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Environmental Challenges for Industry in the Baltic Region

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1.1 On productivity and efficiency

Industry society has become very productive in many ways. The disruptions in the production apparatus and systems of Central and Eastern Europe during recent history have been painful. Yet, in many parts of these countries, the market is increasingly more dynamic and major economic trends look promising. It is only a matter of time when industrial production on the eastern shore of the Baltic will approximate the productivity of the western shore.

Yet, productivity measured in GNP/capita does not always bear a good relationship with industrial or engineering efficiency. If industry does not have to pay the full costs for natural resources and the "sinks" or repositories for waste production, industrial performance will be less than truly efficient. Some environmental economists might say today that society is paying for some of the environmental costs of industrial production. Until industry "internalizes environmental externalities", industry will not realize the extent of the problem.

Central and Eastern Europe continue their transition from an economy and industrial production system based on central state planning and the fulfillment of quotas towards an more pluralistic economy based on freer prices and the variations of supply and demand. Both east and west, however, are in need of accelerating another transition: One towards preventing the environmental problems of industry at the source instead of merely treating the symptoms.

In a wider perspective this transition toward inherently cleaner and more efficient technologies will be a necessary but insufficient be- ginning on a journey towards a more sustainable society. Three additional matters must be dealt with. These are:

1) **the redesign of products;**
2) **changes in consumption patterns and lifestyle; and**
3) **the redesign of production systems to more closely resemble flows of energy and materials in natural ecosystems. The task is enormous.**

1.2 Industrialization starts

How did we get to the present situation of industrial pollution and natural resource exploitation at this rapid pace and global level? Any book about sustainable industry or, perhaps more appropriately emerging trends pointing to a less unsustainable industry, would not be complete without a review of past industrial practices and what has enabled us to dirty the planet at an unprecedented rate. This history will be largely based on the developments in Western Europe, particularly Scandinavia. However those from the rest of the Baltic Sea drainage basin should recognize elements of a common industrial development history.

The questions is: when to begin? The Industrial Revolution, according to economic historians and technology historians, began in England during the 1700s. There are differences of opinion this date, but for our purposes there appear to be several decisive factors. A number of these are:

- the rise of factories and a factory system of production: from craft industry towards standardized production and labour organized in shifts.
- a series of related inventions and improvements in textile production, iron and steel making, the steam engine, improved clocks, and various other production improvements.
- the rise of limited responsibility share holding companies which attracted larger amounts of capital to launch industrial enterprises.

A nearly ubiquitous factor was also that the labour and production organization rules inherited from the Middle Ages were undergoing a period of transformation. The guilds had had traditional rights but had difficulty organizing to meet industrialization. Historians often point to the role of the guilds in maintaining traditions and production *quality*. Industrialization meant breaks with tradition and could also mean an emphasis on production *quantity*.

Governments seldom regulated industrialization, or only selectively so during the hundred years or so after the Industrial Revolution began in England. Regulation most often was related to the demands of the workers who may have been organised in some way. These demands could be for minimum wages, reduced number of working hours per week, or worker protection from very specific hazards.

A Reader's Guide to the Booklet

THE BACKGROUND

The introduction (Chapter 1) puts industry today in a historical perspective and within a general environmental context. We believe that this is necessary to grasp the enormous need for change in industry and to understand why change is so slow in coming.

The historical perspective considers industrialisation as part of a long-term development in society. Environmental concern in the way we define it in the mid 1990s is a relatively recent phenomenon and arises from a multitude of sources. Additionally, for firms to be motivated to improve their environmental performance, a number of conditions have to be fulfilled.

THE STRATEGIES

Chapters 2 and 3 discuss a number of shifts that are taking place with regard to how the environmental impacts of industry can be reduced. Briefly, these shifts go from 1) reacting to and "managing" problems towards prevention, 2) single media or individual impacts towards systems thinking, 3) firm regulation towards market regulation. A fourth shift is the move in some countries toward greater employee participation in environmental protection.

Emerging concepts covered here include cleaner production, dematerialization, and industrial ecology. The chapters point to the need for new strategies and new kinds of interactions in society for industry to more rapidly reduce its environmental impacts.

