Capital*

Stocks:

- Land
- Housing
- Industrial Infrastructure
- Transport & Utility
- Materials
- Energy
- Water
- Food

Urban Systems & Processes

Urban Governance
Technological Sophistication
Urban Design &
Development
Industrial and Organisational
Processes

Supply & Demand:

Energy, Water, Food and
Transport

Liveability: Human Well-Being & Environmental Quality

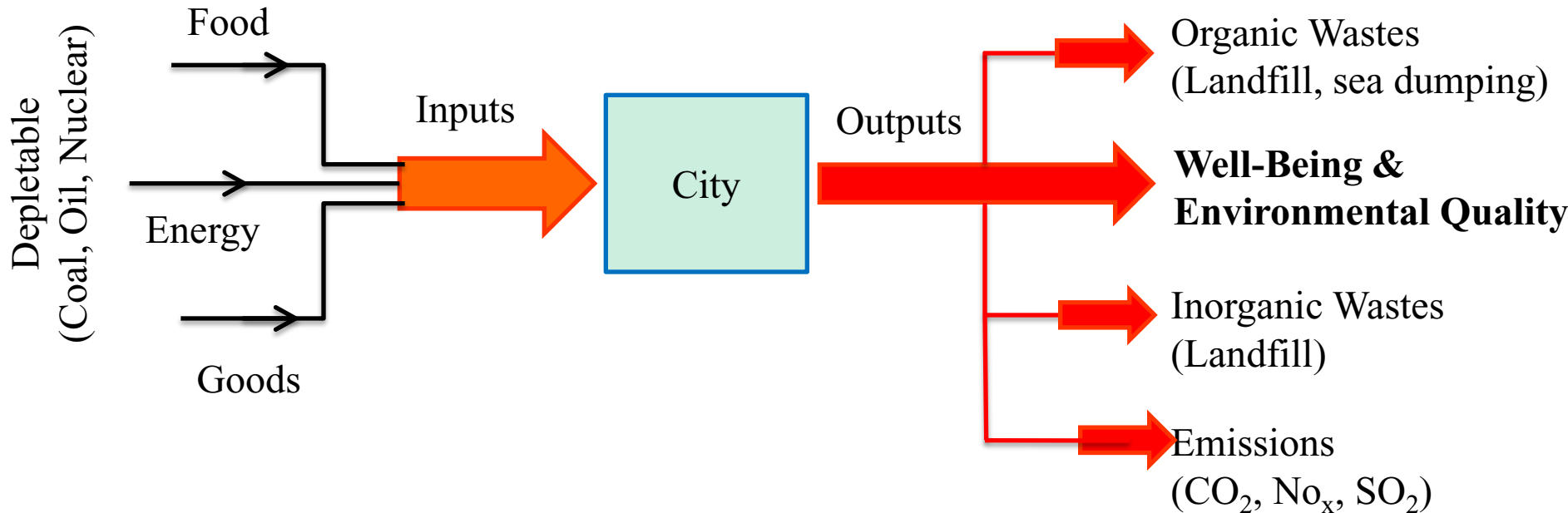
- Housing Quality, Affordability...
- Transport Access, Congestion...
- Social and Economic Well-being, Equity...
- Environmental Health
- Culture & Heritage
- Indoor Air Quality
- Noise

