



Seattle City Council Regional Development and Sustainability Committee Briefing - Seattle, WA

# Eco-Industrial Districts

## Defining the 'Eco' in Industrial Systems

June 15, 2010 - Seattle City Hall

**Andreas W. Koenig**

EcoIndustry - Re-Tem Corp., Frankfurt / Tokyo

## Eco-Industrial Districts

### Seattle - The Context

- Defining Eco-Industrial Development
- Barriers to Sustainable Industrial Development
- Industrial Districts - One Form of Industrial System
- EID Business Cases - How it works
- Industrial Parks & Districts - Issues and Opportunities



## The Pacific Plastic Vortex



# Preserve - The Eco-Industrial Tooth Brush



## Preserve® + Stonyfield Farm®

Since 2001, Preserve and Stonyfield Farm have partnered to keep (literally) tons of plastic out of landfills. We collect cups and scrap plastic from Stonyfield's manufacturing facility in nearby New Hampshire, as well as the used cups that people who have enjoyed Stonyfield Farm yogurt return to them. Then we turn these cups into Preserve Toothbrushes, Tongue Cleaners and Razors.

Working together helps both of us keep our commitment to being responsible for our products from design to disposal. By forging strategic partnerships with other mission-guided companies, like Stonyfield Farm, Preserve helps advance socially and environmentally responsible business to create healthier, safer communities.



### How much of a difference? Preserve plastic requires:

- At least **54% less water** than virgin polypropylene
- At least **64% less greenhouse gases** (in CO<sub>2</sub> equivalents) than virgin polypropylene