MANAGEMENT

Chapter 4 concerns management issues within firms (but the observations could be extended to any organisation, not necessarily only those with a profit motivation). Management has a long tradition but environmental management is rather new and still under development. This chapter covers e.g. policy formulation, how a firm might conduct initial reviews, the notions of performance indicators, the need for reports and audits, as well as the reasons for companies to take all of these measures in the first place. Specific tools or strategies which management may choose to use include life-cycle assessment, employee activation, and environmental management systems.

THE LIFE-CYCLE APPROACH

Life-cycle assessment, or LCA for short (Chapter 5) is the generic term used to describe a number of different kinds of methodologies to obtain either an overview of the environmental impacts of a product throughout the entire life of the product, or a much more detailed analysis of the impacts. The life-cycle approach to products is clearly a necessity but the application of quantiative LCA methodology is not without problems. LCA can be seen as both a management tool and as a way to go about integrating environmental concern into product development.

PRODUCTION TECHNOLOGIES

Industrial production processes always contain scope for improvement. Chapter 6 describes how to identify and assess the viability of such improvements. Five case studies are provided for further understanding. Changing product designs and incorporating environmental issues into the product design from the start is a good practice but is fraught with difficulties. Improving the environmental performance of one aspect, such as recyclability, can reduce other positive qualities like lightening.

This chapter ends with the consideration of how various end-of-pipe filtration and control technologies can be improved where this is the only viable alternative to diminish environmental impacts. Biological treatment is replacing more mechanical or chemically based filtration and emission control technologies; some technologies of this kind are designed to produce reusable filtration products.

PRODUCTS

Chapter 7 deals with how consumers can be assisted in making environmentally correct decisions with regard to product choice through the use of environmental labels. But this is not enough. Extended producer responsibility is identified as a vision worth pursuing. Producers will be forced to compete and this will contribute to firms viewing the environment more as a source of competitive advantage rather than a threat.

A WORD OF CAUTION TO THE READER

This booklet is filled with a number of terms which may be new to you. Different communities of people: academics, policy-makers, business leaders, environmental activists, and the general public may use these terms in different ways. The meanings of terms may change through time and as you move from country to country.

This means that the reader must take care when reading this booklet! It has not always been possible for the authors to maintain consistency in the use of terms. Is waste minimization a form of recycling? What is the difference between source reduction and waste minimization? What is waste: just solid waste or also wastage of resources?

There is no easy way around the potential for confusion. Instead consider viewing this booklet as providing insight into a series of changing ways for industry to go about its business which are still under development and, in some cases, consensus has not yet emerged.

Smoke and effluent were considered as necessary evils for the good of the nation and its increase in production. Very noxious gases, terrible odours, and completely fouled water could give rise to strenuous protests and government action. Yet, air and water were thought to be free goods and the oceans and major rivers considered to have 'limitless' self-cleaning properties.

1.3 Property rights

The notion of property and property rights is important here as well (See box p. 8). Traditional titles to land, or rights of land use, from the Middle Ages came under increasing pressure during industrialization. The emerging view was that it was not enough to own land or other resources. One was to utilize it in a productive fashion that created jobs, goods, and taxation revenues. That which could not be owned lacked a market value and was, therefore, free. The health and welfare of the common man was of less concern than industrial progress.

In Sweden, for example, industrialization and related changes in societal views about natural resources and nature began perhaps one hundred years after the beginnings of the Industrial Revolution in England. Forests were the sources of timber for building both houses and vessels. Running water and lakes provided fish and a means to transport timber. Forests could help augment supplies of food from agriculture among poorer families, and property lines out in the forests were not always marked exactly. Peasants in northern Europe praticed susbsistence agriculture, and had relations with the urban elite in ways not dissimilar from the situation in parts of developing countries today.

The industrialization of Sweden lead to a changed view of forests. Previously almost seen as wasteland, trees now could be made into paper for export. Trees could be made into charcoal for the growing demands of the iron smelters. Trees became the wood in matches. Where land ownership might be unclear, government awarded rights to industrialists to exploit forests for wood and later the construction of hydroelectric dams began in earnest with resulting disruptions in the life of villagers or their loss of fishing possibilities.