Waste & Emissions/ Recycling & Reuse

- Solid, Liquid & Hazardous Wastes
- Wastewater
- Air Pollution, Greenhouse

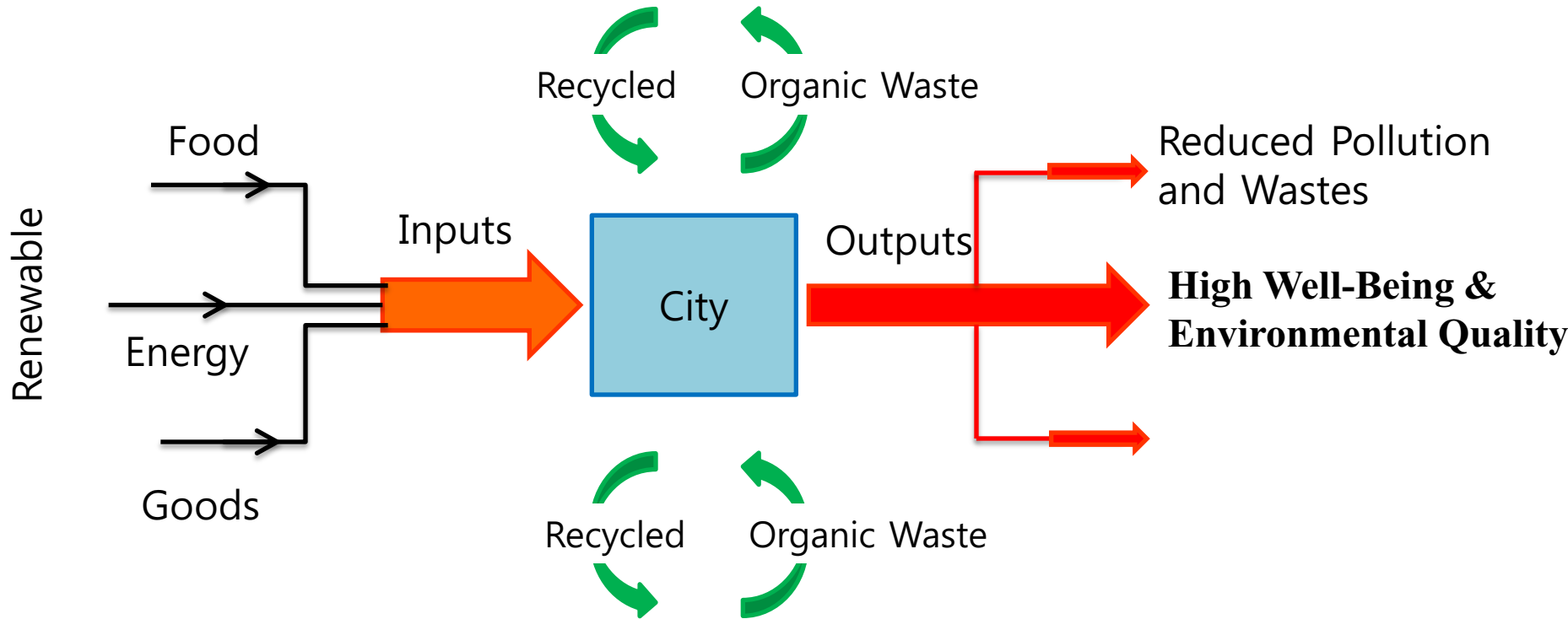
The City as a Metabolic System

**‘Linear metabolism’ cities
(consume and pollute at a high rate)**



Sustainable Circular Urban Metabolism

'Circular metabolism' cities
(minimise new inputs and maximise recycling)



How do we can make city sustainable ?

by Eco-innovation

- eco-innovation is “any form of innovation aiming at significant and demonstrable progress towards the goal of sustainable development, through reducing impacts on the environment or achieving a more efficient and responsible use of natural resources, including energy” (Union 2006).

> International survey on eco-innovation parks

Learning from experiences on the spatial dimension of eco-innovation



Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Confederation

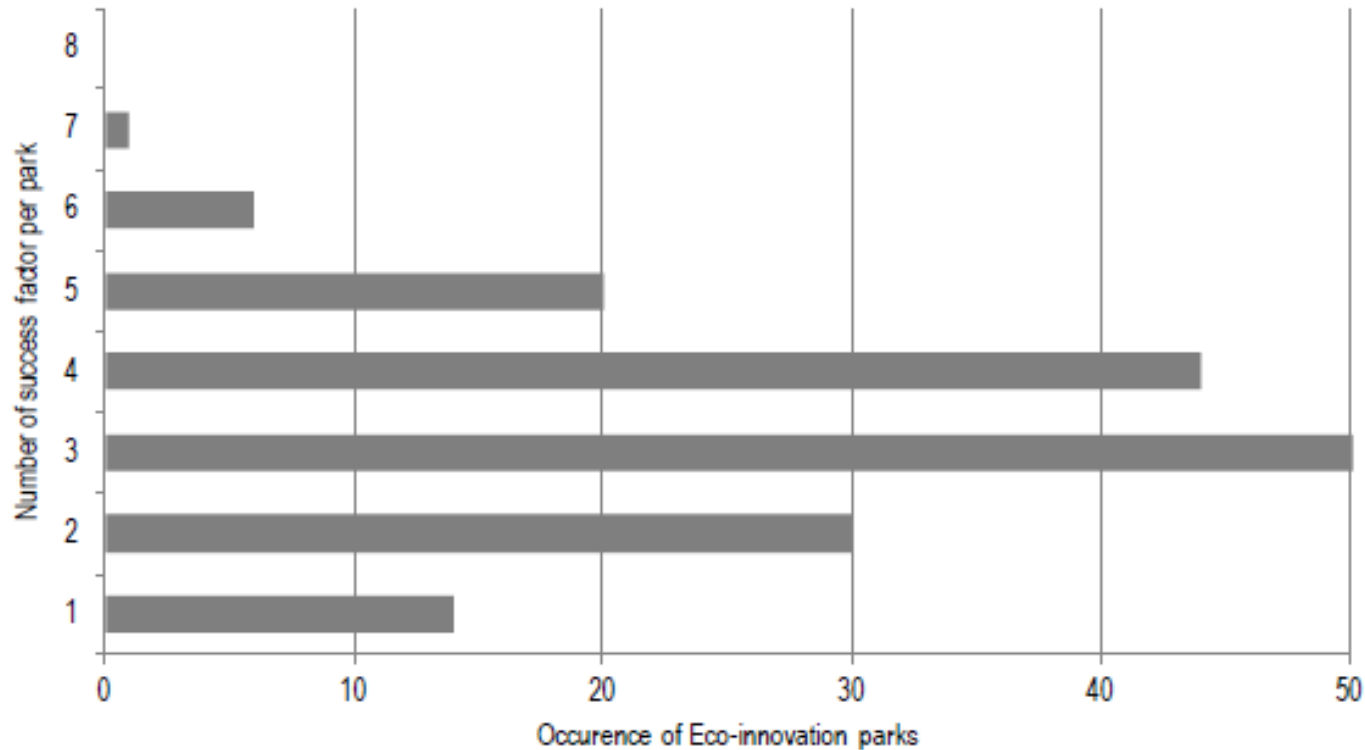
Federal Office for the Environment FOEN



List of Eco-Criteria (ERA-NET ECO-INNOVERA, 2014)

