Eco-Industrial Park

FOR THE CITY OF ROSEMOUNT, RESILIENT COMMUNITY PROGRAM 2015

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What is an Eco-Industrial Park?

- Definition
  - Firms co-locate and seek environmental, economic, and social benefits through collaboration in managing environmental and resource issues.
  - Apply ecological systems thinking to industrial systems.
- Benefits
  - Waste products from one industry provide the inputs for another, reducing input costs.
  - Reduced waste streams mean lower waste disposal costs.
  - Potential for job creation from the formation of 'niche species' firms.

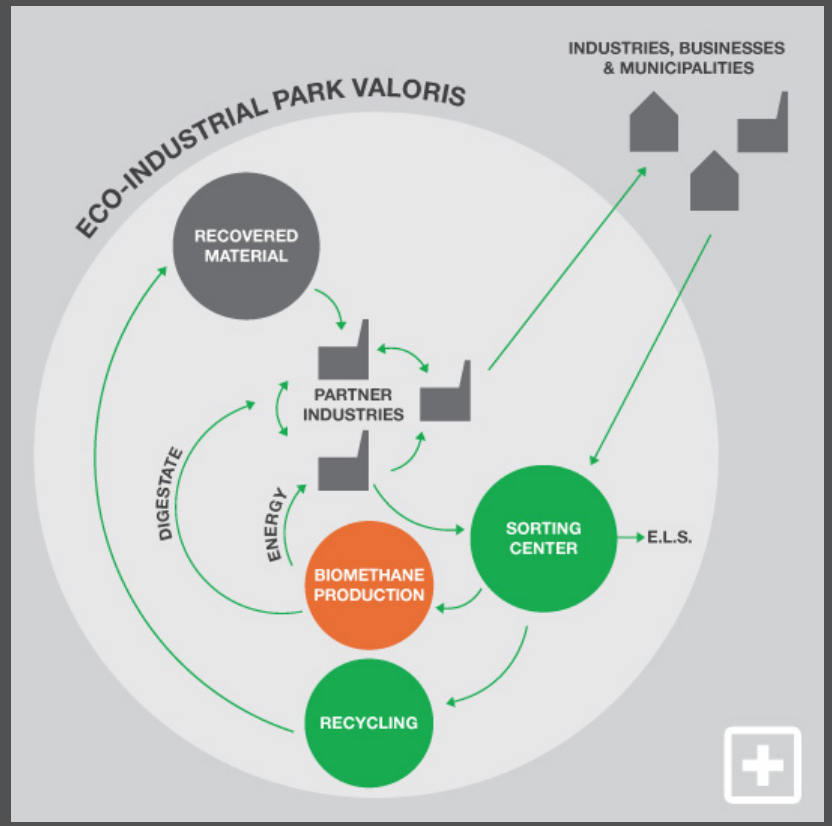
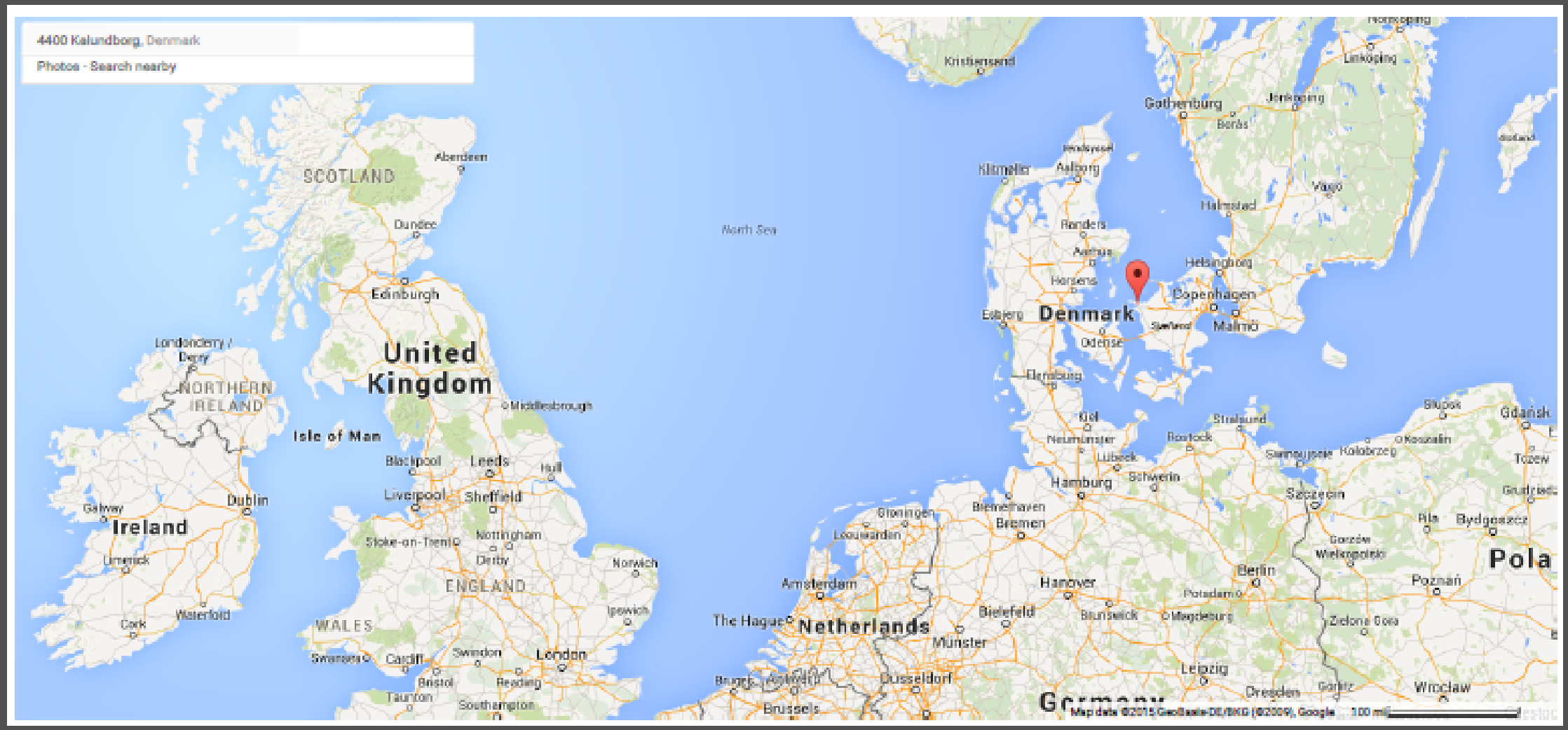


