- WATER FOR LIFE -

FIGHTING WATER POLLUTION IN EASTERN EUROPE

by

Walter C. Frey

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in Partial Fulfillment of the Requirements for the
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ABSTRACT

The opening of Eastern Europe revealed the neglect of environmental activities in these countries. The obligation to clean-up vast areas and to rebuild the economy in an ecological sound manner is inherently linked to the ongoing reconstruction. Based on a concise description of the water pollution problems in the Czech and Slovak Federal Republic, Poland, and Hungary, the past and current environmental market related to the water sector is assessed and compared to markets in the West. In order to achieve an environmental investment level between 2 and 3% of GNP which enables sustainable development the market generators have to be improved. Therefore the most important market generators, public awareness, environmental policy, and financial issues are examined.

The analysis shows that the financial difficulties impose the major constraint on the development of the environmental market. Nevertheless, it is essential to generate local resources and not to rely on external aid of Western developed countries. Fees and fines must be raised considerably and the Polluter Pays Principle should be adopted in the new environmental policy framework, but in the transition period taxes will continue to play a major role. However, a substantial increase of fees and fines or taxes in the near future will be politically difficult due to the low public environmental awareness and the severe economic downturn. The financial resources will not reach the required 2 to 3% in the short term and it is therefore proposed to set priorities for environmental investments based on human and ecological risk assessment. Water pollution often does not cause immediate health or ecological risks and the major investments in water treatment plants can therefore be postponed until the economy regains momentum. The most appropriate water treatment technologies will be low cost solutions, such as chemical primary treatment. In addition emphasis should be put on the improvement of management skills on all organizational levels.

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Walter C. Frey studied at the University of Commerce and Economics and at the Technical University in Vienna. In 1992 he received the degree "Diplomingenieur" in Civil Engineering with excellence. He worked with Soletanche-Entreprise as a geotechnical engineer in France and joined the Department of Civil and Environmental Engineering at M.I.T. in 1992.

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Introduction

"This system - and this is perhaps the worst thing about it - was based on the principle of unbridled exploitation of the past and the future in favor of the present. The system took as its slogan << Après nous le déluge>>."

... Vaclav Havel about the Communist regime at a meeting of environmental ministers in Dobris, Czechoslovakia, June 1991

With the ending of superpower confrontation the world order is changing rapidly and environmental issues are now high on the international agenda. In Europe, so long divided by ideological conflict, the prospect over coming decades is for economic convergence and collaboration. It is a rewarding opportunity to contribute to these efforts which must be based on mutual understanding and acceptance..

However, the magnitude of the task now facing leaders in both West and East Europe to facilitate that convergence has become more apparent, particularly at the interface between economic, political and environmental issues. The collapse of the Communist regimes in Eastern Europe has not only ended systems of economic management in general, and industrial development in particular, under which "external costs", especially environmental considerations, were ignored. It has also made possible official recognition of the serious environmental damage inflicted over the past four decades but denied, suppressed or dismissed for ideological reasons.

With official recognition of the situation has come the opportunity to clean up the errors of the past, to halt the present rate of deterioration and to ensure that future economic development is carried out in an environmentally sustainable manner. Water pollution abatement will consume the major share of total environmental expenditures. This explains the crucial position of the water sector for the implementation of a successful environmental

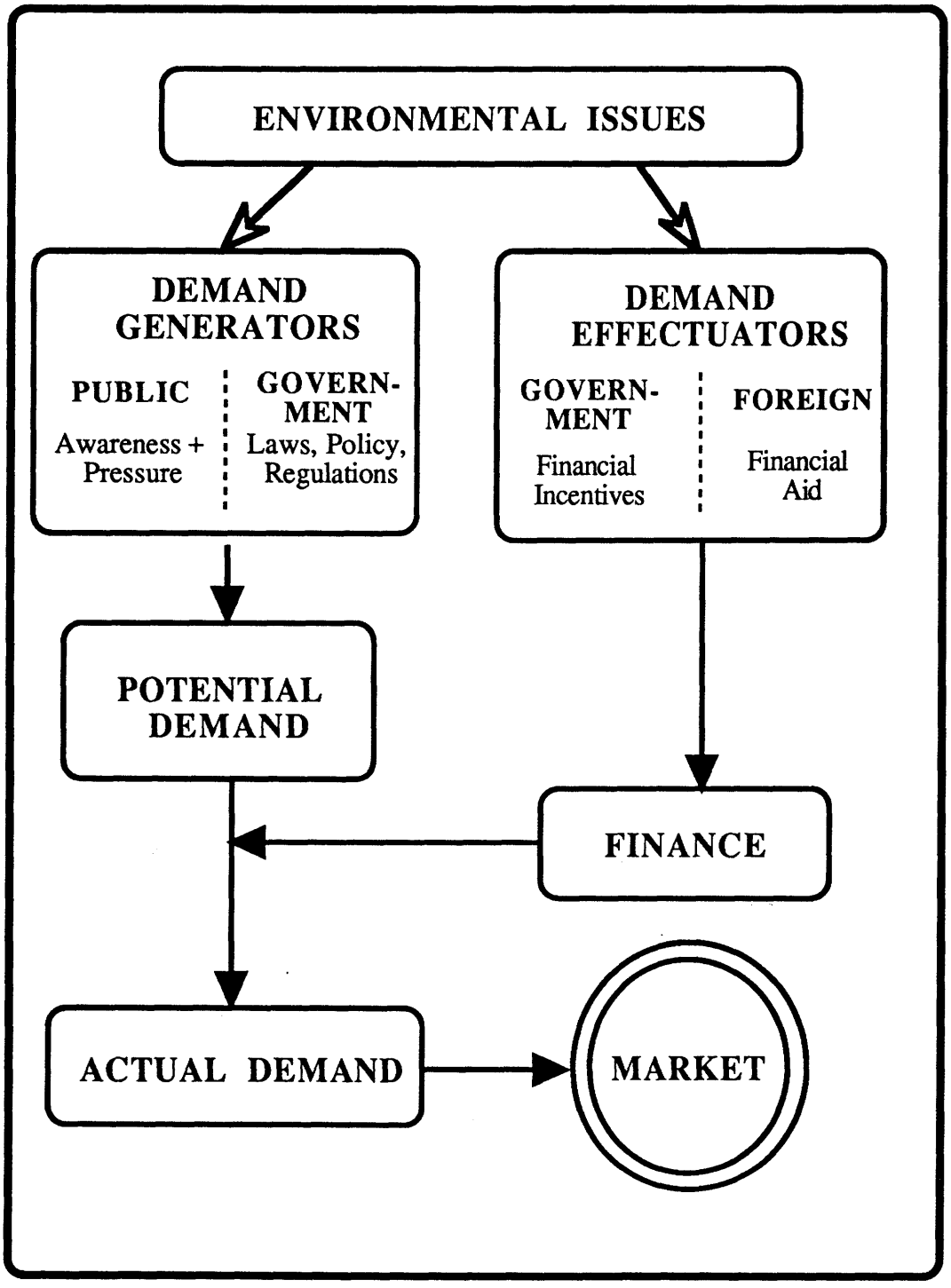
strategy depending on the efficient use and distribution among different media of the limited financial resources.

Nevertheless, air pollution control in Eastern Europe ranks first on the priority list of international concerns, due to the transboundary pollution associated with it. Water pollution has been dealt with to a lesser extent, as the interests of Western countries, with the exception of the countries in the Baltic catchment area, in a safe Eastern European water environment are not so pronounced. Unlike with air pollution, however, the situation with respect to the water quality will not improve considerably due to the economic restructuring process itself. Even though three years have past since the breakup of the Communist regimes, few solutions have so far been presented which go beyond the listing of necessary water treatment plants. This thesis therefore can be at the forefront of initiatives related to the water sector in Eastern Europe. Poland, the Czech and Slovak Federal Republic, and Hungary have pushed the restructuring process furthest. But although the thesis focuses on these three countries it can also provide insight into the environmental challenges other former Communist countries are facing.

