4. Summary Of Case Studies

FIVE CASE STUDIES ARE PRESENTED in the following chapters. Each of them illustrates in a specific way the relevance and utility of the Industrial Ecology perspective. All the studies were undertaken during the period 1996–1998. Although the data have not been updated, the core issues remain unchanged over the years. Updating the data would not dramatically alter the key issues in the cases presented here. For the convenience of the reader, a summary of the case studies is given in this chapter. Figure 4.1 indicates the sites of the case studies in various parts of India.

The studies (except the one of the Damodar Valley region) were designed and directed by Ramesh Ramaswamy, Technology Exchange Network (TEN), India, within a network, Industrial Ecology Praxis, launched and coordinated by Suren Erkman, Director of the Institute for Communication and Analysis of Science and Technology (ICAST), Geneva. The network has the objective of disseminating, testing and implementing the new ideas in Industrial Ecology at an international level. The main support for this network, since its inception in 1995, comes from the Charles Leopold Mayer Foundation, in Paris, in the framework of a global initiative, The Alliance for a Responsible, Plural and United World (http://www.alliance21.org). The initial funding for two of the case studies was from the Swiss Agency for Development and Cooperation.

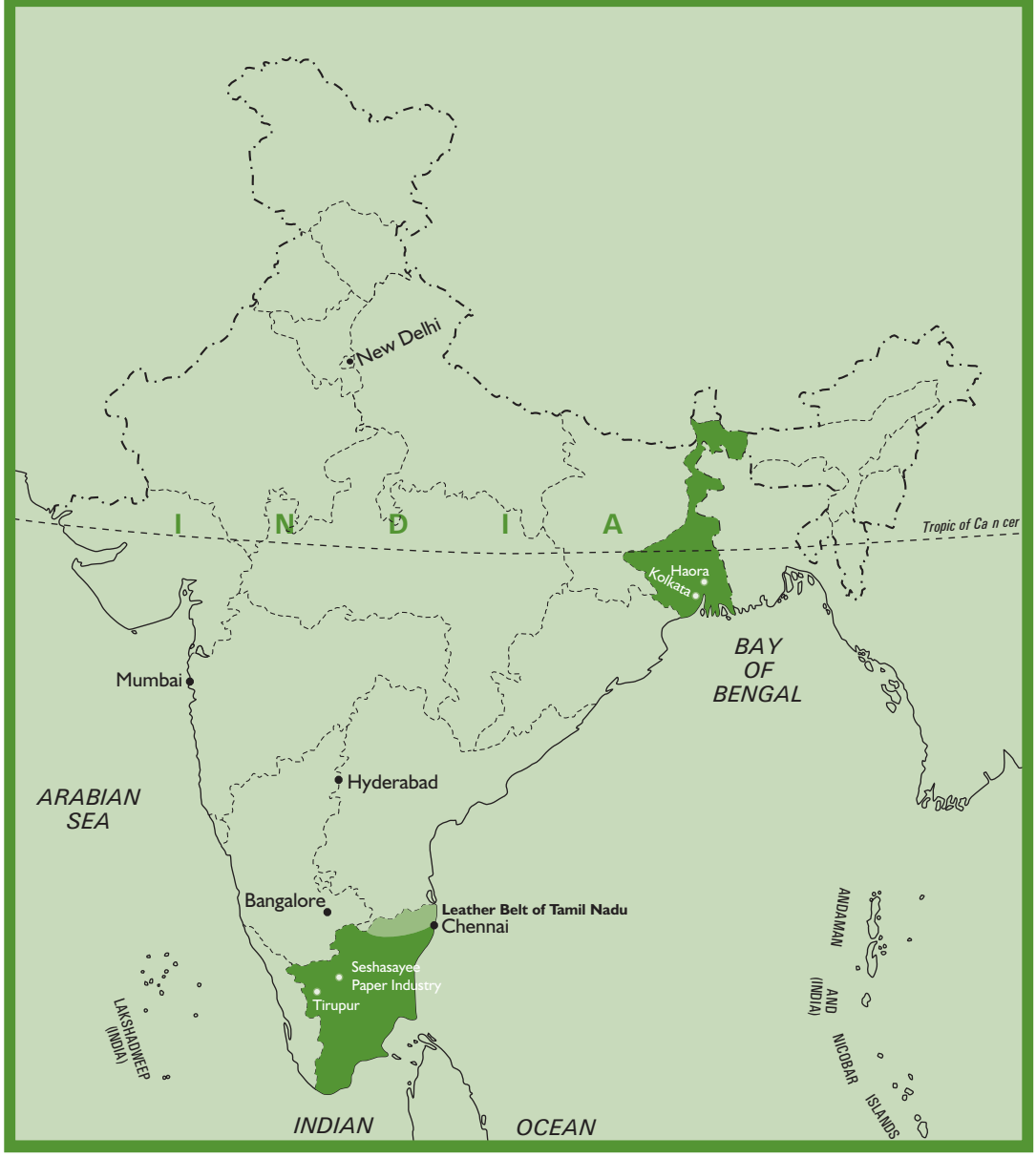
4.1 Case Study of the Textile Industry in Tirupur

