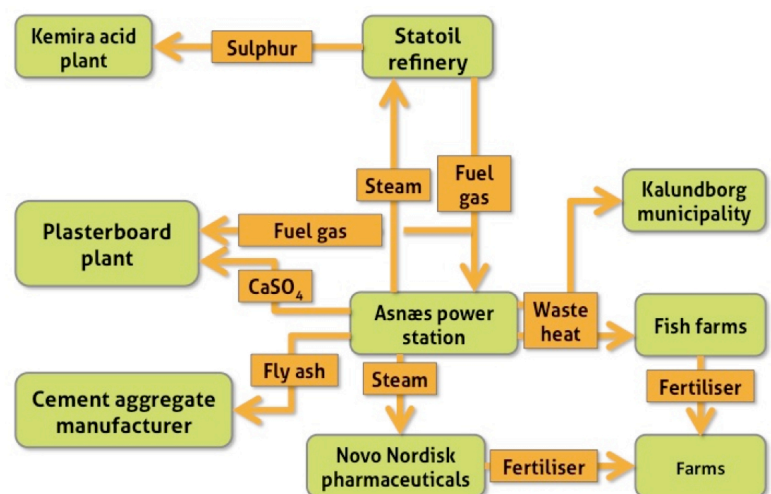


Industrial Ecology

The term industrial ecology was first used in an article 'Strategies for Manufacturing' published in the Scientific American in 1989 written by Robert Frosch and Nicholas Gallopoulos. The original concept is the consideration of the use of materials and waste in industrial systems and the examination of energy and materials flows in a way that is analogous to an ecosystem. The basic principle is that in properly functioning ecosystems there are no 'wastes' and any by-products from one metabolic process provide feedstocks for other coupled metabolic processes. The vision is one of an industrial 'ecopark' with a group of industrial processes operating in some form of industrial symbiosis with zero pollution, because the waste from one factory is the feedstock for another.

In this model, each industrial unit is viewed as an organism operating within a nutrient web. Industrial nutrients are assimilated by a factory which produces material goods, which may then be used by another manufacturing facility to produce a more complex product. This emulates a grazing food chain. However, the industrial processes also yield waste products, and what is often missing from industrial practice is a detrital food chain, where factories 'feed' on waste products. There is no closure of the loops with our present practices.

A much-quoted example of an operating industrial ecology is the Kalundborg eco-industrial park in Denmark. An industrial ecology has been developing here since the 1970's, driven by economic imperatives and without any conscious strategy to develop this evolving symbiotic system. The Kalundborg park involves a network of energy and materials flows between a coal coal-fired power station, an oil refinery, a plasterboard manufacturer, a cement producer, a biotechnology company and the town of Kalundborg.



There are very few examples of integrated industrial eco-industrial parks operating worldwide, but materials exchanges between industrial enterprises are commonplace. However, the industrial ecological concept is somewhat different from these traditional commercial exchanges in that it gives value to waste, the stuff that would ordinarily pollute our environment, but instead becomes a valuable commodity for another industrial process in the ecopark model. Recycling has a vital role to play in such a system, but an industrial ecology is much more than an end of pipe solution.