It is recognized that the economies in many of these countries are in great difficulties and not able to finance the enormous sums necessary to halt the deterioration and begin the clean-up, concurrently with the necessary economic restructuring. This dilemma illustrates the interconnections between environmental protection, economic recovery and ideological and political reforms in Eastern Europe. This thesis therefore adopts a broader view by examining the environmental market related to the water sector from the demand perspective. The integration of an analysis of environmental problems with major demand generators and effectuators, such as economic and political circumstances, environmental law and policy, financing or technology, and the environmental market itself can contribute more to the immanent question of "How to fight water pollution", than an extensive examination of any single market driving force. The market paradigm (figure 4.1 in chapter 4) and the demand side of the market (figure 1) illustrate this interrelationship well.

The thesis is structured according to figure 1. After giving a brief overview of the Eastern European geography and demography in chapter 1, which gives an impression of its diversity and vast extension and provides useful information related to the water environment, the water pollution (i.e. environmental issues) is described in chapter 2.

Figure 1: The Demand Side - Market Drivers



Although not a complete picture can be drawn, due to the low quality of the available data, it is possible to identify the main sources of pollution and country specific problems, as well as to highlight the implications and consequences of pollution. Environmental technology is not mentioned as a major market driver in figure 1 as it would be part of the supply side. Nevertheless chapter 3 examines environmental technology and services, not only as a homage to the name of the institute where this thesis is prepared, but because technologies applied in the West are not the most suitable for the economies in transition.

The examination of the environmental market in chapter 4 represents the centerpiece of the thesis. For an academic work it seems more important to determine an environmental investment level which guarantees "sustainable development" and to determine how the demand generators and effectuators would have to function in order to achieve such a level. Therefore the market is discussed before the driving forces which follow.

Economic and political aspects (chapter 5) concentrate on the most important industrial figures, the market reforms and the public environmental awareness. The old environmental legislation and policy is scrutinized in chapter 6. It also explains in detail the principles of the emerging legislation and policy, and deals with the implications for the organizational structure and the economic tools, which are necessary to generate the required financial resources. Chapter 7 then focuses on the financial aspects and examines the importance of local sources and foreign aid.

Finally chapter 8 presents the recommendations and conclusions which can be drawn from the thesis.

A citation of eloquent Vaclav Havel shall end this short introduction. It illustrates the spirit guiding environmental activities:

"Man is not the ruler of Nature, he is not its master, its pinnacle, its organizer, its reason. Man is simply but its part."

Part I

THE SCOPE

Chapter 1

Eastern Europe a Short Overview

This chapter is designed to serve two purposes: First it will give an impression of the diversity, and vast extension of Eastern Europe. Recent nationalist uproars, drastically reminded us of the multitude of countries and ethnic groups there. This was long ignored as countries behind the iron curtain were comprised as being part of the same repressive regime.

Second it will highlight geographic, topographic and social characteristics of Eastern Europe, the Czech and Slovak Republic, Hungary, and Poland in particular. The quick overview should facilitate the understanding of the environmental problems, their dimension, implications, cross border significance and so on. Macroeconomic and industrial figures, which also speak a graphic language because they relate formidably to the environmental problems will be presented later in chapter 5.

1.1 The Term "Eastern Europe"

Despite the old-fashioned, and potentially derogatory, overtones, the term "Eastern Europe" is applied here because it remains a convenient shorthand reference.

The designation "Eastern Europe" is used chiefly for simplicity and for presentational convenience to group together the smaller countries of Europe that used to be

centrally planned. The core of the group consists of Bulgaria, Czechoslovakia (CSFR) , the German Democratic Republic, Hungary, Poland, and Romania. Of course, in considering reforms after 3 October 1990, the German Unification, and the future of Eastern Europe, the German Democratic Republic no longer belongs in that group. Although it reflects the difficult economic and environmental condition of its eastern neighbors, optimism is associated with the ongoing restructuring efforts, due to the powerful position of the former West Germany.

Traditionally, Yugoslavia has not been included in the categories "Eastern Europe" or "European planned economies", because it abandoned planning in the 1950s and acquired developing-country status in a number of international organizations. Albania is usually omitted from most statistics and computations simply because the pertinent empirical information is not available or not in a format that ensures comparability.

The former Soviet Union, due to its vast extension and political weight is considered to be an entity of its own.

The term "Central Europe" is sometimes applied loosely referring to some of the nations mentioned above (CSFR, Hungary). However "Central Europe" is not well defined and, in fact a lively historical and cultural discussion is being carried out to sketch its outline. Therefore this name shall not be used in order to avoid confusion.

In this thesis, the term "Eastern Europe" will include the following countries.....

... Bulgaria, Czechoslovakia (CSFR) , Hungary, Poland, and Romania

Some countries are in the process of splitting apart or of regaining their independence and sovereignty. The Baltic States broke away from the U.S.S.R. and a Commonwealth was formed by former Soviet republics. Yugoslavia could not cope with its ethnic diversity and nobody knows what will be the outcome of the gloomy civil war; Slovenia and Croatia have already gained independence. The Czechs and Slovaks terminated their cooperation and even the names of the two new states emerging from Czechoslovakia (CSFR) are still unknown.

Disregarding these facts the countries are often considered as if there had been no change. This is done solely for simplicity reasons and because often more detailed or actual data is not available. As the work is focusing also on Czechoslovakia (CSFR), the

breaking apart of Czechoslovakia is of major importance, due to the fact that the two parts will be quite heterogeneous, ideologically and economically.

1.2 Geographic and Demographic Highlights

The size of Eastern Europe (table 1.1) suggests that if these countries were to succeed in significantly adjusting their levels of industrial productivity to those in Western Europe, they would constitute a significant source of global economic growth for many years to come. Unfortunately the prospects for narrowing the gap quickly are not very good, but economic aspects will be discussed in detail later.

All Eastern European countries have a very high percentage of land area in cropland and a large amount of agricultural land in general. The percentage of "protected areas", comprising national parks, wildlife reserves among others, in Poland, the CSFR, and Hungary implies a high degree of environmental concern, although the definition of "protected area" is not a clear cut one and therefore often abused.

The population in Eastern Europe (table 1.2), including Albania and Yugoslavia, is just under that of France and the United Kingdom combined. Including the Soviet Union, the combined population of these reforming economies is only slightly less than that of the European members of OECD. The percentage of urban population (table 1.2) is high which has major impacts on the design of environmental programs, water and waste management facilities in particular.

The difference in life expectancy (table 1.2) of several years between Eastern and Western European countries manifests worrisome evidence about neglect in medical care, social security and industrial safety in the "East". But it is also related to the pollution which is measurably affecting human health.