Energy efficiency	Optimization or reduction of energy use, including energy needed for buildings and other infrastructure as well as for industrial production
Renewable energy sources	Use of and/or onsite production of renewable energy. This includes solar energy, wind energy, hydropower, combined heat and power (CHP), energy production based on waste, geothermal energy, tidal/wave generated energy, biofuels
Waste management	Onsite collection, transport, onsite or external processing and recycling or disposal of waste
Water management	Onsite wastewater treatment, reduction/optimization of water use for infrastructure and production
Material/chemical flow	Synergies, exchange of materials (chemicals, waste, etc) among companies, inter-firm collaborations. Input-output scheme as theoretically defined by industrial symbiosis
Biodiversity	Biodiversity conservation or revitalization of ecosystems in the industrial/urban and surrounding area
Mobility, transportation	Efficient viable transport of goods or person with low environmental impact (e.g. public transport, electric vehicles, plug-in hybrids, carpooling systems)
Land use	Optimization/reduction of land use for industrial/urban infrastructure, revitalization of derelict land
Air pollution prevention	Reduction in pollutant emissions through cleaner production processes or implementation of end-of-pipe technologies
Noise prevention	Reduction in noise emissions through cleaner production processes or implementation of end-of-pipe technologies
Environmental management systems	Certification and labels with environmental standards at the park scale such as ISO 14 000 or EMAS
Cultural, social, health and safety	Cultural aspects include the preservation of cultural diversities and valorization of local specificities; Social aspects include gender equity, professional reintegration, child care, integration of disabled persons; Health and safety aspects include a safe and clean natural and working environment in the industrial/urban and surrounding area

Distribution of success factors among Eco-innovation parks

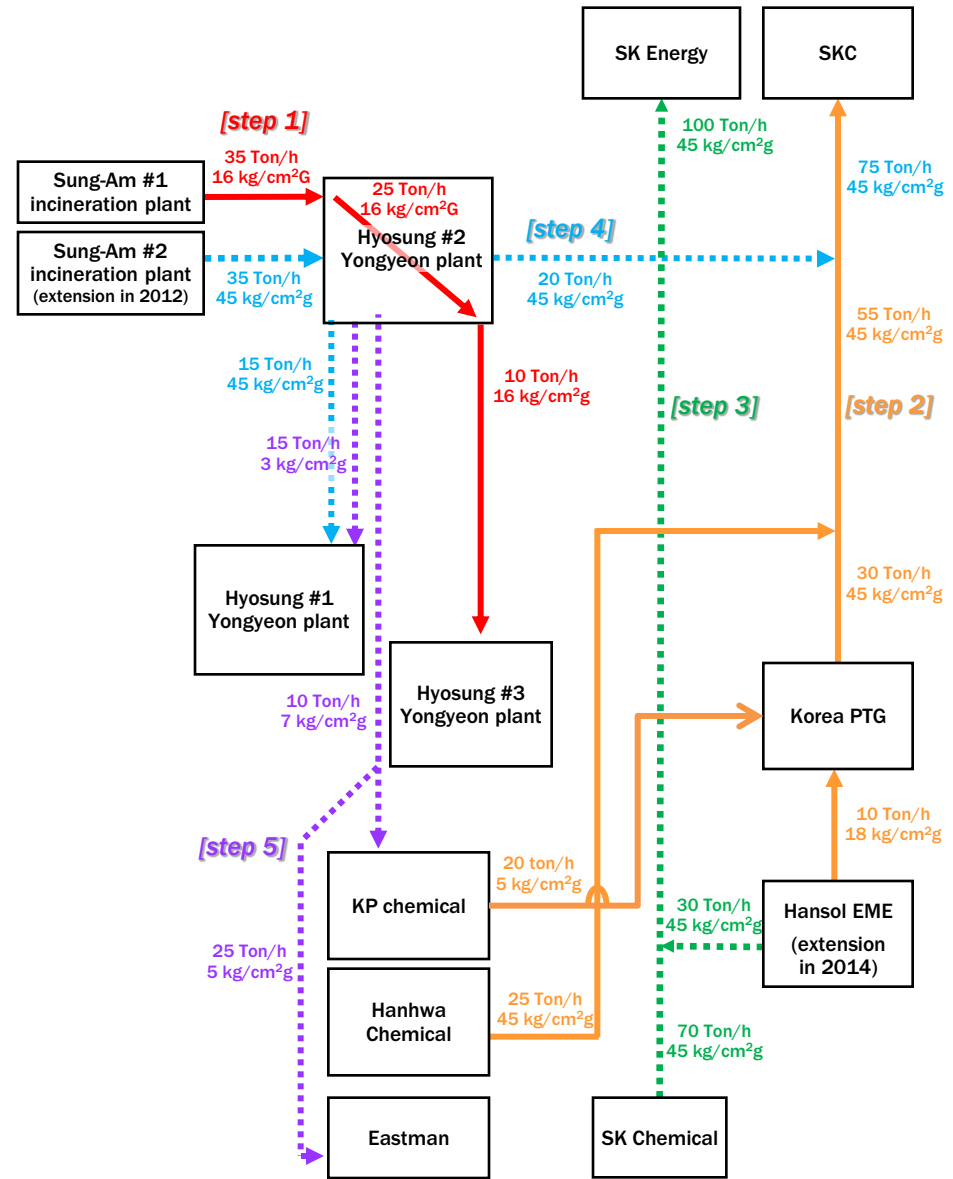
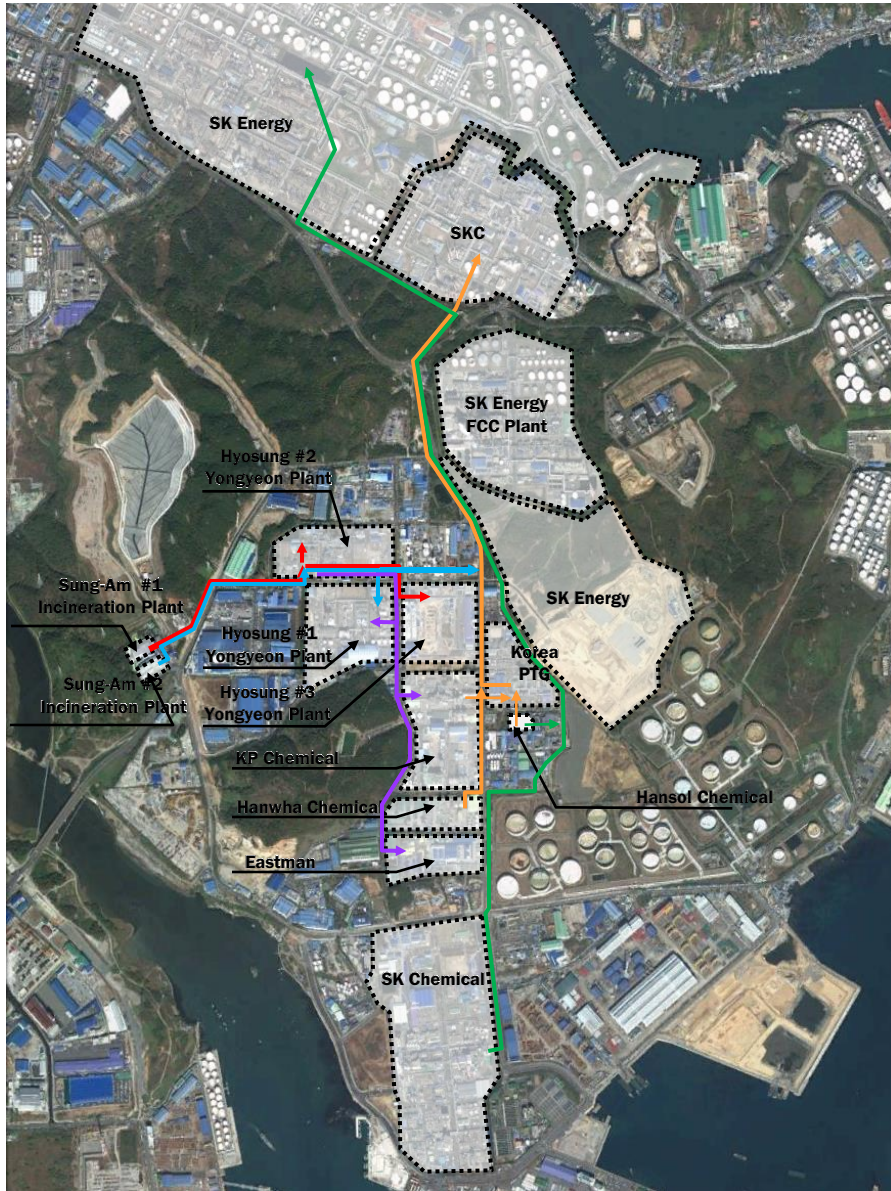


