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Environment-Economy Integration for Land Maintenance Approaches to Heavy Metal Pollution in the Ruhr Area and in Katowice Voivodship

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Abstract

The present paper synthesizes the results of the Ruhr-Katowice Comparison Project. This research was conducted at the International Institute for Applied Systems Analysis (IIASA) between 1994 and 1996 as part of an Industrial Metabolism project which focused on the impacts from production, use and disposal of materials containing heavy metals on soils in the Upper Basins of the Elbe and Oder rivers. Using tools of mass-balance analysis and soil science this project traced the sources, flows, and accumulations of heavy metals.

The Ruhr-Katowice Comparison Project aimed at a better understanding of policy options for reducing heavy metal contamination and managing heavy metal contaminated soils. The Ruhr area in Germany and Katowice Voivodship in Poland are the two „hot spots“ in Europe of heavy metal pollution. They have many economic features in common due to the historical orientation of their economies on coal mining and heavy industries. They differ with respect to environmental policies, however. Pollution has been largely mitigated in the Ruhr area by measures that started in the 1960s while hardly any emphasis was given to environmental protection in Poland before the 1990s.

The Ruhr-Katowice Comparison Project analyzed the role of environmental policies from the perspective of soil protection and identified the key elements that led to the historical reduction of atmospheric heavy metal emissions in the Ruhr area. A complementary analysis was performed on current efforts directed towards environmental clean-up in the Katowice Voivodship.

This study takes an economic point of view. Economic analysis of environmental policy compares the cost and benefits of different policy options. As a comprehensive empirical cost-benefit analysis is not feasible, an assessment is made based on the concept of environment - economy integration. This notion describes attempts to design policies with proper regard to the interrelationships that exist between the environment and the economy in order to exploit synergies or to minimize conflicts between environmental and economic objectives.

Six dimensions of integration are distinguished which represent different, though not independent, strategies to coordinate environmental and economic objectives. Requirements are derived which policies have to correspond to in order to promote environment-economy integration. These requirements are used as criteria for an assessment of historical policies in the Ruhr area and current approaches in the Katowice Voivodship. Based on the identification of the successes as well as the failures of efforts in the Ruhr area and the strengths and deficits of current approaches in Katowice guidelines are proposed for improving environment - economy integration for land maintenance.

The results presented in the present paper are summarized from a series of studies commissioned for the Ruhr-Katowice Comparison Project; they are referenced throughout the text and marked in the list of references. The results of the commissioned studies were discussed at two workshops held at IIASA.

The Ruhr-Katowice Comparison Project yielded four main results: first, it contributes to the methodology of assessing policy options by developing and applying the concept of environment - economy integration. Second, it yields a historical review of the beginning of systematic environmental policies in the Ruhr area. Third, gives an overview of current approaches to managing heavy metal pollution in the Katowice Voivodship. Last but not least it proposes a set of guidelines for the integration of environmental and economic objectives in land management.

Acknowledgments

The present paper summarizes the results of the Ruhr-Katowice Comparison Project conducted at and funded by the International Institute for Applied Systems Analysis (IIASA). The idea to compare historical policies in the Rhine basin and current approaches in the Upper Oder and Elbe Basins was proposed by Bill Stigliani, the leader of IIASA's Industrial Metabolism Project. This summary is based on a series of papers commissioned for the project. The author is indebted to all contributors beyond the credit he was able to give to them in the present paper. He also benefited from the comments of the participants of two workshops which were held at IIASA to discuss intermediate results. Constant inspiration, encouragement and assistance for the author were provided by the members of IIASA's Industrial Metabolism Project, including several generations of participants in IIASA's Young Scientists' Summer Program, as well as many other members of IIASA. Many others supported this project in one way or the other. The author hopes that all of them enjoyed their involvement as much as he did.

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1 Introduction

From 1994 to 1996 the International Institute for Applied Systems Analysis (IIASA) undertook an Industrial Metabolism Project entitled „Regional Material Balance Approaches to Long-Term Environmental Policy Planning“ of the impact of heavy metal loads on soil quality in the Upper Basins of the Elbe and Oder rivers, an international region in Central Europe. To support the design of appropriate policies, this investigation applied a systems approach considering sources and pathways of heavy metals through the economy and the environment.

Accumulations of heavy metals in the environment originating from industrial activities and the hazards they pose for human health have evoked the continued interest of the general public and of policy makers since the early 1970s. Only gradually has it been recognized, however, that the design of appropriate solutions of this problem requires a systems approach tracing all sources, flows and accumulations of heavy metals. An early study applying this approach to heavy metals was the Rhine Basin Study undertaken at IIASA between 1989 and 1993[1]. It reconstructed historical flows of heavy metals in an international river basin and showed that significant decreases of heavy metal loads were achieved since the 1960s. But as many industrialized countries have significantly reduced the release of these substances into the environment - at least from large point sources - heavy metal pollution continues to be a serious problem for newly developing countries.

The “Regional Material Balance Approaches to Long-Term Environmental Policy Planning Project” concentrated on the impact of heavy metals on soils in the Black Triangle and Upper Silesia region. The scientific part of the overall project is concerned

1) See Stigliani, Anderberg 1992.

with a thorough identification of the problems of soil degradation arising from heavy metal emissions and subsequent transport and deposition, taking into account waste water sludge and fertilizer application and observing soil-metals interactions and plant uptake.

The present paper deals with the policy part of the project. This part aims at a better understanding of policy options for controlling heavy metal pollution of soils. To this end it compares policies in the Ruhr area in Germany and in Katowice Voivodship in Poland which were both identified as heavy metal pollution „hot spots“ and historically share many common features arising from the orientation of their economies on coal mining and heavy industry for more than a century.

A historical analysis of the Ruhr area - which also draws on the evidence collected in IIASA's Rhine Basin study - investigates past policies to reduce heavy metal pollution and identifies important key elements. It evaluates these elements from an economic point of view. As a comprehensive cost-benefit analysis is not feasible, a set of criteria derived from the concept of environment - economy integration is applied. Taking into account local conditions as well as lessons from Ruhr area policies the study identifies principles of the approach in the Katowice Voivodship to reducing heavy metal pollution. Current approaches as well as plans and proposals are evaluated for their correspondence with the principles of environment - economy integration. Based on the assessment of historical policies in the Ruhr area and of current approaches in the Katowice Voivodship the paper proposes a set of guidelines for environment - economy integration.

The Ruhr-Katowice Comparison Project has been undertaken between mid-1994 and mid-1996. Important milestones were two workshops held at IIASA. The first workshop early in 1995 discussed the methodology of the study (Blazejczak 1995). Based on the outcome of this workshop a series of studies was commissioned[2]. The second workshop in spring 1996 discussed hypotheses derived from these studies and resulted in a second series of commissioned papers focusing on policy options for Katowice Voivodship. The present paper synthesizes this research.

1.1 Background and Methodology

The research undertaken in the Material Balance Approaches to Long-Term Environmental Policy Planning Project is directed at the formulation of policies for long-term maintenance of the land (Stigliani 1996).

Maintenance of the land comprises all activities

- to avoid entries of toxic substances into soils (qualitative soil protection),
- to rehabilitate contaminated soils (remediation) and
- to manage land use (land use management) (SRU 1995).

2) Papers commissioned for this study are referenced in the text.

The discussion on remediation usually refers to clearly delimited old[3] industrial and waste[4] sites. Recently it has been proposed in Germany to include larger but still precisely delimited areas such as mine tailings, floatation sites etc. in the definition of contaminated sites (SRU 1995). It is recognized that diffuse soil contamination of large areas requires approaches basically different from those appropriate for old industrial and waste sites.

The notion of land use management is commonly used to describe policies directed at preserving open spaces by restricting the utilization of land (quantitative land use management), but in a wider sense this notion also refers to policies directed at influencing how the land is used, i.e. which crops are grown on agricultural land or whether agricultural land is to be afforested (qualitative land use management).

The present research project is primarily concerned with heavy metal pollution of agricultural soils. Therefore this paper focuses on

- avoiding entries of heavy metals into soils,
- remediation of large contaminated areas and
- qualitative land use management.

The paper does not discuss problems of the remediation of contaminated industrial and waste sites and is not concerned with the problem of preserving open spaces.

The aim of maintenance of the land may also be stated as preserving the functions soils provide for man and nature. The demands for the different functions of soils compete with each other. The demand for the regulation function (or - synonymously - the ecological function) of soils (e.g. their ability to serve as a filter or accommodate eco-systems) competes with demand for their production function (e.g. their potential for growing crops) and their carrying function (e.g. their capacity to serve as a location for production or housing) (Wink 1996a).

Of the competing functions soils supply to man and nature their regulation functions - denoting the soil-inherent processes stabilizing the circulation of substances within ecosystems - are most endangered to be deteriorated. The reason is that exclusive property rights cannot be established to these functions. Therefore collective decisions to preserve the regulation functions of soils have to be taken. The incentives to do so are weak, however, because effects on humans are not immediately visible.

As the demands for different soil functions of different users compete with each other, rules have to be set up to coordinate these demands. In particular, mechanisms have to be designed to adjust the behavior of economic agents to the standards collectively defined. This, as well as standard setting itself, requires knowledge not only of already existing incriminations and of options to cope with them but also of the pathways of hazardous substances through the economy and the environment. The material balance

3) I.e. the entry of pollutants is discontinued.
4) In case of old waste sites there is generally no soil layer left; the object to be protected is thus groundwater rather than the soil.

approach helps to understand the precise nature of the competing demands for soil functions and to determine appropriate rules for coordinating them.

This paper takes an economic point of view. From this perspective policies for land maintenance have to be based on a comparison of the costs and benefits of all available policy options. Comprehensive cost-benefit analysis is frequently not feasible in practice, however. Still, interactions between the environment and the economy can be taken into account in policy design in a less formal way based on the concept of environment - economy integration. Environment - economy integration aims at exploiting opportunities to achieve environmental and economic objectives simultaneously or, if this is not feasible, to minimize trade-offs between these objectives. As it takes environment- economy interaction explicitly into account the material balance approach supports the integration of environmental and economic objectives.

The plan of this paper is as follows: In section 2 a framework for the assessment of policy options, based on the concept of policy integration and drawing on the information contained in material balances, is developed. Applying the criteria derived from this framework, key elements of past policies in the Ruhr area are analyzed in section 3. Section 4 evaluates current policies relevant to reducing heavy metal contamination in Katowice within the same framework, giving appropriate regard to the specific conditions in this region. Section 2 and 3 will show that both, past policies for the Ruhr area and current policies for Katowice Voivodship integrate environmental and economic concerns only partly and incompletely though in quite different respects in the two regions. Drawing on the lessons learned from past Ruhr policies and the insights gained about deficits of current Polish approaches, the concluding section defines guidelines for dealing with heavy metal pollution which emphasize the integration of environmental and economic policy objectives.

1.2 The Ruhr Area and Katowice Voivodship – Comparable Features

In order to develop guidelines for policies related to heavy metal contamination of soils in the Katowice region this study analyses policies in the Ruhr area in the 1960s to 1980s. Due to their high share of heavy industry both regions are „hot spots“ of heavy metal emissions.

The current industrial structure of the Katowice Voivodship is similar to the Ruhr area's during the early 1960's. The economy is to a large extent dependent on the coal, the iron and steel, and the non ferrous metal industries which are closely linked with each other. Furthermore, other sectors depend strongly on these industries as they produce supplies for or use and process the output of these industries.

Employment (million)		
	Ruhr Area 1961	Katowice Voivodship 1993
Total	2.043	1.5
Mining and Metals	0.581 (28.5%)	0.386 (25.8%)
Mining (1)	0.353 (17.3%)	0.308 (20.6%)
Metals (2), (3)	0.228 (11.2%)	0.078 (5.2%)

(1) Hard coal mining.
(2) Ruhr Area: iron and steel, non-ferrous metals, foundry, steelworking.
(3) Katowice Voivodship: steel, non-ferrous metals.

Sources: Merian; Preisner/Pindór 1996.

The problem of heavy metal pollution is aggravated in both regions as they are characterized by mixed uses of the land, i.e. a proximity of industry, housing - often with gardens - and agriculture. Both the Ruhr area and Katowice Voivodship have a high share of agricultural land. Even in the mid 1980s the share of agricultural land in the Ruhr Area was about 46%, in Katowice agricultural land currently covers about 50% of the total area.

The Ruhr Area[5] covers an area of 4434 km² with a population of 5.4 million inhabitants; the population density is thus about 1220 people/km² (Düsterhaus/Proll 1992). Katowice Voivodship covers an area of 6650 km² with about 3.9 million inhabitants in 1994; the population density amounts to roughly 590 persons/km².

At the beginning of the 1960s in the Ruhr Area about 350,000 persons (17,3%) were employed in hard coal mining and about 230,000 (11,2%) in metal production[6]. In Katowice in the early 1990's the number of persons employed in hard coal mining was 308,000 (20,6%), metal production accounted for about 78,000 persons employed (5,2%).

Employment in the Ruhr Area has undergone considerable structural change. But even today heavy industry is of central importance. The industrial sector adds up to a share in total employment of nearly 40%. About 135,000 persons (8.8%) are employed in the mining and energy sector and about 103,000 (6.7%) in the metal industry (Hamm/Kampmann (1993).

5) Delimitation 11+4 (see section 3).
6) Iron and steel, non-ferrous metals, foundry, steel working (Stahlverformung).

		Ruhr Area 1991	Katowice Voivodship 1994
Area	(km²)	4433	6650
Population	(million persons)	5.4	3.9
Population Density	(persons/km²)	1220	590

Sources: Preisner/Pindór 1996; Düsterhaus/Proll 1992; Statistical Yearbook NRW.

2 A Framework for Assessment

2.1 The Concept of Policy Integration

To evaluate policies related to heavy metal pollution in the Ruhr area and in Katowice a set of criteria is derived from the concept of Policy Integration developed by the OECD (OECD 1996) and applied in its Environmental Performance Reports (e.g. OECD 1995).

2.1.1 Environment - Economy Interdependencies

Economic activities invariably impact on the environment. Environmental protection, on the other hand, has significant economic consequences as environmental resources - including the absorptive capacity of the environment for pollutants - play a key role in production as well as consumption. The term policy integration is used to denote the process of improving the linkages between the environment and the economy in a way that opportunities for achieving environmental and economic objectives simultaneously are exploited where they exist. In many cases, of course, trade-offs will remain between environmental and economic objectives which need to be taken explicitly into account and minimized in policy making.

Environmental consequences of economic activities

In order to integrate environmental and economic policy objectives it is necessary to recognize environmental externalities of economic activities. Doing this through quantitative monetary estimates of environmental damages encounters many conceptual and methodological difficulties. They are unlikely to be resolved in a way that will make them a routine procedure in economic policy making in the near future. Integrating environmental and economic policy objectives, therefore, requires to define

and systematically describe the environmental consequences of economic activities in physical terms.

Economic consequences of environmental regulation

Environmental policy on the other hand has frequently been designed without giving proper regard to its economic consequences. This has led to steeply increasing costs of environmental protection exceeding its benefits in some cases.

Costs and benefits of environmental standards

The exact derivation of the costs and benefits of attaining environmental quality standards is fraught with many difficulties. For example, the synergy which arises for emission reduction between various pollutants makes it impossible to assign costs to particular abatement efforts, and the estimation of benefits involves ambiguous valuation methods (OECD 1996). These difficulties are aggravated in the case of soil contamination. It is unclear for example, how additional depositions on already contaminated land compare to those on virgin soils in terms of damage costs (Klepper 1996). It also seems to be extremely difficult to determine the benefits of future land use.

Restricting the analysis of the economic consequences of environmental regulation to direct costs and benefits may also be misleading. Non-environmental side effects such as distributional and social consequences have to be taken into account. In a situation of economic transition they may become even more important, this may result in discounting future benefits by a higher rate and, in effect, may justify to postpone policies which have long-term benefits only.

Criteria for assessing environmental policy instruments in economic terms

Economists have developed a set of criteria for the assessment of environmental policy instruments. They include environmental effectiveness, economic efficiency, both static and dynamic, and ease of implementation (Siebert 1976, Klepper 1996). Problems arise from the fact that frequently there are trade-offs between these objectives. Regulatory instruments for example, while leaving not much choice to the polluter, are highly effective with regard to both, the amount and the timeliness of the reduction of pollution. For this very reason, however, they are economically inefficient. Similar choices arise from the fact that the implementation of environmental policies requires substantial economic resources. This favors instruments which are easy to implement even if they are less environmentally effective.

The decision on how to weight these conflicting benefits depends on a variety of factors. One important determinant is the environmental problem at hand: In the case of a few similar emission sources regulatory instruments may not lead to serious efficiency losses. As important are economic and social conditions: in economic transition it may become more important to achieve environmental objectives at minimum costs, i.e. efficiently. Such choices support the case for integrating environmental and economic objectives and make strategies which promise to have net economic benefits all the more attractive.

Net economic benefits of environmental regulation

If environmental regulation promotes technological innovation, costs of pollution control are reduced. It has been further argued that properly designed environmental policies may even yield future net economic benefits (Porter/van der Linde 1995)[7]. If technological change leads to increased resource efficiency, net economic benefits of environmental protection may result and the competitiveness of sectors applying such technologies may be improved. Sectors offering solutions for environmental problems can also gain competitive advantages. The conditions for environmental regulation to trigger innovations are not quite well known yet, though.

2.1.2 Dimensions of Environment - Economy Integration

The integration of environmental and economic objectives can be achieved in many different ways. The following discussion is limited to the dimensions of integration most relevant for managing heavy metal contaminated soils. It will be shown how the various perspectives on integration relate to the overall objective of environment - economy integration.

Integrating emission control and resource management strategies

Environmental policy focusing on controlling flows of pollutants to the extent that is economically achievable by best available technologies - as was the common approach in the past - may overlook the danger of an over-use and a consequent degradation of stocks of environmental resources. The technology based approach to environmental policy may also result in reductions of emissions in excess of what would result from comparing costs and benefits.

The degradation of resources of particular concern in the present context are a gradual deterioration of soils through accumulations of heavy metals and potentials for their mobilization. In this case, the integration of pollution control and resource conservation requires that emission standards are derived from a joint optimization of environmental objectives related to the regulation functions of soils (such as their ability to accommodate eco-systems) and economic objectives related to the production and carrying functions of soils (such as growing crops or providing space for housing) (Wink 1996a). This poses challenges for several fields of policy like the formulation of environmental standards and regional planning. In addition, organizational and procedural arrangements have to be oriented towards resource utilization instead of emission control policy (Knoepfel 1995).

7) Porter's hypothesis has been challenged by many economists, see e.g. Palmer et al. 1995.

Figure 2-1

A Stepwise Procedure for Standard Formulation

Definition of the objects to be protected

Definition of the objectives of protection

Collection of scientific data

Scientific evaluation of the data

Proposals for standards from a scientific point of view

Assessment of technical reduction potentials

Cost-benefit analysis

Discussion

Decision

Control of compliance

Obligation of continuous adjustment

Source: SRU 1996.

The German Council of Advisers on the Environment (Sachverständigenrat für Umweltfragen; SRU) has proposed a stepwise procedure (see figure 2-1) for standard formulation(SRU 1996) which supports an integration of emission control and resource management. The SRU's proposed iterative procedure aims at cooperation and transparency; it incorporates the collection of scientific as well as economic information with a subsequent balancing of interests of various stakeholders, but seeks to separate expertise and political valuation.

As the costs of emission control increase if adjustments are to be made more rapidly, an optimization problem arises with respect to the schedule of emission reductions. It is quite obvious that its solution requires a long term view on environment - economy interactions as well as on interrelationships between different environmental resources.

For managing degraded environmental resources, such as heavy metal contamination of soils, the problem of integration poses itself as one of avoiding damages to man and nature at least costs as well. This requires that options to influence land uses have to be considered and that future land uses are taken into account in decisions about

remediation. The time pattern of remediation adds another dimension to the optimization problem. Distributional and social consequences also have to be looked at carefully, as the polluter pays-principle is frequently not applicable.