More traditional society may not have been productive from an industrial perspective. Various groups and organisations in this society had, however, traditional responsibilities to each other and to the land (i.e. nature). Additionally, traditional production did have environmental impacts but with rare exceptions these tended to be local and limited in terms of time. In short, pre-industrial societies lacked the technology, organisation, and culture for causing widespread environmental degradation.

1.4 Industrialization continues

Now let us consider the trends since the end of the Second World War. During that time unprecedented levels of industrial production were reached. But this quantitiy of industrial production was reached without much or any environmental consideration. Natural resources and natural sinks were used without paying more than a fraction of the environment costs. The "natural" trajectories of production increases were based on increasing exploitation of nature.

There appears to be some evidence that trends in technological and product development are generally toward decreased material and energy intensity provided that the costs for raw materials and energy in general are not falling. However, during the period immediately following the Second World War energy, transportation, and many commodities fell in price up until the early 1970s. Then the price of crude oil rose dramatically in the West and some commodity and resource prices also rose. This resulted in changes in the growth of energy demand in a number of countries and, in some cases, economic recession.

Widespread concerns about energy efficiency first surface in the 1970s. In a number of western industrialized countries environmental concern can be considered, in hindsight, to be rather high in the early and mid 1970s. It followed a period of awakening and radicalisation during the 1960s. Government responded to this public pressure by passing environmental legislation, establishing environmental protection agencies, and beginning a much more systematic and widespread regulation of industry. The demands of the public (clean air, clean water, no more landfills in my backyard, etc.) were translated into regulatory decisions and emission permits. Industry sought exemptions, and appealed to the spectre of job losses. If all else failed, one stuck on various filtration and control equipment on the ends of pipes and stacks thus meeting the regulatory requirements.

1.5 The growth of environmental regulation

The exact process of environmental permitting varies between countries. Generally, however, the regulations tried to reduce the direct environmental impacts from point sources. Emissions limits often were set quite a bit lower than the existing emissions but almost invariably within the realm of the technically possible at that point. Regulators were charged with the task of protecting society and nature but not at whatever price. Companies were not supposed to go bankrupt for the sake of the environment.

The reasoning about emission permits therefore went something around these lines in a number of the countries of western Europe: emissions must decrease to the point where companies still can make profits and the operations of the company not be seriously effected. Filtration technology on the market exists at various prices but by and large are not too expensive to greatly effect the firm. Therefore, by setting emission limits at about the same level as the existing filtration technology the environment will

PROPERTY RIGHTS AND ENVIRONMENTAL REGULATION: ONE STEMS FROM THE OTHER

Environmental regulation, particularly early environmental regulation, was crafted in such a way as to not disturb property rights. In most cases environmental laws and regulation protects the rights of landowners and the public so that ”excessive” environmental protection is not possible without state compensation for losses.

For example Swedish environmental protection legislation which established national parks, nature preserves, and similar kinds of protection of nature took due consideration of the property rights of individuals. Thus most of the national parks in Sweden are located on land that is the property of the state. The idea behind a nature preserve is for the government to compensate landowners for lost income. The institution of nature preserve permits a high degree of ecosystem protection without state confiscation of property. The level of compensation also is a way to regulate the willingness to pay for protection on the part of the state. If the lost income on the part of the property owner will be high then the state may choose to not make the area in question a preserve. Alternatively the government may choose to ”invest” in environmental protection by buying the land and making it a national park. The latter happens rarely.

Protection of property rights can be seen with regard to industrial production and manufacturing in many countries. It stems from the earlier compromises between economic exploitation and development versus environmental protection. If a compromise could not be reached there was a tendency for interests advocating protection to lose completely.

The protection of property rights, and by extension the rights to exploit resources and produce pollution and waste, has not always lead to weak or non-existant environmental protection. Many early environmental protection or environmental-like laws have their origin in concerns for public health in terms of air or water quality. Industrial production was synonomous with progress in many eyes and could not be stopped. At the same time excessive pollution leading to poor water quality or air effected others' property rights either downstream or nearby.