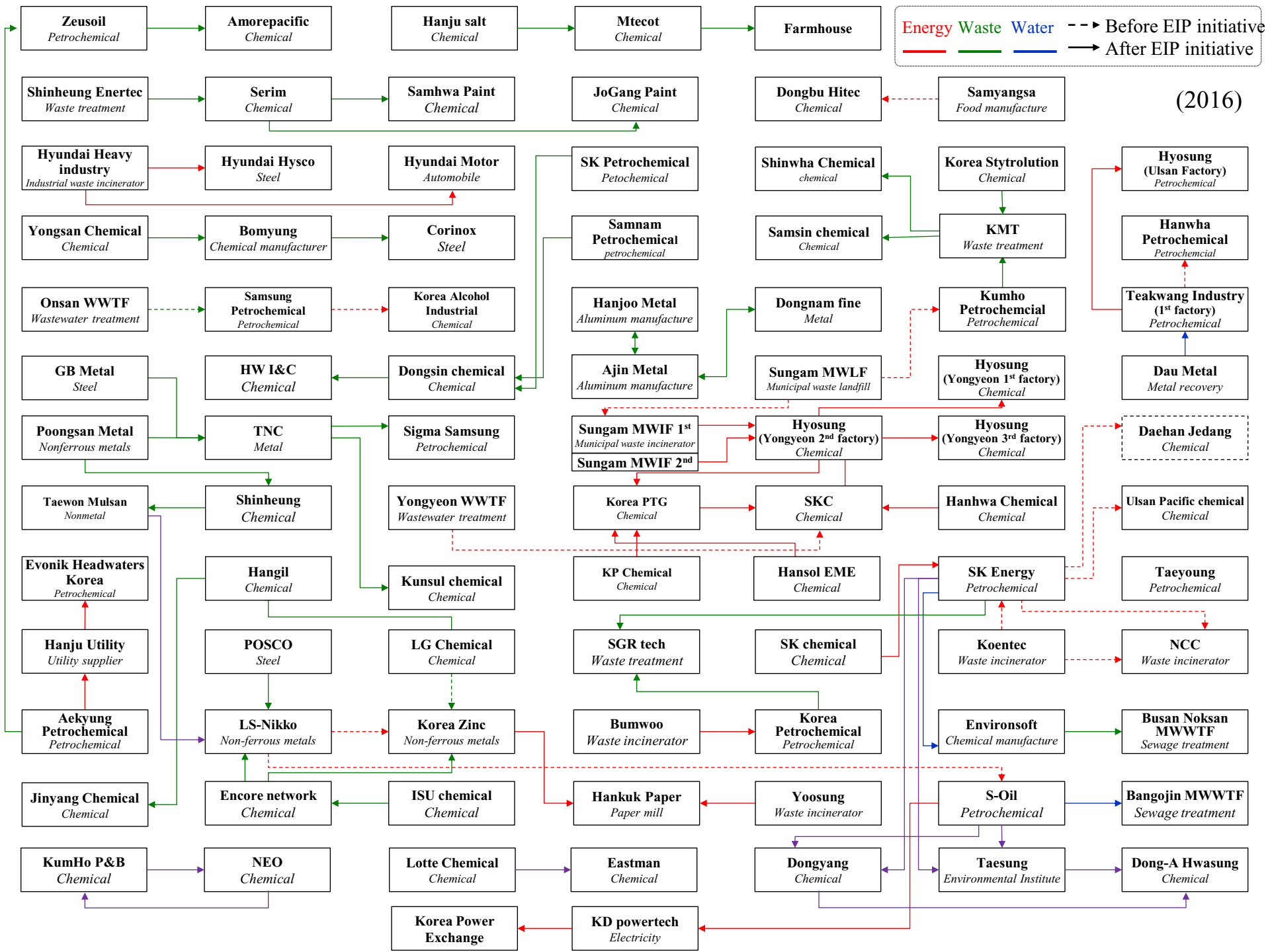
For almost all identified eco-innovation parks a combination of success factors is identified (Fig. 10), confirming multiple-level approach as a prerequisite to favor successful development and implementation of eco-innovation. The Mipo and Onsan EIPs (South Korea, Park no. 153) show the highest number of success factors.

