Industrial Ecology

Industrial ecology derives its name as an analogy to the way that nature works. In nature, there are no "wastes"; all organisms provide food or decomposition products for the benefits of the ecological system. Similarly, industrial ecology imitates nature with a positioning arrangement of economic activities whereby the potential wastes from one activity serve as important inputs to other adjacent economic activities. The particular focus upon exchanges of materials and energy is sometimes referred to as an "industrial symbiosis."

There is extensive literature about industrial ecology and specific case studies. Many of these applications have taken place in Europe and internationally, including the best-known example of Kalundborg, Denmark, a coastal town of about 20,000 about 120 km west of Copenhagen. The Kalundborg example has been studied and documented by many observers (including Indigo Development, a U.S. industrial ecology practitioner, a Colorado university summary depicted below, and even a YouTube feature video).

The Kalundborg example evolved from a large coal-fired plant, Asnaes Power Station, originally built during the 1970s. In addition to electricity, the power station produced as waste products, flyash, gypsum and waste heat. Over a period of about two decades, other economic activities became located on adjacent land: a Statoil oil refinery, a Gyproc plasterboard factory, Novo Norodisk pharmaceutical plant and a fish farm. In addition, some byproducts such as fertilizer, sulfur and flyash are used locally and some of the waste heat from the electric power plant provides district heating for the town. The flow of materials and energy among the economic entities for the Kalundborg industrial ecosystem is depicted below.

In the United States industrial ecology still holds much promise, but has not developed to its full extent. Related, and somewhat simpler, approaches which have been used to some extent include (1) "green twining," an exchange of a single material or energy flow and (2) regional waste exchanges.