

# State of Minnesota's Foundation for Sustainable Industrial Development

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## Overview

Building on a strong foundation of integrated waste management, recycling market development, pollution prevention, and sustainable community development programs, the Minnesota Office of Environmental Assistance in 2001, began implementing program activities to support eco-industrial development (EID) projects in Minnesota. In 2005, the OEA became part of the Minnesota Pollution Control Agency. Since then the MPCA has continued to support EID, through financial and technical assistance, in the context of sustainable industrial development strategies.

Eco-industrial development is pursued as a practical application of industrial ecology and strategy for achieving superior environmental performance in the industrial sector. It provides an opportunity for a more systemic approach to industrial development and greater pollution prevention. It is also a means to capture community benefits, economic development, and green business growth. EID strategies, approaches, practices, and technologies are emerging internationally. Those who effectively adopt widespread applications of industrial ecology will not only solve environmental challenges but will gain competitive advantages in the green economy.

Eco-industrial development integrates more systemic solutions to industrial facilities, complexes, and supply chains. It is an approach that can identify efficiencies across these larger systems, rather than merely within an individual business or organization. Eco-industrial development, eco-industrial parks, and industrial ecology are similar terms for concepts being used worldwide to create more advanced, competitive, and efficient industrial areas.

An EID reflects the character of its surrounding community and integrates economic, environmental, and social goals. It is connected to the community through enterprises that have distinguishing *environmentally superior* facilities, production practices, technologies, and products. When EID becomes a part of an economic development strategy, job creation is pursued in the context of strengthening a community, while enhancing quality of life and protecting local natural resources.

In contrast to current industrial development patterns, an eco-industrial approach aligns industrial systems with ecological systems, resulting in the most efficient industrial processes that:

- **Systematically** examine material and energy flows throughout industrial supply chains.
- **Maximize** efficient use of resources, energy, and by-products.
- **Minimize** impacts on the environment by moving toward zero waste and emissions.
- **Apply a life-cycle approach** to go beyond waste minimization, pollution prevention, and eco-efficiency to address the cumulative impacts of development.
- **Integrate** sustainable design features.
- **Maximize** use of renewable energy and materials.

*\* See Attachment One for definitions and concepts associated with EID*

# Chronology of Sustainable Industrial Development Projects

**Bridal Veil Area Minneapolis Industrial Redevelopment Grant Project 1998** The Sustainable Industrial Redevelopment (SIR) Project sought to demonstrate to real estate developers the benefits of developing land in a sustainable manner. This three-phased project challenged existing perceived barriers to pursuing sustainable development while giving developers information they could use to attract new tenants who operate in an environmentally sound manner. This work was based on “Guidelines for Environmentally Friendly Building Design” developed by the Southeast Economic Development Committee, a local community group.

The project centered on a specific location the Bridal Veil area, a 380-acre brownfield site in southeast Minneapolis. A “Sustainable Design Basics: Linking Developer and Community Interests in High Performance Building Design” resulted from the project. This guide provides information on how sustainable design can benefit developers as well as communities and can be used as a resource for community representatives seeking to champion sustainable development approaches in their communities.

**Phillips Eco-Enterprise Center, completed in October 1999** PEEC incorporated more than 25 different sustainable design strategies and nearly 100 product selections that helped it to meet its design goals. For a decade, the Phillips Eco-Enterprise Center (PEEC) has stood as a state-of-the-art “green” building in an economically deprived neighborhood in South Minneapolis. In its tenth year of operation, the PEEC ranked superior to three-quarters of the existing commercial building stock in the United States for energy efficiency.

**City of St. Peter Eco-industrial Development Feasibility Study 2001** In January of 2001, the City of St. Peter initiated an EIP planning project that included a redevelopment and diversification strategy based on recent natural disasters, economic distress and future community growth. The project was funded by included the City, local economic development groups, the Minnesota Office of Environmental Assistance, and a private utility. The approach emphasized local and regional assets, including the regions agricultural base, local institutions, and the existing small industrial base. The result was a feasibility study that targeted development opportunities in two areas: 1) a bio-based chemical production system with emerging business recruitment options, and 2) a community food production system including local suppliers and processors, institutions, wastewater treatment plant, and marketing cooperative.