Tirupur is a major center for the production of knitted cotton hosiery. The town is located in the south of India and has a population of about 300,000. The 4,000 small units in the town specialize in different aspects of the manufacturing process. The aggregate annual value of production in the town is around US $ 828 million. Much of the produce is exported bringing in very valuable foreign exchange.

Till about the 1980s, for decades, the center was mainly manufacturing white undershirts called banians, which are commonly worn in India. The industry then

FIGURE 4.1

Sites of the Case Studies



discovered the lucrative international market for colored T-shirts, which led to a boom in exports. This enormous growth in the production of colored textiles, led to an increase in the dyeing operations in the town.

Water is scarce in the area and the wet processing of textiles (particularly dyeing) has rendered the groundwater unusable. A large quantity of salt is used in the dyeing process and the process wastewater (90 million liters per day) is highly saline and is contaminated with a variety of dyes and chemicals. As there is hardly any other source of freshwater nearby, trucks bring in water from groundwater sources (which are yet to be polluted) as far as 50 km away at an enormous cost. A massive US$ 30 million project is under way to treat the wastewater at a common effluent treatment facility. After such expensive treatment, the water will still be unusable, as the facility does not include any system for desalination of the wastewater.

A detailed Resource Flow Analysis (RFA) was carried out for the town. Only when the figures were aggregated did the industrialists realize that they were collectively spending over US$ 7 million annually on buying water and in addition, the annual maintenance cost of the effluent treatment plant would be an enormous burden.

Since water is used at so many different points and the industrialists had internalized the cost of buying water in their operations, neither the total volume of water used in the town nor the amount of money collectively spent by the industry in buying water, was immediately obvious. An RFA for the town made the industry aware of the magnitude of resources consumed.

These aggregate figures also showed that water could be recycled profitably. On the basis of the study, a private entrepreneur developed a water recycling system, which could be installed in each dyeing unit. The system used the waste heat from the boilers already working in the dyeing units for the recycling process. This is a relatively low cost system, which is gaining popularity in the town.

Similarly, since the use of the firewood is distributed over nearly 1,200 points, it was not obvious that nearly 500,000 tonnes of firewood were being used. There is grave concern over rapid deforestation in India. The possibility of setting up a central steam source, with the option of solar preheating, was suggested as a way to reduce the consumption of firewood.

Another outcome of the study was that it highlighted the fact that the calorific value of the solid waste (garbage) was high as it contained large quantities of textile and paper wastes. This could be used effectively to partially replace the firewood being consumed in the town.

The case also illustrates the significance of the Industrial Ecology approach in the context of a developing country. For many years a number of research and development institutions have carried out pollution control studies in Tirupur to minimize water use, minimize use of dyes and to improve the quality of the effluent. There appear to be no studies aimed at evaluating the possibility of profitably recycling the wastewater in the town, which should have been the first priority, from the point of view of Industrial Ecology. Again, since water pollution was seen as the only issue, no attempt appeared to have been made either to minimize the use of scarce firewood or to leverage the high calorific value of the solid waste in the town.