Integrating regulatory and economic instruments of environmental policy

A reconciliation of environmental and economic objectives does not only arise from integrating emission control and resource management strategies. Strategies targeted at diffuse sources besides point sources also provide opportunities for integrating environmental and economic objectives. To exploit them, new instruments of environmental policy are required. More recently, it has been recognized that this implies combining regulatory and economic instruments instead of choosing between them (Dente ed. 1995). To cope with immediate environmental health risks or to avoid irreversible damage, regulations will have to be applied; their combination with economic instruments such as product and emission charges, tradable permits or negotiated agreements can improve cost-effectiveness and provide dynamic incentives to search for improved solutions for environmental protection.

To cope with already existing damages of soils from past heavy metal deposition economic instruments will probably not be adequate (Klepper 1996). Instead regulatory instruments will have to be applied, for example to restrict land use. In many cases the owners of contaminated land, although not responsible for the pollution, will incur high costs through either land use restrictions or remediation expenditures which may well exceed their financial capabilities. In such cases, timeliness of the results as well as social and distributional concerns may justify the payment of subsidies. The earmarking of revenues from environmental charges or audit schemes are examples of new tools regarded as appropriate for supplementing more traditional instruments of environmental policy.

More recently it has also been acknowledged that an assessment of individual instruments of environmental policy in isolation is not appropriate; rather it is regulatory patterns - including the particular mix of instruments, the style of implementation, the timing, the institutional contexts, and networks of actors - which determine the degree to which environmental and economic objectives are jointly attained (Jänicke 1996).

Integrating environmental concerns into sectoral policies

Sectoral policies often disregard environmental concerns, sometimes they even counteract the efforts of environmental policy. Thus, both environmental and economic objectives might benefit from an integration of environmental concerns into sectoral policies. This is quite obvious in the case of agricultural policy (OECD 1993a) where a compensation of farmers for environmental services from agriculture has been intensively discussed. Other examples of sectoral economic policies not sufficiently integrating environmental concerns are transport (OECD 1993b) and energy policies (OECD 1993c). In the latter field for example, it has been proposed that the removal of energy subsidies is beneficial for the economy as well as for the environment.

Integrating regional economic and environmental policies

Of particular interest in the present context of regional environmental policy is the relation between the orientation of regional economic policy and regional environmental policy. As long as both pursue equity objectives they tend to be compatible with each other: If uniform environmental quality standards are set, the costs of compliance are likely to be higher in agglomerations, thus creating an incentive for economic activity to be spread out more evenly.

However, environmental as well as economic scarcity is likely to be different in different regions for reasons on the demand as well as on the supply side. Thus, a joint optimizing will in general result in regionally different environmental quality standards. In practice, however, efficient regional environmental quality standards cannot be established unambiguously. Practical policy, therefore, tends to set uniform environmental quality standards at the national level unless particular acceptable reasons for regionally adapted standards can be clearly established. One such reason is a division of functions, such as production and recreation, between regions; this justifies less strict standards for industrial regions. Another reason acceptable to the public could be the promotion of regional growth.

Integrating environmental policies at different levels of government

Effective environmental management requires that responsibilities are organized in accordance with the spatial dimensions of the environmental problems to be solved; these may differ for different problems. In general none of the resulting delimitations can be expected to coincide with the spatial entities relevant for economic policy objectives. Thus, considerable problems may arise for integrating environmental and economic objectives. In practice, a case can be made that environmental management is organized in accordance with the existing overall legal and administrative framework; in general this facilitates the coordination of environmental and economic policies. In addition, there should be arrangements for cooperation across administrative borders, however.

Another coordination problem poses itself with respect to the degree of independence of regional authorities. According to the principle of subsidiarity, responsibilities should be decentralized, i.e. allocated to the lowest possible level of government. This is based on the premise that lower levels of authorities have better knowledge of environmental problems as well as of preferences of individuals with respect to different policy objectives. Independent regional authorities, however, besides being likely to be exposed to pressure from societal group, may be insensitive to environmental as well as economic effects of their decisions resulting outside their region. Thus, mechanisms are required for integrating regional policy objectives with those agreed upon at the national or international level; this will result in a lower degree of independence of regional authorities in practice[8].

8) In theory negotiations between independent regional authorities could be imagined as an alternative.

Integrating environmental and employment policies

There is a continuing debate of the overall net relationship between environmental policy and employment. Many researchers agree that stricter environmental policy will result in positive though rather limited employment effects. What is not under debate, however, is that there are winners and losers in terms of employment effects: certain sectors, occupations and regions are likely to be adversely affected even if the overall effect of environmental policy on employment is positive. This applies to old industrial areas such as the Ruhr and Katowice for which employment is an economic policy concern of high priority as they face job losses in traditional industries independently of environmental policy. As a consequence efforts are made to mitigate any adverse employment effects of environmental policy. Instruments applied include step-wise implementation, exceptions from compliance for economic reasons, and various forms of subsidies.

In addition, policy makers try to exploit a possible positive relation between environmental protection and employment. The success of attempts to create jobs through macro-economic spending programs is doubtful; as they can not be precisely tuned to labor market disequilibria. For high-wage countries it is believed that shifting the tax burden from labor to natural resources would result in some additional employment, especially if targeted at low-skilled labor. Public work schemes have brought temporary relief for groups with high unemployment in addition to some environmental benefits. They may, however, have crowded out commercial activities and have not succeeded in achieving a significant share of transitions to long-term employment.

More promising prospects for integrating environmental and employment policies may arise from a strategic orientation of environmental protection on innovation and the enhancement of overall industrial competitiveness. Elements of this approach are the development of an environmental industry the competitiveness of which may be based on first-mover advantages. The more environmental concerns are integrated into production technology, i.e. the more environmental protection is based on resource efficient clean technologies, the more will overall industrial competitiveness be improved. To promote such innovations and their diffusion environmental policy must be used as an instrument of technology policy. This policy must also include elements of active labor-market policies, such as training for the new skills required for environmentally more friendly ways of production.

2.2 The Material Balance Approach as a Tool for Environment-Economy Integration

The material balance approach can be viewed as an accounting framework for pollutants allowing for the use of economic information in environmental analysis (Ayres et al. 1989). Its application is justified by the fact that a combination of readily available economic data on resource inputs with technical process data is almost always less expensive and sometimes gives more reliable estimates of emissions (or more generally of waste residuals) than direct measurement. More importantly, information about the amount of toxic substances emitted into the environment offers by itself little help for determining damages and thus for designing effective and efficient policies. Material

balances allow the reconstruction of historical emissions and hence of cumulative loads of persistent pollutants such as heavy metals when direct information is unavailable. Material balances also elucidate the relative importance of various sources of pollutants; they show for example, that inadvertent inputs of heavy metals, although representing only a small fraction of their total inputs into the economy, are responsible for a major part of emissions. Last but not least, material balances demonstrate the migration of pollutants through environmental media, and specify the geographical scale of pollution.

Material balances of pollutants support the integration of environmental and economic objectives in many ways (Klepper 1996). By describing the pathways of pollutants through the economy and the environment they help to identify the environmental consequences of economic activities. By distinguishing between immediate and final receptors of toxic substances, for example, they can help to establish causal relationships between sources of emissions and damages.

These features make material balances a valuable tool for designing environmentally effective as well as cost-effective environmental policies. In particular they allow a comparison of the abatement options for each of the sources which contribute to a particular environmental problem. They also support the integration of pollution control and land management strategies by relating emissions to cumulative loads. The tracking of the paths of pollutants through the economy in material balances will facilitate the integration of environmental concerns into economic sectoral policies. Being explicit about the geographical scale of environmental problems in material balances helps integrating economic and environmental policies at different regional scales.

In order to make an appropriate choice of policy options the information on emissions from different sources and on their pathways into different environmental media represented in material balances has to be supplemented by a more detailed analysis of driving forces of economic developments of a region. They include technological options of changing material flows and their costs, the incentives of the various actors involved, and how they are influenced by various policy instruments, as Klepper (1996) points out.

The material balance approach is closely related to the concept of industrial metabolism (Ayres et al. 1989). This concept compares industrial to biological processes which are both based on the use and transformation of matter and energy. Nature has developed a closed cycle in which waste residuals of one species are used as inputs by others and which ultimately relies only on energy derived from the sun. The industrial system has failed to do so; it is characterized by the dissipative use of many resources and the generation of waste residuals. From a programmatic point of view the concept of industrial metabolism can thus be regarded as promoting the recycling of waste products and the reduction of dissipative uses of resources. Material balances serve as a powerful tool in this transformation.

3 Driving Forces of Changes of the Industrial Metabolism of Heavy Metals in the Ruhr Area

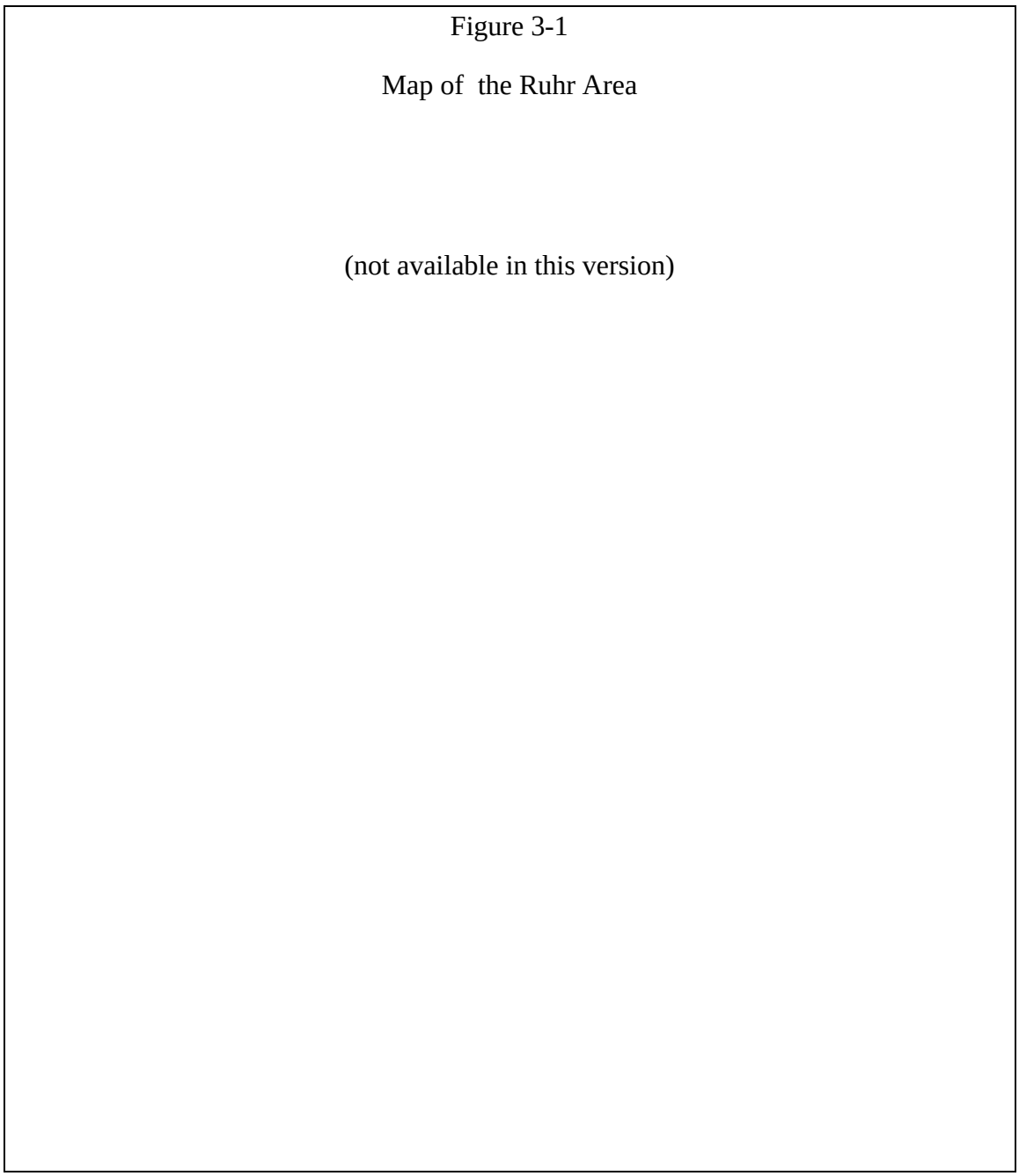
The objective of this chapter is to assess policies relevant for managing heavy metal pollution of soils in the Ruhr area from the 1960s to the 1990s with respect to the integration of economic and environmental policy objectives. The analysis is based on a series of papers commissioned for this study. To set the background for the assessment of key elements of Ruhr area policies the findings of an analysis by Wink (1996a) on how politics responded to the needs for a better coordination of the competing demands for soil functions are reported in the following section. Wink's analysis shows that well into the 1980s there was no explicit soil protection policy addressing this problem. Instead, soil protection was rather achieved as a side-effect of emission control policies, regional planning, and some attempts to cope with existing contamination. A characterization of various aspects of these policies is given by papers of Gornig (1996a) on regional and urban planning, Petzold (1995) and Nagel (1996) on the legal framework, and Keykhah (1997) on cooperation. The influence of international cooperation has been studied by Bernauer and Moser (1996).

The most significant contribution to reductions of heavy metal loads to soils arose from lowering industrial atmospheric emissions. The driving forces behind these reductions have been thoroughly analyzed. As a first step, reductions of emission intensities were attributed to inter- and intrasectoral change by de Bruyn and Schucht (1996). The precise nature of these changes is illuminated by case studies on the non-ferrous metal and iron and steel industry by Schucht (1996a and 1996b). They are further illuminated by an investigation by Edler (1996) of the costs of clean air policies. The findings of these investigations are synthesized in section 2. Section 3 presents the key elements which emerge from the analysis of policies that contributed to soil protection. The remaining section of this chapter assesses these key elements in terms of policy integration based on the framework developed in the previous chapter.

The Ruhr area is part of the state of Northrhine-Westfalia in Germany but is not an administrative unit (figure 3-1). Rather, it is defined as a contingent group of 11 (non-county) cities (Bochum, Bottrop, Dortmund, Duisburg, Essen, Gelsenkirchen, Hagen, Hamm, Herne, Mülheim, Oberhausen) and 4 counties (Ennepe-Ruhr-Kreis, Recklinghausen, Unna, Wesel) characterized by common economic features which arise from the dominance of the coal and iron and steel industry and associated in a planning authority (Kommunalverband Ruhrgebiet; KVR). Other delimitations of the Ruhr area are found, excluding either Hagen and Ennepe-Ruhr-Kreis (10+3) or the latter two and Hamm (9+3). Parts of the Ruhr area each belong to three different middle-level administrative districts (Regierungsbezirke Düsseldorf, Münster and Arnsberg). The legal and administrative framework relevant for the Ruhr area thus is that of the state of Northrhine-Westfalia, the Federal Republic of Germany and the districts and communities making up the Ruhr area (roughly in this order of importance) - the division of power between the various levels of government is determined by the constitution.

Figure 3-1

Map of the Ruhr Area



3.1 Environmental Policy from the Perspective of Soil Protection

Soils provide a variety of functions for man and nature. In particular they serve as a location for settlements (carrying function), allow to grow plants (production function) and regulate the circulation of substances (regulation or environmental function). The uses of different soil functions compete with each other. As no property rights can be established to the regulation function of soils and damages to this function are not immediately visible, it is the least protected one.

Before World War II the institutional framework in Germany did not effectively protect the regulation function of soils in the Ruhr area (Wink 1996a). Planning competence of local authorities was non-existent. License requirements were in effect for only a few installations, once granted, licenses protected facilities from any further interventions. Civil law restricted liability to locally unusual damages; even in this case its assertion was impeded by asymmetric potentials of the conflicting parties to realize their legitimate claims. Agricultural land, forests and waste land diminished as mining and steel industries and the activities they entailed claimed large areas. During the first half of the 20th century the share of land in the Ruhr area used for settlement and transport increased fourfold. In the mid 1980s (see figure 3-2) some 30% of the land is used for settlement and transport; 46% of the land is used for agriculture. Farmers adapted to soil pollution by selecting plants that thrived despite pollution like forage root crop; health hazards were no criterion as they were generally not realized. Private gardeners as well grew mainly undemanding crops like potatoes and cabbage.

Thus a need existed for

- organizing collective decisions to preserve the regulation functions of soils,
- creating incentives for emitters of hazardous substances to consider negative impacts of their activities on soils, and
- generating improved knowledge about already existing contamination and about ways to manage it.

In the 1950s there was widespread agreement that economic restructuring had to be given priority. Although a few initiatives arose from concern over environmental problems, damages to soils - as far as they were realized at all - were generally accepted as a price to be paid for economic progress. The institutional framework of environmental protection of the young Federal Republic of Germany replicated that before the war. Thus, none of the requirements stated above was met. Damages to soils from emissions of hazardous substances increased. In addition, the regulation function of soils was affected by using large areas of agricultural and waste land for industrial and housing purposes.

Figure 3-2

Land Use in the Ruhr Area

(not available in this version)

It was only in the 1960s and 1970s that policies gradually evolved which partly responded to the needs stated above. Soil protection, however, was generally only a side effect of policies directed towards other problems. In the early 1960s the decreasing acceptance by the public of air pollution was taken up by political parties and turned into a campaign issue. At that time, first legal reforms were enacted leading to stricter and extended licensing requirements and to improved potentials to assert liability claims. Simultaneously, authorities responsible for the implementation of environmental

standards were strengthened. Northrhine-Westfalia was a forerunner of environmental protection in the 1960s. It was the first state to pass an air pollution control law in Germany in 1962. Later the scope for regionally adapted pollution control policies was restricted as environmental standards were harmonized at the federal level.

Improved instruments of regional planning (Gornig 1996a) allowed to prevent new mixed-use areas. The implementation of regional development plans in the Ruhr area was impeded, however, by the diverging interests of different authorities, particularly after responsibilities had been transferred to the three district governments from the Settlement Association Ruhr Coal District (Siedlungsverband Ruhrkohlebezirk; SVR), the authority which had been in charge of regional planning for the Ruhr area since 1922.

Other sources of soil contamination than atmospheric emissions were gradually recognized and tackled in the 1970s. The first federal waste law was passed in 1972. Later in the 1970s, standards were established for the content of heavy metals in fertilizers and sewage sludge. The Federal Law for Air Pollution Control of 1974 aimed at relating regional environmental quality standards to pollution control measures at the level of individual plants.

Farms in the Ruhr area reacted to technological change and international competition by switching from forage production to poultry farming and pig breeding in the northern part of the Ruhr area. In the southern part agricultural land was transformed into recreational areas and housing sites. As incomes increased private gardens were less and less used for the production of food but converted into ornamental gardens. The availability of land for the emerging processing industries in the Ruhr area was restricted as a consequence of the hoarding of land by large companies of the mining and steel industries despite their decline. In part this was motivated by fears to become liable for damages to soils; this practice prevented the recognition and analysis of soil contamination.

Contamination of individual industrial sites was realized in the 1970s already, but during the 1980s the number of recognized contaminated sites rose dramatically. Simultaneously, scientific progress led to improved insight into the potential damages from soil contamination. In addition, increasing unemployment motivated initiatives to make additional sites available through the remediation of contaminated land in order to prevent bottlenecks for economic restructuring. In 1980 a fund was set up for the reclamation of contaminated sites in the Ruhr area, followed up by a corresponding fund for the entire state of Northrhine-Westfalia in 1984. The German federal government passed a concept of soil protection in 1985, specific initiatives - besides a tightening of standards for sewage sludge and pesticides - did not follow, however. The tightening of air emission standards that took place in the 1980s was unrelated to soil protection.

In the 1980s heavy metal contamination of agricultural land and private gardens was systematically analyzed for the first time, and their health hazards were intensively investigated in Northrhine-Westfalia. The results were not interpreted as justifying specific action, except for a few particular sites. Instead they resulted in non-binding standards, e.g. for the heavy metal content of vegetables. In 1987 recommendations to select certain crops - celeriac and spinach instead of salad and kale - were issued for private gardeners. These adjustments were quite inexpensive as gardeners usually did

not depend on producing their own food any more; many allotments had already been transformed into ornamental gardens anyway. No progress was made on techniques to deal with large contaminated areas. Some attempts to lime soils were discontinued as they did not result in permanent improvements. Regional planning contributed to the prevention of additional conflicts between incompatible demands for soil functions by excluding new private or agricultural food production on contaminated land and by the denial of permits for activities constituting a potential thread to existing food production.