**Bassett Creek Valley Eco-Industrial Feasibility Study January 2002** The Bassett Creek Valley Industrial Redevelopment Feasibility Study was intended to assess strategic opportunities and develop conceptual plans for business retention and new economic development in Bassett Creek Valley Minneapolis, Minnesota. The study applied an eco-industrial development model that would identify the means to retain the already diverse local industrial base and find opportunities to further diversify through new industrial and commercial development. The entire scope of the study was never implemented, but some analysis of local industries was completed along with conceptual plans for an eco-industrial-based redevelopment of commercial and industrial areas.

**Integrated Bio-based Eco-Industrial Development DOE Proposal May 2003** The Minnesota Office of Environmental Assistance, the University of Minnesota, U.S. Department of Agriculture, the Blue Earth River Basin Initiative, and others submitted a grant application to the U.S. Departments of Energy and Agriculture to develop a bio-based solution, based on alternative

crop production and bio-based industrial processes and products, to reduce the ecological impact of southern Minnesota farms on the Mississippi River basin. **Project was not funded.**

This proposed eco-industrial development project was to create a bio-industrial cluster that would handle and process sustainably grown biomass materials (such as alfalfa, flax, willow, and hazelnut) for the manufacture of value-added bio-based products. The proposed facility (or cluster of facilities) was to be powered by a renewable resource refinery that would incorporate biomass, wind, and solar technologies into a complete renewable distributed energy package. Unique to this solution was the production of hydrogen for process-related applications (e.g. hydrogenation) and fleet applications, linked to a distributed energy facility to the hydrogen infrastructure via the production and use of this emerging fuel.

### **Re-Engineering the Midway Industrial District for 21<sup>st</sup> Century Competitiveness - April 2004 Eco-Industrial Workshop**

The focus of the workshop was to apply some of the principles of eco-industrial development to the area and identify more systemic solutions to some of the area's challenges and opportunities. Objectives were to:

- Reposition current industrial activities and identify the best new development opportunities for strengthening the industrial base, preserving and creating new jobs.
- Focus on retaining existing businesses, including the Rock-Tenn facility, as a part of the industrial district.
- Better integrate industrial uses with other non-industrial uses resulting from transit in the University Corridor, including mixed-use and residential development, and improve the transitional and buffer areas adjacent to residential neighborhoods.
- Identify emerging networks that could form the backbone of an eco-industrial system through the use of energy or stormwater management districts, cooperative ventures in transportation, logistics, and workforce development, and through the creation of development districts with codes and covenants, brownfields cleanup funds and overall financing tools.
- Embed eco-industrial strategies into the ongoing planning and development of the Midway industrial area, by businesses, community groups, and the public sector.
- Identify strategies that will improve overall environmental management, ecological functions of natural systems, enhance the tax base, revitalize industrial development, and establish stronger connections to the community and new emerging land uses.

### **Environ Design 8 April 2004 Minneapolis – Eco-Industrial Development Sessions**

Provided four eco-industrial development sessions in a cohesive track to:

- Educate diverse audience on eco-industrial concepts, practices, examples, how tos, and lessons learned.
- Provide information from EID practitioners.
- Use EID presentations to engage potential stakeholders in local EID projects.

**The Madelia Bio-Based Eco-Industrial Resource Assessment (2005)** This project was funded by the former Minnesota Office of Environmental Assistance. The purpose was to gather and analyze data to develop a basic renewable energy and materials flow analysis (Renewable Resources Profile) for the community of Madelia, Minnesota. The project team identified, inventoried, and assessed the sources of biomass material flows from the major processors, energy users, and agricultural sectors within a 25 mile radius of the Madelia area. The result was a "Renewable Resources Profile" to inform the community about the amounts, characteristics, and methods of utilizing local agricultural and industrial biomass feedstocks for energy and/or bio-based industrial development.

This resulted in the **Madelia Model**, which applies an eco-industrial development approach to help a rural community capitalize on local agricultural production and create a renewable energy and bio-based cluster as a community development strategy. The concept is that within a 25 mile radius, a rural community can grow, or collect from natural or industrial sources, enough biomass to “fuel” local bio-based processing operations. Applying this approach would capitalize on the synergies between agriculture, environment, and community to provide a distinct competitive advantage.

The Madelia Model concept is for a bio-based eco-industrial park that includes small community sub zones for preprocessing, consolidation, processing and identity preserved storage of agricultural products. Local farmers, growing a diverse range of crops, would be the backbone to supply feedstocks. This concept enhances the community’s base agricultural system by promoting crop diversity, develops new local market opportunities, and provides local processing to add value to locally grown crops.