- At least **75% less oil** than virgin polypropylene
- At least **48% less coal** than virgin polypropylene
- At least **77% less natural gas** than virgin polypropylene
- At least **46% less electricity** than virgin polypropylene

## our products

We believe in expecting more out of the products that we use everyday. We think a product should both perform seamlessly and delight our senses. And we all deserve products that help us lead healthy lives and minimize the impact on our increasingly stressed environment.

That's why we take the time to ensure that our products meet your needs intuitively and stylishly. That's why we refuse to consider materials with even a hint of potential health risks. And that's why we have worked so hard to fine-tune our manufacturing process. We make our products out of recycled #5 plastic that can then in turn be recycled. We keep our packaging simple, and we limit carbon emissions by streamlining transportation and manufacturing.

We are demanding because we know you are, too.

**MAKE** something special for your someone **SPECIAL**



**15% OFF** mixing bowls & measuring cups

enter **"urspecial15"** at checkout



personal care >



tableware >



kitchen >

## EID Business Case: Devens, MA - USA

- ⑩ Devens Sustainable Community
- ⑩ Eco-Industrial Park
- ⑩ State as Driver for Economy

- ⑩ Business Engagement Tools
- ⑩ No systems design, but systems thinking
- ⑩ Staff continuity

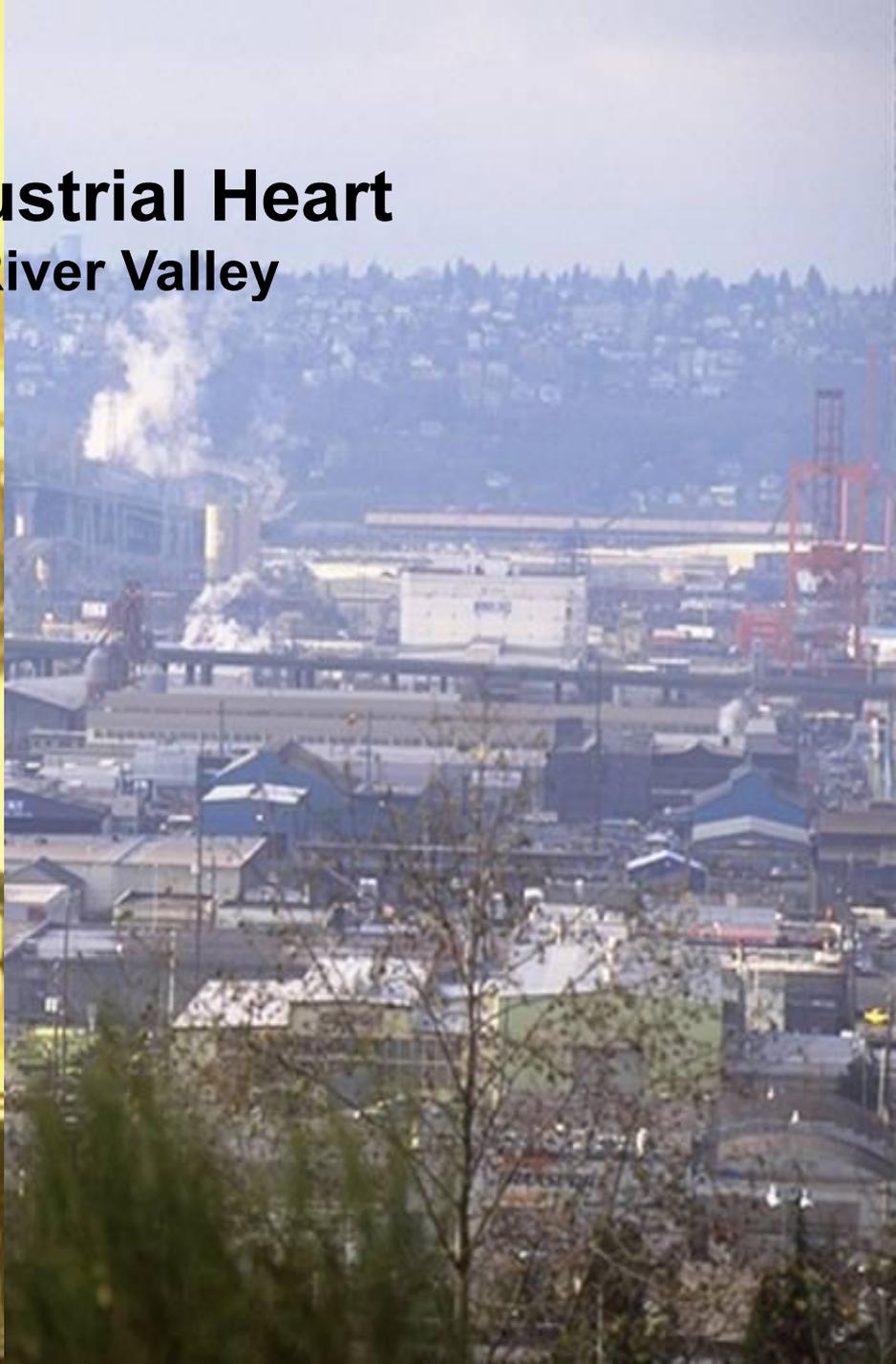
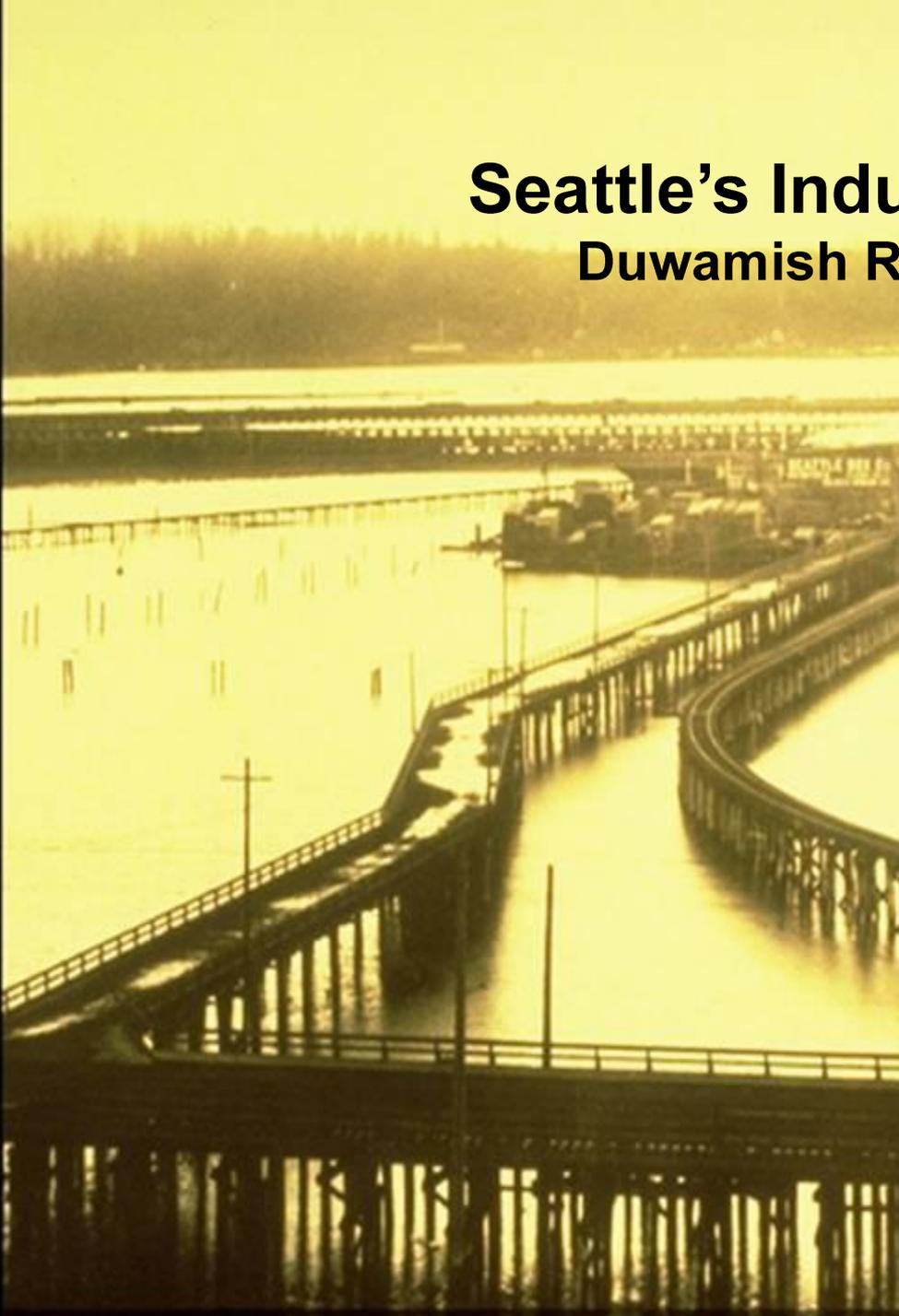