Table 1.1: Country Size, Land Use and Protected Areas

	Bulgaria	CSFR	Hungary	Poland	Romania	Austria	France
Area (km2)	110,994	127,876	93,033	312,683	237,500	83,856	551,700
Cropland	37%	41%	57%	49%	46%	18%	35%
Pasture	18%	13%	13%	13%	19%	24%	21%
Forest	35%	37%	18%	29%	28%	39%	27%
other	9%	9%	11%	10%	7%	19%	17%
Protected Areas							
% of total	1%	16%	6%	7%	1%	19%	8%

Source: World Resource Institute, *The 1992 Information Please Environmental Almanac*, Houghton Mifflin, 1991

Table 1.2: Population and Life Expectancy

	Bulgaria	CSFR	Hungary	Poland	Romania	Austria	France
population (in millions)	9.2	15.7	10.6	38.4	23.2	7.8	56.6
inh./km2	82	123	113	123	98	93	102
% urban population	70%	76%	63%	62%	54%	57%	74%
life expectancy (years)	72	72	70	72	70	75	76

Source: World Resource Institute, *The 1992 Information Please Environmental Almanac*, Houghton Mifflin, 1991

A brief overview of major country characteristics which relate to the environment, particularly as concerns water, is given here:

Poland

Poland, whose name means plain, shares borders with Russia, Lithuania, Belorussia, Germany, and Czechoslovakia. The Baltic Sea lies to its north. Poland is the largest of the Eastern European countries (312,683 km^2 - table 1.1). It is bigger than the United Kingdom, a bit smaller than the united Germany, and roughly 60% the size of France, which is the largest Western European country. The total population (38.4 million - table 1.2) equals roughly 60% of France also. The major part of the population is concentrated in the south and south-west of the country, where the main industrial centers are situated. The capital city is Warsaw, with 1.6 million inhabitants.

The Republic of Poland is divided into 49 regions (voivodships), and voivodships are divided into 2121 village and city communes. National administration is divided into the following levels:

- state administration of central level,
- state administration of voivodship level,
- self-governments in city and village communes.

The northern and central regions are essentially flat. The land along Poland's southern border, the coal belt, which extends from the former East Germany to the East along the Czech-Polish Border, is mountainous. Nearly half the area is devoted to growing crops, including grain, sugar beets, and potatoes.

The country has abundant natural resources, including hard and brown coal, natural gas, copper, and silver.

Water systems: The main Polish rivers Ode (= Odra) and Vistula (=Wisla) have their sources in mountainous Northern Czechoslovakia and Southern Poland in the industrial region around Katowice and Krakow, one of the most polluted and still polluting regions in Europe. The negative impacts on water quality can be anticipated. Both Ode and Vistula flow to the north and empty into the Baltic Sea as do several other smaller Polish rivers.

The Ode and one of its tributaries border Germany, whereas the Vistula flows through the central regions of Poland and passes Warszawa.

The Ode, due to its path from the industrial North of Czechoslovakia and its location on the border to Germany, and the pollution of the Baltic Sea determine the dimension of cross border pollution. In Poland there is no lake of considerable size, with the exception of the Moravian lake region.

The Czech and Slovak Federal Republic (CSFR)

The CSFR shares borders with Poland, Ukraine, Hungary, Austria, and Germany. The CSFR consists of 127,876 km2 (62% Czech Republic - 38% Slovak Republic), which is one and a half times the size of Austria. Over one half of the country is agricultural land and more than one third is covered by forests. The population totals 15.7 million, of whom 10.4 million are living within the territory of the Czech Republic (94% Czech and 3.8% Slovaks) and 5.3 million are living in Slovakia (87% Slovaks and 11% Hungarians). The capital city is Prague, lying almost in the geometric center of Bohemia (Czech Republic). The capital city of Slovakia is Bratislava located on the Danube at the Austrian border.

Administratively, the CSFR is divided into 11 regions and 112 districts.

Czechoslovakia holds large deposits of coal. Minerals, uranium, and iron are also mined throughout the country. Smaller deposits of oil and natural gas, which can be found at great depth, have not been exploited.

Water Systems: The water systems can be better understood from a geographic perspective. The CSFR can be grouped into seven regions:

- The Bohemian Mountains on CSFR's western border with Germany;
- The Sudetes Mountains on CSFR's northwestern border with Poland. The Ode has its headwaters in this region;
- The Bohemian Basin which contains the city of Prague. Three major rivers run through the basin: the Vltava River (through Prague to Labe), the Labe River which goes to Germany, and the Ohre River which flows through northern Bohemia to the Labe River.

- The Bohemian - Moravian highlands located in the west central part of the country. This region has two major rivers, the Berounka and Sazava, which flow into the Vltava River.
- The Moravian Lowlands including the Morava River, which flows south into Dyje, which crosses to the south;
- The Western Carpathian Mountains forming the western boundary of the Slovak Republic. This region contains the headwaters for Vah and Hron, which flow south into Danaj, and the Hornad, which flows south to the Tisza River in Hungary; and
- The Danubian Lowlands including the city of Bratislava and two major rivers, the Vah and the Hron, which flow south into Danaj River, which , in turn, flows east through Bratislava to Hungary.

In short, the Labe River flowing north towards the North Sea is draining the West, whereas the Danube emptying in the Black Sea is draining the East. The transboundary pollution problems are manifold, as most of the rivers in the CSFR have also their headwaters in the CSFR, but leave the CSFR polluted.

In the CSFR there are no lakes of major size.

Hungary

Hungary lies south of Slovakia. The other neighboring countries are: The Ukraine, Romania, Yugoslavia, and Austria. Hungary is slightly bigger than Austria in size (93,033 km^2 - 10.6 million inhabitants). The largest city is the capital Budapest, with about 2.1 million people.

Administratively Hungary is divided into 19 counties, each of which has an elected council. In all, there are 120 towns with town councils and 3,200 communities.

Hungary was considered to be the granary of the Austrian-Hungarian empire. More than 55 percent of the country is devoted to growing crops. Hungary's lack of natural

resources, such as coal, may have been a blessing in disguise for its environmental welfare.

Water systems: The main territory of Hungary located entirely within the Carpathian basin is crossed by two main rivers, the Danube and the Tisza. To the south, the Drava River drains from the Alps and the south slopes of the Bakony range in Hungary, and runs along the southwest boundary with Croatia before joining the Danube.

Almost all rivers in Hungary originate abroad. The Danube is the largest in terms of flow volume and runs along the border with Slovakia before turning south towards Budapest. The Sajo, Hornad, and Bodrog come from Slovakia and join the Tisza, which flows from Ukraine.

Hungary is situated in a basin and has two plains areas: the Little Hungarian Plain in the west with lake Balaton and the Great Hungarian Plain in the center of the country. The Tisza crosses the Great Hungarian Plain and moves sluggishly across this semi-arid area, which is periodically hit by severe droughts.

Chapter 2

Water Pollution in Eastern Europe

In this chapter both surface and subsurface water quality are described in the CSFR, Hungary, and Poland together with the main sources of pollution and the consequences of contamination. As the task to draw a complete water quality picture would be overwhelming, if not impossible due to a lack of accurate data, the focus is set on the most apparent, countrywide problems as well as on the differences related to water contamination in the three countries. The main sources of pollution, environmental "hot spots", and country specific problems are also identified.

2.1 Status Quo

Water Pollution Indicators

The characterization of water quality is not an easy task due to the multitude of indicators. Table 2.1 contains a selection of indicators and describes their main characteristics and principal health and environmental effects.

Table 2.1: Parameters of Major Water Pollution Indicators

INDICATOR	MAIN CHARACTERISTICS	PRINCIPAL HEALTH AND ENVIRONMENTAL EFFECTS
Dissolved oxygen level	Dissolved oxygen is necessary in streams for fish and other aquatic life to survive. Soluble organics deplete the oxygen by the activity of aerobic bacteria. The quantity organics in a waste is measured either by biochemical of soluble oxygen demand, chemical oxygen demand, total organic compound, or total oxygen demand. These measurements calculate the quantity of oxygen which a given waste will take from the stream.	As the level of dissolved oxygen falls below five parts per million, adverse effects are observed on aquatic life. Many fish and marine species cannot survive significant reductions in dissolved oxygen.
Total dissolved solids (TDS)	TDS is a measure of the total inorganic salts and other inorganic substances that are dissolved in water.	Accelerates corrosion in water systems and pipes, depressed crop yields when used for irrigation, and at high levels adversely affects fish and other aquatic life; may make water unfit for drinking.
Suspended solids	Includes soil and other solid particles.	Turns waterways brown; adversely affects aquatic life; creates sludge blankets which can produce noxious gases; interferes with operation of water purification plants.
Bacteria	Measurements are usually taken for one specific bacteria - fecal coliform - to indicate the presence of other disease-causing bacteria.	Creates strong potential for infection and disease.