The conflict became between competing economic interests, and in this conflict the environment played a very minor role. If the economic and political strength of the interests standing to loose from decreased water quality were to win, then the factory could be forced to pollute less or pollute in some other location. In this way the environment was protected indirectly. Yet, the regulators and politicians tended to listen to the voices of industrialists. The numbers of people involved in industry and commerce increased while the countryside lost population and the numbers of forest labourers and farmers fell. Additionally, the owners of factories often had greater resources to exercise power. The collections of homeowners, fishermen, or other groups required efforts to mobilize equivalent resources.

be protected by a known quantity at a known price. The installment and proper use of the filtration techniques will require minimal enforcement.

There was a strong reluctance on the part of the regulators to begin to tinker with the inner workings of the factory, the production process. We can see some sort of legacy here from the previous generations of environmental regulations. Then the sanctity of property rights was not to be breached for the sake of the environment. It was acceptable to regulate emissions to the free goods of the air and water – since the government was acting for the interests of society as a whole when protecting water and air quality. But regulating production processes for the sake of the environment was, in effect, taking away the freedom of use of the owner.

The reluctance stemmed from another matter as well. Most regulators did not have sufficient knowledge of all the production systems he/she was to regulate. Thus in many cases the regulator would feel incompetent in suggesting improvements or modifications. The idea of just questioning certain aspects of the production line and then letting the production engineers and line managers do their homework and find problems themselves was beyond the idea of regulation at that time.

If 'modern' environmental regulation of industry began during the 1960s and 1970s in more progressive countries, we can make two additional observations. First the regulatory instruments used by the regulator were primarily permits and fines. The scope of action of the regulators was also fixed in environmental legislation. The spirit of this stemmed from earlier more piecemeal environmental or quasi-environmental legislation. Furthermore, the object of regulation was to greatly diminish point sources.

The second observation is that we are in the midst of a series of changes. These concern

- the notion of what constitutes environmental policy;
- the emergence of a set of environmental principles; and
- a continuing shift of concentration on environmental problems from the local toward the global. Furthermore,

- the idea of regulating non-point sources (including the goods themselves) is gaining interest.

It may not be merely coincidence that these changes and shifts are happening simultaneously. Many of the global environmental problems like ozone depletion, global warming, the spread of endocrine disrupting substances in the environment, etc. are not the result of point sources. To work more effectively on non-point source emissions may require new environmental protection principles and new kinds of policy instruments.

Witness in this light the increasing importance of the following principles

- the precautionary principle,
- the principle of (chemical) substitution, and
- the polluter pays principle.

These principles have become increasingly mentioned or clearly emphasized in a number of international agreements (the various documents resulting from UNCED in Rio, the Montreal Protocol and later revision) or policy documents issued by international organisations such as the EU or the International Joint Commission (for Water Quality in the Canadian and US Great Lakes).

Figure 1.1 In early industrialization forests changed from wasteland to resources. Growing industry used the trees for building and furniture, for pulp and paper, for everything from matches to houses. In some countries this prompted long term (50-100 year) planning of forest production, with many similarities to sustainable management.

1.6 From pollution to products

Another matter to consider is the changing nature of the environmental impacts of industry. All parts of the Baltic Sea region have experienced economic growth and environmental degradation thanks to industry

In many countries in the region prior to World War II with few exceptions industry was scattered. Following the Second World War industrialization grew and became more concentrated either to large cities or some other favorable location based on ease of transportation or access to important resources. For example, in parts of southern Poland towns, mines, and industry grew into each other leading to an urban industrial complex with poor air, lowered life expectancy, and a bleak landscape.

Several other places around the Baltic came to be considered "Hot Spots". Book 1 mentions Rönnskärsverket in northern Sweden as an example. The environmental damage from oil shale mining in Estonia is another example of severe environmental degradation.

But the nature of the industrial environmental problem began to diverge in the Baltic during the 1970s. Strenuous efforts in Scandinavia and other parts of western Europe lead to the reduction in number and severity of hot spots. Environmental improvement could be seen in a number of places as emissions to air and water decreased. At the same time the governments in the other countries in the Baltic Sea region attached less importance to environmental protection. By the time of the dissolution of the Soviet Union industrial impacts on air and water in countries like Denmark, Finland, and Sweden had been reduced considerably. This means that the source of air pollution problems in Scandinavian cities is today often transportation and in particular car traffic.