- ❑ Redeveloped Army Base near Boston
- ❑ Currently approximately 90 businesses
  - 70 % small-medium enterprises
  - Mostly industrial - manufacturing, distribution, recycling
- ❑ Major New Investment 2007/2008:
  - Bristol Meyers Squibb Pharmaceutical Complex
  - Evergreen Solar Photovoltaic Panels
  - Largest Construction Recycling Facility in North America
- ❑ Major Success Factors:
  - 45 day permitting (vs. 18 Months)
  - Sustainable image and active industrial community
  - (EcoStar Program)



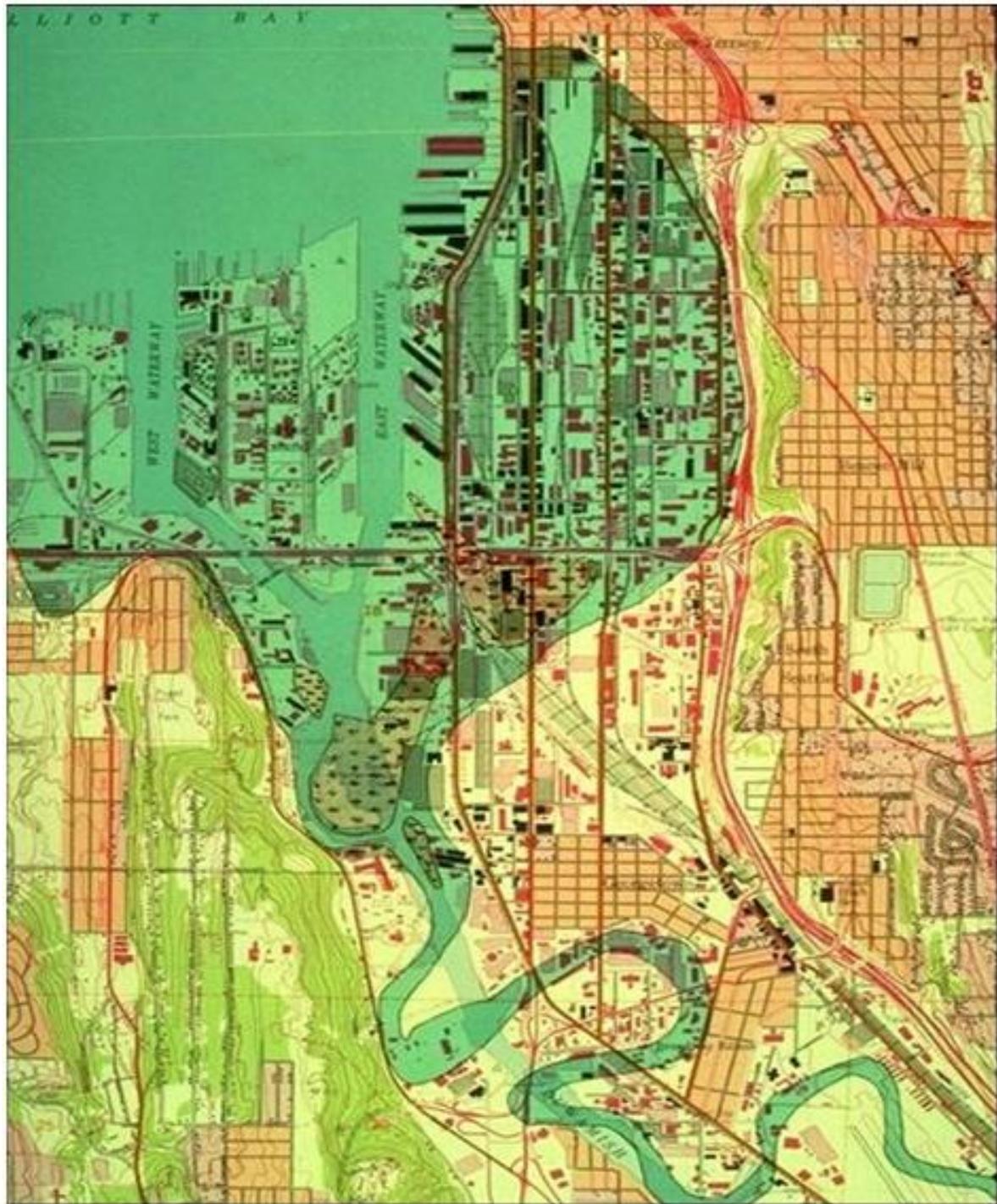
# Seattle's Industrial Heart

## Duwamish River Valley



# Duwamish River delta

then and  
now



# Visioning Workshops Residents & Workers







## Definition of Eco-Industrial Parks (EIP) &amp; Networks (EIN)

**EIP Definition** (applies also to clusters & networks)

A **community** of manufacturing and service enterprises located together, on a common property or in the same Region

Members seek enhanced environmental, economic, and social performance through **collaboration** in managing resources



## □ **Circular Economy**

- ▶ **Maximum cycling** of resources and materials
- ▶ ‚Cradle to Grave‘ stewardship of products
- ▶ 3R, CP, Eco-Efficiency, Renewable Energy
- ▶ National Policy in Germany, Scandinavia, Japan and China

## □ **Eco-Industrial Development**

- ▶ **Industrial Ecology** as principle for the new economy
- ▶ **Eco-Industrial Parks and Clusters** as strategy to innovate
- ▶ **Networks** as key to system change

## Ecological System vs. Industrial System

Industrial Ecology is **assuming** that Industrial Systems behave like Ecological Systems

### ❑ Ecological System



- Biotop
- Food Chain Stability through Diversity
- Closed Loop Nutrients are circulated

### ❑ Industrial System



- Cluster
- Supply Chain
- Tendency to Monopoly
- Cradle to Grave
- Materials leave region

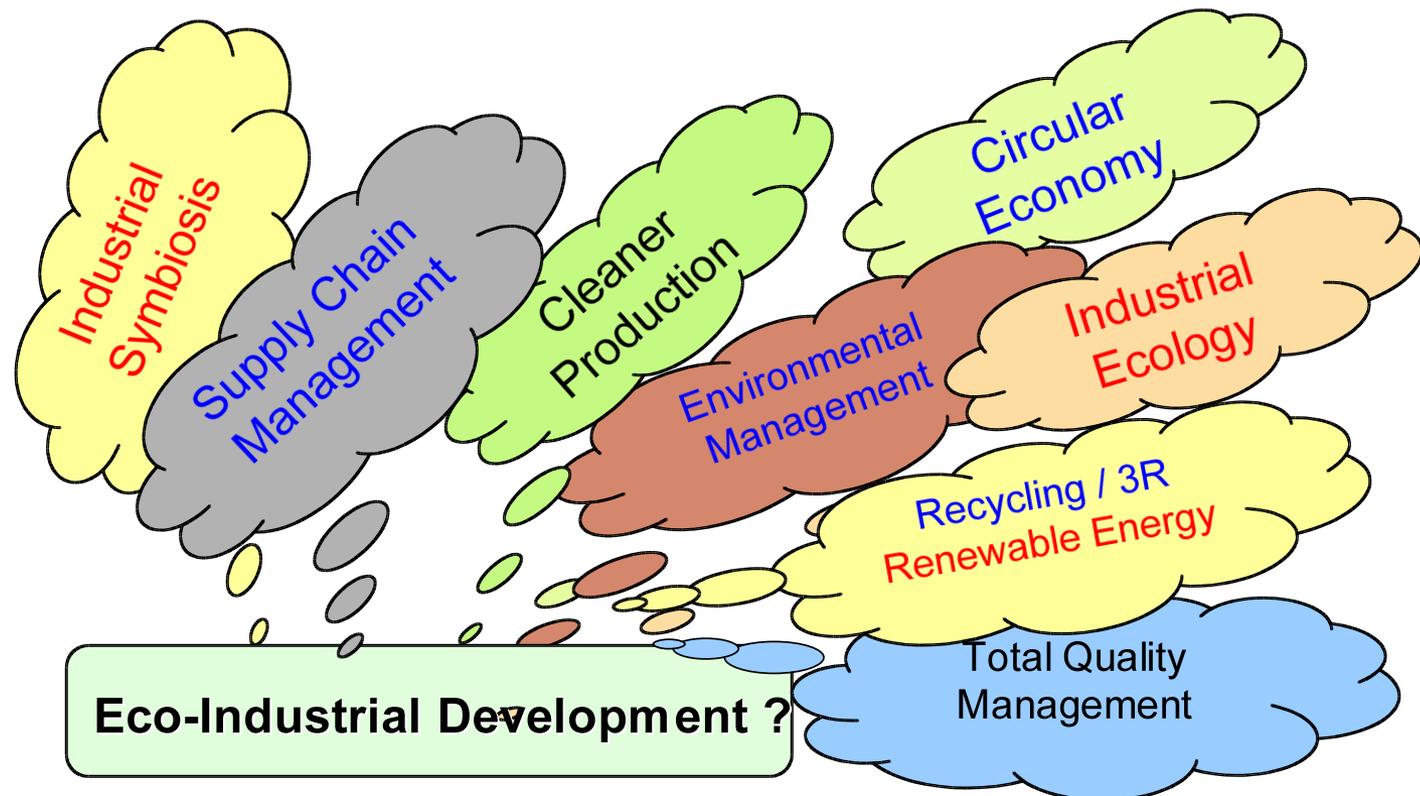
## Environmental Management as Reactive Strategy