Image from: http://www.valoris-estrie.com/eco-industrial-park

Kalundborg, Demmark

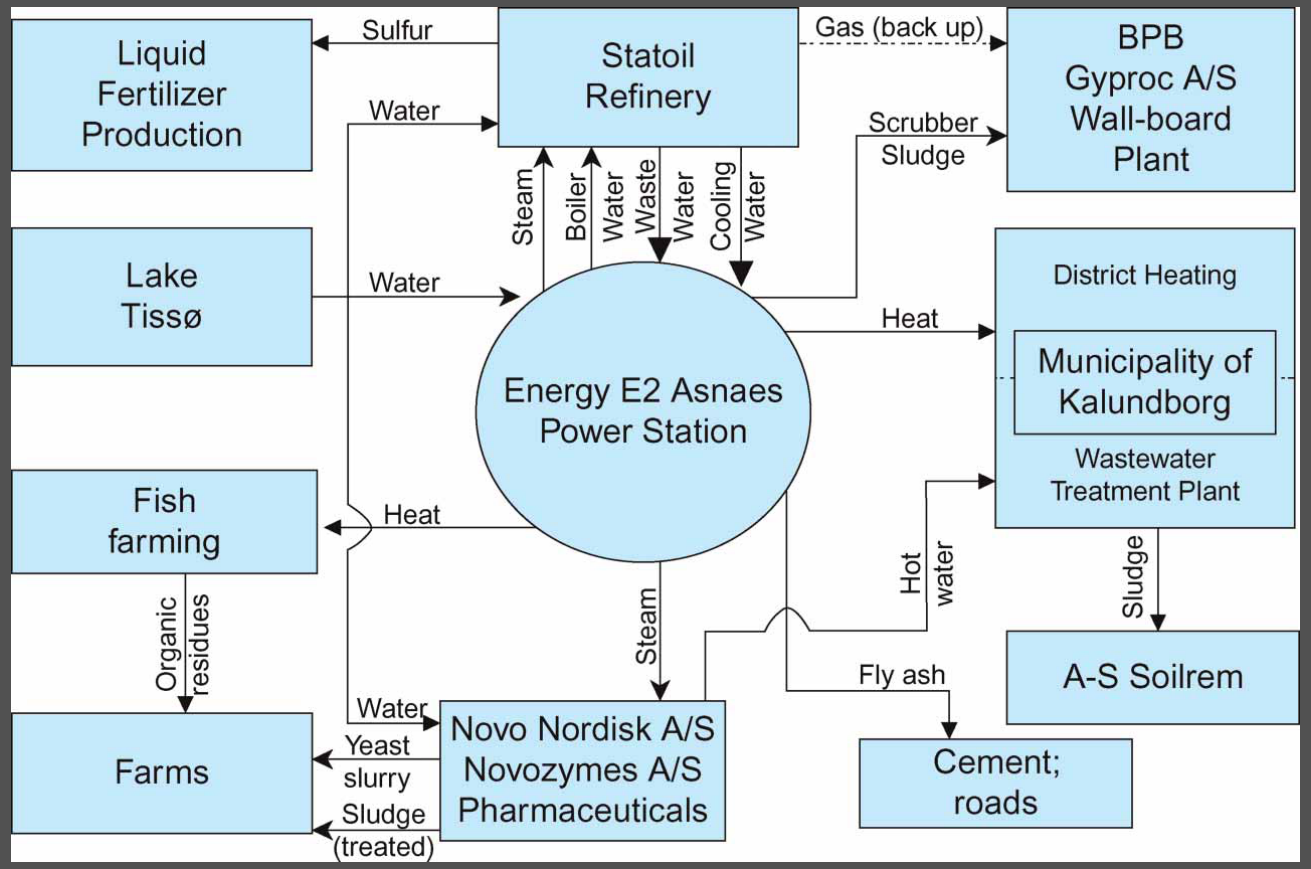


Kalundborg, Demmark

Photo from: http://www.nature.com/nclimate/journal/v2/n6/fig_tab/nclimate1541_F1.html

Industrial Symbiosis in Kalundborg

- 1972: Gryproc built, gas piped from Statoil
- 1973: Asnaes expands, draws water from Statoil pipeline
- 1976: Novo Norisk begins shipping sludge to farmers
- 1979: Asnaes sells fly ash to cement producers
- 1981: Asnaes delivers steam to Statoil and Novo Nordisk
- 1987: Statoil pipes cooling water to Asnaes
- 1990: Statoil sells molten sulfur to chemical manufacturer
- 1991: Statoil sends treated wastewater to Asnaes
- 1992: Statoil sends desulfurized waste gas to Asnaes
- 1993: Asnaes supplies gypsum to Gryproc