Table 2.1 cont'd

INDICATOR	MAIN CHARACTERISTICS	PRINCIPAL HEALTH AND ENVIRONMENTAL EFFECTS
Nutrients (phosphorous and nitrogen)	Essential to aquatic life in small amounts.	At high levels nutrients stimulate growth of algae and seaweed, tend to accelerate eutophication, and increase oxygen depletion.
pH value	Measures acidity and alkalinity of a stream.	Changes in the pH value may upset the ecological balance of the aquatic environment; excessive acidity may create air pollution problems from hydrogen sulfide.
Temperatutre	Increased temperature caused by discharge of industrial cooling water into streams.	Decreases ability of water to assimilate waste; increases bacterial activity; may upset ecological . balance of aquatic environment

Source: Research and Education Association, Pollution Control Technology, vol. 11 (New York, 1978)

In order to facilitate the understanding of the term "water quality", which to some degree is subjective, most countries have adopted a system of water quality classes or standards. Unfortunately there are considerable differences between the definitions of water classes, which complicates a comparison among countries.

Water Quality Classification

East European water quality standards for rivers are, like their air equivalents, quite strict. The CMEA standard requires water for agricultural and recreational use (classes I & II) to have dissolved oxygen >6mg/l for the highest quality (class I), and water for industrial use (classes III & IV) to have dissolved oxygen >4mg/l. Water of worse quality than class IV is grossly polluted and is not considered fit for any kind of use. The US standard for dissolved oxygen is 5mg/l corresponding to water that would only be placed in class III on the CMEA classification. In the light of these differences, the statements using water quality classes to evaluate the environmental condition in Eastern Europe do not reflect as serious problems as might appear on the surface.[1]

Eastern Europe has acquired an image as an expensive ecological disaster zone. Newspapers, eager to report such disasters, and lobbying groups were disseminating this picture.

Furthermore Eastern European countries which had just emerged from communist rule had a vested interest to some extent in exaggerating the severity of the environmental problems they face, in order to highlight the negative traits of the previous regime and to attract additional foreign resources.[2]

Almost all available data has been collected by local or regional government authorities and are often lacking adequate measurement standards and monitoring quality. Due to these deficiencies, there is still much confusion related to the environmental status quo in Eastern Europe. Precise monitoring has been initiated and promoted through

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[1] Hughes, Gordon, *Are the Costs of Cleaning up Eastern Europe Exaggerated? - Economic Reform and the Environment*, The World Bank, October 1991

[2] Ackermann, Richard , *Environmental Action Programme for Central and Eastern Europe - Environmental Policy Issues*, Background Note, The World Bank, April 1992

technology and know-how transfer. It is essential for the design of the most effective clean-up efforts to clarify the state and development of pollution in Eastern Europe.

These facts should be kept in mind while rending the following description of water pollution in Eastern Europe. Due to differences in classification, the description emphasizes more the qualitative than the quantitative aspect. Nevertheless a picture can be drawn which allows clarification of widespread oversimplification, and which builds a basis for the reasoning and analysis to come in the following chapters.

Extent of Water Pollution

As in Western Europe many East European rivers are seriously polluted downstream of major towns and cities, especially with organic waste because of the discharge of industrial and municipal effluent which has been only partially treated or not treated at all. this means that these sections of the rivers are unfit for swimming or other recreational purposes and may have an offensive smell during periods of slow water flow and high temperatures in the summer. Few rivers are biologically "dead" and, in general, their problems are considered less severe than for the rivers passing major industrial centers in Western Europe 10 or 20 years ago.[3]

This qualitative view of the water pollution extent, expressed by an economist working for the World Bank is rather optimistic. However it represents one of very few opinions which are based on research and questioning of the governmental data. The following country specific descriptions are based primarily on such governmental data.

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[3] Hughes, Gordon, *Are the Costs of Cleaning up Eastern Europe Exaggerated? - Economic Reform and the Environment*, The World Bank, October 1991

CSFR

Surface Water

Almost all major rivers are heavily polluted, which poses an extremely large burden on the surrounding and other downstream countries, as many important European rivers have there headwaters in the CSFR. In the Czech Republic, significant pollution of the major rivers occurred in the 1950's and 1960's and they have deteriorated significantly during the last decades. By 1980, the proportion of the flow length in water quality class I and II decreased to 3 percent of the length of the Labe River, 26 percent of the Jizera, 45 percent of the Vltava, 0 percent of the Berounka, and 21 percent of the Ohre (SKVTRI, 1990) (Table 2.2). The Berounka and Labe Rivers are the most polluted, with almost the entire lengths of the rivers in the lowest water quality categories.[4]

In the Slovak Republic, about one-half of all the water flows qualified for Class IV. The major water systems considered polluted (Ruzocka, 1990) include the Nitra River, the Maly Dunaj, the Horda, and the Vah. The Nitra River has the worst pollution, as 70 percent of the total flow length are above the norm for contamination. 50 percent of the Maly Dunaj river represents cooling water from the Slovnaft refinery in Bratislava.[5]

The contamination of water resources by organic substances, measured by means of biochemical oxygen demand (BOD), from registered sources grew until the beginning of the 1980's up to the level of about 320 thousand tons of BOD annually; since then it has only slightly dropped to the present level of about 265 thousand tons of BOD annually (table 2.3). The municipal share of contamination increased from 55 thousand tons in 1971 up to 103 thousand tons in 1990; the amount of organic contamination released by industrial enterprises is gradually decreasing.

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[4] The World Bank, *Czech and Slovak Federal Republic - Joint Environmental Study: Volume II*, The World Bank, January 1992

[5] The World Bank, *Czech and Slovak Federal Republic - Joint Environmental Study: Volume II*, The World Bank, January 1992

Table 2.2 : Change in the Classification of Clean Water in Selected Rivers in the Czech Republic from 1940 to 1980

River	Water Quality Class	Percentage of Length of River in Class				
		1940	1950	1960	1970	1980
Labe	I - II	87	63	30	4	3
	III - IV	13	37	70	96	97
Jizera	I - II	91	85	70	33	26
	III - IV	9	15	30	67	74
Vltava	I - II	72	53	55	50	45
	III - IV	28	47	45	50	55
Berounka	I - II	56	34	29	11	0
	III - IV	44	66	71	89	100
Odra	I - II	NA	NA	49	26	26
	III - IV			51	74	74

Source: Czechoslovak Academy of Science (CSAV), "State of the Development of Environment in Czechoslovakia" (CSAV, Prague, 1989), Table 2.13; cited in James R. Newman, "Draft Joint Environmental Study: Volume 2 Technical Report," prepared for the U.S. Agency for International Development and the World Bank, Table 5-1

Besides the pollutants listed in table 2.3, there is increased concern about other substances such as PCBs, CHCl, and metals. Because of the lack of instrumentation and limited monitoring, only scattered information exists. Heavy metals were found to exceed the obligatory standard in 123 places (supplying 553,000 inhabitants), cyanides in 10 places (10,000 inhabitants), phenols on 57 sites (230,000 inhabitants) and petroleum substances in 169 cases (1 million inhabitants). An enhanced content of radioactive substances was reported from 100 sources (300,000 inhabitants) (Ministry of the Environment of the Czech Republic).[6]

[6] The World Bank, *Czech and Slovak Federal Republic - Joint Environmental Study: Volume II*, The World Bank, January 1992

Table 2.3: CSFR: Pollutants Discharged into Rivers (including Accidental Discharges)