### □ History of Environmental Management Approaches

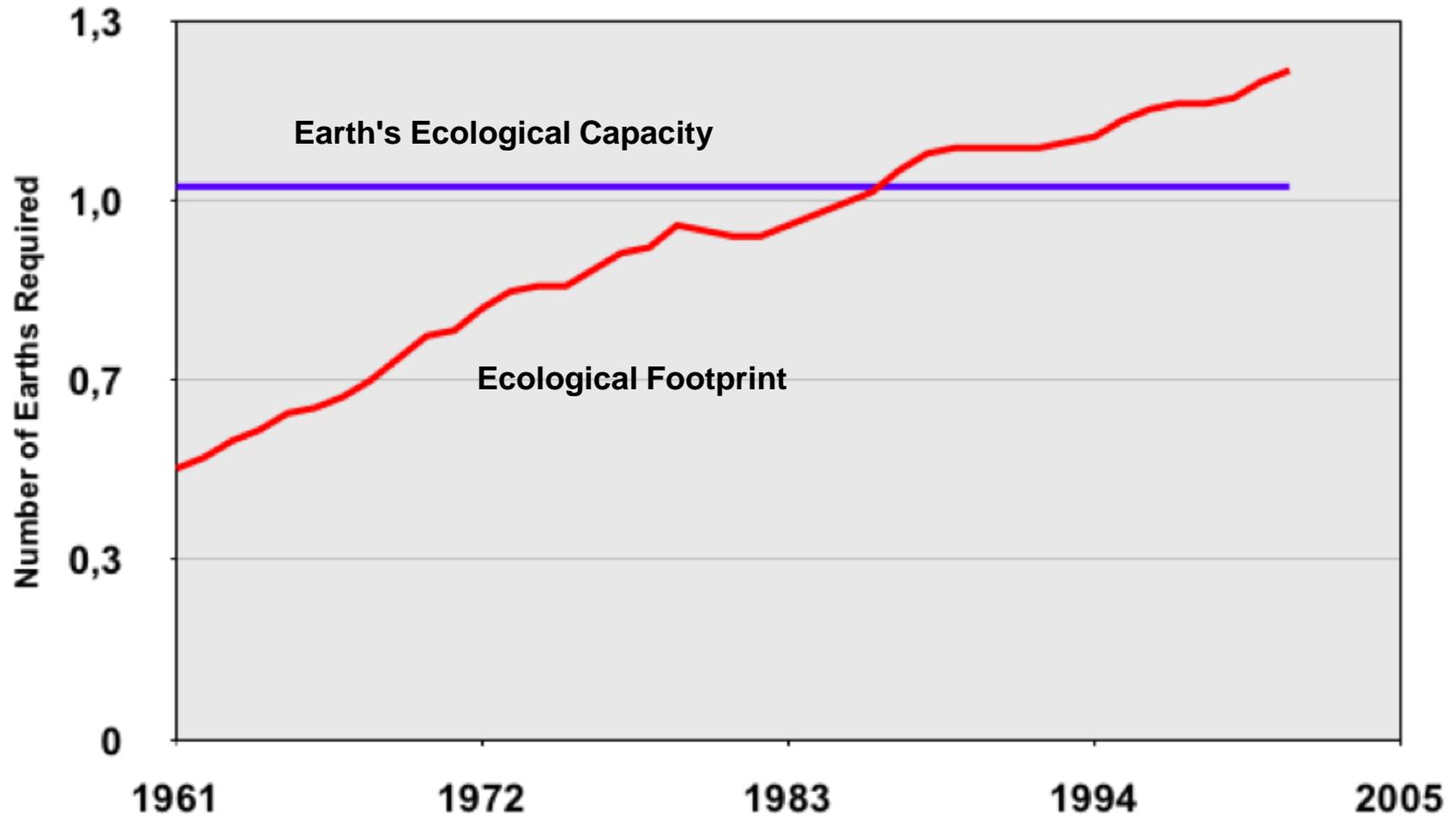
Principle of Diffusion	1960s	⇒ Policy of 'high smoke stacks', hazardous waste discharge to open sea
End of Pipe Technology	1970s	⇒ Filter, Catalyst, WWTP: development of Environmental Technologies
Closed Loop Economy	1980s	⇒ Recycling of secondary materials, reduction of waste volume, resource efficiency, 'Green Dot'
Cleaner Production	1990s	⇒ Integrated view of production processes, integration of technology and management
Eco-Efficiency	mid 1990s	⇒ Re-designing of production processes, products and markets
Industrial Ecology	mid 1990s	⇒ Synergies by maximum use of resources through the greatest cycling of material and energy

## What is Sustainable Industrial Development ?

- Many approaches to environmental issues require good management practice
- SME mostly lack capacity and knowhow to absorb tools
- Dissemination often based on 'Door-to-Door' approach



## World Ecological Footprint, 1961-2001

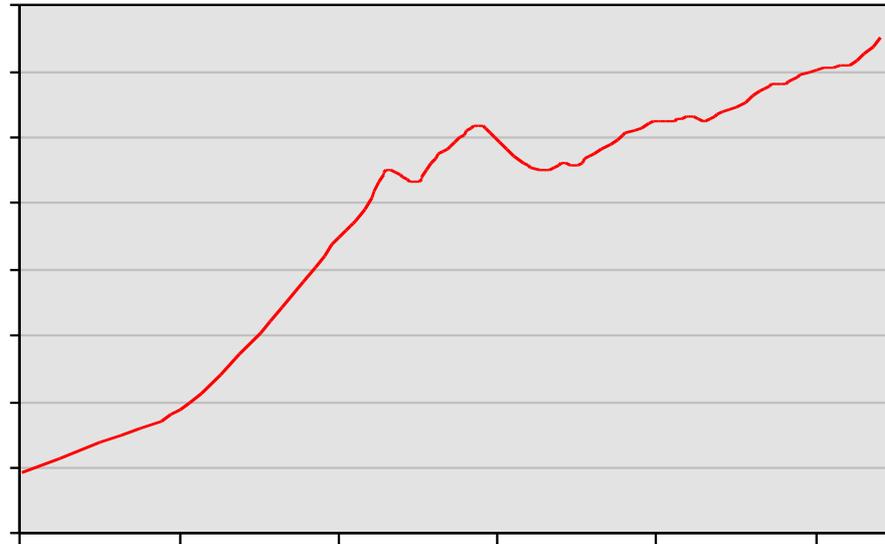


Source: WWF, UNEP, Global Footprint Network

## Peak Oil and Resource Crisis (1)

### □ Resource Scarcity

- fluctuating prices expose SME to higher risk
- China is absorbing increasing resources in direct competition in Asia
- Peak Oil: higher consumption than production / new exploration



## Peak Oil and Resource Crisis (2)

# Steel Prices Nearly Doubled In Past Year

Financial Times | Chris Flood | April 27, 2008 05:48 PM



Read More: [Commodity Prices](#), [Price Of Steel](#), [Steel](#), [Steel Prices](#), [Breaking Business News](#)

Show your support.  
Buzz this article up.



Steel prices have almost doubled in the past year as steelmakers have passed big increases in the costs of iron ore and coking coal on to consumers.

The jump threatens to create fresh problems for manufacturers and stoke inflationary pressures in emerging markets where demand is high, driven by urbanisation in China and infrastructure spending in the Middle East and elsewhere in Asia.

It comes as the London Metal Exchange starts trading steel futures on its floor today after trials on its Select electronic system. The launch could help drive trading volumes far higher.