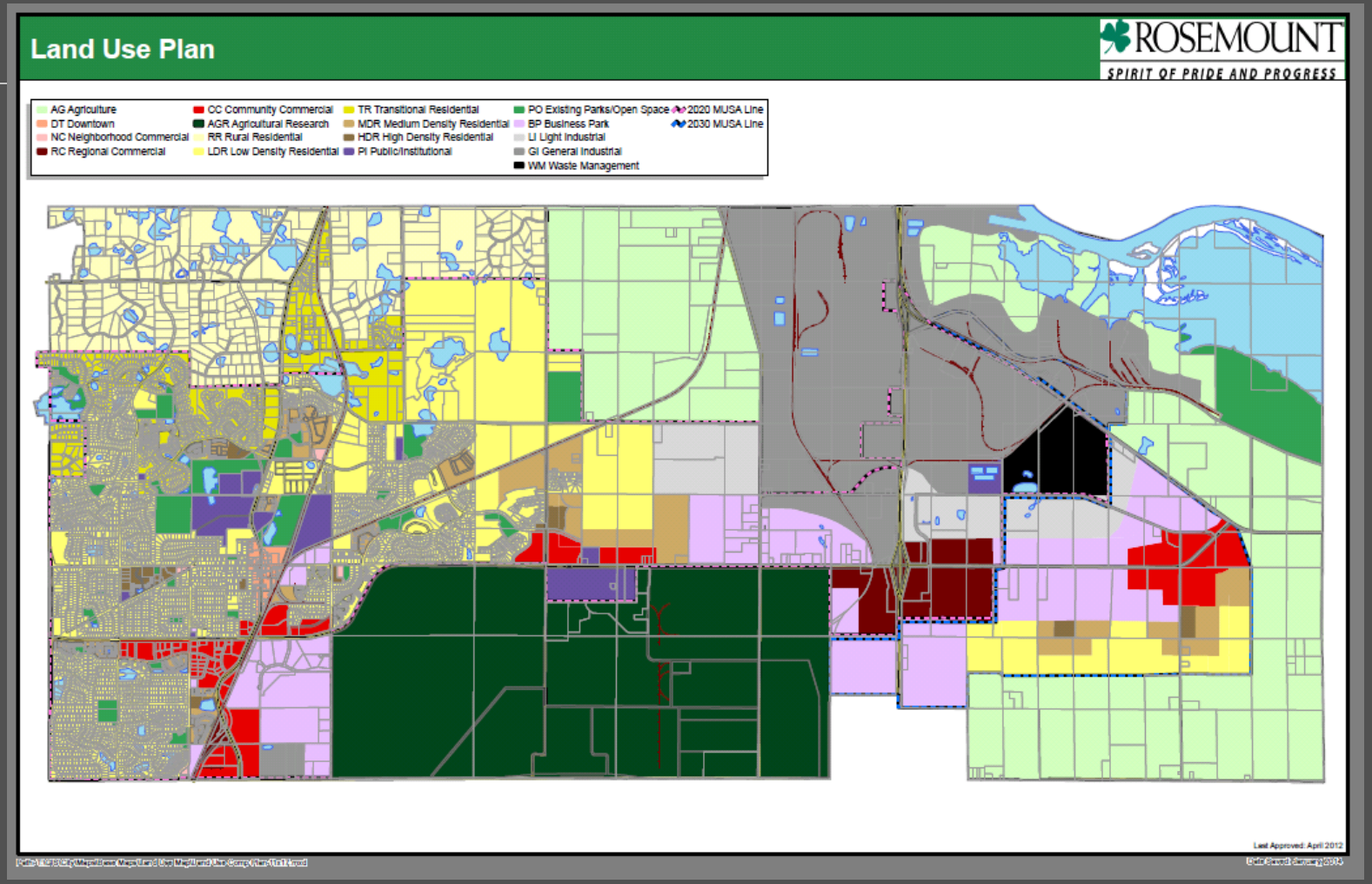


Ehrenfeld and Gertler 1997

Chertow 2007

Application to Rosemount

- **Relative Location**
  - -10-20 miles outside of Major Metro
- **Population & Size**
  - -20,000-30,000 people
  - -30-45 square miles
- **Transportation**
  - -Rail, Air, Barge, Freeway
- **Land Use**
  - -Primarily Residential
  - -Expanding Commercially & Industrially