Pollutants discharged into streams (1989)	1000t/year
Insolubles	293
Anorganic salts in solution	1838
BOD (biological oxygen demand)	265
COD (chemical oxygen demand)	595
Oil and oil materials	3.5
Accidental discharges	
oil and oil materials	
caused by agricultural production	0.42
others	0.03
other substances	
caused by agricultural production	0.13
others	0.32

Source: Federal Committee for the Environment, State of the Environment in Czechoslovakia, Federal Committee for the Environment, 1991, Table 7

Ground Water

Ground water contamination is mainly from agricultural non-point sources of fertilizer and pesticides residues. During the last 30 years, the average nitrate concentrations in ground waters of the developed areas of settlements and their surroundings, increased 4-fold [from 30 to 120 milligrams per liter (mg/L)], and, in agriculturally managed areas, increased more than 2-fold from 24 to 56 mg/L. The highest nitrate concentrations found, however, exceed 1,200 mg/L (the drinking water standard in the CSFR allows 15 mg/L nitrates for nursing babies and 50 mg/L for adults). In agricultural lands, a "nitrate cloud" is spreading gradually and, in many areas, reaches a depth of 10 to 25 m, thus representing an acute or potential hazard for the ground waters (SKVTRI, 1990). [7]

Hungary

In general, water quality in Hungary is considered to be better than in the CSFR or Poland. Nevertheless environmental concerns regarding the water quality cannot be dismissed.

Surface Water

The quality of Hungary's surface waters is illustrated in figure 2.1. The map is based on a classification system that incorporates 25 chemical water quality indicators. Water of Class I, shown in light gray on the map, represents clean water of high quality, requiring little if any treatment to meet consumer demands and ecological needs. Middle gray denotes the slightly polluted waters of Class II, which require some form of treatment before the water is suitable for use by consumers. Such pollution, however is not considered detrimental to the ecological health of the system. Dark gray (Class III) indicates those lakes and rivers so polluted with industrial, municipal, and agricultural effluents, that

[7] The World Bank, *Czech and Slovak Federal Republic - Joint Environmental Study: Volume II*, The World Bank, January 1992

the water quality cannot be restored by acceptable treatment methods. This also means that pollution is considered detrimental to the ecosystem itself.[8]

The water quality in five rivers - Kapos, Zala, Zagyva, Danube (border sections), and Tisza (border sections) - has been analyzed and compared over a 15 year period. The catchment areas of the first three rivers are situated entirely on Hungarian territory, so the pollution loads are all produced in the country. For the Danube and the Tisza Rivers, measurements were taken at the borders so that the quality of the water entering and leaving Hungary could be appropriately assessed in both cases. From the study it was concluded that, in general, the water quality in these five rivers has deteriorated continuously over the past 15 years.

The quality of the Danube's water, as it enters the country, has consistently deteriorated in terms of nitrate and total dissolved solids. As the water leaves Hungary it is worse off in relation to ammonium, nitrate, and total dissolved solids. The other components registered improvements. By contrast, the Tisza River at both border cross sections has consistently deteriorated for all seven indicators over the 15 year period and the rate of deterioration is one of the highest for any water body in Hungary.[9]

It is interesting to note that the maximum values recorded for several metals, iron and zinc for instance, in the Danube's river sediment exceed maximum concentrations set for soils growing food crop. Large quantities of bank-filtered water are pumped from these sediments.

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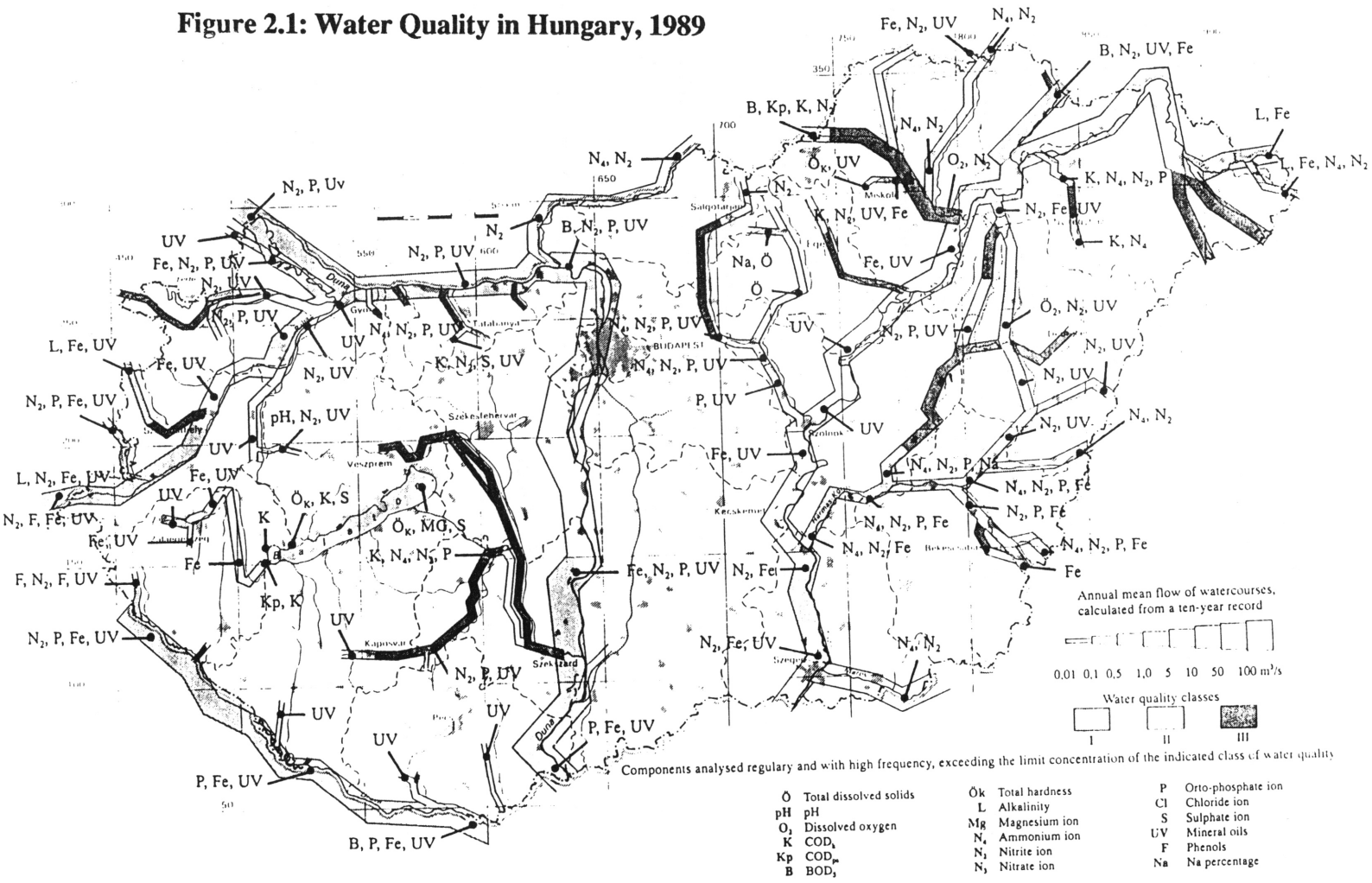
[8] Hungarian Academy of Sciences, *State of the Hungarian Environment*, Hungarian Academy of Sciences, January 1990

[9] Hungarian Academy of Sciences, *State of the Hungarian Environment*, Hungarian Academy of Sciences, January 1990

Figure 2.1: Water Quality in Hungary, 1989



Source: Institute for Environmental Management

One encouraging highlight in the evaluation of Hungary's measures against water pollution is the undergoing reversing of the eutrophication of lake Balaton. This lake, one of the largest freshwater bodies in central Europe, is the most important recreational area in Hungary. As a result of low sewage capacity, increased agricultural production along its shores (see "sources of water pollution"), algae biomass levels have increased dramatically and lake Balaton has become eutrophic. Major fish kills aroused public attention, and there were indicators of a collapsing ecosystem in the second half of the 1970s. In 1983 the Hungarian Government approved a clean-up program, which is being implemented in three phases until 2010. Only recently the ban on water activities was removed.