[Read the whole story here.](#)

SHARE

PRINT

COMMENTS

## Stock Quote

Enter a ticker symbol

Data provided by A

## Popular Sto



Or bad luck. Or  
any name, Sen



statement Frid  
Obama oppose



***Climate Change and Financial Crisis  
are not the Problem ...***

***.... they are Symptoms of the Problem***

## Limits of Existing Industrial Systems - Barriers for Business

---

### ❑ Environmental Policy Approach

- ⑩ **regulation** is adding more cost than benefits
- ⑩ **market** is distorting true cost to society
- ⑩ **dissemination** of best practice prevented by weak tools

### ❑ Lack of Integration

- ⑩ **tools** made for individual companies, not systems  
**networking** is done by sector, not by region
- ⑩ **individual** technologies vs. **holistic** approach

### ❑ Waste Management and Recycling

- ⑩ **end-of-pipe thinking** still prevailing
- ⑩ **companies** act individually, not as industry
- ⑩ **best available technologies** not widely adapted
- ⑩ **Circular Economy** not yet anchored in society

## Forms of Eco-Industrial Development

### ❑ Eco-Industrial Park / Estate

- ⑩ defined area with zoning and boundary
- ⑩ often dedicated management
- ⑩ special laws & incentives (national & local)

### ❑ Eco-Industrial Cluster / District

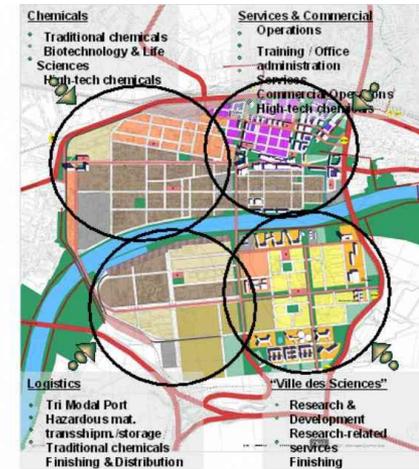
- ⑩ local (regional) network with close proximity
- ⑩ usually no management structure
- ⑩ often Co-Op or Association

### ❑ Eco-Industrial Network

- ⑩ regional links with few co-locations
- ⑩ often based on material flow or supply chain
- ⑩ usually with 3rd party institution (university)

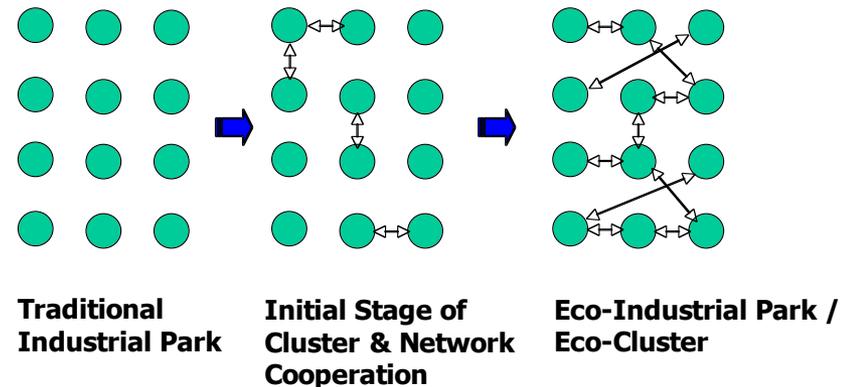
### ❑ Special Purpose Systems

- ⑩ Resource Recovery Park
- ⑩ Eco-Town
- ⑩ Eco-Technology Park
- ⑩ Biomass-based Cluster
- ⑩ ....



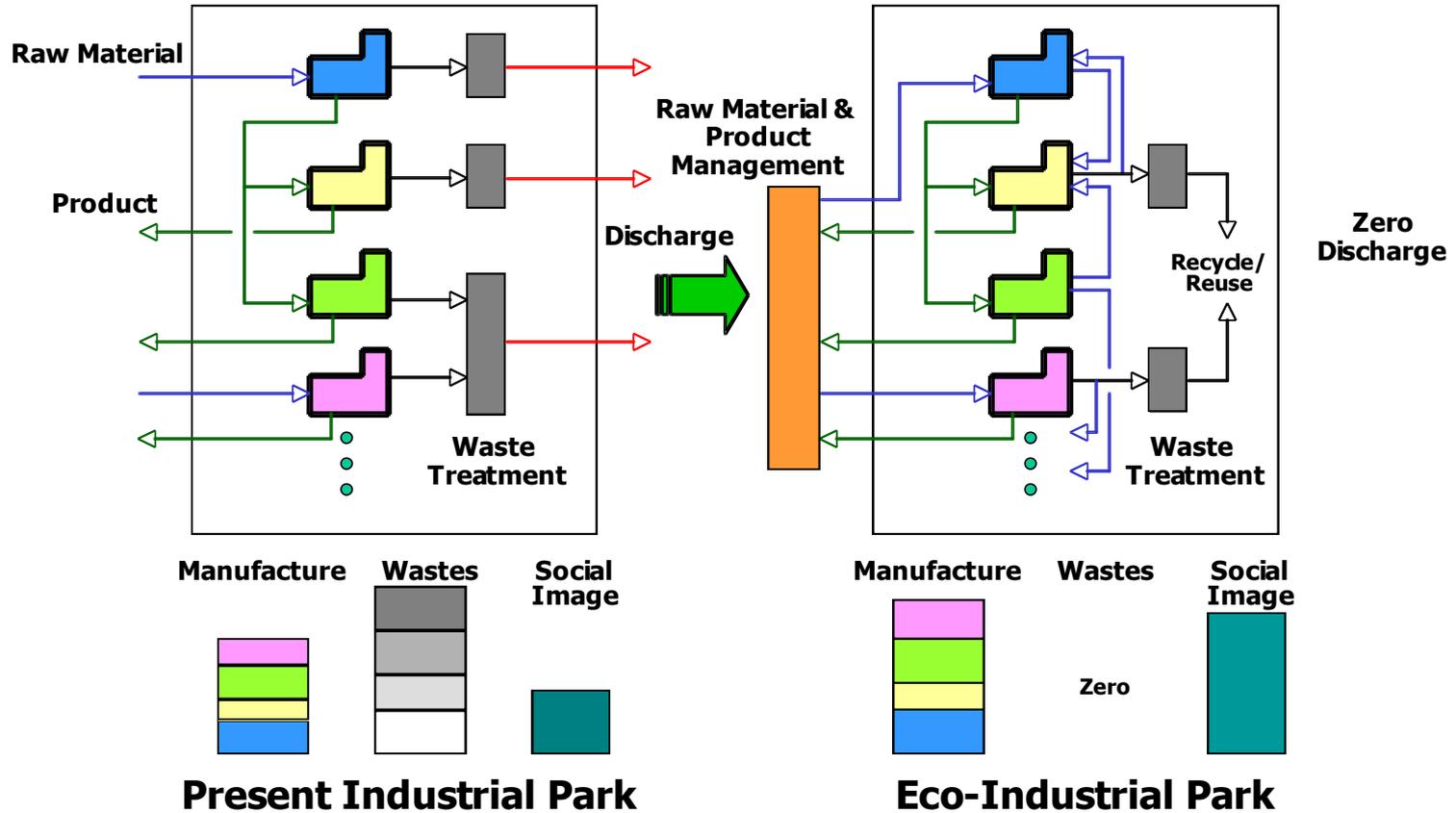
### ■ Networking between businesses

#### •Networking beyond Supply Chains



## Eco-Industrial Development - A System Approach

### ■ What is Eco-Industrial Park?



*Imagine ...*

*.... our Knowledge about Sustainable Management, Lean Production, Logistics, Renewable Energy, Environmental Management, Green Design ....*