Spatial dimension of eco-innovation

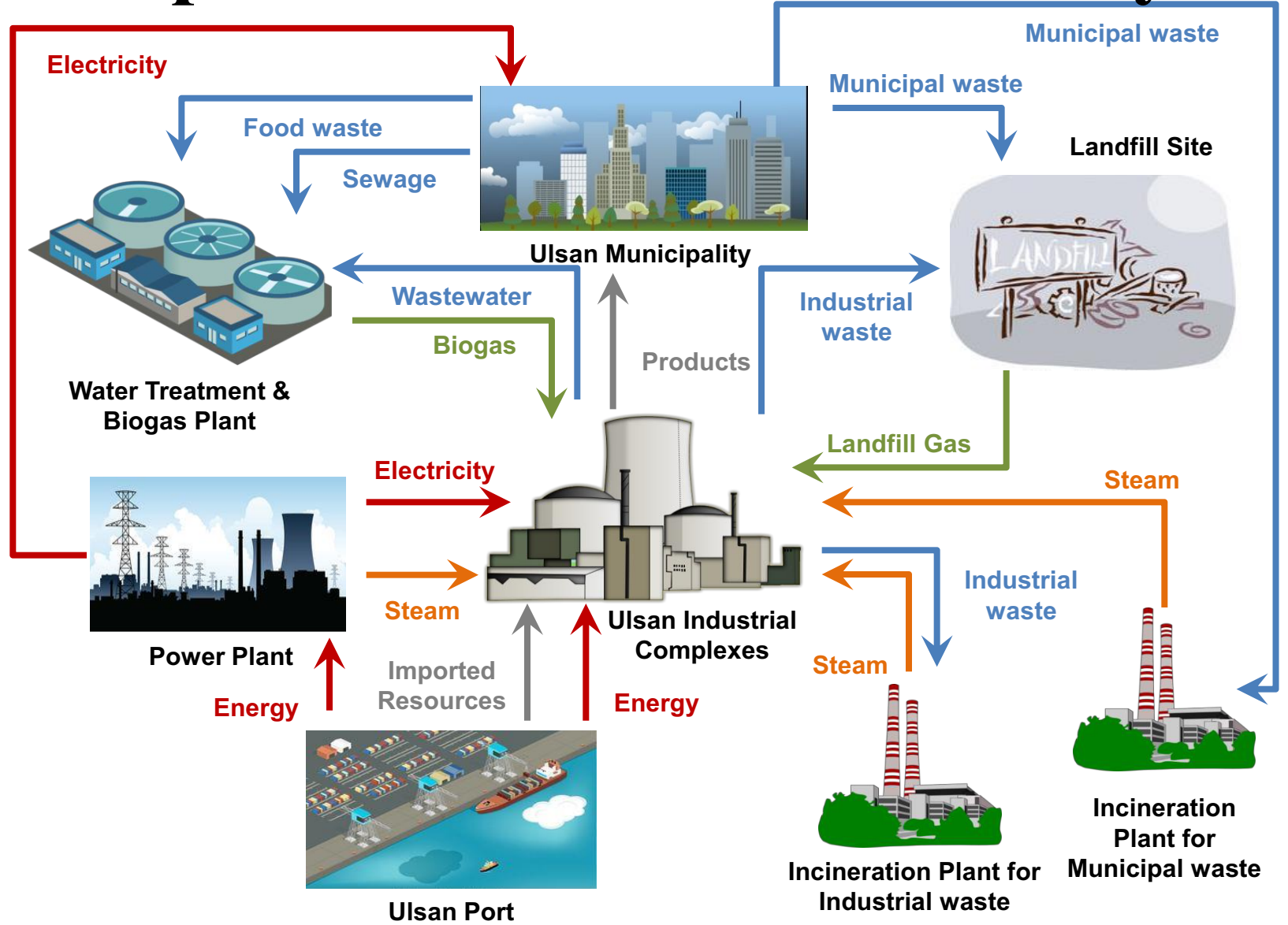


IS and US in Ulsan, Korea





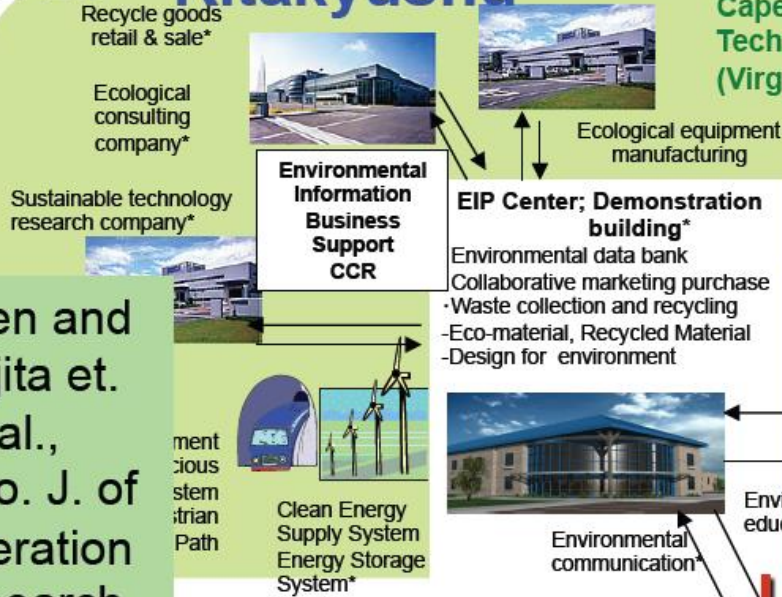
Concept of SD Based on Urban Symbiosis



Variation of Eco-Industrial Parks(EIP) Strategies in Eco-towns

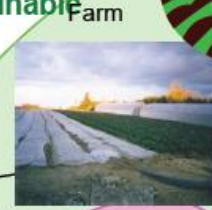
URBAN REDEVELOPMENT TYPE EIP

Kitakyushu



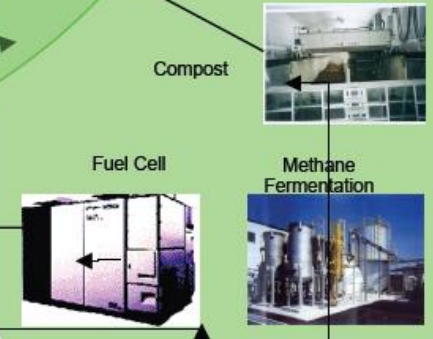
Chen and Fujita et. al., Euro. J. of Operation Research,

Green Institute (Minneapolis) Rural Area Cape Charles Sustainable Technology Park (Virginia)



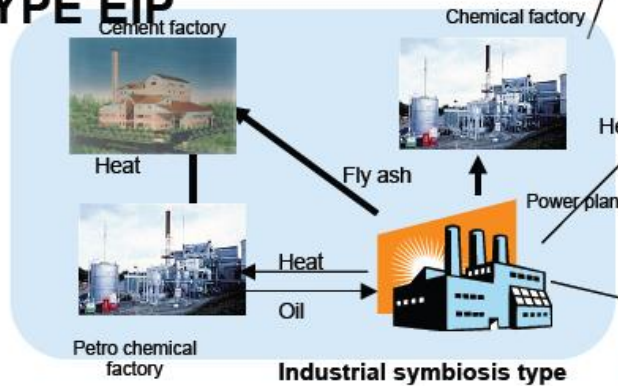
CITY-FARM COLLABORATION TYPE EIP

Hokkaido



INDUSTRIAL SYMBIOSIS TYPE EIP

2013 Kawasaki, Minamata



Urban Area



Brownfield Neighborhood



Industrial complex

Akita, Osaka