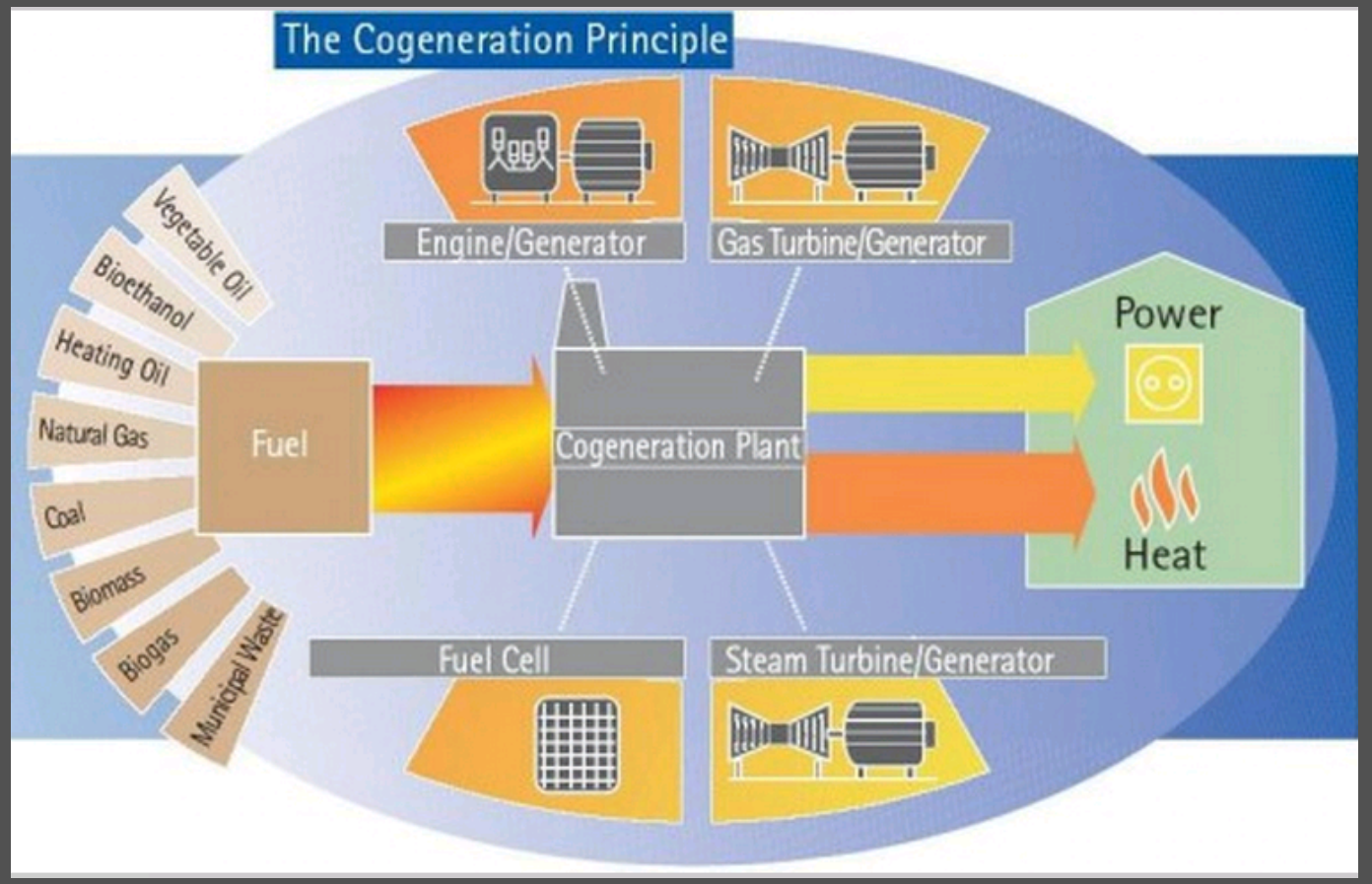


http://www.ci.rosemount.mn.us/DocumentCenter/Home/View/102

Energy Use / District Energy

Maximizing Energy Efficiency

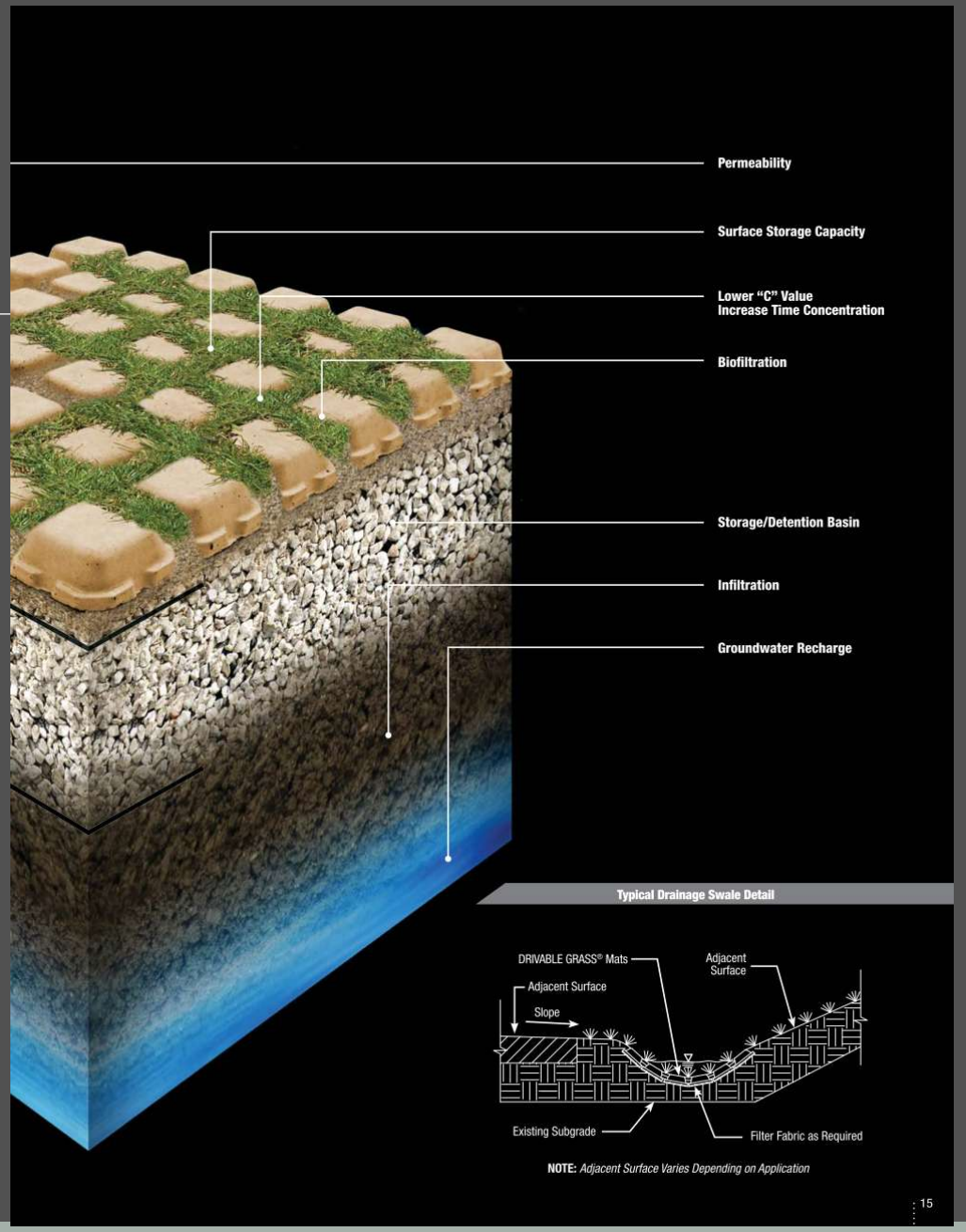
- Facility Design/Rehabilitation
- Inter-Plant Energy Flows
- Cogeneration
- Energy Cascading
- Renewable Energy sources