*... being **designed** into  
the urban - industrial system*



## INDUSTRIAL PARK

- Old sites outdated, less organized, often no management
- New sites in rural areas, not integrated in local economy
- Zoning based on site structures, not on co-location
- Provides basic Infrastructure and Management
- Target: Sale of individual lots

## Eco-Industrial Parks & Clusters: Sustainable Industrial Systems

### ENERGY CLUSTERS

Provide flexible, efficient and renewable energy through local interlinked systems

### URBAN & GREEN DESIGN

Integration of Industry and Urban Areas

### SUSTAINABLE COMMUNITY

Cooperation among companies to increase sustainable performance of industrial park

### RESOURCE RECOVERY PARK

Integrated into Industrial Network

### SERVICE FACILITIES

One-Stop Service integrated into industrial community

### ECO-INDUSTRIAL PARK

### INDUSTRIAL PARK

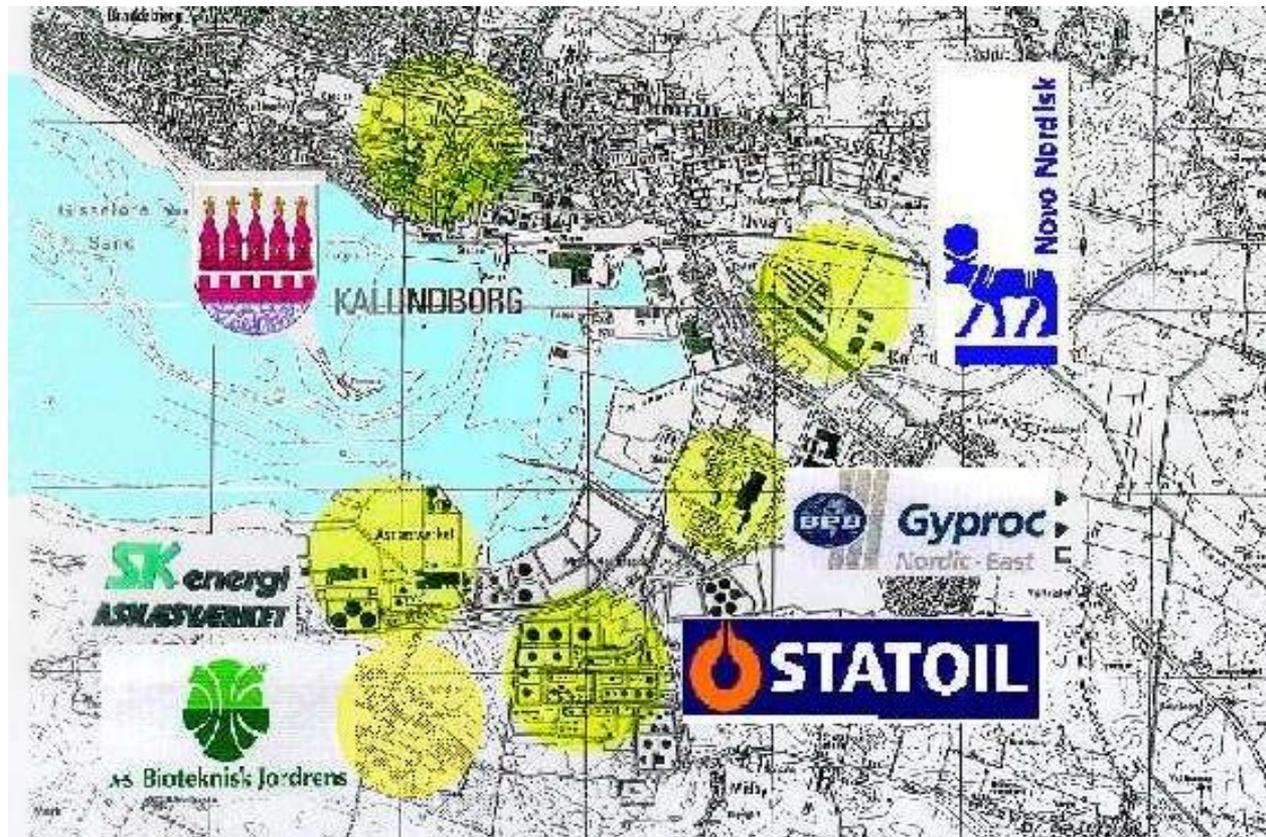
- Old sites outdated, less organized, often no management
- New sites in rural areas, not integrated in local economy
- Zoning based on site structures, not on co-location
- Provides basic Infrastructure and Management
- Target: Sale of individual lots

- Designed or Redeveloped to sustainable standards
- Decentralized, efficient infrastructure
- Embedded into local economy and environment
- Provides Full-Service through stakeholder cooperation
- Helps establish industrial community through networking
- Eco-Center manages information, material flow, synergies
- Serves as information platform for sustainable development throughout the region