PRODUCT REMANUFACTURING TYPE EIP

Kawasaki, Minamata

(Fujita, 2015)

Water Front

Socio-Economic Infrastructure System

CROSS-SCALE POLLUTION AND RESOURCE FOOTPRINT

Extraction

CROSS-SCALE INFRASTRUCTURES

End-use

Natural System



Industrial Ecology



A CITY'S POROUS BOUNDARY

Urban Metabolism



Urban Ecology



Social System

Policy Actors;
Infrastructure Designers and Operators

Individual
Users

Global Scale

CROSS-SCALE INFRASTRUCTURES

Home Scale

Global Climate

Regional Water Impact & Air Polln.

Urban Heat Island

Indoor Air Pollution

2013 ISIE Conference held in Ulsan

Co-organized by Korea, Japan and China



Standardization of Eco-industrial Park

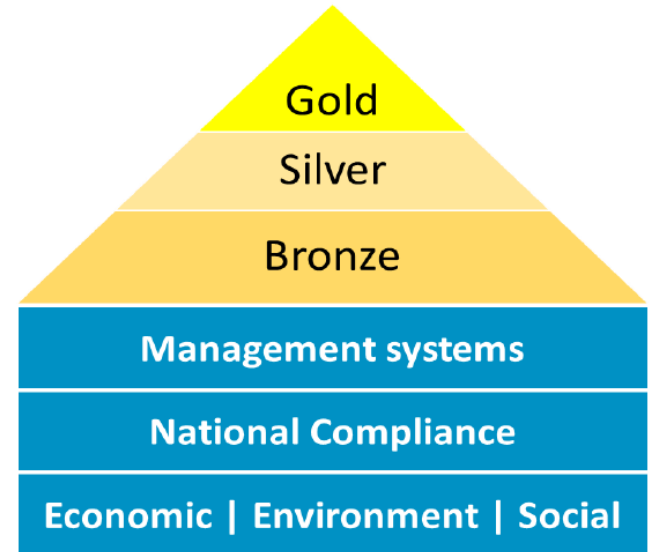
Eco industrial parks: towards a standardized approach