Land Use & Site Design

"Ex-Nihilo Model" Eco-Industrial Park

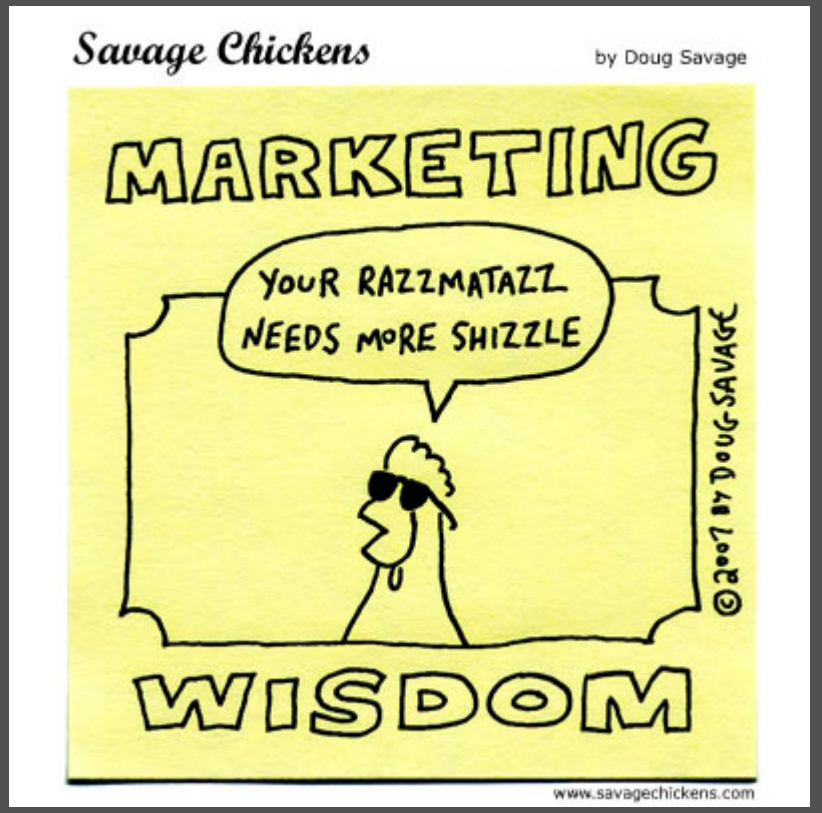
- Intelligent Directional Orientation
- Native Plant Species
- Storm-Water Run-Off Network
- Light Reflection & Refraction
- "Green" Infrastructure
- Smart Climate-Control Systems
- Ecologically Compatible Materials