Ground water

Quality concerns related to subsurface water reserves are to a large extent caused by nitrate pollution. Underground waters (at depths between 0 and 20 meters) in populated areas are too polluted to be used for drinking water supply. A very slow but steady process of nitrification has been going on both in the open karst areas and in the industrialized and densely populated parts of Hungary.

It is mainly the small settlements where major drinking-water supply difficulties occur. From a sanitation point of view, among the 3064 settlements located in Hungary, 570 ones are endangered in terms of drinking water supply. 0.8% of the Hungarian population live in these settlements.[10]

[10] The Government of the Hungarian Republic, *National Report to the United Nations Conference on Environment and Development*, The Government of the Hungarian Republic, December 1991

Poland

Surface Water

According to the Polish three degree classification system, water quality in Poland is extremely poor, and has been poor for the last 15 years (table 2.4). Only 4.8% of the total assessed flow length was measured to be in Class I, and almost 35% contains water which cannot even be used for industrial purposes. Once again it must be emphasized that the classification system is quite strict compared to Western standards.

Table 2.4: The Quality of Water in Poland

Water quality	% of total length of assessed rivers	
	1978-83	1984-88
Class I - potable water	6.9	4.8
Class II - water suitable for swimming and recreation	28.0	30.7
Class III - water suitable for industrial purposes and irrigation	30.1	29.7
Water quality below established standards	35	34.8

Source: Reproduced from: Polish Ministry of Environmental Protection, Natural Resources and Forestry Protection, The State of the Environment in Poland - Damage and Remedy, Polish Ministry of Environmental Protection, Natural Resources and Forestry, 1991, Table 5

Assessment of the Vistula River shows that the decisive factors determining its water quality are dissolved substances and especially chlorides and sulfates originating from coal mines. 5.4 percent of the length of the Vistula river are class II, 37.5% of class III, and 57.1% are below standard. However, elimination of saline coal mine waters' impact alone would lead to limiting the range of occurrence of waters polluted below

standard from 57.1% to 23.7%.[11] Lake waters are also polluted to an alarming extent. During the period of 1984 to 1988 an assessment of 161 lakes revealed the following results:

- 4 lakes were qualified as Class I
- 64 were qualified as Class II
- 47 were qualified as Class III,

and in the remaining 46 lakes the water quality was below Class III standards.[12]

Ground water

The assessment of underground water pollution is fragmentary. Regional-scale studies have revealed non-point pollution of underground waters in the voivodships of Walbrzych and Legnica and, to a lesser extent, in the Kielce voivodship. Ground water quality control in these areas shows water salinity, and pollution by nitrogen compound, caused by intensive use of artificial fertilizers. Cases of contamination with oil derivatives of aquiferous layers exploited by water supply enterprises have been noted. Drinking water in households is assessed to be bad with respect to chemical (iron, manganese) and biological indices.[13] It is estimated that the number of wells with poor water quality has doubled over the last decade. This applies particularly to public and household wells.[14]

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[11] Polish Ministry of Environmental Protection, Natural Resources and Forestry Protection, *The State of the Environment in Poland - Damage and Remedy*, Polish Ministry of Environmental Protection, Natural Resources and Forestry, 1991

[12] Polish Ministry of Environmental Protection, Natural Resources and Forestry Protection, *The State of the Environment in Poland - Damage and Remedy*, Polish Ministry of Environmental Protection, Natural Resources and Forestry, 1991

[13] Polish Ministry of Environmental Protection, Natural Resources and Forestry,*Polish National Report for the UN Conference "Environment and Development"- UNCED Brazil 1992*, Polish Ministry of Environmental Protection, Natural Resources and Forestry, 1991

[14] Polish Ministry of Environmental Protection, Natural Resources and Forestry Protection, *The State of the Environment in Poland - Damage and Remedy*, Polish Ministry of Environmental Protection, Natural Resources and Forestry, 1991

2.2 Sources of Environmental Pollution

Where the sources of water pollution is concerned, the CSFR, Poland, and Hungary exhibit many similarities. The main sources of water pollution are the industry, municipal waste water, and pollution from non-point sources such as effluents from agriculture and solid waste dumps. Surface water runoff and ground water plumes from hazardous and solid waste sites are rarely documented; and although they have a considerable detrimental effect on a local scale, they probably play a minor role in terms of total countrywide water pollution loads. Nevertheless, the release of extremely harmful substances should trigger immediate clean-up and therefore could create a considerable "environmental market". However, due to the lack of data this pollution source is not discussed here.

Industrial Waste Water

With the exception of the energy industry, which produces much waste water during the cooling process, with the temperature as the main indicator of pollution, the chemical and mining industry are the largest producers of industrial waste water and discharge also the greatest pollution loads (table 2.5). Table 2.5 shows the industrial waste water discharge to surface waters only in Hungary in 1984, but the relative importance of the different industry sectors would be similar in the CSFR or Poland.

A small amount of polluters contribute to the major share of contamination. The overwhelming majority of COD inputs on the Danube in Hungary come from Budapest; all other sources on the Danube (in Hungary) combined amount to only two-thirds of the communal and industrial load from the capital.[15]

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[15] Hungarian Academy of Sciences, *State of the Hungarian Environment*, Hungarian Academy of Sciences, January 1990

Table 2.5: Hungary: Industrial Waste Water Discharge to Surface Waters, 1984

	Number of Sources	Waste Water millions of m3
Mining and quarrying	81	82
Electric energy	23	2563
Metallurgy	13	59
Engineering	195	54
Building materials	95	9
Chemical industry	50	110
Light industry	106	57
Food industry	540	38
Other industry	65	0
Industry total	**1168**	**2972**

Source: Reproduced from: Hungarian Academy of Sciences, State of the Hungarian Environment, Hungarian Academy of Sciences, January 1990, Table 1.15

A similar picture can be obtained in the CSFR and Poland. In the Czech Republic, there were 4,979 registered pollution sources in 1985; 0.3 percent (15) of the registered water pollution sources contributed to 43 percent of the BOD discharge and 31 percent of the total dissolved solids (TDS) discharge (CSAV, 1989). The following factories were the highest sources of pollution, as expressed in BOD:

- South Bohemian Paper Factories at Vetrni and Cesky Krumlov - 14,056 TPY,
- UCOV Prague - 13,000 TPY, and
- Synthesia at Semtin - 9140 TPY. [16]

In Poland Upper Silesia and Warsaw account for the lion's share of pollution.

[16] The World Bank, *Czech and Slovak Federal Republic - Joint Environmental Study: Volume II*, The World Bank, January 1992

Mining

River water salinity caused by the coal mines of Upper Silesia is a specific Polish problem. In 1991, the amount of salts contained in mine water discharged daily into the Upper Vistula, the Oder and other tributaries is about 9000 tons and is still growing.[17] Elevated salinity hampers self purification processes in rivers, and causes corrosion of water plants, ships, municipal and industrial water supply systems and cooling surfaces. Waters from different coal mines vary greatly with respect to salinity. Salt concentration in some mine waters exceeds 70,000 mg/l.[18] The main Polish rivers, Vistula and Odra, are carrying the salted water continuously towards the Baltic Sea. Because of limited water availability and the flatness of the terrain in Poland the salt content of these rivers is not diluted as quickly as in other countries. As a result the salinity of the Vistula in Krakow is close to that of a river cross section near the Baltic Sea.