In the 1980s for the first time steps were taken in the Ruhr area which aimed directly at preserving the regulation function of soils. They were not generally oriented towards high efficiency, however. Emission control policies for airborne pollutants as well as for sewage sludge did not provide sufficient flexibility to allow to take advantage of different costs of reduction in different sectors or regions and incurred high costs of implementation. Decision processes in coping with contaminated industrial and waste sites were far from transparent, mainly as a consequence of uncertain standards and rivalry between different authorities, and did not provide incentives to develop efficiently adapted solutions. Health hazards arising from the contamination of large areas were not regarded as a priority, more complex environmental damages were not taken into account. Policy measures were restricted to the dissemination of information and were probably not very effective; instead, changes of agricultural and private food production motivated by other reasons largely reduced the health hazards from heavy metal contamination of soils.

Currently a federal soil protection law is under discussion in Germany (soil protection laws exist in some states but not in Northrhine-Westfalia), aiming at the harmonization of the procedures to formulate soil quality standards and at the coordination of measures to cope with soil incriminations; priority is given to restricting emissions from agriculture. Simultaneously, problems associated with the contamination of large areas are being recognized, recommendations for their analysis are elaborated, and new guidelines for the cultivation and consumption of foods are prepared.

3.2 Reductions of Industrial Atmospheric Emission

Reducing air emissions has been the most important contribution to lowering heavy metal loads received by agricultural soils in the Ruhr area. Stigliani and Jaffe (1993) reckon that the atmospheric deposition of cadmium has been reduced from 62 to 13 tons per year in the Rhine basin between 1970 and 1988 contributing 80% to the total reduction of cadmium deposition on agricultural land.

The reduction of atmospheric heavy metal emissions cannot be explained by changes of the sectoral composition of industrial production; production prone to cause high emissions of heavy metals did not decrease in relation to overall economic activity as de Bruyn and Schucht (1996) have shown. Rather, intrasectoral changes led to lower specific emissions. The kind of intrasectoral changes varied from sector to sector; usually the installation of end-of-pipe pollution control equipment and the switch to more efficient processes played a dominant role. Schucht 1996a and 1996b has investigated the precise nature and the driving forces of intrasectoral change in two case studies of the non-ferrous metal and iron and steel industry.

3.3 Key Elements

As the previous sections have shown, the key elements of policies related to heavy metal contamination of soils in the Ruhr area were

- command and control-type clean air policies,
- flexible regional planning procedures,
- decentralized independent institutions,
- cooperative approaches to standard setting and implementation, and
- subsidy schemes for retrofitting existing facilities and for promoting environmental technology.

They will be described in the following section.

The previous discussion also has shown that environmental policies in the Ruhr area - and in Germany overall - developed in distinct phases over time. In particular, there has been a gradual and partial reorientation - in some fields even a reversal - of environmental policy since the late 1970s, reflecting a more integrated approach to environmental protection.

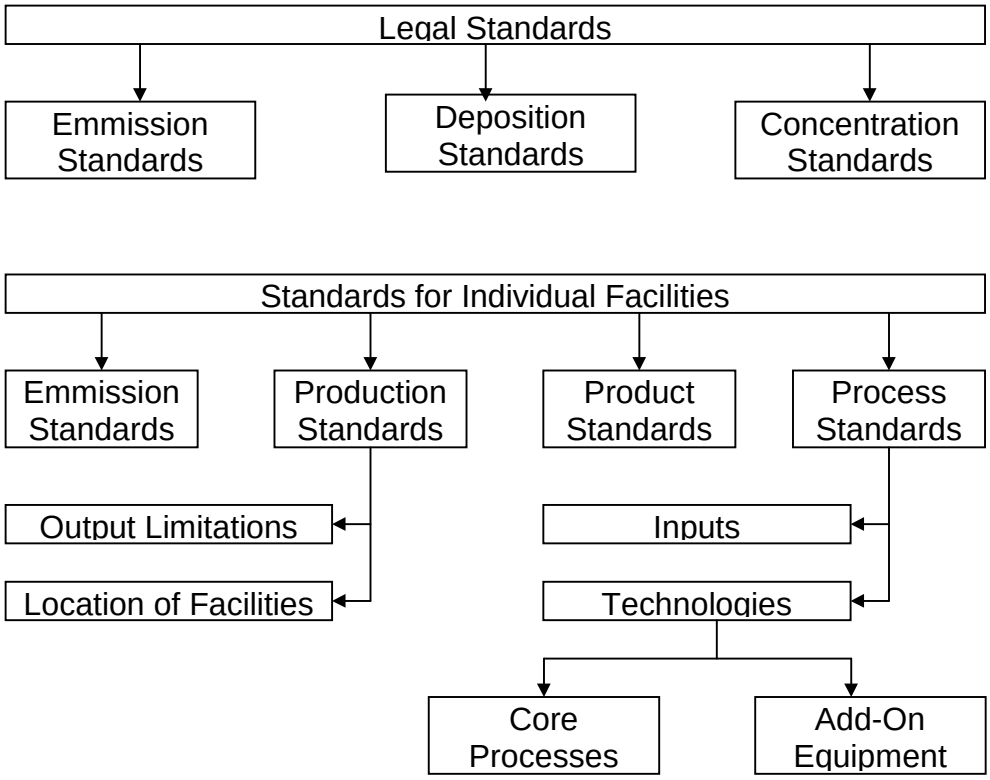
3.3.1 Clean Air Policies

The most significant contribution to the reduction of heavy metal contamination of soils in the Ruhr area arose from decreasing industrial atmospheric emissions, particularly during the 1960s and 1970s. They were achieved by an approach to clean air policies relying almost exclusively on command and control, being directed at dust emissions at first and shifting attention to particularly hazardous components like heavy metals in the 1970s. Liability rules of civil law did not play a significant role as an incentive for polluters to reduce emissions, primarily because of the exclusion of damages regarded as common in a particular location (Nagel 1996).

Command and control type policies are implemented through licensing procedures in which standards are set for individual facilities by the local administrations in charge. They base their decisions on legally established air quality standards usually referring to emissions, depositions or concentrations of pollutants. Individual standards may be formulated with respect to emissions, products, processes, or production (figure 3-3). In case of process related standards inputs or technologies of either core processes or add-on pollution control equipment may be regulated. Standards for production can take the form of limiting output, up to a closure of facilities, or restrictions on the location of activities in certain areas.

Figure 3-3

Types of Standards



The first legal document defining air quality standards for Germany was the technical directive on clean air (Technische Anleitung Luft; TALuft) of 1964. It set deposition standards as well as emission standards for dust. The long term limit for dust deposition in industrialized areas, for example, was 850 mg/m²d. For other pollutants like SO_2 concentration standards were set. In addition, minimum requirements for emissions of designated facilities were formulated; the dust content of exhaust gases of copper mills was restricted to 500mg/Nm³, for example. A revised technical directive appeared in 1974. It included previously unregulated facilities and reduced many standards by more than half. For the first time, concentrations of heavy metals in exhaust gases were restricted according to the different health hazards they pose and to the volume of emissions per unit of time. The standard set for cadmium was 20mg/m³ for emissions of 0.1 kg/h or more. These standards were further tightened in a revised technical directive in 1986.

From an economic point of view, legal standards should be based on a notion of desirable environmental quality, founded on cost-benefit considerations. As formal cost-benefit analysis is often not feasible, political decisions have to be taken. Since the 1970s the procedure of standard setting has been transformed into a cooperative process (SRU 1996; see also section 3.3.4). Simultaneously standard setting has increasingly been based on the precaution principle. In the 1960s standards had dominated that were directed at averting hazards, i.e. damages with well known probability. Since the 1970s increasing environmental awareness created pressure to set standards even if information, for example on the relation between doses and effects, is lacking. If in such cases potential damages are serious, standards are regarded as being justified by the precaution principle. Precaution standards are based on technical feasibility; implicitly they assessed costs relative to the potential of damages.

The German Council of Advisers on Environmental Issues (Rat von Sachverständigen für Umweltfragen; SRU) has assessed some 150 lists of standards existing in Germany today (SRU 1996). It lists the following deficits of standard setting:

- insufficient participation of the public,
- missing information about decision bodies and procedures,
- insufficient or missing justification for most of the standards,
- lacking control procedures for standards,
- no defined procedures for the adjustments of standards.

The procedures for establishing standards have to be based as far as possible on detailed and comprehensive knowledge about the effects of pollution. Collecting such information was one of the tasks assigned to a special administration in NRW - Landesanstalt für Immissions- und Bodennutzungsschutz (LIS) - which was founded in 1963 by reorganizing and strengthening an existing research institute. An important role in the process of establishing legal standards has also been played by the Association of German Engineers (Vereinigung Deutscher Ingenieure; VDI) and in particular by its Commission on Clean Air (Kommission Reinhaltung der Luft; KRL). Early in the 1970s it published a report on heavy metal pollution and organized a congress on this issue the results of which greatly influenced the revision of the technical directive on clean air (TALuft) of 1974. In practice, information on available technologies and their costs - besides health effects - played an important role for the formulation of standards.

Transforming environmental quality standards into regulations for individual enterprises poses a complex problem. Its formal solution requires information on all sources of pollutants, their transport over short and long distances, and interactions with other pollutants. Securing a desired future level of environmental quality poses even higher information requirements. Some - imperfect - attempts have been made in the Ruhr area to solve these problems within the framework of clean air planning.

Part of this problem can be solved more easily by setting standards for the maximum amount of pollutants to be emitted in a particular region, instead of formulating standards for mass concentrations which dominated in German clean air policy. These

can than be broken down to maximum permitted emissions for individual facilities. Standards for amounts of emissions are more effective (in the sense of leading to a pre-defined level of environmental quality). They also allow more flexibility for individual plants to adjust, thus improving efficiency. Finally, they set incentives for the development of more efficient solutions. This reasoning applies to maximum amounts of emissions for individual plants as well as for groups of polluters.

Clean air planning introduced in the mid-1970s marked a switch from an orientation of clean air policy on economic sectors to one operating in a regional context. In addition, it extended the scope of emissions dealt with beyond emissions from industrial sources (MURL 1989). Clean air planning can be seen as an attempt to solve the problem of systematically relating environmental quality and emission standards. The requirement to establish clean air plans was legally binding for areas of high pollution although the plans were not. These plans comprised (RISP 1984, TALuft 1974)

- inventories of depositions and emissions,
- pollution forecasts,
- environmental effects of pollution,
- inventories specifying relationships between sources of pollution and depositions, and
- proposals for emission reductions of individual facilities.

Clean air plans were established for the western, the central and the eastern part of the Ruhr area. The first generation of clean air plans was valid for the period from 1976 to 1982. It aimed primarily at reducing SO_2 and dust emissions. A second generation of clean air plans for the period from 1983 to 1988 tackled the problem of heavy metals in dusts. Currently a third generation of clean air plans is under preparation focusing on highly toxic substances (LIS 1994).

The implementation of legal emission, deposition, or concentration standards resulted predominantly in process related standards for individual facilities. This is illustrated by the types of actions to protect ambient air ordinated by the local administrations in charge (Gewerbeaufsichtsämter) or agreed upon between them and enterprises in 1968 (Landesregierung NRW 1969). Of nearly 14,000 measures[9] more than 9,000 related to production processes of which almost 2,000 restricted the use of raw materials and fuels. Of the remaining more than 7,000 measures regulating technologies nearly 3,000 related to core processes (including encapsulation and the like). A number of 1,700 measures required exhaust gas or dust cleaning, and 2,500 concerned chimneys. The remaining more than 4,500 actions regulated production either by restricting it or by determining the location of facilities. In some 150 cases permits were denied. Standards relating to processes - as prevailed in Northrhine-Westfalia - as well as standards regulating products or production - in addition to being more difficult to administer - pose stronger restrictions on enterprises. Thus, they are less efficient than emission standards for individual enterprises which leave more room for flexibility.

9) Excluding approximately 3,000 cases concerned with measurement or maintainance issues.

Command and control type policies are generally regarded as effective with respect to the target of reducing emissions within a short period of time[10]. Therefore they are judged as being particularly suitable for coping with immediate hazards to human health; dust emissions were widely regarded as constituting such a hazard in the Ruhr area in the 1960s. A necessary prerequisite for their effectiveness is that the means for controlling and enforcing compliance with standards exist. This was recognized in the Ruhr area. As early as 1960 the installation of a measurement system was initiated comprising more than 50 stations in the Ruhr area. To monitor air quality was the responsibility of the Landesanstalt für Immissions- und Bodennutzungsschutz (LIS). This institution also observed technological developments relevant for defining BAT. Simultaneously, administrations were established for the implementation of clean air legislation building on existing experiences (see section 3.3.3).

Individually adjusted standards[11] as opposed to uniform standards for all sources can generally be expected to be less inefficient. Clean air legislation in Northrhine-Westfalia (LImSchG) required that the specifics of facilities are taken into account in the licensing process. How close to cost-optimal solutions individual standard setting gets depends i.a. on the knowledge administrations have about the pollution abatement cost functions of individual enterprises. Decentralized administrations as in Northrhine-Westfalia can be expected to dispose of this kind of information (see section 3.3.3). Evaluations of the practice of implementation of clean air legislation by Mayntz et al. (SRU 1978) support the hypothesis that standards were adapted as a result of negotiations between administrations and enterprises. Thus, provisions existed in principle to improve the efficiency of regulatory instruments by taking into account information provided by enterprises. In many cases the decision on the actions to be taken as well as on their timing was in effect the result of negotiations.

Individual standards may improve efficiency, particularly by taking costs of rapid adjustments, such as initially high costs of abatement technologies or sunk costs, into account. For enterprises likely to be driven out of the market by abatement costs exemptions were provided by the law. By granting exemptions for installations unable to bear the costs of compliance unwarranted social consequences have been avoided - probably at a small price in terms of reduced effectiveness.

A policy of setting emission standards, or other types of standards, creates disincentives to reduce emissions below the level required and discourages the development of more efficient environmental technologies. Tying emission standards to BAT may further reduce incentives of enterprises to develop new technologies for curbing pollution: in order to avoid stricter standards enterprises may withhold information. The government can counteract this tendency by promoting technological progress. This strategy was pursued in Germany through subsidizing research and development (section 3.3.5).

The administrative problems of setting individual standards are aggravated if the number of emitters is large. Practicability can be improved if small sources are

10) The widespread use of standards has also been explained by incentive structures of entrepreneurs, politicians and beaurocrats.

11) They require i.a. information on the potentials for substitution between various environmental problems, either in terms of pollutants, environmental media affected, time, or space. This kind of information is taken into account by material balance approaches.

exempted. In German clean air policy there has been a tendency to focus on large industrial sources; this has shifted the weight of emissions to diffuse sources (Klepper 1995). The consequence for efficiency depends on the (largely unknown) costs of reducing emissions from both kinds of sources. As emissions from small and diffuse sources are probably more expensive to reduce at the margin, efficiency may have been improved by focusing on large sources at first.

In summary the following conclusions can be drawn with respect to policies designed to reduce atmospheric heavy metal emissions in the Ruhr area:

- Command and control-type policies effectively reduced emissions within a rather short period of time; the necessary prerequisite of disposing of institutions for implementation could be met mainly by building upon existing administrations.

- The formulation of air quality standards was not based on a formal procedure of weighting their costs and benefits. Economic criteria were taken into account only indirectly.

- Implementation resulted predominantly in process related standards, but their adaptation to individual facilities provided some efficiency.

- The problem of insufficient dynamic incentives was partially alleviated by subsidy schemes designed to promote innovative abatement technologies.

- Focusing on emissions of large sources and neglecting emissions of small and diffuse sources improved manageability while efficiency may not have been seriously affected.

The rational for uniform environmental standards at the national level is that distortions of competition are to be avoided by creating equal conditions for all competitors. It is proposed that setting uniform standards is also less costly. Economists have usually argued in favor of regionally different standards, however: if the scarcity of environmental resources differs between regions - because supply or demand for these resources differ - this should be represented in differing costs in order to assure their efficient use. According to this view environmental resources are not different from other resources like labor and capital; for each region there exists a specific optimal mix of resources for producing a maximum contribution to welfare. This view implies that different regions should specialize on different functions, like industrial production or recreation. In addition, specific non-environmental conditions, like economic capacities of a region, can be taken into account if scope for a regional differentiation of environmental policy exists.

In the early 1960s Northrhine-Westfalia took a lead in environmental policy in Germany by passing a state clean air law going beyond federal legislation particularly in terms of its coverage of installations. During the following decade the competencies of the German states in environmental legislation were gradually restricted. An amendment to the constitution passed in 1972 established the principle of concurrent legislation for clean air management: state regulation is permitted only if federal regulation on that

particular has not been passed. Two years later a federal clean air act was passed establishing uniform clean air standards and instruments at the national level.

3.3.2 Regional and Urban Planning

Regional and urban planning coordinate in a spatial context environmental and economic policy objectives. In this process they allow for an integration of economic and environmental objectives at the regional level.

That the Ruhr area constitutes a region with rather uniform economic and environmental characteristics which therefore requires unified planning was recognized as early as in the 1920s when the Siedlungsverband Ruhrkohlebezirk (SVR) was founded as the first association of independent communities in Germany for common planning. The pronounced needs for coordination in a spatial context also motivated a forerunner position of Northrhine-Westfalia in regional and urban planning.

Three periods can be distinguished, characterized by different approaches of regional and urban planning to solving conflicts between environmental and economic objectives in Northrhine-Westfalia and the Ruhr area. Motivated by a generally accepted view on the Ruhr area as an „engine of reconstruction“, in the 1950s solutions to the problem of air pollution were sought by spatially separating industrial and residential land uses.

In the 1960s and 1970s higher levels of incomes resulted in weaker preferences for economic objectives. As high levels of pollution still prevailed in the Ruhr area, polluting production in this region was restricted by regional and urban planning. Distances required between industrial and residential uses were increased. As planning requirements do not affect existing industrial activities, the implementation of a separation of uses proved to be extremely difficult for a region where industry and housing are as interwoven as in the Ruhr area. Even for new facilities exemptions were often granted because spare areas conforming to the planning requirements were generally not available. Even though, pressure was exerted on polluting facilities to relocate to regions outside the Ruhr area. This was supported by defining preferential regions for setting up large industrial facilities outside the Ruhr area displaying low concentrations of pollutants and permitting to observe the required distances. Plans at the community level frequently set even stricter standards than national law if air quality standards were exceeded or distances could not be kept. However, courts often abandoned such requirements unless they were justified by specific local conditions.

Increasing economic difficulties in the 1980s, which affected old industrial areas like the Ruhr area more adversely then other regions, led to a reversal of the regional and urban planning objectives of the previous decades. Attempts were now made to secure industrial production close to residential areas. The strict distance rules were loosened. Regulations were developed for the reclamation of contaminated industrial sites in order to provide sufficient space for new establishments. In addition, individual solutions were sought to continue production and still improve environmental conditions. To achieve this joint objective contracts were set up between local administrations and enterprises, permitting the establishment of a new plant if in exchange old facilities were closed down, for example.

In summary, it can be stated that regional and urban planning contributed to improving the efficiency of environmental policy in the Ruhr area by adjusting national environmental requirements to regional conditions and in particular to the economic situation.

Integrating environmental and economic objectives as well as integrating policies at different levels of government through regional and urban planning in the Ruhr area was based on a number of general legal and administrative preconditions:

- regional and local administrations were endowed with planning competencies,
- iterative procedures existed to coordinate regional and national planning,
- far-reaching rights to participate were guaranteed for stakeholders in order to solve local conflicts,
- particularly in large cities competent administrations were created.

Integration by regional and urban planning requires that administrative units are delimited in such a way that similar environmental and economic conditions prevail. In the Ruhr area this condition did not hold - it is not an administrative unit but it is administered by three different district governments. As a remedy to this problem an authority - Kommunalverband Ruhr (KVR)[12] - with informal planning competencies has been established for the entire Ruhr area.

Planning in the Ruhr area - as in Germany overall - is characterized by cooperative procedures for the definition and implementation of plans. Besides municipalities and other administrative entities, industry and other societal groups are represented in regional planning bodies. Urban planning formally involves stakeholders and the general public.