“... need for *process standards* for all industrial parks and *performance standards* for eco-industrial parks”

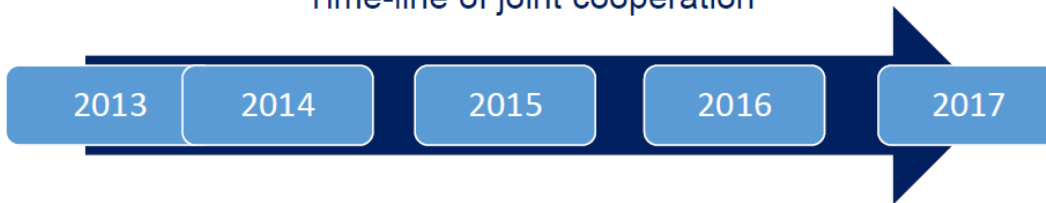
Joint cooperation



Towards a common framework



Time-line of joint cooperation

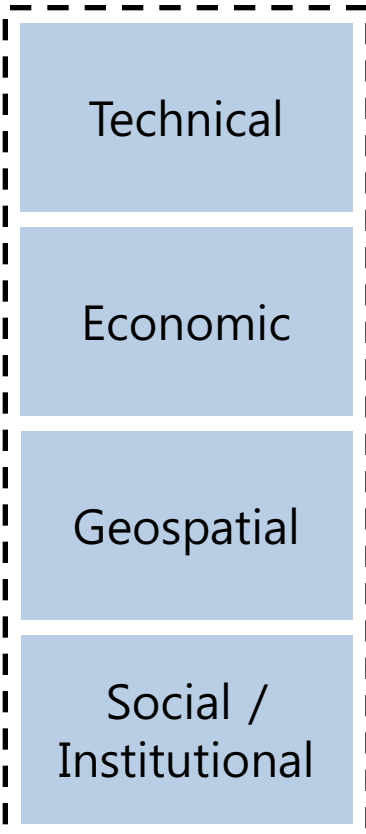


Standardization of SD in Cities

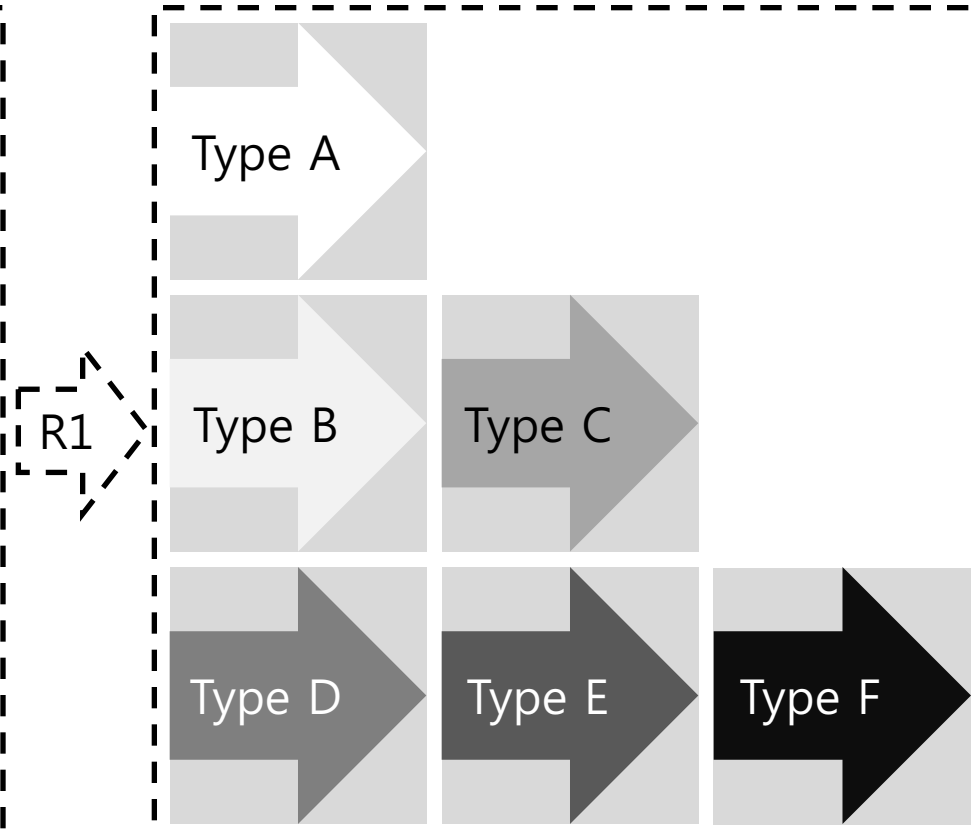
POLICY INSTRUMENTS



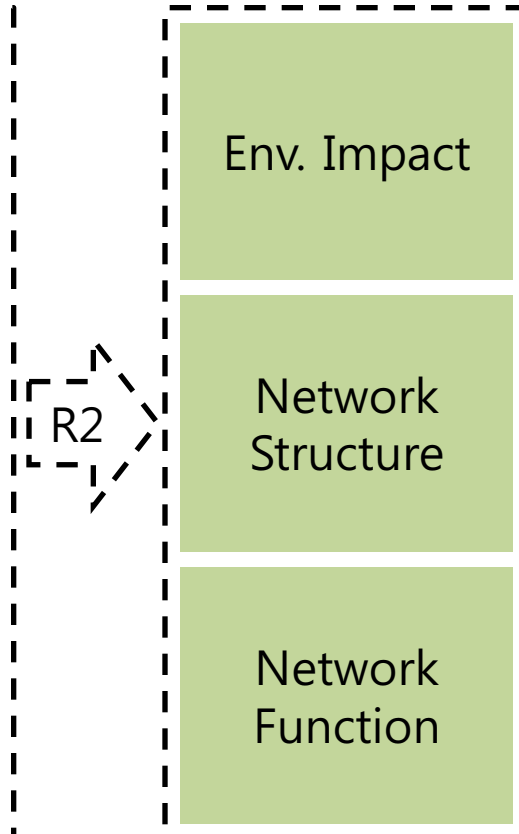
Conditions



IS and US Dynamics (R3)