Inadequate Waste Water Treatment
Lack of Sewage Treatment

The lack of water treatment plants is, of course, per se not a pollution source. Although industry should strive to reduce pollution loads through the application of environmentally sound technology, water pollution, certainly sewage, will be unavoidable in the future and waste water has to be adequately treated. Incentives to promote the right environmental behavior, which reduces pollution at its source and therefore minimizes "end of pipe" solutions will be discussed later.

A great portion of the industrial and also municipal waste water is discharged directly to surface water. Table 2.6 illustrates the inadequate treatment of waste water in Poland, but the situation in the CSFR or Hungary is equally unsatisfactory.

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[17] Bradecki, Jerzy, *Environmental Technology Needs of Poland-Finance Aspects-Going into Business with Polish Companies*, October 1990

[18] Polish Ministry of Environmental Protection, Natural Resources and Forestry Protection, *The State of the Environment in Poland - Damage and Remedy*, Polish Ministry of Environmental Protection, Natural Resources and Forestry, 1991

Table 2.6: Poland: The Amounts of Waste Water Discharged from Point Sources and the Degree of Purification

Waste Water		mil cu m/yr
Total		**12265.9**
Discharged directly from industrial plants		9822.4
including cooling water	7860.3	
Discharged through municipal sewage network		2443.5
Waste water requiring treatment		**4406**
untreated		1549.6
discharged directly from industrial plants	444.8	
discharged through municipal sewage	1104.8	
treated		2856
including from municipal sewage	1338.7	

Waste water requiring treatment	100%
Mechanical treatment	35%
Biological and/or chemical treatment	32%
Untreated	33%

Source: Polish Ministry of Environmental Protection, Natural Resources and Forestry, Polish National Report for the UN Conference "Environment and Development"- UNCED Brazil 1992, Polish Ministry of Environmental Protection, Natural Resources and Forestry, 1991

In the CSFR there are more than 2,500 sewage systems without waste water treatment plants. Water quality was so poor that the cities of Prague and Bratislava among others were granted exemptions from Law No. 138/1973 mandating construction of new sewage treatment plants (CSAV, 1983).[19]

[19] The World Bank, *Czech and Slovak Federal Republic - Joint Environmental Study: Volume II*, The World Bank, January 1992

In Hungary precedence has also been given to supplying the population with communal, piped water systems, rather than sewage treatment plants. As a consequence of this policy, there is a marked "utility gap" between the percentage of the population served with communal water supply and those connected to sewage treatment plants. The gap which is currently at 38 percent continues to widen. Some 1.3 billion cubic meters of untreated sewage is discharged into the country's surface waters every year. The situation is even worse than the "utility gap" implies. 67.1 percent of Hungary's total treated wastewater (including industrial effluent) is treated mechanically only. 25.4 percent is treated biologically and 7.5 percent chemically.[20]

In addition to the lack of wastewater treatment plants, many incidents of malfunctioning of treatment plants and also sewage systems have also been reported.

Agriculture

Although a significant proportion of land in the CSFR, and Poland is devoted to agriculture (see table 1.1, chapter 1), agriculture plays a small role to the economy, contributing between 10% and 15% to the countries' national income. Hungarian agriculture operates in significantly more favorable conditions than the East European average. Along with forestry it produces about 20 percent of GDP. However, the agricultural sector appears to be a primary contributor to the surface water and ground water pollution. Unfortunately its detrimental effects are often neglected or considered an unavoidable burden.

Two agrochemical problems have been identified: the overuse and misuse of fertilizers and pesticides and the use of contaminated fertilizers. Careless agricultural practices combined with heavily subsidized prices for fertilizers and pesticides have contributed to these problems.

The impression must be avoided that the problems are restricted to Eastern Europe. Agricultural practices in Western Europe are equally detrimental as table 2.7 conveys:

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[20] Hungarian Academy of Sciences, *State of the Hungarian Environment*, Hungarian Academy of Sciences, January 1990

Table 2.7: Mineral Fertilizer Utilization (in 1987)

	fertilizer usage pro one hectar of agricultural area [kg/ha]
Austria	90
Belgium	275
CSFR	270
France	180
FRG	260
Holland	315
Hungary	225
Poland	180

Source: FAO Fertilizer Yearbook, Vol. 38, 1988, FAO, Rome, 1989

The agricultural production in Europe is heavily dependent on the use of industrial fertilizers. The Netherlands has the greatest application rate of mineral fertilizer, 315 kg/ha/year. The CSFR ranks sixth in Europe in fertilizer application. A closer look reveals that the Czech Republic uses 1.5 times more calcium fertilizers than the Slovak Republic (Selected Indicators, 1990). This increased use in calcium fertilizers may be related to the requirements for liming in regions with heavy acid depositions, e.g., the northern Bohemian region.[21] Besides the dramatic increase in the use of fertilizers over the last 30 years, there also has been a shift away from the use of organic fertilizers to industrial fertilizers. In 1983, only 18 percent of the fertilizers used in the CSFR were organic

[21] The World Bank, *Czech and Slovak Federal Republic - Joint Environmental Study: Volume II*, The World Bank, January 1992

fertilizers. Nitrate fertilizer usage increased 4.1 times from 1960 to 1979 and remained relatively constant since (CSAV, 1983). [22]

The primary effect of the overuse of fertilizers on water has been surface water and ground water contamination. Because of soil acidification and leaching of nutrients, the salt content of ground water is increasing in some regions and surface waters are becoming eutrophied. On average, 20 percent of the nitrogen applied to the soil is lost. It is estimated that 88 percent of the nitrates and 48 percent of the calcium in the Labe River are from agricultural runoff (CSAV, 1983).

Although fertilizer consumption in Poland is relatively low and falling and hence pollution loads per unit area are significantly lower, it is estimated that surface runoff contributes 56 percent of the total nitrogen load in Poland, 40 percent of organic loads and about 30 percent of phosphorus.

Detailed pesticide use information cannot be obtained. Pesticide consumption in the CSFR has averaged 2.2 to 2.48 kg/ha during the period 1985 to 1988, with approximately 68 percent being herbicides (Selected Indicators, 1990).[23] The volume of pesticides applied to one hectare of agricultural land in Hungary is currently 10 kg/ha/year.[24] These figures do not place the CSFR or Hungary high on the list of pesticide users, but the doses used still pose unacceptable environmental risks in some areas. Some estimates indicate only 1 to 2 percent of pesticides are utilized, and the rest is lost to the soil and water (SKVTRI, 1990). Use of mercury, DDT (dichloro- diphenyl- trichloroethane), and other chlorinated hydrocarbon pesticides is not allowed in the CSFR. The real danger posed by pesticides is their ability to pollute the ecosphere and endanger the equilibrium of ecosystems by affecting the entire food chains. [25]

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[22] The World Bank, *Czech and Slovak Federal Republic - Joint Environmental Study: Volume II*, The World Bank, January 1992

[23] The World Bank, *Czech and Slovak Federal Republic - Joint Environmental Study: Volume II*, The World Bank, January 1992

[24] Hungarian Academy of Sciences, *State of the Hungarian Environment*, Hungarian Academy of Sciences, January 1990

[25] The World Bank, *Czech and Slovak Federal Republic - Joint Environmental Study: Volume II*, The World Bank, January 1992

Water Availability Problems

Concerns about water availability rise in the CSFR, Hungary, and Poland. Although the total water resources seem sufficient compared to the total national consumption, some areas, especially in the Slovak Republic and along the Tisza River system (Great Hungarian Plain), are experiencing shortages due to the unequal water distribution.[26,27] Most scientists believe that there will be enough water available to meet the future demands up to the turn of the century, but continued contamination of important water sources (e.g. aquifers, lost watershed functions through the damage of forest) and/or long-lasting droughts could cause a sudden crisis. In the future it will be necessary to set realistic (market) prices for water. In the absence of water pricing policies, all the water available, cheaply, will be used. [28]