Linkages existed between regional planning and subsidization of environmental protection in the Ruhr area. The sectoral crisis of the coal and steel industry motivated a Development Program Ruhr to be launched in 1968. The program integrated actions in several areas of infrastructure and environmental policies, including clean air management. In this field it listed actions like closure, restructuring, or relocation for more than 100 specified facilities the costs of which were partly subsidized (see section 3.3.5 below).

3.3.3 Organizational and Procedural Arrangements for Implementation

The integration of environmental and economic objectives needs to be supported by appropriate organizational and procedural arrangements pertaining to standard formulation as well as to the implementation of these standards.

12) The KVR - established in 1979 - is the sucessor institution of the Siedlungsverband Ruhrkohlebezirk (SVR) which existed from 1920 to 1976. Contrary to the latter it has no formal planning competences, however. Wink (1996) proposes that this was the reason for incriminations of soils along the borders of the tree districts in the Ruhr area.

Standard formulation has to be based on detailed and comprehensive information about environmental quality, depositions, emissions, and the effects of pollution. This requires, i.a., a monitoring system to be set up. This is a prerequisite for evaluating environmental policy as well. Equally important for integrating environmental and economic concerns in standard setting are arrangements which support the coordination between various stakeholders and actors.

Implementation, i.e. the realization of politically defined standards (SRU 1978), involves a variety of responsibilities like translating environmental quality standards into installation specific requirements, issuing permits, controlling compliance etc. This requires authorities disposing of experienced personnel, being provided with local information on polluting plants, environmental quality and pollution abatement technologies, commanding technical equipment for measurements and endowed with the competence to take decisions. Commanding the retrofitting of existing plants requires an even higher degree of competence: the necessity of retrofitting has to be perceived and proven, technical feasibility and economic reasonability have to be ensured. Close contacts with stakeholders may improve information and thus promote effectiveness and efficiency of environmental policy.

In Northrhine-Westfalia these needs were perceived early. The state government responded to them by a variety of organizational and procedural arrangements in parallel to developing the legal framework. For the implementation of clean air legislation Northrhine-Westfalia relied on existing administrations, namely the State Trade Supervisory Offices (Staatliche Gewerbeaufsichtsämter) which in Germany traditionally had been responsible for overseeing technical installations in industry in order to prevent accidents. The State Trade Supervisory Offices in Northrhine-Westfalia had already been concerned with pollution control since the late 1940s. In parallel with the mounting importance of environmental policy during the 1960s and 1970s they focused increasingly on environmental protection. The tasks assigned to the State Offices were the authorization of new installations, the command of retrofitting activities, and the control of compliance with standards. In addition they administered financial support of environmental investment. To promote the integration of environmental and sectoral policies the State Offices formally participated in regional and urban planning.

Twenty-two State Trade Supervisory Offices existed in NRW until the early 1990s. Implementation of clean air legislation has thus been highly decentralized. This assured close familiarity of administrators with local problems. In order to be able to flexibly respond to local problems, the State Offices in NRW are endowed with both, technical expertise and competence to take formal administrative decisions. Only particularly important licensing procedures are decided upon at the level of the district administration. NRW's arrangement - referred to as special administration (Sonderverwaltung) - is unique in German states. It guarantees a high degree of independence in implementing environmental legislation but potentially leads to coordination problems with other branches of the administration.

The State Offices are supervised by the 5 district administrations (Regierungspräsidien) which exist in NRW as an intermediate, purely administrative level between the state and local levels (at which both, administrative and legislative institutions exist in Germany). The implementation of clean air legislation is directed and overseen by the

state ministry responsible for environmental protection. Until 1985 the Ministry for Labor, Health and Social Affairs (MAGS) was in charge. Since then, the newly founded Ministry for Environmental Protection, Regional Planning and Agriculture (MURL) assumed responsibility.

The internal organization of the State Offices was adapted to the changing challenges over time. Originally, responsibility had been regionally subdivided within each of the State Offices, reflected by regionally responsible departments. During the 1960s a sectoral organization emerged in some of the State Offices due to the increasing complexity of their tasks brought about by rapid technological developments. In 1967 a sectoral organization was made mandatory by a decree of the responsible ministry. At the same time the need was recognized to internally coordinate tasks related to environmental protection in various sectors by establishing departments for general matters of environmental protection within each of the State Offices. In the 1980s the two functions - workplace protection and environmental protection were clearly separated: the State Offices were structured by these functions at the primary level while lower levels were organized according to economic sectors. In the early 1990s responsibilities for workplace protection and environmental protection were allocated to separate authorities. In parallel, responsibilities for all environmental media - air, water, and soil - were integrated by merging the departments for environmental protection of the 22 State Trade Supervisory Offices and the 8 State Offices for Water and Waste Management (Staatliche Ämter for Wasser- und Abfallwirtschaft) to create the 12 State Environmental Offices (Staatliche Umweltämter) existing today[13].

To scientifically support the formulation of clean air standards and their implementation in NRW, a State Agency for Pollution Control and Land Use Protection (Landesanstalt für Immissions- und Bodennutzungsschutz; LIS) was established in 1963, based on a previously existing research institution (Koch 1983). Within five years after its establishment the LIS set up a comprehensive network of air quality monitoring stations. In addition, it contributed to defining Best Available Technology by research on clean air technologies and to formulating air quality standards by investigating the effects of air pollution. The LIS also provided advice to the administration and conducted training programs for administrators. It also cooperated with other institutions - such as the VDI-KRL - concerned with environmental protection. The LIS played an important role in clean air planning introduced by the Federal Clean Air Act (BImSchG) of 1974; it established emission inventories, set up and operated a telemetric monitoring network for depositions, and prepared clean air plans.

A variety of arrangements was made in order to support internal as well as external coordination or environmental policy:

- A state advisory board for pollution control (Landesbeirat für Immissionsschutz), was established by the NRW state government in 1962 in order to advice the administration and to promote the exchange of information and the balancing of interests between polluters and those affected by pollution. Polluting industries, industry association, trade unions, agriculture, land owners, experts, and the administration were represented in this body.

13) In addition 12 State Offices for Workplace Protection (Staatliche Ämter für Arbeitsschutz) exist in NRW today.

- At the level of each of the State Offices an exchange of information between the administration and industry was institutionalized by establishing working groups on environmental protection (Arbeitskreise Umweltschutz).

- The Federal Clean Air Act (BImSchG) of 1974 required a person to be made responsible for environmental protection in enterprises operating installations subject to licensing (Betriebsbeauftragter für Umweltschutz); these representatives were the counterparts for administrators in the State Offices.

- To coordinate sectoral policies relevant for environmental protection an inter-ministerial committee for environmental protection (Interministerieller Ausschuß für Umweltschutz) was established in NRW in 1971.

To coordinate environmental policy among the German states and with the federal government a joint committee for pollution control (Länderausschuß für Immissionsschutz) was set up in 1964. It was later substituted by the conference of the ministers responsible for environmental protection in the German states and the federation (Umweltministerkonferenz).

3.3.4 Cooperation

In the present context, the term cooperation denotes mechanisms to solve in non-administrative and non-hierarchical ways conflicts which arise from environmental protection. The main focus is on cooperation between state and society[14]. Cooperation aims at gaining more information on facts as well as on interests and at incorporating them into decision processes. In this way it extends the set of options available for problem solving and promotes flexibility. Solutions agreed upon by the parties involved are rather accepted and are easier to implement. In summary, cooperation can be expected to increase the efficiency of environmental protection.

Cooperation takes two forms: participation of affected parties in decision making processes or division of duties between public and private actors. The first form of cooperation is exemplified by the possibility of public objections to be raised during plant permit processes. An example of division of duties is the provision of scientific counsel to environmental decision making with input of industry and industrial organizations. Voluntary agreements or self-obligations are still other examples. Cooperation in the form of a division of duties has occasionally been interpreted as assigning a subsidiary role to government in environmental protection: the more this type of cooperation is promoted, the less state involvement becomes necessary.

Cooperation has been one of the tenets of German environmental policy at least since the Federal Government's Environmental Report in 1976, but cooperation - both institutionalized and informal - has a much longer tradition in environmental protection in Germany and in the Ruhr area.

14) In a wider sense the notion of cooperation includes cooperation among governments, different levels of government, and private parties.

Within the framework of regional and urban planning as well as in licensing procedures there has always been an institutionalized participation of the parties directly affected. Frequently, experts are also involved. In the course of time the participation of the general public and of representatives of societal groups has been extended. Apart from a participation in decisions relating to particular cases there has been institutionalized participation of experts and interest groups in drafting legislation and in standard formulation. Parliaments, political parties, or ministries at the federal as well as the state level regularly held hearings with experts, interest groups, representatives of the administration etc. In addition, expert councils were assigned to provide continuous advice to the legislation or execution. In Northrhine-Westfalia a Council on Clean Air (Landesbeirat für Immissionsschutz) was installed in 1962, representing polluters, those affected from pollution, and experts, in order to give advice to the state government and promote cooperation between the represented parties. The federal government established a Council of Advisers on the Environment (Sachverständigenrat für Umweltfragen; SRU) in 1971.

In clean air management, standard formulation has in practice taken the form of a division of duties between the government and private organizations. Laws or ordinances referred to technical rules which had been elaborated by private or semi-public organizations like the Association of German Engineers (Vereinigung Deutscher Ingenieuere; VDI) (Keykhah 1997). In 1955 the Association of German Engineers' Group on Technical Dust Control (in existence since 1928) offered the IPA (Interparlamentarische Arbeitsgruppe für naturgemäße Wirtschaftsweise; a group of members of the federal and the NRW state parliament having drafted air quality legislation as early as 1954) a proposal to conduct scientific research on air pollution and to produce technical results suitable for policy guidelines. The Group proposed to form a committee on Air Quality which would include engineers, meteorologists, hygiene technicians, biologists, doctors, forestry advisors, chemists, metallurgists, and legal representatives. The IPA accepted this offer and a committee (in 1957 raised to the status of an independent commission (Kommission Reinhaltung der Luft; KRL)) was established in the Association of German Engineers[15].

In the 1960s the Commission included some 150 researchers and representatives from industry, government, and academia16. It integrated scientific determination of causal links between air pollution and environmental damage, expertise on technical options and costs to reduce emissions, and the balancing of different interests in the determination of the costs and benefits to affected parties. Although the Commission's leaders were also heads of German industrial groups, the Commission was publicly committed to independence and objectivity. However, as transparency of the Commission's work was lacking and expertise and valuation were not clearly separated collusion between industry and the Commission could have been suspected.

Most of the financing for the Commission's work was supplied by federal and state governments with substantial support from industry and research organizations. Over

15) In 1990 a joint commission - Kommission Reinhaltung der Luft im VDI und DIN - was founded by merging the respective organizations of the Association of German Engineers and the German Institute for Standard Setting (Deutsches Institut für Normung; DIN).
16) Today some 1700 experts participate in more than 200 committees and working groups of the joint commission.

the next fifteen years the Commission was given about 130 assignments, ranging from an analysis of the execution and implementation of the Commerce Code (Gewerbeordnung), for example, to guidelines dealing with dust emissions from hard coal fired steam generators. New guidelines elaborated by the Commission are made binding by publishing them in a government publication (Bundesanzeiger). Guidelines existing today are integrated in a six-volume handbook.

Informal cooperation plays an important role in environmental policy. It is often chosen as a substitute if legal regulation is lacking or unclear. Informal cooperation avoids legal uncertainty, increases flexibility and practicability, and helps mitigating conflicts. The results of informal cooperation are initially non-binding; frequently they are transformed into binding administrative acts or contracts, however. In urban planning in the Ruhr area such contracts have been frequently applied in order to solve conflicts between environmental and economic objectives.

In the process of implementation of legal norms informal cooperation is common for determining individual cases. It takes a variety of forms. Before submitting an application for a license applicants usually contact authorities; communication normally continues during the entire time of the licensing procedure. The low number of permits denied is explained by the practice of informally discussing alternatives before formally rejecting an application. Authorities often use such talks to suggest „package-solutions“: licensing of a new facility is tied to improvements of existing ones. The way clean air management is organized in Northrhine-Westfalia facilitates this kind of informal cooperation.

In response to limited capacities of governments a division of duties between the state and private actors has been developed which has been termed „regulated self-regulation“ (Hoffmann-Riem/Eifert 1995). The government passes functions to private actors but supplies a regulatory framework encompassing safeguards such as minimum requirements for the case of failure of self-regulation. An example is the plant responsible for environmental protection (Betriebsbeauftragter für den Immissionsschutz) - required by clean air, water and waste laws - who is i.a. responsible for monitoring compliance and thus eases the workload of the administration. The institution of a plant responsible (Immissionschutzbeauftragter) was first introduced in an ordinance based on the federal clean air act (5. BImSchV) in 1975. Recently introduced environmental auditing schemes can be regarded as an extension of this principle. It is also present in the law on environmental impact assessment (UVPG) which requires applicants to collect information beyond their own sphere; usually administrations only check this information but they do have the right to conduct investigations of their own.

Deliberate agreements between government and industry - often represented by industry associations - or self-obligations of industry have begun to play a larger role recently. They are meant to avoid regulation and to provide flexibility to enterprises. Their success depends on a number of conditions, particularly on provisions for control and sanctions. In the Ruhr area this form of cooperation did play a limited role; usually such agreements were combined with subsidies from government for industry.

Cooperation poses a variety of hazards which requires that appropriate safeguards are taken. First of all, cooperation tends to weaken constitutional rights like having

administrative acts revised through courts. It may also undermine legal standards. Cooperation also endangers the rights of third parties - including nature and future generations - which cannot adequately pronounce their interests. Therefore transparency is required as well a separation of expertise and interests. It has also been argued that anti-trust legislation is undermined by certain forms of cooperation. Participation of the public requires openness of procedures with respect to their outcomes and comprehensive information.

3.3.5 Subsidy Schemes

Subsidy schemes have played an important role in environmental policies in the Ruhr area. While it is impossible to reliably estimate the amount of subsidies related to managing heavy metal pollution in the past, it has been reckoned that subsidies for environmental protection provided by some 130 programs of the European Union and the federal and state governments in Germany amount to an annual DM 2.5 to 5 billion today (TAB 1995).

Programs designed for environmental protection that played an important role in the Ruhr area were directed at two distinct objectives:

- retrofitting of existing facilities which were exempted from the legal requirements,
- promotion of environmental technologies, including research on and development of such technologies and their diffusion.

In the 1960s and early 1970s financial support for retrofitting facilities dominated. This support was targeted at facilities which were exempted from regulation because the enterprises would have been unable to bear the costs of emission control. Later such programs were also designed to accelerate the installation of pollution control equipment: subsidies were paid to enterprises installing pollution control equipment ahead of the time required by the law. A considerable share of the funds of these programs was provided by the federal government. These subsidies were granted on a case by case basis. Under various labels (e.g. Aktionsprogramm Ruhr (APR), Landesimmissionsschutzprogramm (LIP)) subsidy schemes for pollution abatement investment existed uninterruptedly up to the present.

In addition, a general scheme of depreciation allowances existed at the federal level since 1959 (until 1990) for end-of-pipe pollution abatement installations in existing plants. In 1968 eligible investment amounted to more than DM 600 million. This program was more important than the state programs; in NRW clean air investment was subsidized with some DM 50 million in 1968. State programs could be more precisely adjusted to specific problems in the Ruhr area and were seen as a supplement to federal funds in particularly severe cases, however. A considerably larger than average share of the funds of the APR went to projects in the city of Duisburg, for example, where environmental and economic problems were concentrated.

Over time, subsidies have increasingly been applied to influence the direction of technological change by promoting the development and pilot applications of environmental technologies. One objective, besides developing new solutions

(innovation function), was to demonstrate the feasibility of new technical solutions of environmental problems (demonstration function). The results of the projects promoted within the framework of these programs served also to tighten legal requirements (standard formulation function). A recent evaluation of the effects of some 1600 R&D projects worth DM 1.5 billion supported by the federal government between 1980 and 1992 concluded that one third of these projects influenced the design or the implementation of environmental regulation; approximately half of the influential projects was of decisive importance (Angerer et al. 1996).

Last but not least, technology oriented programs were motivated by the desire to create a competitive environmental industry, able to provide new jobs to compensate for those lost in traditional industrial sectors. In 1979 the flagship-program of the Federal Environmental Ministry (Programm zur Förderung von Investitionen zur Vermeidung von Umweltbelastungen) supported more than 90 projects representing expenditures of more than 500 Mill. DM mostly targeted at technologies for dedusting steel and non-ferrous metal works. The sectoral focus of this program shifted over time according to changing priorities; in recent time waste minimization and heat utilization were of prime concern.

Economists have argued that subsidies distort relative prices. In particular, it has been proposed that subsidizing investment in pollution control equipment favors polluting activities relative to environmentally more benign activities, thus causing more polluting activities to take place than would be optimal from the society's point of view. In addition it has been proposed that subsidies do not lead to efficient abatement measures. In case of general schemes such as depreciation allowances there is no control of efficiency. A delimitation of subsidies to end-of-pipe equipment as in Germany - motivated at least partly by administrative manageability - even systematically discourages more efficient integrated solutions. In principle, subsidies granted on a case by case basis allow for a control of efficiency but it has been doubted that administrations dispose of the knowledge required to make appropriate decisions.

It has even been doubted that subsidies paid for reducing emissions are effective. This applies to subsidizing expenditures based on legal requirements as was the case with the above mentioned depreciation allowance scheme. Such schemes also create incentives for additional environmental investments - if at all - only for enterprises making profits.

Under certain conditions, however, subsidies are accepted as being justified. The OECD (1986) has established a set of criteria under which it finds environmental subsidies acceptable[17]. Public financing is justified

- if the development of new technologies is to be promoted to avoid environmental damages,
- if unusual circumstances, such as a rapid implementation of stricter standards, cause social and economic problems,
- if other social or economic objectives, such as reducing regional disequilibria, imply environmental measures.

17) It should be noted that this view has not remained unchallenged.

Even in these cases the OECD requires that deviations from the polluter-pays-principle meet strict conditions. Subsidies should

- be selective, i.e. restricted to industries, regions etc. with serious problems,
- be transitional, i.e. delimited to well-defined periods of time which are pre-announced and adjusted to the problems to be mitigated,
- be neutral, i.e. not biased with respect to investments and trade.

Subsidies for retrofitting plants excepted from compliance under the feasibility criterion are justified by the objective of avoiding unemployment through plant closures. They thus helped to mitigate the conflict between social and environmental objectives. These programs generally corresponded to the condition to be selective. But while each of the programs was transitional, a series of such programs existed (and still exists) uninterruptedly. Subsidies aimed at accelerating the introduction of control technologies and at promoting the development and diffusion of environmental technologies also corresponded to the criteria set up by the OECD (which are motivated by the view that R&D has positive externalities). Such justification does not apply to the general depreciation allowance scheme for end-of-pipe technologies, though; neither were these subsidies selective nor were they transitional as the OECD criteria require.

3.4 Environment - Economy Integration

The review in the previous sections of the key elements of policies to manage heavy metal pollution in the Ruhr area has suggested that the requirement to integrate environmental and economic objectives has been observed, although in a rather non-systematic and somewhat unconscious way. This section summarizes the evidence supporting that hypothesis.

Integrating emission control and resource management strategies

Integrating emission control and resource management strategies in the case of heavy metal contamination of soils poses as requirements for emission control

- to develop emission standards from soils as one of the objects to be protected,
- to observe the competing demands for the regulation, production and carrying functions of soils, and
- to optimize policy over all sources of contamination.

It can be assumed that soil protection by timely emission control is always preferable to the remediation of contaminated land. This choice does not pose itself if the long-time existence of externalities has led to contamination in the past. In order to integrate environmental and economic objectives in determining solutions for dealing with existing diffuse contamination of large areas

- options to influence crop selection and land use have to be considered as an alternative to remediation,

- remediation has to be optimized with respect to future land uses as well as on the time scale,

- financing problems have to be solved if persons responsible for pollution cannot be identified, observing distribution consequences.