The bio-based eco-industrial park would process, manufacture, and package agricultural crops raised in the region. The energy supply would be a locally grown renewable energy source that might include bio-fuels, wind, methane, synthetic natural gas, solar, or hydrogen. A processing company would be the main anchor of the industrial park and would transform agricultural products into higher value commodities such as derivatives, medicines, or cellulose to plastics. Other companies within the industrial park would process their own agricultural commodities, utilize the value-added products for further processing, or utilize co-products for additional value added products.

*\* The Madelia Model is continuing to develop and as of April 2009, is focused on establishing a gasification demonstration facility that would process mixed prairie grasses.*

### **Duluth Superior Area Eco-Industrial Development Initiative – Knight Foundation Grant, January 2005 to December 2006**

In late 2003, there was a convergence of eco-industrial development (EID) activities in the Duluth, Minnesota, and Superior, Wisconsin, area. Separate from this, other efforts in both the Twin Ports area and communities in the region were grappling with how to drive a transition toward sustainable development. Some of those efforts show varying degrees of progress. In October 2004, the Knight Foundation awarded seed funding for the Duluth-Superior Area Eco-Industrial Development Initiative Phase One. The project officially began in January 2005, extending until December 2006. The primary focus was to explore the circumstances, conditions, and readiness of the region to undertake eco-industrial development. One key result of this project was to initiate the **Coalition for Eco-Industrial Development**.

### **Coalition for Eco-Industrial Development Strategic Financial Plan, approved by CEID Board February 2008**

The Coalition for Eco-Industrial Development (CEID) was established to advance applications of industrial ecology in the Twin Ports region of northwestern Wisconsin and northeastern Minnesota by providing organized and targeted intellectual capital to its clients, partners, and communities. Six mission critical success factors are to:

- Build a highly collaborative Coalition Membership and an EID Network of multi-disciplinary specialists that maximize internet technologies,
- Design, market, and implement, CEID Services,
- Apply a sustainable financial model,
- Conduct excellent community relationships,
- Learn from and align with national and international trends,
- Interface with existing economic development organizations and environmental programs involved in protection, prevention, and restoration.

*\* The CEID Board voted to cease operations in January 2009*

**Sustainable Redevelopment of St. Paul's Ford Site Workshop April 8, 2008** The workshop explored eight topic areas that would need to be addressed if the Ford Production facility site could be redeveloped. Topic areas included land use, green remediation, transportation, buildings, energy, green business development, natural resources, and water. The green business development scenario included the following summary recommendations:

- Consider a mix of industrial/commercial uses. To do so, developer would have to address community needs, anchor tenants, green businesses, management authority for ongoing operation, and maintenance.
- Investigate direct applications for production and use on-site of green energy (i.e. closed loop systems, off-site connections). Position site for new energy economy and low-carbon development. Consider solar, hydro, geothermal options.
- Preserve multimodal access for industrial/business workforce. Determine connections to neighborhood and community and design guidelines.
- Augment LEED-ND to develop an additional standard for an industrial district to keep small block pattern to allow for smaller scale industrial, provide incentives for modular/successional use, determine extension to urban fabric, and develop codes/standards to last over time.
- Determine how important a green business technology/strategy is and consider design intent, shared amenities, to what extent it furthers value-added/artisan production, cost reduction, and a post-occupancy study.
- Inventory existing local/regional business base to determine what new capacity can be developed to enable community food production and products to feed an industry.
- Consider how technically feasible a “sustainable technology/strategy” is, including job creation potential, livable wage jobs, access to workforce matched to business use.
- Develop various scenarios which consider: raw material flows, finished good flows, barge traffic and access, dual use of railroad corridor, and community-based businesses.
- Create (as one big district) a municipal authority to: manage redevelopment over time, keeping design intent alive, provide maintenance services, provide green design assistance.
- Adapt a green market strategy, including reduced connection fees (water, wastewater, transit), workforce transportation and site walkability amenities, expedited site plan review, and permitting for green businesses.

## **Emerging Sustainable Industrial Projects 2009**

As part of a continuing strategy to foster SID projects the Minnesota Pollution Control Agency included SID as a preferred project area for a FY09 Environmental Assistance Grant Round. Sustainable Industrial Development Preferred Projects: “Plan and/or demonstrate industrial ecology that involve eco-industrial parks, industrial symbiosis and other types of eco-industrial developments by local governmental units or development organizations.” Up to \$50,000 grant with 25% match. Several proposed projects emerged.