Outcomes



(Modified from Frank boon, 2016)

International Center on EID and EIPs



IMPLEMENTATION STRUCTURE

Project Steering Committee
University of Ulsan, City of Ulsan, ITPO Seoul, UNIDO, and other stakeholders (e.g. Government/private sector)

UNIDO
Project Manager

University of Ulsan
(Host institution)

**International
Consultants**

**National
Consultants**

ITPO

Project Office:

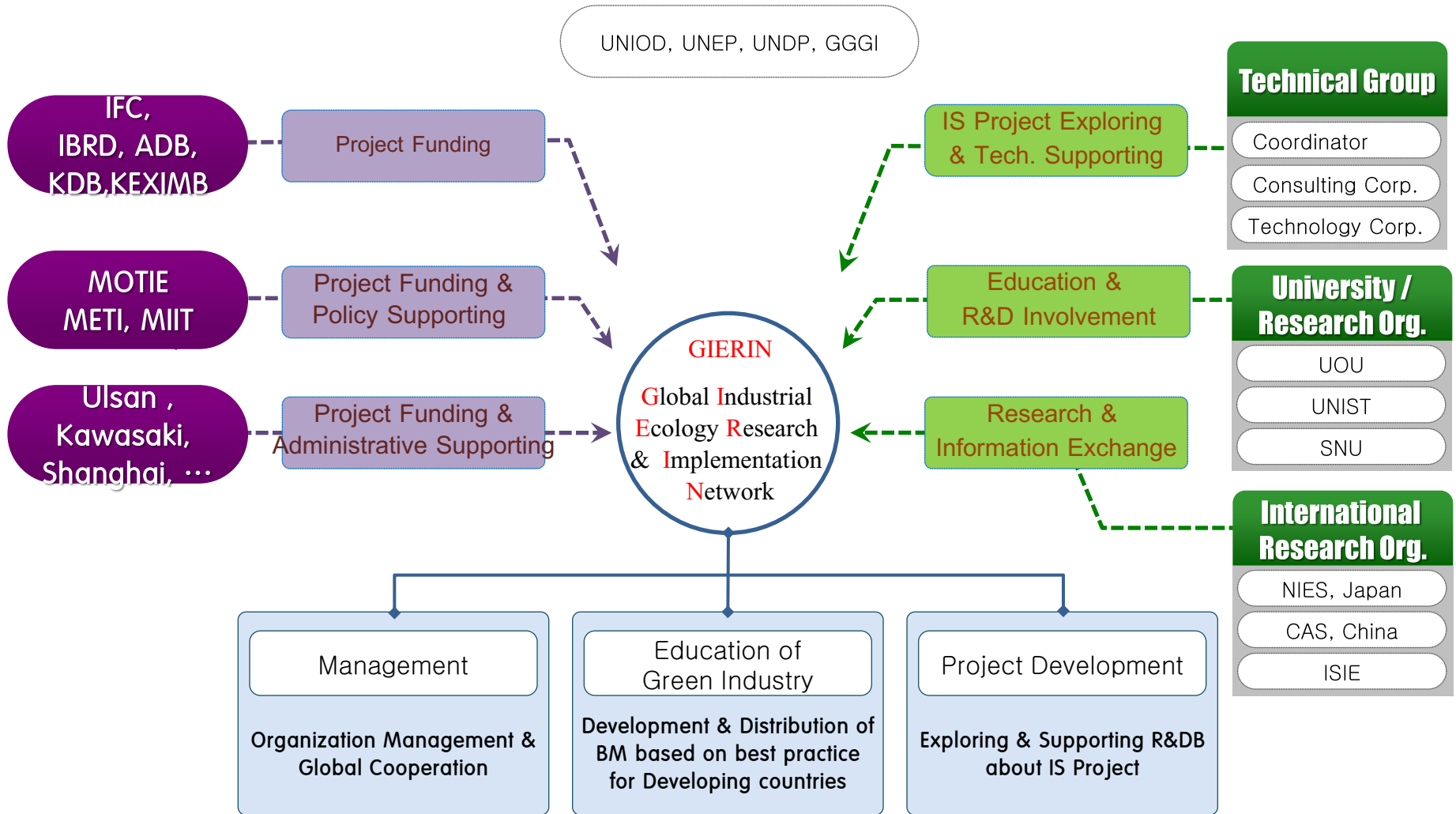
- RECP / EIP Programme Director
- Executive Assistant
- Support Staff

Global Industry and Resource Efficiency Industrial Network(GIERIN)

Governance Structure for GIERIN

Supporting System

Cooperation System



Summary

Strategy for Achieving the Sustainable Development Goals (SDGs) in Asia and Developing Countries are

- Knowledge Sharing
- Capacity Building
- Technology Transfer
- Institutional Support
- Financial Support
- Climate Investment
- International Collaboration

Korea-China MOU for Eco-industrial Development Cooperation



Thank you

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