In principle the necessity was recognized in the Ruhr area to base air quality standards on information of the effects of pollution, particularly its hazards for human health. The linkage between atmospheric emissions, soil contamination, and the ingestion of contaminated food was clearly recognized. The work of the VDI-KRL - the body that developed clean air standards (see section 3.3.1) - reflects this idea; it created a specific section to deal with the effects of dust and gases. In an international symposium it organized on heavy metals as air pollutants in 1973, it made soil contamination and its consequences one of the questions to be discussed in detail (VDI 1974). The idea to base standard formulation on a notion of potential damages expresses itself in the creation of a department of the LIS the task of which was to investigate the effects of air pollution on soils, crops and animals, aiming explicitly at the formulation or air quality standards.

In the practice of standard setting as well as of implementation the principle of founding clean air standards on a notion of soil quality was watered down. Clean air management in the Ruhr area strongly emphasized technical feasibility of emission control. This orientation was somewhat mitigated - though nor revised - by the introduction of clean air planning in the mid-1970s.

As far as the functions of soils were taken into consideration in environmental policy, the focus was on their production and carrying functions. Due to a decrease and reorientation of agricultural and private food production, policy concentrated on coordinating competing demands for using the land for settlements. This expresses itself in the widespread application of distance rules in regional and urban planning as an instrument to coordinate competing demands for land for housing or for locating industrial plants. When the problem of a large number of contaminated sites was recognized in the 1980s, it was mainly because of the shortage of land for commercial uses. The regulation function of soils was largely neglected.

The principle of optimizing over all sources in order to efficiently maintain the land has been recognized only gradually in practice. Its initial neglect was mainly a consequence of limited administrative capacities. Emission control at first focused on large industrial point sources of atmospheric emissions only, followed by attempts to better control first fugitive emissions such as dust blown away from floatation sites or storage, and later also emissions from small and diffuse sources. In 1977 an ordinance restricted the content of lead and zinc in fertilizers. Comprehensive binding regulation for controlling the use of sewage sludge in agriculture and gardening - which was also applied to dredge - was issued in 1982; it restricted the content of heavy metals in sewage sludge and set limits for the permissible content of heavy metals in soils to which sewage sludge was to be applied.

Integrating regulatory and economic instruments of environmental policy

To provide as much flexibility as possible for effectively attaining the objectives of environmental policy, regulatory and economic instruments have to be applied in combination with each other. However, considerable flexibility can also be built into regulatory instruments or into the style of implementation of such instruments.

Economic instruments of environmental policy such as charges or tradable emission permits were no part of clean air policies in Germany[18,19]. Only lately the opportunity has been introduced to compensate legally required emission reductions through lower emissions elsewhere. Still, considerable flexibility was provided for enterprises through both, legal provisions and the way legal standards were implemented.

The requirement of economic reasonableness of administrative orders to retrofit existing installations - later substituted by the principle of appropriateness - prevented emission reductions at extremely high costs. Effective emission reductions were still achieved, for example by agreeing on a schedule for phasing out polluting installations or by granting subsidies[20]. Formal or informal agreements were also frequently used in implementation of clean air legislation as well as in urban planning procedures to agree on compensatory emission reductions. A certain degree of external flexibility was provided through clean air planning which allowed to take cost considerations into account in determining how a predetermined reduction of emissions in a region was to be allocated to the sources in this region. Of course, administrations have only limited knowledge of the cost functions of enterprises; the decentralized organization of the administration in Northrhine-Westfalia favored the collection of reliable information, however.

Integrating environmental concerns into sectoral policies

Efficient policy making requires that possible trade-offs between environmental and other policy objectives are taken into account as early as possible; to the extent possible the coordination of sectoral policies has to be embedded into the formulation of the legal framework. This poses challenges primarily for federal and state ministries. Soil protection in particular requires a coordination of environmental with agricultural, energy, transport and industry policies.

Decisive attempts to integrate environmental objectives into sectoral policies have not been made either at the federal or at the NRW state level until well into the 1980s. The inter-ministerial committee for environmental protection established in NRW in 1971 improved the exchange of information between ministries, it did not formulate mandatory obligations to observe environmental objectives in sectoral policies, though.

In general, sectoral policies in NRW even counteracted the objectives of soil protection:

- Agricultural policy aimed at the intensive utilization of the land still available for agricultural use.

18) Charges were used as an instrument of waste water management in Germany.
19) Some charges exist which may have effects on heavy metal emissions, they were not motivated by the objective to reduce emissions, however. The only exception is a charge on leaded gasoline.
20) In such cases the cost of emission reductions was born by society.

- Energy policy tried to counteract the pressure for substituting coal by other primary energies such as natural gas.

- Transport policy promoted the extension of the share of land used for settlements by road construction.

- Economic policy supported the preservation of 'dirty' basic industries, particularly iron and steel production.

Resulting from the increasing environmental awareness of the public rather than from new forms of cooperation between administrations, environmental objectives were integrated into sectoral policies more systematically since the mid 1980s. Road construction projects in particular faced objections from the public. By the end of the 1980s the obligation to perform environmental impact assessment was introduced for public infrastructure projects, constituting a key element of integration of environmental objectives into sectoral policies.

The pursuit of integrative approaches is also visible in technology and industry policies. In the 1980s the policy of re-industrialization was gradually abandoned in favor of a policy oriented towards diversification of the economy. Within this framework the federal as well as the NRW state government promoted research and development as well as the diffusion of environmental technologies, primarily by establishing a tight network of organizations to promote innovative businesses.

The relation of environmental and other policies as well as its relative importance has been mirrored by institutional arrangements at the level of the NRW state government. In the 1950s and 1960 environmental protection was dealt with within the administrative framework of the technical supervision of industry. In 1971 an administrative unit was established in the Ministry of Labor, Health and Social Affairs to deal with general environmental problems. Since 1982 an independent ministry was established responsible for environmental protection as well as regional planning and agriculture. This arrangement promoted a more intensive integration of environmental protection and regional planning. Attempts to integrate environmental and agricultural objectives have been intensified only recently by promoting a dialogue between interest groups representing the two domains.

Integrating economic and environmental policies at the regional level

Considerable potentials for conflict exist between economic and environmental objectives at the regional level. From an economic point of view a regional division of functions is necessary in order to account for regional differences of resource endowments and to make use of positive external effects of agglomeration resulting from the regional concentration of economic activities. This regional division of functions, however, entails different environmental stresses in different regions. This contradicts the principle of regionally uniform living conditions, guaranteed by the German constitution. This principle can not be interpreted as requiring identical environmental quality standards to be obtained in all regions; but it calls for avoiding large differences of environmental quality between regions.

The necessity of a regional division of functions on the one hand and the requirement of uniform living conditions on the other hand imply that in each region economic and environmental objectives have to be equilibrated in order to secure environmental quality as well as economic development. This again calls for a close coordination between environmental and economic policies at the regional level.

Because it lacked regional autonomy environmental policy by itself was restricted in its ability to coordinate environmental and economic objectives in the Ruhr area. This gap has at least partly been filled by regional and urban planning which developed specific solutions adapted to economic and environmental conditions in the Ruhr area. The elaboration of such solutions frequently involved enterprises and the affected public. Typically enterprises offered a compensation for pollution from new sources and signed corresponding contracts with the administration.

The process of regional coordination was strongly supported by the large cities in the Ruhr area which were endowed with planning sovereignty and disposed of sufficient administrative capacities. For the Ruhr area overall, coordination proved to be more difficult as different parts were administered by three different district governments. This difficulty was partly offset, however, by the specific authority established for this purpose (SVR or - since 1979 - its successor organization KVR).

An important contribution to integrating environmental and economic policy objectives arose from the coordination of subsidy schemes administered by different ministries and at different regional levels. A first attempt of such coordination was the Development Program Ruhr of 1968 which focused funds of both, Northrhine Westfalia and the federal government, for transport, education, labor market, and regional policy objectives on economic and environmental problems of the Ruhr area. Other more recent examples of integrative subsidy schemes (Zukunftsinitiative Montanregion, Internationale Bauausstellung Emscher Park) increasingly rely on European Community funds besides state and federal funds.

Integrating environmental policies at different levels of government

Due to different economic conditions preferences with respect to environmental quality as well as the demand for environmental resources differ between different regions of a country: the esteem for an unspoiled environment increases with incomes and the use of environmental resources for production expands with economic activity.

To be efficient, environmental policy has to account for such differences by providing regional flexibility with respect to environmental standards and instruments. According to the principle of subsidiarity the degree of regional influence on environmental policy should be larger in case of local environmental problems and smaller in case of effects extending beyond the regional scale.

Because the Ruhr area was strongly affected by pollution the first initiatives in Germany for effective environmental protection arose in this region. The Settlement Association Ruhr Coal District (SVR) and a working group for economic development in accordance with the environment of representatives from the federal and state parliaments (Interparlamentarischer Arbeitskreis für naturgemäße Wirtschaftsweise; IPA) first formulated requirements for environmental protection. These initiatives

resulted in stricter clean air legislation at the federal and state level in 1959 (GewO) and 1962 (LImSchG NRW). Later, other states also passed legislation setting standards for ambient air quality. These activities of the states were coordinated by a committee for environmental protection representing the governments of all German states and the federal government (Länderausschuß für Immissionsschutz).

Early in the 1970s the competence for clean air legislation was passed to the federal level. The federal clean air act of 1974 established uniform standards and instruments at the national level. Neither states nor regions are hence permitted to set up specific clean air regulation. Except for political pressure, mainly through the political parties, states and regions can only influence legislation in this field through the federal council (Bundesrat), the house of parliament representing the states. More recently efforts have been increased to standardize environmental policy at the European level.

Regional characteristics continued to play a - limited - part in the process of implementing environmental standards, however. In the Ruhr area environmental legislation was temporarily more strictly interpreted[21]. According to the law, the economic situation of enterprises and regions had to be taken into account in implementing environmental legislation.

Regional and urban planning play an important role for environmental protection. Non-hierarchical coordination between different levels is one the key features of the planning process. At all levels planning sovereignty exists for the respective region. But regional planning has to take into account plans existing at the supra-regional level; conversely state planning has to consider local plans. The consistent coordination of plans at different levels is achieved in an iterative process. In recent times, the efforts to coordinate supra-regional planning have been intensified by setting up appropriate administrative arrangements. Representatives of the regions participate in supra-regional planning committees; national guidelines are elaborated in a conference of the ministers responsible for regional planning of all German states.

Integrating environmental and employment policies

When pollution was first realized as a severe problem in the Ruhr area around 1960, unemployment was not yet an issue. Still, it was argued that environmental regulation would lead to plant closures and job losses. The government responded to these fears by developing various provisions to mitigate any adverse employment effects of environmental protection. Environmental standards were tightened only gradually. „Grandfather rules“ temporarily protected old facilities from having to comply with new standards. In addition, there was a legal obligation for administrations to adequately consider the economic situation of individual enterprises when issuing permits or ordering a retrofitting. Finally, various subsidy programs were set up to help enterprises to finance environmental investments. As early as 1959 depreciation allowances were introduced for clean air investments, and a first program of NRW offering soft loans for abatement investments started in 1962. During the second half of the 1970s about 50% of all environmental investment was supported by some form of subsidies (Schucht 1997).

21) This has also been attributed to a better qualification of personnel.

Soon after the beginning of a systematic environmental policy in the late 1960s a controversial debate started on the employment effects of environmental policy which was stimulated by increasing rates of unemployment. In this debate the argument was made that a positive relation exists between environmental policy and employment which could be exploited by appropriate policies. This led to the development of various efforts to integrate environmental and employment objectives, although this notion was not used at that time.

When unemployment first occurred in post-war Germany in 1966/67, the federal government launched a Keynesian expenditure program for promoting clean air investment. A similar program was set up by the NRW state government after the first oil price crisis in 1973. Public work schemes were used as in instrument of labor market policy in the Ruhr area since around 1970 but gained momentum only in the second half of the 1970s. It has been reckoned that at that time about 15% of all measures in the framework of public works schemes in Germany were directed at environmental protection (Lindner/Jäckle-Sönmez 1989).

An environmental industry supplying abatement technologies began to emerge in NRW in the 1960s (Nordhause-Janz, Rehfeld 1995). Many of these enterprises originated from the traditional heavy industry sector. A second wave of foundations of companies supplying environmental technology, mainly of the mechanical engineering sector, was spurred by the tightening of environmental policy in the 1970s. In the second half of the 1980s environmental policy focused on waste and hazardous substances; this provided the impetus for the emergence of many new environmental service suppliers.

Before the 1980s, the NRW government provided support to the environmental industry mainly through promoting its markets, for example through the spending programs mentioned above, while the federal government provided financial assistance for research and development activities. In the 1980 the NRW state government started to set up a research infrastructure for the environmental industry, comprising specialized research institutes, research cooperations, technology transfer centers, and training centers, for example. Simultaneously, the focus of technology policy shifted from end-of-pipe solutions to integrated technologies. From 1978 to 1992 the NRW government spend approximately DM 1 billion on subsidies for technology promotion of which only DM 35 million went to the environmental industry. However, as much as DM 300 million were spent for the promotion of technologies relevant for environmental protection. The idea of targeting environmental policy strategically on innovation and competitiveness gained ground only in recent years. Several initiatives were taken to promote environmental auditing and voluptuary agreements, but the Ruhr area and NRW did not take a pioneering role in this field.

4 The Current Approach to Reducing Heavy Metal Pollution in Katowice

An assessment of approaches to heavy metal pollution in Katowice has to thoroughly take into account local economic and social conditions. Such analysis will also have to recognize that progress made in the analysis of environmental policy making - and in particular of ways to integrate environmental and economic objectives - has affected the

approaches taken in Poland. Still, the previous analysis on how heavy metal pollution was dealt with in the Ruhr area suggests that there is room for further improvements. This can be demonstrated by analyzing the approaches to dealing with heavy metal contamination in Katowice.

The analysis presented in this and the following chapter is based on series of papers commissioned for this study. Preisner and Pindór (1995) have given a comprehensive account of the economic and social conditions for restructuring and environmental clean-up of the Katowice area. The industries emitting large amounts of heavy metals have been investigated in detail. The situation and prospects of the non-ferrous metal industry in Katowice Voivodship have been analyzed by Gegotek (1995) and those of the iron and steel industry by Novy (1996a). Pacyna (1996) has studied policy options to reduce heavy metal pollution from energy production and use. Fertilizer and sewage sludge application as sources of heavy metal contamination of soils are dealt with by Suschka (1996). His paper also discusses the problem of the leaching of heavy metals from contaminated soils into groundwater. Nowinska (1995) and Kucharski et al. (1996) have evaluated options for managing contaminated land. Wink (1996b) draws lessons from soil protection in the Ruhr area for Katowice. International activities relevant for managing heavy metal pollution in Katowice have been studied by Novy (1996b). Gornig (1996b) has evaluated the potentials of regional and urban planning to contribute to land maintenance in the Katowice Voivodship.

The plan of this chapter is as follows: In the first section economic conditions for environmental clean-up in Katowice Voivodship are discussed with a focus on features different from those in the Ruhr area in the 1960s. Approaches to environmental protection taken in Poland and Katowice are presented in the following section. The third section discusses these approaches with respect to their achievement of environment - economy integration.

4.1 Economic Conditions of Environmental Clean-Up

Poland is a highly industrialized country and ranks fourth among coal exporting countries. Katowice Voivodship is the center of these activities. Economic activities in this region contribute 20% to Polish gross domestic product while its share of the land area is merely 2.1%; its share of the population amounts to some 10%. Coal, zinc, and lead are almost exclusively produced in this region. As many as 45 coal mines, 16 steel plants, 11 large power plants in addition to a number of coking plants, non-ferrous metal mining and processing units are located in Katowice Voivodship. Still, about 50% of the region is used for agricultural purposes. The main crops cultivated are cereals (55%), potatoes (14%), pasture plants (14%), and vegetables (5%) (Suschka 1996). Animals kept include cattle, pigs, and sheep. The number of farms in the province exceeds 50,000; more than half are smaller than 2 ha, only about 70 farms are larger than 50 ha (Nowinska 1995).

Heavy metal contamination is also a concern in relation to allotment gardens in Katowice Voivodship. There are about 600 allotment complexes, including some 100,000 plots averaging 300 m². They are used for recreation and for food production. It has been reckoned that allotments provide vegetables for some 400,000 persons; additionally, 1.2 million persons consume vegetables grown in backyard gardens

(Nowinska 1995). However, for most of them these vegetables make up just a small part of their daily diet.

At a first glance, similarities between Katowice today and the Ruhr more than 30 years ago are striking (section 1.2). This does not only refer to the nature of environmental problems but also to the importance of the region for the national economy and the dependence of the regional economy on the coal-steel complex.

There are marked differences, however. Of those relevant for integrating economic and environmental objectives

- state ownership of industrial companies,
- a large modernization backlog, and
- high unemployment

are the most significant ones.

Unlike other transformation countries which pursued rapid privatization, Poland favors restructuring prior to full privatization. While many large industrial firms are still entirely state owned, others have been converted into joint stock companies as a first stage of privatization. The state has retained a majority ownership in these firms and exerts control through the Ministry of Industry and Trade while selling a remainder of shares to a variety of investors, including banks, trade organizations, workers, and managers. More recently, Poland has begun to implement a mass privatization program which allows citizens to receive shares in companies at virtually no cost. Several joint stock companies in Katowice will participate in this program.

In the industries contributing significantly to heavy metal pollution - like the energy, iron and steel and non-ferrous metal sectors - nearly all companies are still completely or predominantly state-owned. In the iron and steel industry, for example, only one steelworks in Poland was fully privatized by mid 1996[22]. While some steelworks are still entirely state-owned, a majority has been converted into joint-stock companies as a first step towards privatization. Of the 11 companies of the non-ferrous metal industry located in Katowice, 9 are state-owned while the remaining two are joint-stock companies.

State-ownership has serious consequences for environmental policy and for the integration of economic and environmental objectives. Economic instruments of environmental policy may fail because managers of such firms do not have strong incentives to assure profitability. In addition, because of well established relations, administrators may be lenient in case of non-compliance with standards. Additionally, ambivalence towards privatization may discourage foreign investors.

Many industrial companies in Katowice operate inefficient equipment. The shortage of hard currencies has hindered the installation of modern technologies in the past. As more efficient technologies are also cleaner, major improvements of environmental

22) Lucchini Warsaw.

quality can be expected from just doing what is economically sound, namely replacing outmoded processes with state-of-the-art technology. This is illustrated by the situation in the iron and steel industry. By 1990, 37 open hearth furnaces were still operated in Katowice; their number was reduced to 17 by 1994. For economic reasons this technology had been phased out in the Ruhr area during the 1960s already[23]. Simultaneously with shutting down outmoded polluting furnaces, continuous casting technology is introduced which will considerably lower the energy intensity of steel making. It is reckoned that by mid-1996 some 60% of Polish steel was produced using - mostly Austrian and German made - continuous casting technology.

In contrast to the situation in the Ruhr area in the 1960s and 1970s, when integrated technologies became available only gradually, a leap forward with respect to environmental quality is possible in principle in Katowice if production processes would swiftly be modernized to correspond to western standards. This is hardly feasible, however, because of the shortage of funds - aggravated by the need to solve many other problems simultaneously - and social problems as a consequence of the job losses which will be associated with modernization.

In the Ruhr area unemployment was not a serious concern at least until 1966. Even after the recession of 1966/67 and until the mid-1970s full-employment was regarded as achievable by appropriate economic policy. In Katowice unemployment rose to above 10% of the active population by the end of 1994. This figure is considerably lower than that for Poland overall (16%). The sectoral structure in Katowice suggests, however, that hidden unemployment is likely to be higher than in some other parts of Poland. This argument can be illustrated by the situation of the iron and steel industry in the region, the largest source of employment of any industrial sector (Novy 1996). Traditionally low cost of labor relative to other inputs, the tendency of firms under central planning to hoard labor, and the lack of hard budget constraints have led to labor redundancy. Although employment in the Katowice steel industry has been steadily falling since the late 1980s, declines in employment have been less sharp than declines in production, leading to further diminishing rates of labor productivity. Thus, restructuring of the Katowice steel industry, as well as of other industries, will require a very significant reduction of employment. A "Plan for the Restructuring of the Iron and Steel Industry in Poland" adopted by the Polish Government in 1992 - though subsequently not implemented - proposed a reduction of employment by half within ten years; this could imply as many as 30,000 jobs to be lost of the 53,000 still existing in the iron and steel industry in Katowice. Even more dramatically, a sectoral restructuring program prepared by the Ministry of Industry and Commerce expects - probably too optimistically - that another 90,000 workers in hard coal mining in addition to those laid off already (72,000 from 1990 to 1993) will loose their jobs between 1996 and 2000. It is interesting to note that the steel industry in Katowice has shed labor less rapidly than in other parts of the country. This may be due to still higher state ownership while management is heavily influenced by worker’s councils in place since the early 1980s.