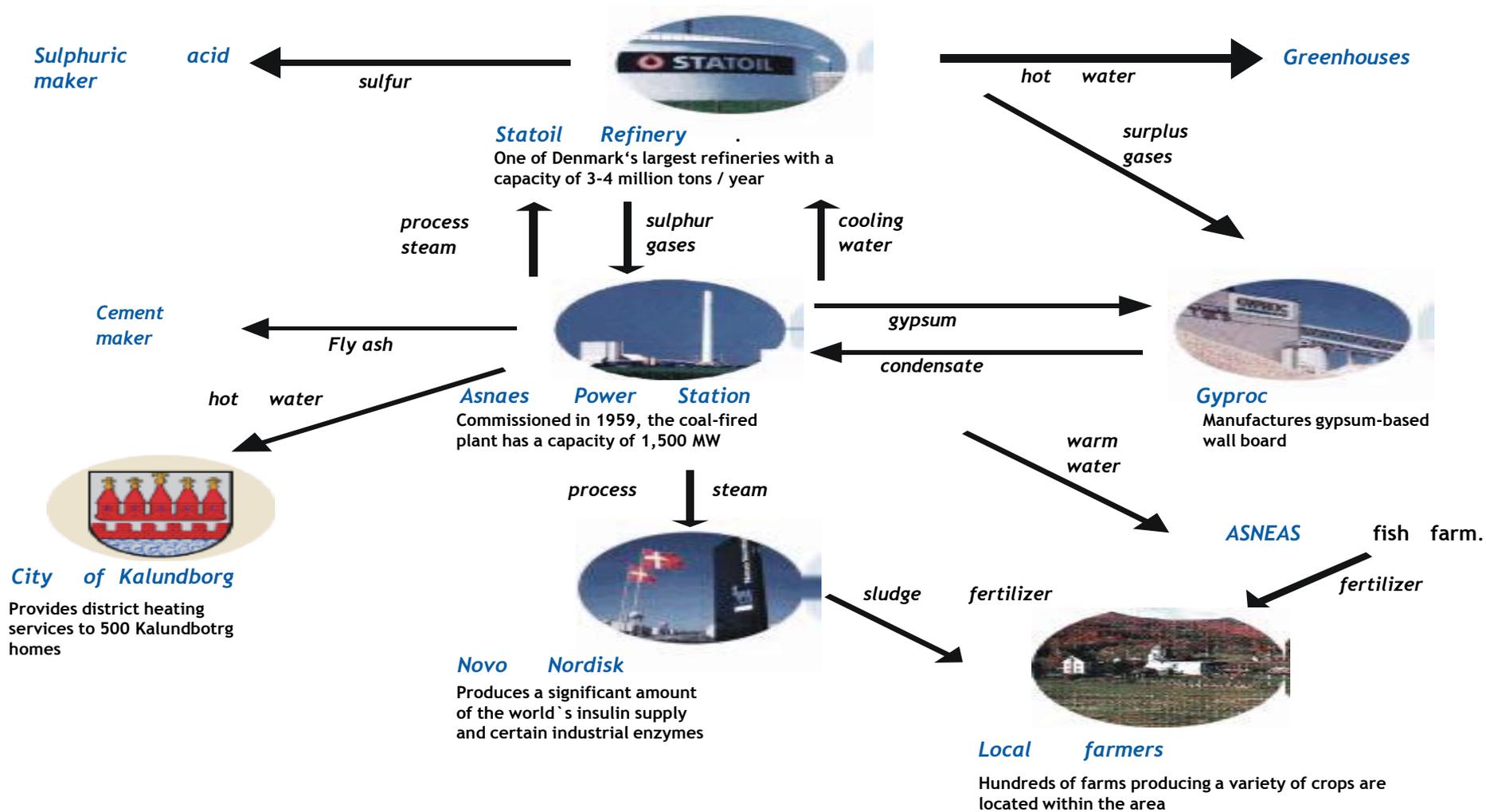


## The Kalundborg Symbiosis - Kalundborg - Denmark

- ⑩ Large companies in a small town
- ⑩ No system design
- ⑩ No government involvement
- ⑩ Symbiosis Institute as 'Gate Keeper'
- ⑩ many projects not implemented
- ⑩ 30 year development



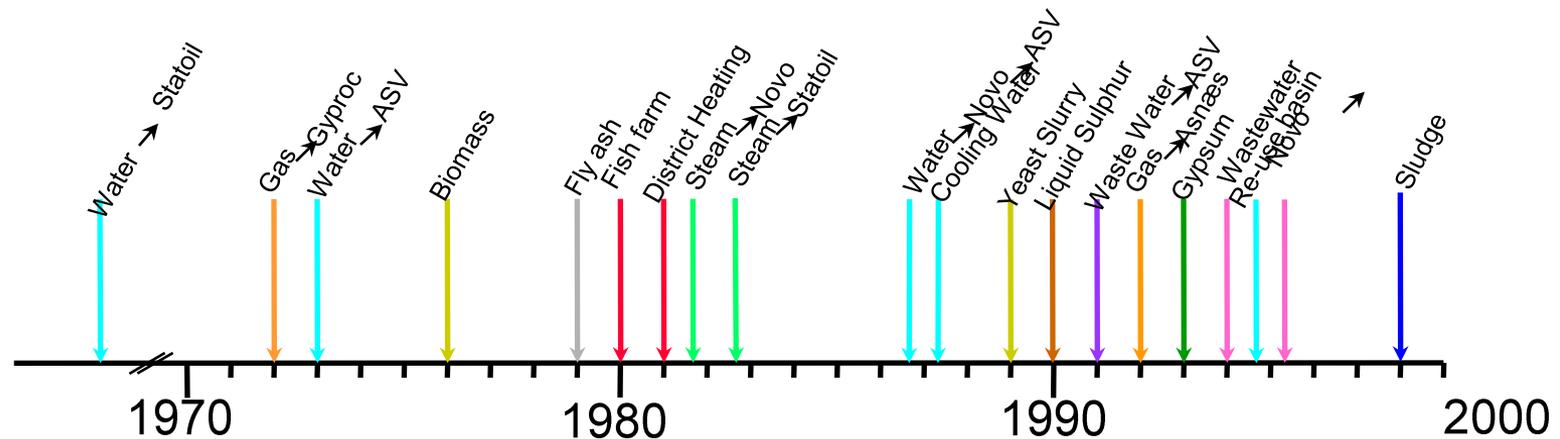
## The Kalundborg Symbiosis - Kalundborg - Denmark (2)



## EID Business Case: Kalundborg - Denmark

### ⑩ Kalundborg - the Non - EID Model

- Network of exchanges was not planned, no central management
- No government involvement (city is system partner)
- Symbiosis Institute focal point, only created recently
- activities were driven by economics, not environment
- many projects not implemented due to some economic obstacles



## EID Business Case: Kalundborg - Denmark

---

### □ Projects between companies and Kalundborg municipality

Recycling of water:	9 Projects
Exchange of energy:	6 Projects
Recycling of waste products:	6 Projects
The “internal” Symbiosis:	15 Projects
The “external” Symbiosis	4 Projects
<b>Not implemented projects:</b>	<b>many...</b>

*Data: 2000*

## EID Business Case: Kalundborg - Denmark

---

### □ Industrial Symbiosis : Resource Savings & Budget

#### Resource savings:

Ground water:	1,9 mill. m <sup>3</sup> /year
Surface water:	1,0 mill. m <sup>3</sup> /year
Oil:	20,000 ton/year
Gypsum:	200,000 ton/year

*Data: 2000*

#### Investment Budget:

<b>Total investments in 19 Projects:</b>	~ 75 mio. US \$
<b>Annual savings:</b>	> 15 mio. US \$
<b>Total savings until 1998:</b>	~ 160 mio. US\$

*Data: 2000*

## EID Business Case: Philips Eco-Enterprise Center - PEEC, Minneapolis - USA

- ❑ **First Eco-Industrial Building**
  - High-Efficient Industrial Facility
  - LEED-Certified Green Building
  - SME production space
  - Industrial space in low-income area
  
- ❑ **EID-Center for City and State**
  - Hub for several new projects
  - NGO Operates Recycling & Reuse system