http://www.ebuild.com/soil-retention-systems-inc.-soil-retention-drivable-grass-catalog/2010/5144_14_1_1.hwx

Marketing

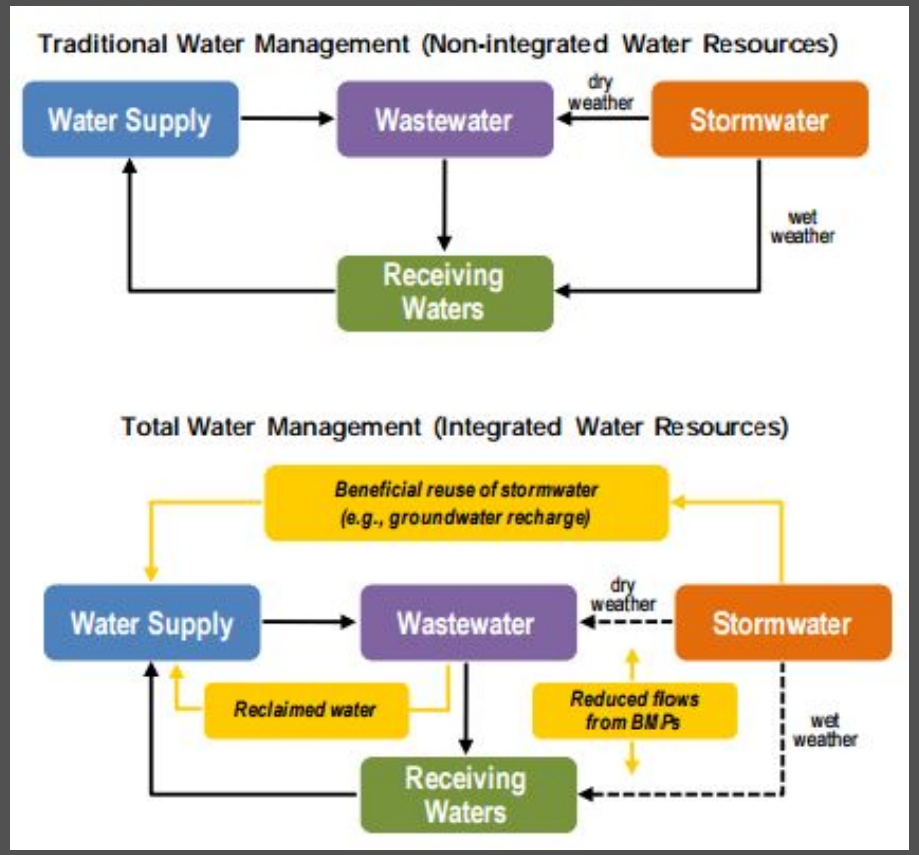
- Marketing is a crucial element to ensure success for an EIP
- Convincing businesses to participate in an EIP means outlining potential benefits for them
- Tax incentives could also be used as a marketing strategy
- Various measures to capture benefits



Information Management

- Networking and Information Sharing Hub
- Database
- Experience
  - Ulsan Industrial Park Center
  - Devens Eco-Efficiency Center, EcoStar program

Effluent and Water Reuse



Development Methods

- Municipal Effluent Utility Service
  - Ex. San Antonio Water System
- Public-Private Partnership
  - Ex. Mankato and Fargo
- Private-Private Partnership
  - Ex. Kalundborg

Image from: 2012 Guidelines for Water Reuse, EPA

Key Findings

- Many successful EIPs developed organically over years and are the result of independent business negotiations.
- There is no single way to engineer an industrial eco-system.
- The first required input into an EIP is information about firms' operations.
- Success of an EIP requires that participants are open to depending on each other.
- For greatest economic benefits, the EIP will require substantial investment in infrastructure in early stages.