Proposals have been made to minimize social costs of unemployment including early retirement programs, a shorter working week, employee training, lump sum compensations for job leavers, and alternative job creation programs (Pytel 1995). So

23) In 1960, 54 Thomas steel converters were in operation in NRW. By 1971 all of them had been taken out of operation.

far, in the absence of government funds to finance such programs, firms had to rely mostly on voluntary reductions in employment.

Katowice Voivodship competes internationally as a location for investments. Its main comparative advantages are its human capital (including its development potential), its low wage level compared to West European countries, its proximity to MEE-markets, and a high acceptance of industrial activities coupled with substantial experience with polluting industrial activities. Existing contamination, on the other hand, is a disadvantage for attracting capital, as is the dominance of large state-owned enterprises which, thanks to existing cooperative networks with authorities, are able to obtain favorable conditions, for example with respect to regulation or subsidies. As in the Ruhr area in the 1960s (and still today), the need for economic structural change is obvious in Katowice. This relates to the high shares of industrial activities, of old industries, and of large enterprises. The established network of cooperation between authorities and large companies is likely to form an obstacle to such restructuring.

4.2 Approaches to Environmental Protection

4.2.1 Clean Air Policies

Strategies

In 1990 the Polish Ministry of Environmental Protection, Natural Resources and Forestry established a list of 80 establishments in Poland which were regarded as posing the most severe hazards to the environment; of these, 22 were located in Katowice Voivodship (Beblo 1994). The Department of Environmental Protection of the Voivodship Office added another 65 establishments which it regards as particularly polluting. An investment program was initiated to reduce the environmental pressure originating from these establishments by liquidating old equipment and implementing new technology.

By these and other measures Poland has achieved quite significant reductions of industrial atmospheric heavy metal emissions already. Industrial restructuring has significantly contributed to this trend. The iron and steel industry[24] is gradually transformed from a sector producing mostly low grade raw materials into a high value-added processing industry; continuing raw material production concentrates on carbon and alloy steel. In addition, modern technology, such as continuous casting, is introduced in many plants while economically obsolete and environmentally unsound equipment is phased out. The list of the department for Ecology of Katowice Voivodship of equipment which should be eliminated for both, economic and environmental reasons includes open hearth furnaces and blast furnaces with throat construction, for example (Zawiejska 1995). Of course, the installation of modern abatement technology plays a major role as well. Finally, action is taken to improve the energy economy of the iron and steel industry by recovery of waste heat and re-use of blast furnace and converter gas, for instance.

24) See Novy 1996a.

Since 1990, the Polish government has put forward several proposals for restructuring the Polish iron and steel industry. These proposals assumed that a decline in pollution levels will largely be achieved by modernizing production facilities and lowering the intensity of energy and material inputs - efforts that also improve the economic efficiency of production. After the laissez-faire economic policy under Prime Minister Mazowiecki (1990-91) the Olszewski government that followed created a sector based industrial policy. It commissioned 70 sectoral studies on which it based sectoral restructuring programs. The „Plan for the Restructuring of the Iron and Steel Industry in Poland Until 2002“ recommended a significant reduction of steel production as well as increases of labor productivity from 22 work hours per ton of finished product to less than 5 work hours per ton[25]. The plan implied a reduction in total employment by more than 50%. The total investment required for restructuring was estimated at over US$ 4.4 billion over ten years, including US$ 300 million for restructuring employment by providing training and payments for job leavers. The plan was adopted by the Polish Government in December 1992 as the basis for its restructuring program of the iron and steel industry but was subsequently not implemented due to the lack of a coordinating institution, limited government resources, and the social costs involved. The new government under Prime Minister Pawlak, inaugurated in September 1993, first established an Intervention Fund to provide additional assistance for enterprise restructuring. Later it abandoned the previous sectoral approach, focusing on specific regions instead. Its policies for regions with a high concentration of industry such as Katowice include export promotion, R&D and technical support, and gradual privatization.

Due to the lack of a consistent industrial policy of the government, individual enterprises have adopted their own policy of restructuring at the firm level, in some cases with government help in the form of loan guarantees, waivers of tax arrears, or subsidized credit. In some cases, this has used up resources that may have been used more efficiently elsewhere. However, this process has led to the liquidation of inefficient and heavily polluting processes and their replacement by more modern technologies.

A similar pattern of change as in the iron and steel industry can be observed in the non-ferrous metal industry[26]: a gradual departure from raw material production, the replacement of old equipment by modern processing technologies, and the installation of modern abatement technology. Building on its experience this industry seeks new opportunities in the processing of wastes containing non-ferrous metals, such as lead batteries. There remain serious problems with fugitive emissions and with waste management, particularly from secondary non-ferrous metal production, however.

Energy production and use is one of the major sources of air pollution in the region[27]. As many as 6,000 heat producing sources with capacity above 0.1 MW are located in Katowice Voivodship, including 13 major electric power and co-generation plants. They mainly operate on hard coal. Due to the low quality of coal and the old equipment the efficiency of energy conversion is low. Environmental policies related to energy

25) The most efficient mini-mills in Western Europe achieve a labor productivity of 1.5 work hours per ton.
26) See Gegotek 1995.
27) See Pacyna 1996.

production aim at making more efficient use of existing power plants by co-generating electricity and heat. In addition, heavy metal emissions are reduced through the installation of highly efficient control equipment to remove dust from exhaust gases, the use of clean fuels with low ash content, and the installation of flue gas desulfurization technologies which simultaneously remove the gaseous portions of several heavy metals. For thermal power and heating stations standards have been set for dust emissions per unit of energy.

Whereas heavy metal emissions from industrial sources have decreased by a factor of 2 during the last decade, there has been a 2-fold increase of the amount of heavy metal-containing dust from municipal sources during the same period. In order to reduce air pollution from low stacks, a strategy has been developed comprising the provision of natural gas to residential areas for room heating, the supply of coal with low sulfur and ash content, the use of coke and other smokeless fuels, the provision of electricity room heating and cooking, and the provision of methane as a fuel for communal heating plants.

Comprehensive plans have been elaborated for modernizing the energy sector in Katowice Voivodship (Pacyna 1996). They focus on three strategies: a reduction of the number of residential and commercial boilers, the use of methane and clean coal, and the application of best available abatement technology for large sources. Highest priority is given to a reduction of the number of residential and commercial boilers. This issue is emphasized in the Regional Contract for Silesia, a regional development plan for the region (see section 4.2). The Institute for Ecology of Industrial Areas (IEIA) in Katowice has set up an inventory of low level municipal sources, including the location and dust emissions of residential and commercial boilers. There are as many as 800,000 small residential boilers for individual heating in the region, over 500 small industrial boilers and some 5,500 local heat producing plants in the region. Three parallel strategies have been proposed to reduce the number of these sources: a system of combined heat and power production (CHP) along with the development of heat distribution networks, the use of heat from industrial processes, and the use of electricity as an alternative source of heat. CHP in particular can double the efficiency of energy use from coal. CHP is regarded to be economical for some 60% of the region with a heat density ratio from 5 to 15 MW/km^2. In areas where heat distribution networks can not be developed at reasonable costs, for example because of damage caused by mining activities or inadequate technical conditions of buildings, the use of electricity as a source of heat is considered as an alternative. To promote the use of surplus electricity, a differentiation of electricity prices is required. In addition, investments are necessary to improve the electricity distribution network. The overall cost of a reduction of small residential and commercial boilers resulting in emission reductions of 60% from these sources would amount to some US$ 20 million annually for a period of 10 years according to the IEIA (see Pacyna 1996). Katowice is also the only voivodship where a subsidy scheme has been introduced to support the conversion of home heating from coal to gas (Suschka 1996).

During coal mining operations large amounts of so called coalbed methane are released. The potential for extraction is almost large enough to substitute all coal consumed in small residential and commercial boilers in the region. Major R&D efforts and investments are needed to develop methane burning boilers, modernize heat producing

plants, and enable coal mines to exploit coalbed methane. Coal can be treated chemically and mechanically to reduce dust emissions during combustion. by 40 to 70%. This is regarded as a low cost alternative to the use of electricity or coalbed methane to produce heat with comparable environmental benefits.

In the short run, the largest reductions of emissions of heavy metals can be achieved through the installation of devices removing heavy metals from exhaust gases of large industrial boilers and power plants. On behalf of the UN Economic Commission for Europe the Swedish Environmental Protection Agency has elaborated guidelines on measures and methods for heavy metal control based on the concept of best available technology (BAT) (UN ECE 1994). According to these guidelines electrostatic precipitators and fabric filters are the most suitable control devices considering both, effectiveness and costs. A reduction of heavy metal emissions equivalent to the decrease to be expected from reducing the number of small residential and commercial boilers is estimated to cost some US$ 15 million per year (Pacyna 1996)[28].

No individual strategy will efficiently reduce atmospheric heavy metal emissions from combustion processes by more than 35%. However, a combined strategy will allow to reduce these emissions by up to 70%. A combined strategy of reducing the number of small boilers and of applying BAT in large boilers is also politically most feasible and comparatively easy to implement.

Combustion of leaded gasoline for transport is a primary source of lead emissions. It is estimated that transport contributes 11% to total lead emissions in Katowice Voivodship. Low leaded and unleaded gasoline has been introduced in Poland only by the end of the 1980s. The permitted amounts of lead additives were significantly lowered in 1993. The additional costs of producing unleaded gasoline for the region have been estimated to amount to some US$ 1 million per year (Pacyna 1996). Rules for a regular testing of vehicles, including their exhausts, are developed. Reductions of transport related emissions are also expected from a modernization of the outdated transport infrastructure. This would also contribute to increasing overall productivity in the region. High sunk costs require a long term perspective on transport infrastructure modernization, however.

Instruments

Differently from early Ruhr policies the policy relied upon for clean air policies in Poland comprises a mix of regulatory and economic instruments[29]. Based on national ambient air quality standards defining permissible concentrations of pollutants in ambient air - which are stricter than the equivalent EU standards - voivodship environmental authorities set standards of permitted loads of emission for industrial facilities. Concentrations of cadmium must not exceed 0.22 µg/m³ for example, within 24 hours or 0.01µg/m³ on average during a year[30]. In addition, permissible depositions of heavy metals and dust have been limited (in case of cadmium to 10mg/m²*year, for instance). Many standards are tightened in 1995 for new sources and - less though in

28) It should be noted that total environmental benefits differ between these options.
29) In Germany a mix of regulatory and economic instruments has been used in water management since 1976.
30) Somewhat tighter standards exist for particular areas such as health resorts.

many cases - in 1998 for existing sources. It should be noted that to date, Poland's environmental policy for air pollution control has not formally introduced best available technology requirements, or restrictions on the use of harmful inputs of production processes. Such forms of regulation were commonly used in the Ruhr area to combat pollution.

Fees are charged for emissions below the permitted level. If emissions exceed this level, polluters are fined at a rate ten times higher than the fee rate. Fines can be reduced if polluters invest in pollution control equipment. Recently fee and fine rates have been doubled for the Katowice (and Krakow) Voivodship[31]. Firms are required to report to the voivodship representative the quantity and kind of all emissions for a given year by January 31 of the following year. Fees are then assessed and collected by the Voivodship Department of Environmental Protection.

The revenues go to national (40%), voivodship (50%) and municipal funds (10%); the national funds are redistributed to the voivodship and local level. Total revenue of the national, regional and local funds amounts to approximately US$ 500 million per year. The environmental funds are used to finance environmental investment of enterprises and communities through grants or soft loans. Contributions from environmental funds account for about one half of all sources of finance of environmental investments; other sources are own funds of enterprises, public budgets, and foreign aid. In Katowice Voivodship nearly 400 projects were supported by the voivodship environmental fund, of which more than 200 related to ambient air protection and more than 100 to water and waste management including flood protection; 18 projects implemented clean technologies.

The environmental effectiveness of fees and fines is probably rather low. Fees are generally significantly lower than abatement costs. Fines are frequently not enforced. Fees and fines are not indexed to inflation which has averaged some 20% in Poland in recent years. For state owned companies fees and fines do not create strong incentives because they are not confronted with any hard budget constraint. Still, the system of fees and fines signals the determination of authorities to fight pollution and contributes to an awareness in enterprises of adverse environmental impacts of their activities (Suschka 1996).

For new installations impact assessement is required. Enterprises have to prove that emissions will not cause an increase of pollution above a predefined level which is set in a way as to leave room for emissions from additional sources. Comprehensive environmental impact assessment studies have to be performed for large projects with possible adverse effects on the environment. These studies have to describe the impact on various environmental media and on humans. They have to demonstrate the efforts made to minimize environmental impacts and discuss alternative solutions. Environmental impact assessments are a prerequisite for eligibility for subsidies

31) This decree was challenged in court by industry with a decision still pending (as of July 1996).

4.2.2 Soil Protection and Contaminated Land Management

The primary pathway of heavy metals into humans is via vegetables. Additionally, heavy metals enter the food chain through the contamination of fodder plants. Finally, it has been shown that for children living in industrial areas involuntary ingestion is a major source of heavy metal intoxication; sources of involuntary ingestion include dirt on the hands, dust in rooms, and contamination of sand and soil in playgrounds (Nowinska 1995).

Avoiding the entry of toxics into soils

Binding legal standards of maximum permitted concentrations of heavy metals in soils have not yet been introduced in Poland. Proposals have been made to introduce such standards for permitted heavy metal contents of the upper layer of soils which differ for arable and non-arable land; for cadmium the proposed standards range between 1ppm for the top 25 cm of light arable soils to 5 ppm for heavy non-arable soils. Heavy metal concentrations in vegetables are regulated in Poland (Nowinska 1995). The permissible value for cadmium is 0.08 mg/kg f.w., for example.

Little information is available on the content of heavy metals in the some 90 million tonnes of wastes deposited annually in Katowice Voivodship. Environmental and health hazards arise mainly as a consequence or re-emissions of heavy metal-containing fine particles into the atmosphere and wash-out of metals by surface waters. Excavation filling is suggested as one of the most important ways of managing industrials wastes, such as fly ash and bottom ash from electric power plants. Efforts are made to develop appropriate technologies with aid from international donor organizations. Dust collected by filters is sometimes sold to cement plants for the manufacture of clinker bricks. For deposition in landfills solid wastes containing heavy metals have to be screened (isolated from the soil with impermeable material), containers and tanks have to be closed, and emitted gaseous or liquid streams have to be treated.

As well as for the disposal of waste in landfills, an environmental impact assessment is required for the application of sewage sludge to agricultural land. Usually the agricultural use of sewage sludge is not permitted because of high heavy metal contamination (Suschka 1996). However, it has been reported that sewage sludge is applied illegally by some farmers in collaboration with treatment plant operators. No binding standards exist for heavy metal contents of sewage sludge to be applied as fertilizer on agricultural land or as material for the recultivation of degraded land. In practice guidelines has been developed, limiting cadmium concentration to 50 ppm for example. More recently, a set of differentiated standards has been proposed according to which the cadmium content of sewage sludge must not exceed 10 ppm for agricultural use and 25 ppm for non-agricultural use. In addition, cumulative loads of heavy metals to agricultural soils must not exceed certain limits, for cadmium the proposed standard is 0.15 kg/ha within a ten year period. These standards equal those of a corresponding EU directive. However, sewage use is not permitted on soils with metal contents above certain limits. For cadmium the standard is 3 mg/kg of dry soil for light as well as for heavy soil.

An executive order on water quality also restricts the permissible concentrations of pollutants discharged to the soil. For cadmium, for instance, the limit is 100 µg/l. It is

not permitted to discharge wastewater to the soil where shallow groundwater reservoirs are used for water supply or where groundwater protection zones exist.

Mineral fertilizers are another major source of heavy metal contamination of agricultural soils. Nitrogen fertilizers produced by 'clean' synthesis contain practically no heavy metals. Phosphorous fertilizers contain significant concentrations of lead and cadmium. The most serious risks originate from lime and lime-magnesium fertilizers generated as industrial by-products. About 55% of the lime used in agriculture originates from industrial processes like floatation and sintering (Nowinska 1995). The problems of contamination of land through mineral fertilizer application has not been explicitly addressed by environmental policy yet.

Contaminated land management- Strategies

„Hot spots" of heavy metal contamination in Katowice pose dangers to human health. As remediation of large areas is not feasible in the short run, uses need to be adapted to existing contamination. A system of information has been established for this purpose. It promotes awareness about pathways of contamination and includes recommendations on the use of agricultural areas and gardens. More than half of the agricultural area of Katowice Voivodship has been evaluated and divided into 3 categories by 1995 (Nowinska 1995)[32]: in category A (64% of arable land) there are no environmental limits for agricultural production, category B is suited for plants which have a low metal-cumulating potential and are consumed in small quantities, on category C-land (8%) growing of edible and pasture plants is not recommended. According to the Decree on Arable and Forestry Land Protection fee are collected for land use changes and degradation of land by the Voivodship Arable Land Protection Fund which finances soil improvement projects.

Basically two groups of policy options exist for the management of contaminated land:

- technical solutions, including
    - excavation,
    - isolation,
    - treatment (chemical, biological, physical; to either destroy or immobilize contaminants), and
    - mixing of contaminated soil with clean material, or
- administrative solutions, including
    - change of crops, and
    - change of land use.

32) A map showing the environmental classification of agricultural land in Katowice Voivodship is presented in Nowinska 1995.

Each of these options has its advantages as well as its disadvantages. For example, the treatment of soils often impairs the biological functioning of the soil. Similarly, immobilizing metals in soils may create a „chemical time bomb“ (Hesterberg, Stigliani et al. 1992).

The choice among these options depends on future land uses. They can be ranked by their sensitivity to heavy metal contamination (Kucharski et al. 1996). Allotment gardens, farm land, backyard gardens, playgrounds, housing sites and recreational facilities are considered to be very sensitive or sensitive. Office, commercial, and industrial sites, parking lots and roads are less or not sensitive. Changes of land use to less sensitive categories offer cost-effective opportunities for managing contaminated land.

A systematic comparative analysis of 12 options for managing contaminated land in Katowice Voivodship according to a set of 10 criteria was performed by Kucharski et al. (1996). The criteria cover ecological, technological, economic, and social aspects; they include the preservation of multifunctional usability of soils after application, the effectiveness in removing a wide range of metals, and the long-range effectiveness for example. The analysis was formalized by multi-criteria model developed by Saaty (1980). The various criteria have been weighted from two different perspectives, that of a land owner and the different one of a representative of the local authorities responsible for environmental protection.

Based on this analysis the authors concluded that the superior method for managing contaminated agricultural land is controlled cultivation of either non-edible plants, such as forests, bio-fuels, commercial crops, and ornamental plants, or cultivation of selected edible and pasture plants while observing proper agricultural practices. Another recommended action, in areas where its application is feasible, is deep ploughing. Of all methods of remediation, phyto-remediation, i.e. the cultivation of high-cumulative plants to remove metals from the soil, is the most recommended one. All other methods should be considered only if the options mentioned above are not applicable.

- *Instruments*

Procedures for managing contaminated agricultural land are regulated by an Act of 1995 on the Protection of Agricultural and Forest Land. For degraded land in designated areas land management plans have to be developed, stating i.a. information on types and effects of pollution, agricultural products and producers, recommendations and plans for future cultivation and use of products, and expected costs including indemnities. The development and approval of these plans involves land owners, the Ministries of Agriculture and Food Production as well as of Environmental Protection, Natural Resources and Forestry, and the municipal council. Costs of preparing the plan have to be covered by the responsible polluters. Sanctions for enforcing the plans exist: Local authorities, in agreement with the Voivodship Sanitary Inspectorate, can order the destruction of crops and the transfer or slaughter of live-stock, for example. In principle, it is conceivable that these plans help to create a favorable consumer image of products produced in regions covered by the plan.