**Algae-Based Waste Recovery Project – BioMatrix and U.S. Distilled Products, Princeton, Minnesota** Proposal is to conduct a pilot project to test optimum facility design and determine the viability of constructing an algae-based treatment facility to handle wastes and produce an algae byproduct for use by BioMatix, a local company. The city proposes to initiate a research program with BioMatrix International and Tierra Verde Consulting to create data needed to evaluate feasibility. This could become the basis for a regional or national business, based on technologies developed in the research. These businesses could co-locate to create a bio-based industrial cluster. Potential project outcomes include:

- Process development and growth regimes, testing biobased products, to produce baseline data – early stage data.

- Develop water purification methodology.
- Establish a biological process and product development facility.
- Establish ecologically sound and low cost wastewater treatment for city.

**City of Frazee Eco-Industrial Park** The city proposes to create an Eco-Industrial Park Plan which will identify suitable sites and assess the interactions between EIP businesses and other community. The community has need for a new industrial park and wants to apply principles of industrial ecology. This is in line with a recently completed comprehensive plan. Becker County EDA will assist the city and provide strong qualifications from their Economic Development Coordinator. The EDA has strong experience in developing and managing industrial parks in the county, which is a plus for future implementation. Pursuing and eco-industrial park plan could provide a model for other similar projects in the region.

**Silver Bay Eco-Industrial Opportunities** Silver Bay is located 56 miles northeast of Duluth, along the scenic shores of Lake Superior. In the community is North Shore Mining, a taconite-processing plant, and the 110-acre Silver Bay Business Park. Roads, utilities, and site/environmental permits are in place, and the park is ready for the development of retail and light industrial businesses. This project brings together a strong inter-disciplinary team to assess and plan the economic feasibility of transforming the Business Park into an Eco-Industrial Park. The park would be subdivided into industrial and business clusters in order to align industrial systems, maximize the use of resources, energy, and by-products, and minimize impacts on the environment, while also attracting tourists and retail consumers. Businesses will be attracted to the EIP by its access to renewable energy, the economic and environmental benefits of industrial clustering, and its location.

A keystone of the park would be the development and integration of a renewable, cyclical, self-sustaining, combined heat and power energy production system. The requested funds will analyze and identify the most economical and environmentally responsible combination of renewable energy sources for the energy production system. The five potential renewable energy sources that will be assessed are: wind/solar, biomass/binary, bio-diesel through algae production (using nutrient-rich wastewater from the wastewater treatment plant), gravity turbine (tailing water) and waste heat recovery (from North Shore Mining). This project will re-invest in the City of Silver Bay and serve as a model of sustainable development for other communities.

**Design and Incorporation of Low-Impact Development Design into Eastwood Energy Center - City of Mankato** Early stages of industrial park development with significant potential to influence design and integrate low-impact landscape design. Potential to provide a model for the region. City-owned site being developed for industrial purposes. Focus on “new generation” of light industrial uses. Intent to reduce energy use and pollutant emissions, compatible near residential, and reduced operating costs.

**Pioneer Mine Project – City of Ely, Minnesota** Feasibility of geothermal energy production from existing mine shaft. Project focuses on a renewable community-based energy system for industrial park and businesses.

## Other Sustainable Industrial Development Projects

**St. Paul and Minneapolis Mayor's Initiative on Green Manufacturing, completed February 2008** Recommendations to develop Green Zones for manufacturing.

**Red Wing Port Authority April 2008** Initial exploration of a green industrial park.

**Minneapolis Proposal to Create an Industrial Ecology Model in the North Washington Industrial Area** Minneapolis is seeking strategies for the North Washington Industrial Area that will expand employment, attract new businesses, and improve opportunities for business success among the existing businesses in the area. As part of a larger effort to integrate advanced environmental goals across north Minneapolis, the city seeks to reduce the environmental footprint of this industrial zone and increase the employment density and level of value-added manufacturing that occurs in the district. Implementation of an industrial ecology planning approach could be a means to achieve these economic development and environmental goals.

**Bioenergy Park in Lindstrom, Minnesota, December 2008** The basic vision of the project is to attract a Swedish company to build a bio-energy manufacturing plant in Lindstrom. The city believed that Lindstrom was in a unique position to attract a Swedish company due to its Swedish heritage.

**City of Kennedy Green Jobs Incubator February 2009 Legislation for Bond Funds** Proposal from the City of Kennedy to design and construct a geothermal, wind turbine, and solar energy power generating facility at a city-owned building to be used as a combination community center and green jobs business incubator.