### Financial Benefits:

EID Characteristic	Developer Capital Cost Differential	Resulting Annual Return to Tenants*	Resulting Annual Return to Developer*	Combined Developer & Tenant Payback*	Combined Developer & Tenant IRR*
Sum of Occupant Health Features	\$ 144,000	\$ 43,000		3.3	29.8%
Ground-source heat pump	\$ 48,000	\$ 6,500		7.4	12.4%
Air-to-air energy recovery system	\$ 6,000	\$ 700		8.6	10.1%
Efficient lighting and controls	\$ 10,000	\$ 3,500		2.9	35.0%
Energy management system	\$ 36,000	\$ 4,000		9	9.4%
Salvaged material installations	\$ (20,000)	None		Immediate	NA
Native landscaping	\$ (55,000)	\$ 3,500		Immediate	NA
Active skylights (energy)	\$ 90,000	\$ 5,000		18	1.1%
Lease premiums*	\$ 169,000	\$ (39,700)	\$ 39,700	4.3	23.3%
<b>Totals</b>	<b>\$ 168,500</b>	<b>\$ 26,500</b>	<b>\$ 39,700</b>	<b>2.5</b>	<b>39.3%</b>

## EID Business Case: National EIP Program - Korea

### □ National Strategy

- transform all industrial parks & clusters into Eco-Industrial systems

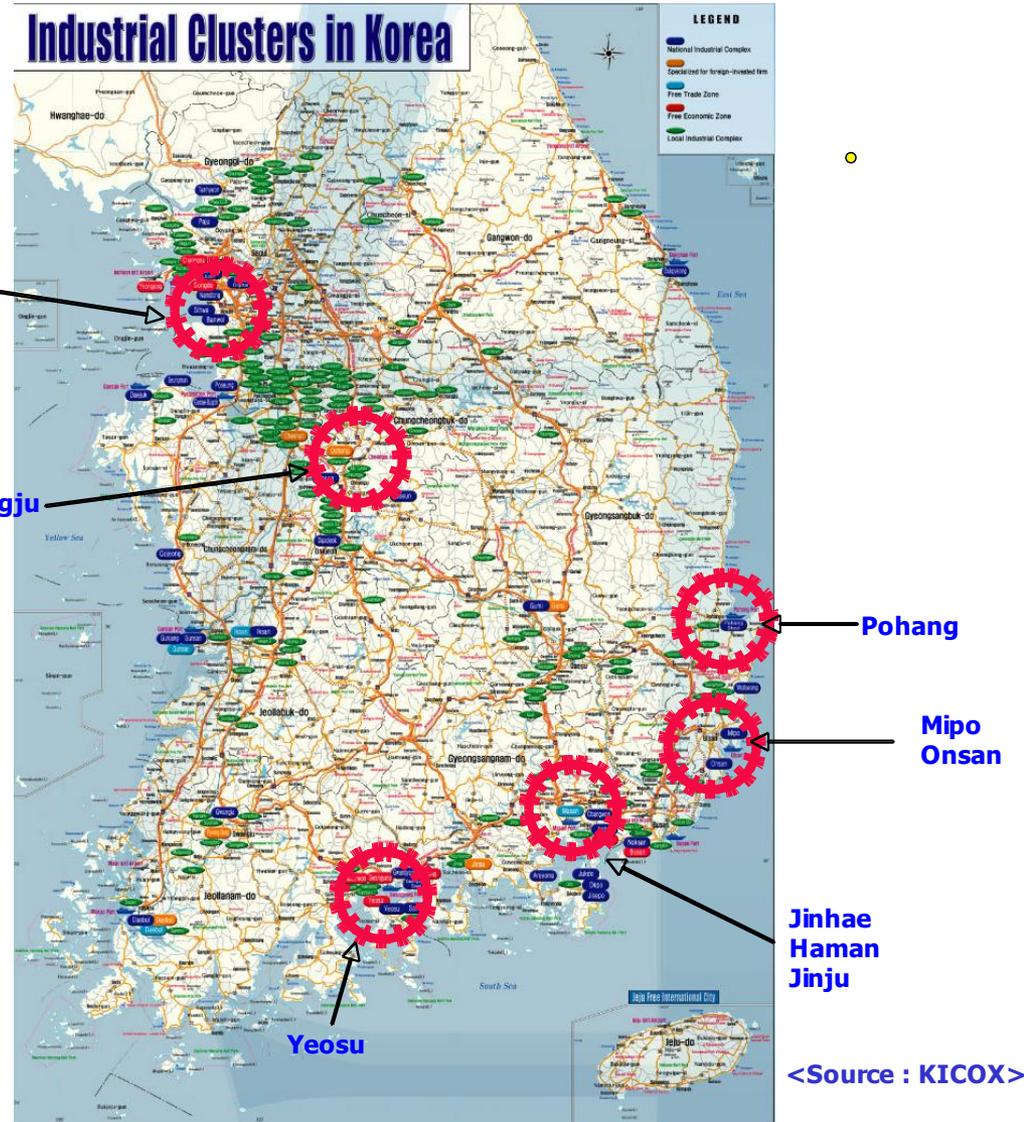
### □ 5 Pilot Sites of various industries

### □ National & Local Support

- Program Started by Korean National Cleaner Production Center KNCPC
- Supported and transferred to KIKOX National industrial development organization



Ulsan Industrial Harbor Zone - EIP Pilot



## Worldwide Eco-Industrial Development Initiatives



## 'Acknowledged' Eco-Industrial Parks and Eco-Industrial Networks



## Industrial Parks & Clusters - Issues and Opportunities

---

- What works - what doesn't: Issues of Concern
  - few well-documented case studies, mostly from a scientific view
    - many projects are driven by research sector
    - projects often fail (or never take off) during planning stage
  - business is focussing on implementation, not documentation
    - some projects have web presence, but no activity
    - others have activity, but no web presence
  - lack of standards and benchmarking
    - projects are called EIP from the moment the *IDEA* is recognized
  - project approach: limited development
    - Projects have finite lifespan and finite budget
    - Long-term commitment and systems-change are not yet recognized
    - Funding often depends on donors - not on business budget

## Lessons Learned - Challenges Ahead

---

### □ EIP implementation: Support Structures

- **Successful Projects**

- are driven by industry and local government
- have wide support through knowledge networking
- Integrate EIP / EIN development in overall development policy
- are managed systems



- **Failed Projects**

- have lost their one and only champion
- are working isolated from the business community
- fail in communicating and selling the concept
- lack management and knowledge system



## Lessons Learned - How to Approach EID

---

- **EID is not about the Environment**
  - Industry adapts to challenges through **smart business practices** & resources efficiency
  - Business networking & community engagement are **key success factors**
- **Technology is not the Problem**
  - Tools for systems and **SD knowledge** are underdeveloped
  - Technology and management tools are available in today's market
- **EID is more than By-Product Exchange and Recycling**
  - Aiming for a **circular economy and zero emission** will minimize the future need for end-of pipe solution
  - Industrial Clusters show: **services & know-how** networks are key to business success

# *Thank You*

**Andreas W. Koenig**

EcoIndustry &

Re-Tem Corporation

3-6-10 Sotokanda Chiyoda-Ku

TOKYO 101-0021

T: 81-3-3258-8586

F: 81-3-3251-5804

[andreas.koenig@ecoindustry.org](mailto:andreas.koenig@ecoindustry.org)

[andreas-koenig@re-tem.com](mailto:andreas-koenig@re-tem.com)