To exclude land from agricultural production a permit is required which can be issued only in accordance with a spatial management plan. A one-time fee is charged for this

permit; for permanent non-agricultural use an annual fee has to be paid for a 10-year period. If the reason for exclusion is contamination of plants, the polluter pays principle applies. The revenues are used to fund designated contaminated soil management projects through the Agricultural Land Protection Fund.

Decisions on land reclamation can be taken by local authorities, defining, i.a., the method and schedule of reclamation and the responsible for conducting reclamation. Regulations concerning the management of contaminated agricultural land can also be applied to garden allotments. A program to discontinue food production on contaminated land has been supported by funds from the European Union's PHARE program (Beblo 1994).For contaminated non-agricultural land the regulations of a decree of the Council of Ministers of 1987 apply. It states the obligation of legal units causing degradation to restore the biological balance of the earth's surface.

To avoid liability, potential investors are hesitant to acquire land which may be contaminated. In order to avoid the withdrawal of investors and to protect uncontaminated spaces legal provisions have been created to free investors from such liability.

Implementation of contaminated land management encounters various obstacles. Many farmers are reluctant to change a profile of agricultural production which is based on long-term traditions. In addition, farmers do not have any incentives to observe recommended land use changes. Thus, education of land owners and their involvement in establishing land management plans is important. Strong incentives could also be created by establishing a labeling system for food produced on properly managed land.

A control of cultivation as the preferred method of contaminated agricultural land management is in accordance with other objectives of environmental policy as well as sectoral policies. One of the goals of Polish environmental policy is to increase the area of woodlands. This is consistent with improving the country's water balance and reducing its climate impact. Using contaminated land for the production of bio-fuels corresponds to the energy strategy which includes an increase of the share of renewable energies. At the same time, agricultural productivity may be increased. The production of bio-fuels as well as phyto-remediation may create new jobs for farmers. Finally, the supply of moderately priced sites, not suitable for sensitive land uses but save for less sensitive uses, as well as a consistent overall policy of managing contaminated land may help to attract investors to the region.

4.2.3 Organizational and Procedural Arrangements for Implementation

Many environmental standards in Poland are as stringent as or even more stringent than standards in western countries. Implementation is deficient, however. It is obvious that some of the large industrial enterprises do not always comply with environmental standards while pointing out to a lack of funds or possible hazards to employment (Suschka 1996).

Administration of environmental regulation is the responsibility of the State Environmental Protection Inspectorate (SEPI) which is headed by the Deputy Minister of the Environment. Administration of environmental regulations is executed at the

voivodship level (Novy. 1996). In each voivodship a Voivodship Board of the State Environmental Protection Inspectorate which is responsible directly to the Ministry of the Environment carries out part of SEPI's responsibilities, including imposing fines for violations of environmental standards, ordering the stop of hazardous activities, the prevention of licensing of activities not conforming to environmental regulations, coordination of the National Monitoring Network, and cooperation with other authorities. In addition, each voivodship has its own Department of Environmental Protection. Its main responsibility is to take decisions on permissible emission levels for individual point sources to ensure that the district complies with national air quality standards established in the decree on air pollution from the Ministry of Environment. Its further responsibilities include issuing permits, collecting fees and fines, issuing administrative orders, measuring and monitoring pollution, and keeping records. The rechanneling of funds from the collection of fees and fines is administered at the district level by a Voivodship Environmental Fund. A similar administrative structure at the municipal level assists the voivodship offices.

In setting each firm's emission levels, the Voivodship Department of Environmental Protection takes into account the technology used by the firm, the duration of operation, the pollution control equipment installed, and the range of dispersion of pollutants. Permitted emission levels can be adjusted flexibly, for example in case of new investments or a change of standards. If new emitters start production in the region, the Voivodship Department of Environmental Protection is entitled to change emission standards for each firm.

The proper implementation of the instruments of clean air policies requires experienced personnel as well as modern technical equipment. If authorities cannot control and verify information supplied by enterprises on emissions, technical processes, and economic conditions, incentives to comply with regulations will be weak. This has been recognized and an initiative has been taken to establish a nation-wide monitoring system in accordance with international conventions. Local monitoring of concentrations of pollutants has to be performed by enterprises. Firms discharging an excess of 800 kg per hour of dust (or 1,200 kg per hour of SO_2) are required to install permanent monitoring devices. In addition, firms that have the capacity to discharge more than 100 kg per hour of dust or SO_2 must sample their emissions twice a year at times agreed upon with the district administration.

Several organizations in the Katowice Voivodship help to design strategies for environmental protection, support the environmental administration, perform environmental monitoring, and promote ecological education (Beblo 1994). The Energy Regard Agency, a privately organized company with a foreign capital share, designs energy strategies for the regions, particularly for municipalities. The Waste Management Agency develops strategies for integrated waste management and promotes recycling technologies. Monitoring of air pollution is conducted by local sanitation-epidemiological stations under the supervision of the Voivodship Sanitation-Epidemiological Station and the Monitoring Service which is part of the Department of Environmental Protection of the Voivodship Office. Monitoring of the state of the environment in Katowice is also performed by various semi-public and public research institutes like the Center of Environmental Research and Control, the Institute for Ecology of Industrial Areas, and the Environmental Research and Development Center.

Studies on the health effects of pollution are conducted by various institutions, including the Oncology Center in Gliwice and the Institute of Medicine of Labor and Environmental Health.

The Regional Center for Ecological Education (RCEE) coordinates some 25 institutions which are engaged in ecological education. Among the activities of the RCEE are training of administrators and company responsibles for environmental protection, information and education of the public, and the transfer of knowledge through conferences and international cooperation.

Enforcement of emission standards and collection of fees and fines is further complicated - in addition to limited resources and staffing of administrations - by continued state ownership of many large enterprises. These firms lack the incentive, or are simply not forced, to pay fees and fines for pollution. Additionally, many of these firms are subsidized by the government through tax arrears, which makes paying fees and fines seem largely irrelevant.

There are also indications that regional and local authorities use their discretionary powers to favor large companies in the dominant sectors. On the other hand, cooperation between authorities and companies, by providing information, may help to quickly reduce particularly severe environmental hazards while taking into account the specifics of individual cases.

Deficits of implementation and enforcement may signal a flexible approach to environmental protection which takes into account economic as well as administrative and political feasibility. In this way the efficiency of environmental policy is promoted and significant reductions of damages can be achieved. In the long run, implementation deficits may have rather serious negative consequences, however, such as conserving dirty and possibly also economically wasteful productions.

4.2.4 Regional and Urban Planning[33]

The legal basis of planning in Poland originates from the 1970s and 1980s. Similar to the situation in Germany regional and urban planning is organized in three layers:

- state planning (compares to „Raumordnung“ in Germany);
- regional planning („Regionalplanung“);
- local planning („Bauplanung“).

State planning is regulated by a state planning law of 1984 and relates to Poland overall. Regional planning is based on an ordinance of the responsible ministry of 1988; the planning unit are voivodships. Local planning concerns construction projects; local planning is the responsibility of communities and is governed by a law of 1974.

The general objective of planning in Poland also corresponds to that in Germany: planning coordinates various uses of spaces within the respective regional context. This

33) See Gornig (1996b).

includes the integration of economic and environmental objectives. For this purpose, maximum permissible emissions (air, water, waste) can be established. Different from the situation Germany, emission limits may be set not only at the level of local planning but also at the level of state and regional planning.

The effectiveness of planning and its contribution to the integration of economic and environmental objectives depends on actual competencies of different levels of government. In Poland - as in other former communist states - government was strictly centralized. In the mid 1970s counties (powiats) were eliminated. Simultaneously the voivodships which historically played and important role were weakened through a re-organization. Instead of 22 voivodships a number of 49 was created. The newly delimited voivodships as well as the communities which continued to exist, were deprived of autonomous power.

Soon after the end of communist rule the self-governance of communities was reestablished, including their planning competencies. In addition, considerable influence on regional planning was granted to communities. They make proposals for regional plans which are assessed by a joint commission of community and voivodship officials. Communities also have the right to reject plans proposed by the voivodship. Currently, a re-organization of administrative units at the regional level is being discussed. A reestablishment of counties (powiats) is envisioned. Simultaneously a strengthening of voivodships is under debate, i.a. by significantly reducing their number.

Initiatives to revive regional structures have been particularly pronounced in Upper Silesia. Regional institutions, such as a Silesian parliament which had existed before World War II were reintroduced. Regional representatives - including, for example, business associations, labor unions, and development agencies - have elaborated a strategy for regional structural adjustment. It led to a „regional contract“ in 1995 making proposals for restructuring in various policy fields, including environmental protection, economic development, and social security.

Until now, administrative capacities for local and regional planning are still weak. Communities and voivodships mostly have to rely on former state planning agencies.

4.3 Environment-Economy Integration

From the beginning of the democratic transition the need to integrate environmental and economic objectives has been recognized in Poland. During the „Round Table“ negotiations in 1989 principles of environmental policy were laid down which emphasized a restructuring of industry, material savings through integrated technologies, and economic instruments. In 1990 these principles were confirmed in a document of the Polish Ministry of Environmental Protection, Natural Resources, and Forestry on National Environmental Policy. In addition to the „Round Table“ principles, this program called for a hierarchy of

- avoidance of pollution,
- closing of cycles, and

- pollution control.

It also proposed the participation of citizens, social groups, and non-governmental organizations, as well as extended rights of local and regional governments to adjust environmental standards and policy instruments. With respect to soil protection the document suggested an elimination of degrading activities, the neutralization of chemical pollutants, and the reclamation of land degraded by industrial activities.

Integrating emission control and resource management strategies

As has been argued above (sections 2.1.2 and 3.4), the integration of emission control and resource management strategies requires that emission standards are i.a. based on the objective of maintaining the land. In doing so, it has to be taken into account that the demands for the different functions soils provide for man and nature compete with each other. Finally, effective and efficient policies observing the above requirement have to be optimized over all sources of contamination.

To manage contaminated land in a way that integrates environmental and economic objectives, administrative policies which aim at influencing crop selection and land uses have to be considered as an alternative to technical measures of remediation. The choice of appropriate policies has to take future land uses into account and must optimize the schedule of remediation. Finally, as the polluter pays-principle is frequently not applicable, financing problems have to solved, observing distributional consequences.

Different from the situation in the 1960, when standards were first established in the Ruhr area, ambient air quality standards are now an issue of debate among an international network of experts. Although there is an awareness of the importance of soil protection as an objective of clean air policies in these discussions, this objective has not yet been formally taken into account. National air quality standards in Poland, although not always enforced, are stricter than those of the European Union. It is not quite clear, however, to what extent this reflects the objective of avoiding soil contamination. Polish clean air policy, contrary to what is common in many other industrialized countries including Germany, does not rely on the principle of best available technology. In principle, environmental policy in Poland is thus more prone to base standards on a notion of damages, including contamination of soils.

The procedural arrangements in Poland of establishing emission standards for individual sources is flexible enough to allow for taking into account local soil contamination. There are no procedures for formally ensuring this, however. Rather, the objective of soil protection is observed on a case by case basis in practical implementation only.

In the Ruhr area a ranking existed of the importance attributed to the various functions of soils. As the importance of food production decreased in the Ruhr area, the production function of soils was subordinated to the carrying function. The regulation function was largely neglected while policy focused on coordinating competing demands for the carrying function of soils. In Poland a better balance has been achieved between different soil functions in the legal framework applying to emission control, soil protection, and contaminated land management. For example, incentives have been created to establish new industrial facilities on already contaminated land by freeing new investors from liability for existing contamination.

Policy makers in Poland and in Katowice are conscious of the need to simultaneously consider all sources of heavy metal contamination of the soil. In particular, policies to reduce emissions from energy production and consumption target small sources besides large ones. Limited administrative capacities are responsible for some asymmetries that still exist, for example with respect to mineral fertilizer use which remains largely unregulated so far.

Options to influence crop selection and land use have high priority in strategies to manage contaminated land in Katowice Voivodship. Solutions to deal with the obstacles to such policies, primarily from farmers, have not yet been developed, however. In determining the preferred options for remediation, future land uses are taken into account. To optimize remediation on the time scale, plans for land management are set up for designated regions. Land management plans are also used as a tool to take into account future land uses as well as financing problems. Financing is also facilitated through a special fund (Agricultural Land Protection Fund).

Integrating regulatory and economic instruments of environmental policy

To exploit the opportunities which exist for integrating environmental and economic objectives in Katowice a balance of regulatory and economic policy instruments will have to be found. Besides finding the appropriate combination of economic and regulatory instruments, the latter ones have to be designed to provide as much flexibility as possible. New tools of environmental policy like negotiated agreements, labeling, and auditing should also be exploited. Finally, the mix of instruments has to be assessed within the framework of the overall pattern of policy, including the style of implementation, administrative capacities, and networks of actors.

For the protection of ambient air both, regulatory and economic instruments are relied upon in Poland. Emissions are effectively and timely reduced by setting standards for each plant. Economic incentives are created to reduce emissions further and not to exceed permitted emissions. Enterprises also can choose between abatement or payment of a charge. However, the effectiveness of the fees and fines system is doubtful for several reasons. First, it has been reckoned that the fees are much lower than marginal abatement cost, Second, fees are not indexed to inflation which further deteriorates their effectiveness. Third, many large enterprises are still state owned and do not face a serious budget constraint. Finally, fees and fines are not always enforced. Thus, fees and fines have to be regarded as an instrument for raising funds only. Economic instruments are used in other fields as well. Land use management, for example, also uses charges as an instrument; a fee is charged for taking agricultural land out of production and for using it for other purposes.

Subsidies are used as an instrument of environmental policy, too. Basically the design of financing schemes in Poland seems to correspond to the rules the OECD has proposed for environmental subsidies. There does not seem to exist a sound procedure, however, to make sure that the Environmental Funds raised through charges are used in an efficient way.

Considerable flexibility has been built into regulatory instruments in Poland. Enterprises are required not to exceed a certain level of emissions; this gives them internal flexibility for choosing the most efficient way to do so. As Polish standards are not

explicitly based on the concept of Best Available Technology they also do not implicitly determine a particular technology. The practice of phasing-in tighter standards gradually and with early pre-announcement makes it easier for enterprises to search for efficient solutions. The close cooperation that exists between administrations and many enterprises may help to find solutions adapted to economic as well as to environmental conditions in each individual case.

There is no formal scheme in Poland which provides external flexibility for emission reductions to enterprises (while still ensuring the desired environmental quality) such as tradable permits. The value of approaches providing external flexibility was demonstrated in a pilot project in Chorzow in the Katowice region (Zylicz 1994).

Environmental regulation is not always strictly enforced in the Katowice Voivodship[34]. As far as this reflects a flexible approach to environmental protection it may promote effectiveness as well as efficiency. In particular, large losses of jobs - which are associated with high social costs of unemployment and poverty as well as long-term economic costs as a consequence of a loss of human capital - can be avoided. However, as weak enforcement is biased towards large companies in the dominant sectors, it tends to stabilize a situation which is untenable from an environmental as well as economic point of view. The same argument holds true as far as deficits of enforcement are simply due to insufficient capacities on the part of the administration.

New tools of environmental policy have been tried only occasionally yet. The Chorzow project mentioned above is an example of a negotiated agreement between the administration and several enterprises. This tool has not been systematically exploited yet, however. Environmental auditing - internally as well as externally - is not yet common. Environmental labeling - which could support the implementation of land management plans, for example - has not yet been introduced. An innovative element in Polish environmental policy is the earmarking of the revenues of environmental charges for environmental protection. The use of the funds created from these revenues does not seem to be sufficiently evaluated to ensure efficiency, though.

Integrating environmental concerns into sectoral policies

By making explicit the trade-offs between economic and environmental objectives conflicts between these aims can be mitigated more easily. For this purpose an obligation to design sectoral policies with regard to of environmental concerns has to be incorporated into the legal framework. Environmental impact assessment and environmental strategy assessment - the ex-ante assessment of plans and proposals - are powerful tools of sectoral integration. Legal provisions have to be supported by appropriate institutional arrangements. For land maintenance, the integration of environmental objectives into energy, transport, agricultural, and industry policies is of key importance.

Policy makers in Poland and Katowice Voivodship are aware of the benefits of sectoral integration as is noticeable from several strategic documents on environmental policy. Energy policy in Poland largely integrates environmental objectives. There has been a

34) Polish air quality standards are frequently exceeded in urban areas; even the less strict EU standards (daily concentrations of particulates) were exceeded in 50% of all voivodships in the period 1990 - 92.

substantial cut into subsidies on energy use, intended further increases in energy prices will stimulate energy savings. No energy taxes which would account for the external costs of energy use are planned, though. Energy infrastructure investments programs as well as financial assistance schemes exist which support emission reductions from energy production and use. Poland also has plans to increase the share of renewable energies.

Transport policy seems largely to be directed towards improving the efficiency of road transport without much regard to environmental concerns. An effective transport system is important for an improvement the economic situation in the Katowice region. As decisions made now will bear long into the future proper regard should be given to the sustainability of transport (OECD 1997). This implies an adequate role of railroads, for example.

Agricultural policy also integrates environmental objectives to some extent. Environmentally more benign agricultural practices, such as lower fertilizer use, are encouraged by price adjustments. Also, plans are under discussion to substitute food production by the cultivation of bio-fuels. A comprehensive strategy which would result in compensating farmers for environmental services - instead of economic value - has not yet been designed, despite proposals to create jobs for farmers through phyto-remediation of heavy metal contaminated land. Poland plans to extend the share of its forest land in order to protect water resources and contribute to greenhouse gas reduction; this integration of environmental objectives into forestry policy is probably facilitated by the establishment of a Ministry of Environmental Protection, Natural Resources, and Forestry.

Industrial policy besides transport policy is least supportive to environmental policy. It will be difficult to control pollution without speeding up and improving the process of industrial restructuring and privatization. While there are some initiatives to promote innovation, there could be a much stronger role for technology policy directed towards the development of clean technology.

Integrating regional environmental and economic policies

Conflicts arising from the principle of a division of functions between regions (founded on the objective of economic efficiency) and the aim of equal living conditions in the regions of a nation (or of larger political entities) require a close coordination between environmental and economic objectives at the regional level. This in turn calls for at least some degree of autonomy of regional administrations in environmental policy making. Regional planning, designed to equilibrate conflicting demands for the different functions of soil, can be a powerful tool for coordinating environmental objectives with economic, social, and other objectives in a spatial context. For this purpose it must take environmental objectives, such as preserving the regulation functions of soils, explicitly into account. It also has to give actual influence to all stakeholders and actors. Finally, capacities have to be created capable of coping with the administrative difficulties of planning.

In principle, the legal prerequisites exist in Poland and Katowice for integrating regional environmental and economic policies. However, actual capacities and conditions do not permit to fully exploit these opportunities yet. In Poland, a greater flexibility seems to

exist to regionally adjust environmental standards than in Germany. Limits exist to design environmental policy corresponding to regional conditions, however, as is demonstrated by the challenge of regionally different fees for air pollution in court.

A framework for regional and urban planning exists in Poland. Steps have been taken to endow local and regional bodies with actual competencies. However, administrative capacities are still insufficient and data and information are still incomplete. As under communist rule regional planning was primarily used as an instrument to implement the objectives of the central government, confidence has been harmed that planning is an appropriate instrument for coordinating local, regional and national interests.

In view of these deficits it seems unlikely that a comprehensive planning approach comparable to that in Germany can be implemented in Poland in the near future. For the moment, an incremental approach seems more promising which focuses on developing existing potentials rather than designing comprehensive concepts of uses of spaces.

Integrating environmental policies at different levels of government

Different environmental problems have different spatial dimensions. Effective problem solving requires that responsibilities for environmental policy are organized according to the spatial dimensions of the problems to be solved. As these do not always correspond to the overall administrative framework, appropriate forms of cooperation across the borders of administrative units have to be established.

Simultaneously, responsibilities for environmental policy should be attributed to different levels of government according to the principle of subsidiarity. It requires that competencies are given to higher levels of government only if a particular problem can be solved easier at this level than at a lower one.