Focus

This study highlights the utility of an Industrial Ecology approach. It clearly illustrates the use of an RFA to understand various material flows in an area and use this for planning. The case also suggests an approach to a methodology for data collection and analysis to aid decision-making.

4.2 Case Study of the Foundries in Haora

There are nearly 500 cast iron foundries in Haora, a suburb of Kolkata (formerly Calcutta), in Eastern India. The air pollution from the foundries has been a source of concern. The pollution control authorities have been insisting on the foundries installing pollution control systems to mitigate the emissions. The poor health of the engineering industry in the eastern region has affected the financial health of the foundries here, which now subsist on manufacturing very low value-added products like manhole covers.

Since pollution from the foundries was a major source of concern for the state authorities and a matter of public debate, a number of agencies had launched studies to develop and set up technologies and equipment for limiting the air pollution.

One of the governmental research agencies had developed a process to use natural gas instead of coke (the major cause of pollution) that the foundries were using. This process was in an advanced stage of development. It was considered likely that the environment protection authorities might insist on the foundries using this new technology to eliminate the pollution problem. Since natural gas is not available in the region, the use of this new technology could substantially increase the cost of production and the foundries would not be competitive.

An RFA of the region showed that the industry could adapt the new technology to use coke oven gases instead of natural gas. As the eastern region is a major coal-producing area and as there are many independent coke ovens, coke oven gas is easily available locally and is often wasted. Depending on the economics, either the foundries could be relocated near the coke ovens or the coke oven gases could be transported to the foundries.

Focus

The study highlights the relevance of an RFA to an industry planner, as it would point to unused resources (by-products or wastes) in a region. The industry (or a group of industries) could consider how they might leverage the availability of any of these unused resources to their advantage and for their sustained operations. This can be done by establishing new linkages between industries in different sectors (like foundries and coke ovens), which is far from obvious, without an RFA that helps in the detection of such resources in a systematic way.

4.3 Case Study of the Leather Industry in Tamil Nadu

Tamil Nadu, a state in the south of India, is the premier center in India for the processing of leather. Water is scarce in Tamil Nadu.

India had traditionally been a major center for the export of hides and skins. In the 1970s, the government of India banned the export of raw hides and skins with a view to improving the value addition of production, and thereby enhancing the inflow of scarce foreign exchange. Environmental issues were not considered seriously in India those days.

This boosted the leather processing activity in India in general and in Tamil Nadu in particular. The industry is a major foreign exchange earner and important to the economy of the state and the country. Meanwhile, compliance with strict environment regulations has rendered the processing very expensive in the developed world.

The leather industry (which is made up of thousands of small industries) is a major user of water, as each tonne of hide/skin needs 30,000–50,000 liters of water for processing. This is a large volume, as the average per capita water availability for human settlements in India is estimated at around 30 liters per day.

The growth of the industry has resulted in extremely high water pollution in the regions where the tanneries are concentrated.

The leather industry has been under pressure from the pollution control authorities and many have subscribed to a central effluent treatment plant. The water after treatment continues to be unusable, as it is very saline. The sludge from water treatment continues to be a serious problem.

A detailed study in the context of Industrial Ecology helped in redefining the problem which till then had been only viewed as a pollution control issue as the effluents did not meet the specifications laid down by the law. Many academic studies have been undertaken to ensure that the effluent quality comes as close as possible to the standards using the best available technology.

However, the problem is much more serious. The tanneries are using a resource, water, which is extremely scarce in the region. The industry is also contaminating the groundwater resources of the local community, which is causing great hardship to the population, as it is depriving them of desperately needed water. It will not be long before the social pressure and the law courts bring the leather industry to a halt.

