8. INDUSTRIAL ECOLOGY IN TRANSITION COUNTRIES: HISTORICAL PRECEDENT AND FUTURE PROSPECTS

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Abstract: Industrial ecology uses the structure and processes of natural ecosystems as a model for organizing industrial activities, seeking to integrate wastes and by-products into the production process thus reducing the need for material extraction and waste disposal. In this paper we discuss the theory and practice of industrial ecology as developed in the former centrally planned economies, and make observations on the suitability of industrial ecology in current transition countries. We describe the Soviet concepts of “combined production” and “waste-free technology”, and show that Soviet scientists were familiar with many fundamental elements of modern industrial ecology. Although the potential environmental benefits of industrial ecology were recognized by central planners, industrial ecology was pursued primarily as a means to increase production. We then discuss issues specific to the (re)implementation of industrial ecology in transition countries, such as appropriate policy instruments, the relation between economic growth and environmental impacts, the question of central planning versus spontaneous organization of industrial interactions, the valuation of resources and environmental externalities, and the underlying goals of industry and society in the context of changing material aspirations among the populations of transition countries.

Keywords: industrial ecology; transition countries; by-products; central planning; market economy; Soviet Union; environmental protection; production; consumption

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1. The Modern Concept of Industrial Ecology

Environmental security literature in recent years has recognized dual roles for industrial production in modern society, both as a source of material welfare as well as a cause of ecological stress. The concept of industrial ecology is increasingly noted for its potential to reconcile manufactured abundance with minimized environmental impact (Frosch and Gallopoulos, 1989; Graedel and Allenby, 2003).

1.1. WHAT IS INDUSTRIAL ECOLOGY?

Industrial ecology is an approach to organizing industrial systems that uses natural biological ecosystems as a model. The structure and processes of natural ecosystems, including the complex interactions of organisms with each other, are used as a basis for creating industrial networks. The traditional pattern of industrial production/consumption is a linear flow, where raw materials are extracted from nature, processed in factories and used by consumers, and then disposed as waste back to the environment (Figure 1a). Industrial ecology seeks to integrate wastes and by-products back into the production process, thus reducing the demand on nature for material extraction and waste dumping (Figure 1b). This approach closes material cycles and reduces the need for raw material input and pollution output.

![Figure 1](image-url). Material flows in (a) traditional linear industrial system and (b) industrial ecology system.