Problems may arise because lower levels of government are insensitive to environmental as well as economic effects of their policies resulting outside their region. Thus, mechanisms have to be designed to internalize such external effects. External environmental and economic effects require a top-down approach to policy making while the principle of subsidiarity calls for a bottom-up approach. This conflict can be largely solved by non-hierarchical planning. To assure mutual influence of different levels of government appropriate procedural and administrative arrangements have to be established. Key elements of such arrangements are iterative planning procedures and the participation of representatives of all levels of government in planning bodies.

The prerequisites for attributing responsibilities according to the spatial dimension of environmental problems have been or are being created in Poland. Self-governance of municipalities has been reestablished. A reintroduction of counties (powiats), while reducing the number of voivodships, is envisioned. The nature of many problems associated with soil contamination and land maintenance, such as waste management, will require a coordination across the borders of these administrative units. Institutional arrangements will have to be made to meet this requirement.

The allocation of competencies to municipalities, voivodships, and the central government seems to correspond largely to the principle of subsidiarity. It does not

seem to be consistently applied yet. The administration of environmental funds, for example, seems to be overly centralized. Such deficiencies may be the result of a certain inertia after many years of rigidly centralized government under communist rule.

The three layer planning system that exists in Poland is capable of solving the top-down vs. bottom-up conflict described above. Planning is largely based on laws and ordinances of the 1970s and 1980s. In regard of the highly centralized government at that time it is not surprising that the principle of mutuality was then violated. When the communities were reestablished they were given considerable influence on regional planning. They make proposals for regional plans and have the right to reject voivodship plans. Plans are assessed by a joint commission of community and voivodship officials. If the role of voivodships will be strengthened by reducing their number and reestablishing their previous size their influence on state planning will also increase.

Integrating environmental and employment policies

Unemployment, open and hidden, is high in Katowice Voivodship. Any further increases will cause considerable social costs and leads to a deterioration of human capital. Because of the relationships that exist between employment and environmental policy, environmental objectives and the aim of securing jobs have to be coordinated. This requires that any adverse effects of environmental policy are mitigated and a positive relation between the two objectives is exploited.

In order to mitigate adverse employment effects of environmental policy a stepwise implementation of environmental policy is required which takes account of the economic situation of the affected enterprises. This includes exemptions for enterprises the existence of which would be threatened if they had to comply with environmental regulation; in such cases a plausible schedule for reaching legal standards should be required. Under the same condition, subsidies should be made available to firms.

Spending programs designed to exploit a positive relation between environmental protection and employment have to be carefully tuned to both, environmental bottlenecks and labor market problem groups. This implies that such programs will be of a rather limited size. Public work schemes can be used to temporarily take some of the strain off the labor market. In order to reintegrate laid-off persons into regular employment through such schemes, a cooperation with private firms is necessary, however, which again restricts the possible size of such programs.

In the long run, the most promising way to integrate environmental and labor market objectives with each other is a strategic orientation of environmental policy on innovation and competitiveness. This strategy is not limited to promoting an environmental industry but also comprises an improvement of overall competitiveness through the installation of clean technology. This approach has to be supported by appropriate training activities.

A gradual phasing in of new standards is common in Poland. In addition, transitional arrangements are usually made for existing facilities. Regional and local authorities do take the economic situation of enterprises into account when they determine permissible emissions and grant permits. It can be assumed that exemptions from enforcing legal

requirements are made if necessary. There are no reports of plants being closed down or driven into bankruptcy for environmental reasons. Subsidy schemes, such as the Environmental Funds, exist which support enterprises that do not dispose of proper funds for complying with environmental standards. Public financing of loss-making state-owned enterprises probably also contributes to financing environmental investments.

Primarily due to a lack of public funds, large spending programs on environmental projects have not been initiated so far. However, plans that exist to reduce atmospheric emissions from small sources by reducing the number of residential and commercial boilers, for example, will amount to spending programs of considerable size if they are implemented. Similar programs can be imagined for the remediation of contaminated sites. It is doubtful, though, that such programs could be specifically targeted at the labor market problems of Katowice Voivodship. Energy infrastructure or remediation projects will usually not create jobs for laid off miners of steel workers.

Although unemployment is high compared to historical standards in Katowice no need has been seen to implement public work schemes yet as a buffer against mass unemployment. It would be appropriate, however, in view of some proposals to cut employment in the mining and iron and steel sectors, to prepare public works schemes which could simultaneously be directed at improving environmental quality in the region.

First signs of a strategic orientation of environmental policy on innovation and competitiveness are visible in Katowice. Part of the emission reductions in the iron and steel and heavy metal industries result from the restructuring of production from raw materials to finished products, thus improving international competitiveness and increasing the share of value added. Similarly, competitiveness of the steel industry has been considerably improved by the introduction of continuous casting technology. There are also measures to establish an environmental industry in the region. The Bobrek steel plant started to produce environmental protection equipment and technology for smokeless fuel production simultaneously with the closure of its raw material departments; in addition, a department of ecological services has been established (Beblo 1994).

5 Guidelines for Improving Environment - Economy Integration

The analysis of environmental policies in the Ruhr area and the account of current approaches in the Katowice Voivodship allow to suggest some guidelines for an approach to land maintenance characterized by an integration of environmental and economic policy objectives.

- Environmental quality standards should be based on all available information. This includes - but is not restricted to - the kind of information embedded in material balances. The material balance approach helps to integrate environmental and economic objectives in several respects. In particular, it may serve as a tool to integrate emission control and resource management strategies. More information for

formulating efficient environmental quality standard can be made available through cooperative approaches involving all stakeholders. A methodology to determine standards which appropriately account for interdependencies between different pollutants has still to be developed.

- To derive emission standards for individual facilities consistently from environmental quality standards is difficult both theoretically and in practice. The proper use of economic instruments - as one component of a mix of instruments - can help to solve this problem. Charges have to be flexibly adjusted to determine the level at which they ensure the desired environmental quality standards; this may prove to be difficult in practice. An emissions trading scheme can solve the problem of assuring the desired overall level of emissions. A limited number of large emitters and of substances constitute favorable preconditions for its introductions. To avoid a lock-in of old sectoral patterns of production (one of the major problems of Ruhr policies), it is important to provide opportunities for new investors to acquire emission rights.

- Economic instruments also provide internal and external flexibility and create incentives to search for better solutions to environmental problems, thus improving efficiency. Economic instruments work by creating incentives, i.e. by opening chances to increase incomes or profits. Profit oriented business-making and competition are therefore necessary conditions for the functioning of economic instruments. This implies that a speedy privatization is necessary in order to make economic instruments of environmental policy effective. Effective monitoring and enforcement are also necessary conditions to create effective incentives. This again requires adequate human and technical capacities.

- To avoid local pollution and to avert immediate hazards, standards limiting the emissions of individual facilities are appropriate in addition to economic instruments.

- Supplementary instruments should be used to improve environmental performance of (privatized) enterprises. Environmental auditing schemes are particularly suitable for tackling diffuse sources of pollution; they are also suited to discover low-cost or even profitable opportunities to reduce pollution. Voluntary agreements and environmental education are other examples of supplementary instruments.

- Implementation plans including financing mechanisms, such as subsidy schemes, proved to be very effective. particularly for retrofitting industrial facilities, in the Ruhr area. Such plans should also be developed for small sources. Provisions should be taken to promote the efficiency of subsidy schemes. Subsidy schemes may also be set up to promote the diffusion and possibly the development of clean technologies, e.g. by supporting the establishment of pilot plants.

- Cooperation between authorities and large companies of the dominant sectors, although beneficial for quick and efficient emission reductions in the short run, may turn out to develop into a major obstacle to economic restructuring as experience from the Ruhr area suggests. Therefore it is necessary to create fair conditions for the establishment of new enterprises and to phase out support to old economic activities which are costly in environmental as well as economic terms.

- There is a need as well as a wide scope of opportunities to strengthen policy integration in various other dimensions. Particularly important is a stronger integration of environmental concerns into sectoral policies. Examples are energy policies which encourage wasteful energy use through subsidized prices. Transport and agricultural policies do not yet sufficiently take environmental objectives into account, as well.

- A system of information on soil contamination can help to adapt land use to existing hazards. Polluting activities should be restricted to already contaminated land as the cost of later remediation is often independent of additional depositions. Remediation of large areas has to be coupled to economic development. A funding systems should be established for the remediation of soil contamination for which polluters can not be held responsible.

- Regional planning is a powerful instrument for integrating environmental and economic objectives at the regional level and for coordinating policies at different levels of government. The deficiencies impeding a comprehensive planning, such as missing data and information, insufficient capacities at the regional and local level, and harmed confidence, can only be removed in the long run.

- In the short run, an incremental approach to regional planning will have to be adopted, focusing on

    * developing a model view of the region,

    * moderating conflicts between different demands for spaces,

    * coordinating different sectoral policies, and

    * supporting exemplary restructuring projects.

- A model view of the region developed jointly by all societal groups helps to integrate the interests of various stakeholders and actors. It also helps to coordinate environmental, economic, and social objectives. Finally, it supports the integration of environmental objectives into sectoral policies.

- Environmental and economic restructuring will invariably lead to conflicts over land uses, for example between old industrial establishments and new investments. Regional and urban planning can act as moderator in such conflicts and helps to jointly optimize environmental and economic benefits.

- Whereas regional restructuring will remain a persistent challenge, individual projects can set examples of successful restructuring and, thus, serve as a signal and an orientation. Such projects may develop into focal points of regional development.

- Increases in unemployment, particularly of young people, should be avoided in order to prevent dequalification and migration. This is important for safeguarding the human resources necessary for reconstruction. In the short run, job creation programs can be set up. In the long run, educational efforts should be strengthened.

6 Summary and Conclusions

The Ruhr-Katowice Comparison Project summarized in the present paper aimed at a better understanding of policy options for land maintenance in the context of heavy metal pollution. Its main results may be grouped into four categories:

- The study contributes to the methodology of assessing environmental policy from an economic point of view by further developing and applying the concept of environment - economy integration.

- The investigation yields a review and assessment of past environmental policies directed at heavy metal pollution in the Ruhr area in Germany.

- The research results in an overview of current efforts to manage heavy metal pollution in the Katowice Voivodship in Poland.

- Finally, the project develops a set of guidelines for improving environment - economy integration in the reduction of heavy metal pollution and the management of heavy metal contaminated soils.

The concept of environment - economy integration

Cost-benefit analysis of environmental policy options aims at calculating their net economic welfare effects; theoretically the option with the highest net benefit should be selected. However, a comprehensive cost-benefit analysis is not only fraught with many difficulties, it also ignores many politically important consequences. Economists largely agree that this tool should therefore be used for preparing decisions only, but that its application will not result in an unambiguous ranking of different options. It has been argued in the present paper that designing policies according to the principle of environment - economy integration is an alternative to selecting policy options by their net economic benefits.

The notion of environment - economy integration is based on the observation of many strong interdependencies between economic activities and the protection of the environment. It describes any attempt to exploit synergies where they exist or to minimize conflicts where trade-offs dominate between economic and environmental objectives. Environment - economy integration can take different forms. In this paper six dimensions are identified which are particularly relevant for managing heavy metal pollution: the integration of pollution control and resource management strategies, the integration of regulatory and economic instruments of environmental policy, the integration of environmental concerns into sectoral policies, the integration of regional economic and environmental policies, the integration of environmental policies at different levels of government, and the integration of environmental and employment policies. For each of these dimensions conditions are formulated which have to be met by environmental and other policies in order to optimally coordinate environmental and economic objectives. For example, in order to integrate environmental policies at different levels of government, arrangements are necessary which facilitate cooperation across administrative borders, the principle of subsidiarity has to be observed, and mechanisms have to be provided for ensuring that economic as well as environmental

effects occurring elsewhere are taken into account. Such conditions are suited as criteria for assessing policies which is demonstrated by applying them for a review of historical policies in the Ruhr area and of current approaches in the Katowice Voivodship.

Past policies in the Ruhr area

The most significant reductions of heavy metal loads to soils in the Ruhr area arose from reducing industrial atmospheric emissions; other sources of heavy metal pollution of soils were only gradually addressed since the 1970s. The necessities of an efficient protection of soils - collective decisions, incentives, generation of know-how - were recognized only hesitantly and partially.

The reduction of industrial air emissions was brought about by changes within individual sectors rather than a shift of economic activity to cleaner industries. Actually, policies in the Ruhr area failed to initiate a process of modernization of the economy. In part this was due to strong traditional links between politicians, administrators, and representatives from both, the capital and the labor side, of the dominant old industries although the same links were helpful for an effective reduction of atmospheric emissions.

The installation of end-of-pipe pollution control equipment and the installation of more efficient processes both played an important role in intrasectoral changes in the Ruhr area. Both, economic influences and environmental policy, motivated these changes, their relative importance remains unknown, however. The key elements of the policies that contributed to these changes were:

- effective command and control-type protection of ambient air
    - implemented in a way as to provide considerable flexibility to enterprises,
    - improving manageability by focusing on large sources,
    - embedded in a consistent framework of clean air planning since the mid 1970s, and
    - complemented by comprehensive subsidy schemes;
- flexible regional planning
    - adjusting national standards to regional environmental and economic conditions,
    - facilitating solutions through participation of stakeholders,
    - addressing land management by excluding food production on contaminated land and by restricting activities posing a thread for food production;
    - focusing primarily on conflicts between housing and industrial activities and largely failed to protect the environmental functions of soils, however;

- implementation by decentralized and independent institutions,
    - set up by starting from existing administrations,
    - with a flexibly adapted internal organization,
    - disposing of the necessary capacities, and
    - endowed with the competence to take decisions;
- cooperative approaches to standard setting as well as to implementation,
    - aimed at both, participation and a division of duties between government and private actors,
    - took a variety of forms, and
    - generating additional information and motivation;
    - not explicitly addressing inherent hazards of cooperation, however;
- comprehensive subsidy schemes,
    - directed at retrofitting of existing facilities at first (they were also meant as an instrument of business cycle management)
    - shifted to technology promotion later,
    - partly administered and focused on specific problems by regional authorities,
    - largely directed at problems recognized by the OECD;
    - not always corresponding to the OECD's principles of selectivity, transitionality, and neutrality, and not sufficiently evaluated for efficiency, however.

A rather surprising conclusion that emerges from the assessment of historical policies in the Ruhr area is that many of the principles denoted in the present paper as prerequisites for environment - economy integration were realized, although this concept had not yet been explicitly developed. This holds true for the integration of environmental policies of different levels of government and for the integration of regional environmental and economic policies, mainly through regional and urban planning. Partial integration was achieved between environmental objectives and employment. Economic instruments - except for subsidies - were not used in the Ruhr area but considerable flexibility was built into regulatory instruments through legal provisions and through the practice of implementation. Ruhr policies failed with respect to the integration of environmental concerns into sectoral policies. They also did not achieve an integration of pollution control and resource management strategies: until lately, apart from some initiatives to

cope with contaminated sites, soil protection was achieved as a side-effect of emission control and regional planning only.

Current approaches in Katowice Voivodship

Many similarities exist between the Ruhr area and Katowice voivodship. However, some of the prime conditions for environment - economy integration are different in Katowice today from what they were like in the Ruhr area when a systematic environmental policy started there around 1960. First, many large industrial companies located in Katowice are still entirely or predominantly state owned; this seriously hinders the integration of environmental and economic objectives. Second, a considerable modernization backlog exists in the dominant industries; this offers many cost-effective opportunities for emission reductions. However, the lack of funds often prevents that these opportunities are seized. Third, open and hidden unemployment is high in Katowice Voivodship; this is another obstacle to any attempts to restructure the economy; it also calls for a strong emphasis on the integration of environmental and employment objectives.

The current approaches to managing heavy metal pollution in the Katowice Voivodship are more advanced than historical policies in the Ruhr area in at least three important respects. First, emission control is not only targeted on large industrial sources of atmospheric emissions but simultaneously addresses other emissions like those from small residential and commercial boilers, from transport, and from waste handling and fertilizer and sewage sludge application. Second, efforts to reduce emissions do not exclusively rely on the installation end-of-pipe technology. Industrial restructuring away from raw material production, replacement of outdated equipment, energy conservation and combined heat and power generation significantly contribute to emission reductions. Third, contaminated land management is addressed in a more systematic way. Administrative solutions, such as changes of crops and of land use, are preferred to technical solutions like excavation or treatment of soil. Changes of crops and of land use are promoted by disseminating information and land management plans have to be set up for degraded land in designated areas.

As in the Ruhr area, environmental policy is an important driving force of heavy metal emission reductions in the Katowice Voivodship. Differently from Germany and the Ruhr area, a mix of regulatory instruments, i.e. permitting, and economic instruments, i.e. environmental charges, is applied in Poland. Permitting - also unlike the practice in the Ruhr area - is generally not based on the concept of best available technology. The funds raised through environmental charges are rechanneled to environmental protection projects. The implementation of environmental law is still insufficient in Poland. In part, this may reflect a flexible approach; mainly it is due to a lack of capacities, however. There are efforts, supported by international donor organizations, to improve both, training of personnel and equipment for monitoring. State ownership of enterprises and a tendency of administrations to favor large enterprises of the dominant industries contribute to deficits of implementation.

As in Germany, different land uses are coordinated through regional and urban planning in Poland. This includes the formulation of emission limits. First steps have been taken to reestablish the autonomy of regional and local administrations; a proposed reorganization of administrative units will further strengthen their influence. However,

effective regional and urban planning is impeded not only by insufficient administrative capacities but also by a lack of confidence after a long period of centralism.

The need to integrate environmental and economic objectives is recognized in Poland. The assessment of policies related to heavy metal pollution gives evidence for an advanced state of environment - economy integration. But not all of the principles of environment - economy integration developed in the present paper are observed already. Emission standards are not yet formally based on soil quality objectives although a better balance than in the Ruhr area has been achieved in protecting different soil functions. Also, strategies to manage contaminated land are considered in the same context as strategies to reduce entries of heavy metals into soils. A balanced system of regulatory and economic instruments has been introduced in Poland. This has to be regarded as a progress in environment - economy integration even if the present design of environmental charges lessens their effectiveness. Considerable flexibility has also been built into regulatory instruments while new tools of environmental policy have been tried only occasionally yet. Environmental concerns have also been at least partly integrated into sectoral policies. Insufficient sectoral integration is most obvious in industrial policy which needs to strengthen the process of privatization and restructuring. While the legal prerequisites exist in Poland for integrating environmental and economic policies as well as for integrating environmental policies at different levels of government, these potentials can not be fully exploited primarily because of insufficient capacities and harmed confidence. Integrating environmental and employment policies is of high priority in Katowice Voivodship as has been argued above. Efforts are made to mitigate adverse employment effects of environmental policy. Strategies to exploit a positive relation between environmental protection and employment have still to be developed, however.

Guidelines

Based on the principles of environment - economy integration developed in the present paper and their application to historical policies in the Ruhr area and to current approaches in the Katowice Voivodship, a set of guidelines has been drafted for an approach to land management that improves the integration of environmental and economic objectives.

In this approach environmental policy is guided by quality standards based on all available information, including that represented in material balances, in order to integrate emission control and resource management. Economic instruments, such as charges or tradable permits, have an important role to play to solve the problem of consistently determining standards for individual installations and to provide flexibility as well as incentives to continuously search for better solutions of environmental problems. To ensure the proper functioning of economic instruments the privatization of enterprises and the creation of capacities for monitoring and control have to be promoted. Economic instruments have to be complemented by flexible regulatory instruments as well as „new“ instruments such as environmental auditing schemes.

Cooperation between administrations and enterprises is mostly beneficial to integration in the short run but poses the danger of preserving outdated economic activities. Implementation plans, including proposals for funding, should be set up. To integrate environmental concerns into sectoral policies, appropriate procedural and organizational

arrangements have to be made. Promoting land use changes by disseminating information is a cost-effective strategy to manage contaminated land.

Regional and urban planning is a powerful instrument of environment - economy integration if appropriate conditions exist. While basic deficit such as missing data or insufficient capacities, can only be removed in the long run, an incremental approach to planning can be adopted. Finally, strategies should be elaborated to avoid increases of employment not only to reduce social cost but also to prevent a loss of the human capacities needed for reconstruction.

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