In the context of Industrial Ecology, the first priority is to focus on the use of the local resource, water. The local community cannot afford to spare water for the industry. One option would be to relocate the tanneries along the coast, where they could draw seawater instead of using valuable freshwater. If the industry is unable to develop processes that can use seawater as it is, it will have to desalinate the seawater for its use. The treated wastewater could be discharged into the sea, as long as all pollutants other than salt are removed.

The study points to a new strategy option for sustainability of the leather industry in the region.

Focus

The study gives an example of how a redefinition of a problem from a perspective of resource-use could drastically alter the approach. This could lead to new possible strategy options, more effective (and less costly) than traditional end-of-pipe solutions.

The study also points to the need for industries or industry groups to carry out studies on resource availability in the region, while establishing new plants or expanding the present plants. This could be critical to their long-term survival and their peaceful coexistence with the local community.

4.4 Case Study of a Corporate Paper–Sugar Complex

Industrial Ecology also offers the possibility of an alternate corporate planning model. This is illustrated by the case of a paper company, Seshasayee Paper and Boards Ltd (SPB), in Tamil Nadu. SPB started a paper mill, which went into commercial production in 1962. In order to ensure regular supply of raw material, a sugar mill was set up. The waste from the sugar mill (called bagasse) was used as a raw material for paper-making. Another waste from the sugar mill, molasses, was used in a distillery nearby for the production of ethyl alcohol. In order to ensure regular supply of sugarcane for the sugar mill, the company took interest in the cultivation of sugarcane by organizing the farmers in the region. The company struck long-term agreements with the farmers to buy back their produce and, in turn, took the responsibility of supplying them with water. Much of the water supplied for cultivation was the treated wastewater from the paper manufacturing operations. The company also used bagasse pith (a waste after the paper making) and other combustible agricultural wastes in the region, as an energy source in their captive power plant.

Focus

This case study highlights an alternate corporate planning model, which is compatible with the concepts of Industrial Ecology. Usually, a company plans its

growth within a product-market matrix. It tries to define its business as specifically as possible such that its energies in acquisition of capabilities and skills are clearly focused. Many organizations would be reluctant to enter into areas unfamiliar to them. Environmental issues are often seen as secondary to the main goals of the company.

A model where a company sets up not one, but a complex of diverse industries, where one industry uses the wastes of another, is a viable option for sustainable industrial growth in developing countries. The case of SPB also shows that there is a high potential for Industrial Ecology in rural areas, where integrated agro-industrial complexes can benefit the local community through efficient use of resources.

4.5 Case Study of the Damodar Valley Region

The basin of the River Damodar, in the eastern part of India, covers a vast area. This mineral-rich region (near Kolkata) is the source of much of the coal produced in India. Coal is a major energy source in the country. Many large power utilities and steel plants are located here, in addition to industries associated with coal, such as coal washeries and coke ovens. The region is considered very highly polluted.

An industrial metabolism study was undertaken in the region. The quantities of the flow of two of the major local resources, the waters of the River Damodar and coal, were studied. The results of the study gave a good overview of how the waters of the river and coal are used in the system

Since agriculture consumes nearly 85% of the waters of the river, it is critical to estimate the impact on the agricultural produce, of the thousands of tonnes of potentially toxic wastes dumped into the river, resulting from the high levels of industrial activity upstream.

All along, to reduce the high levels of air pollution, the policy of the regulatory authorities had been to focus on the “major” polluters, which in their opinion were the steel and power plants. These plants have access to some of the best available technologies for controlling their pollution.

However, a study of the flow of coal gave surprising results. Huge quantities of coal are consumed in millions of homes and in the informal sector. In this sector, coal is used in very inefficient combustion systems, obviously without any pollution control systems, which makes the whole area extremely polluted. It was obvious that if the air had to be clean, a new fuel policy would have to be evolved. Some new systems of transportation of coal also need to be evolved to minimize the spillages during transportation, a major contributor to the dust levels of the region.

Focus

This case highlights the importance of a quantitative study of the resource flows in a region. Even a broad understanding of the flow of the resources serves as a guide to the policy maker and gives a new perspective and a direction for policy making.