Today increasing numbers of policy makers and industrialists in Western Europe are identifying products as the source of environmental impacts. Some analysts predict that the environmental impacts from product use, recycling and disposal are approaching the impacts from production in terms of total environmental load. While there has been regulatory success with regard to direct emissions, non-point sources will require new kinds of policy instruments for success.

1.7 Environmental space – redistribution of the right to consume resources

But which direction should we take to move away from the unsustainability of the present toward a more sustainable future? Clearly our industry must become more efficient and our patterns of consumption and production must change. However, how much must we reduce our consumption and by what year? How do we estimate what is sustainable?

'Environmental space' is understood as the total sum of what the earth can provide for us and future generations without overstressing its carrying capacity. The environmental space is the resource base, in terms of raw materials and energy, productive land, water of good quality and the capacity to assimilate waste and pollution. The equity principle – saying that each person in the world has the same right to use an equal amount of resources and 'sinks'– is an important part of the notion of environmental space.

This is a basic human right and an important policy guideline. The equity principle calls for enormous changes, because 20 per cent of the world's population living in the rich industrialised countries today uses 75 per cent of the world's natural resources. The environmental space may be calculated on a national or regional basis. The expected population in the country or region is related to the expected world's population in year 2010 and to the total environmental space. The individual environmental space is calculated by dividing the environmental space by the population in the country or region.

Year 2030 has been chosen as the year where sustainable development should be reached. There seems to be international consensus that a sustainable development should be realised within a generation. Year 2010 is used as an intermediate reference year. This date is far enough away to allow quite a significant redistribution of environmental space for a number of areas, and it is at the same time near enough to foresee possible developments in societies and technologies.

Friends of the Earth Netherlands has estimated that the consequences of global redistribution of environmental space demands for the Netherlands by year 2010:

- a reduction of the use of fossil fuels of 60 per cent,
- fresh water by 38 per cent,
- aluminium by 80 per cent,
- agricultural land by 45 per cent and
- timber by 65 per cent.

Also the Central and Eastern European countries have a resource consumption which is above the global average. This over-consumption covers, like in the Western European countries, the huge differences in consumption among different population groups, from the richest to the poorest people. The huge need for reductions calls upon new strategies. These are very much in line with the principles of prevention at the source or what is often called cleaner production. The concept of environmental space focuses, however, at the total resource consumption and environmental impact. The cleaner production concept addresses the consumption and impact per produced unit. We will come back to cleaner production later in this booklet, particularly in chapters two, four and six.

In Europe one of the principle advocates of the idea of environmental space has been Friends of the Earth. In their "campaign handbook" the following strategies are stressed:

- *Closing process cycles*: re-use and recycling as much as is environmental beneficial. If possible in unchanged form: returnable packaging, second hand goods, recycling materials from demolition sites, dismantable and repairable goods etc.
- *Reducing the use of fossil fuels for energy production*: maximum use of energy conservation and shrinking of energy intensive sectors.
- *Quality improvement of products*: longer life-span of products, avoiding the use of scarce or hazardous materials.
- *Less transportation*: the proximity principle – produce as close as possible to the consumers.

1.8 Moving from the abstract to the concrete

Environmental space may be a good guiding idea which permits us to evaluate our individual, national, and regional efforts toward a more sustainable future. Reducing the use of fossil fuels by 60 percent and the use of aluminum by 80 percent in the Netherlands by the year 2010 sounds very concrete: targets, substances and dates are stipulated. Yet the notion of environmental space remains abstract since we are not told *how* to reach these goals. We are not provided with the tools and steering instruments to proceed.

Particularly for private industry and business this becomes a key point. Since industrial companies are organisations seeking economic profit through manufacturing and selling goods, what does the idea of environmental space mean for them? How can they change so that they contribute to a sustainable future?

This booklet addresses the way that industry can change both during the short and long term so that environmental impacts are reduced. There is always scope for efficiency improvements and products can be designed with the environment in mind. Industry could move towards dematerialization with processes and systems based more on ecological systems combined with a shift from selling goods toward selling services.

This booklet provides a number of concrete examples of successful change in companies as well as points the way towards parts of new industrial paradigms.

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