In spite of these conditions and predictions, water consumption is increasing. The drinking water consumption, especially in the CSFR, is exorbitantly high and is 1.5 times more than in neighboring Bavaria. Prague uses 533 liters per capita per day (Lpd) which is 2 times more than in Munich or Vienna.[29]

Also contributing to this problem is the inefficiency in water distribution in the CSFR. Fifty percent of communities (representing 2 million people) have no water supply systems (Wilczynski, 1990). High losses of drinking water have been reported, although no specific value has been provided. The losses are attributed to the fact that only 50 percent of repairs or maintenance is performed (CSAV, 1989). In 1982, 23.1 percent of the water mains in the Czech Republic leaked and wasted water (Zvosec, 1984). It is estimated that there is a 30 to 40 percent loss of drinking water in households.[30]

In Poland 194 cities, including Warsaw and 21 voivodship capitals, experience permanent or temporary water shortage.[31]

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[26] The World Bank, *Czech and Slovak Federal Republic - Joint Environmental Study: Volume II*, The World Bank, January 1992

[27] Hungarian Academy of Sciences, *State of the Hungarian Environment*, Hungarian Academy of Sciences, January 1990

[28] Hungarian Academy of Sciences, *State of the Hungarian Environment*, Hungarian Academy of Sciences, January 1990

[29] Federal Committee for the Environment, *State of the Environment in Czechoslovakia*, Federal Committee for the Environment, 1991

[30] The World Bank, *Czech and Slovak Federal Republic - Joint Environmental Study: Volume II*, The World Bank, January 1992

[31] The World Bank, *Poland Environmental Strategy*, The World Bank, April 1992

2.3 Most Effected Areas

The popular image of environmental damage in Eastern Europe has been one of general disaster, with little differentiation with regard to types and location of sources, and least cost mitigation measures. A closer analysis reveals that just as there have been (and still are) major polluted industrial areas in Western Europe and North America, there are a limited number of heavily polluted industrial regions and isolated "hot spots" which merit priority attention in Eastern Europe. In Poland and the CSFR this is the Black (Coal) Triangle region (Upper Silesia in Poland; Northern Bohemia in the CSFR) and in Hungary it is the Borsod industrial region. Almost all big towns, including Prague, Budapest, and Warsaw lack adequate waste water discharging practices or water treatment plants.

This view of environmental "hot spots" applies to water pollution and even more so to air pollution, due to the different migration characteristics of water and air pollution. Rivers collect contamination and if they do not possess enough self purifying ability, the contamination will accumulate at the end of the migration path. The two most conspicuous examples in the region are the eutrophication of lake Balaton and the Baltic Sea. Important social "amenities", recreational areas, lovely beaches, tourist attractions have lost their beauty and intrinsic (commercial) value.

Water pollution in rural communities which is mainly due to agricultural runoffs and the lack of sewage treatment also opposes the "hot spot" view. Large areas, but only a small percentage of the population are affected directly.

2.4 Implications and Consequences of Pollution

The Economic Effects of Environmental Pollution

The actual meaning of the concept of environmental losses, as well as their classification, depend on criteria assumed by individual researchers.

Environmental losses can be defined as negative phenomena resulting from environmental pollution reducing living standards and hampering fulfillment of social needs. Environmental losses assume the form of destruction and unproductive use of natural resources (direct damage and losses) or the form of loss of material value or profits (indirect losses).

A number of efforts have been undertaken in recent years to assess losses suffered by regional or national economies due to environmental pollution. The complexity of the problem and the diversity of processes leading to degradation add to the difficulties of pricing direct or indirect losses, such as the degradation of recreational areas or the increase in medical expenditures. Studies in Poland, which were limited to losses which could be measured and evaluated, have shown that annual environmental losses suffered by the national economy amount to about 10% of the national income. [32] The share of losses with respect to the medium of contamination is as follows:

- losses due to air pollution 46%
- losses due to surface degradation 39%
- losses due to water pollution 15%.

The loss distribution among individual sectors of the economy was assessed according to the following categories:

- Losses in agriculture: 28%

Losses due to diminution of arable areas, reduction of crop yields caused by air pollution, losses in fish stocks and costs of liming.

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[32] Polish Ministry of Environmental Protection, Natural Resources and Forestry Protection, *The State of the Environment in Poland - Damage and Remedy*, Polish Ministry of Environmental Protection, Natural Resources and Forestry, 1991

• Losses in forestry: 11%

Losses due to diminution of forest areas, losses due to reduction of stand increment caused by air pollution and losses connected with the inhibition of extra-productive functions of forests.

• Losses inflicted by corrosion: 32%

Losses in buildings and structures caused by air pollution and losses in facilities in contact with excessively polluted waters.

• Losses due to incorrect natural resource management: 10%

Losses due to faulty mining of hard coal deposits and losses of organic raw materials discharged with waste water.

• Losses due to mining damage: 2%

• Losses involving human health: 7%

Includes only material losses arising from increased costs of medical treatment, temporary unfitness for work and resulting production losses.

• Other losses: 10%

Losses due to diminished water self-purification capacity, due to effects of tourist facilities and due to excessive noise.

Corrosion, losses in fish stocks and the destruction of recreational areas (other losses) represent the major share of losses due to water pollution. [33]

Harmful health effects have certainly been underestimated in this study as it was limited to losses which could be measured and evaluated.

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[33] Polish Ministry of Environmental Protection, Natural Resources and Forestry Protection, *The State of the Environment in Poland - Damage and Remedy*, Polish Ministry of Environmental Protection, Natural Resources and Forestry, 1991

Harmful Health Effect

"One cannot demand proof that people die or fall ill because of the devastation of the environment for we cannot wait until we all die in order to provide the authorities with proof that something is wrong with environmental protection."(Professor Zbigniew Brzezinski at the "Man - Environment - Health" conference organized in 1985 by the Polish Academy of Sciences. The statement was made before the transition in Poland and criticized the authorities who disbelieved in environmental health hazards due to the lack of scientific research. Nevertheless the difficulties of linking environmental pollution with detrimental health effects still persist, especially with contamination in water. The data is scarce and only gives glimpses the truth:

As a result of the agricultural malpractices and the overuse of fertilizers, most waters in agricultural regions and rivers draining these regions show high concentrations of nitrates. The drinking water in parts of the CSFR contains so many nitrates that it is dangerous to babies under four months of age if it is not boiled and diluted.[34]

Also due to the extensive use of artificial fertilizers and the leakage of hazardous material into the soil and ground water agricultural activity had to be terminated or modified in several parts of Eastern Europe. Reports indicate that in some regions potatoes cannot be grown because they would be unsafe to eat.[35]

Children in parts of Poland carry cancer-causing agents in their bodies, at levels that some experts believe are the highest in the world.[36]

In general life expectancy in Eastern Europe is about 5 years below the average in Western European countries, both for men and women. The mortality in the industrial regions, e.g. in Upper Silesia ranks among the highest in Poland, and factors like soil contamination and air and water pollution certainly augment the unwelcome trends. Pollutants, such as heavy metals, accumulating in the food chain are extremely hazardous and children, due to their sensitivity indicate population health best.

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[34] Arnst, Catherine, *East European Countries Face Environmental Nightmare*, Reuters, March 22, 1990
[35] Carlson, Alver, *Reform-Minded Eastern Europe Faces Environmental Nightmare*, Reuters, May 7, 1990
[36] Carlson, Alver, *Reform-Minded Eastern Europe Faces Environmental Nightmare*, Reuters, May 7, 1990

2.5 Cross-Border and International Consequences of Pollution

Many crossborder pollution issues between Eastern European countries or Eastern European and Western countries create a need for international institutions and environmental management, uniform legislation, environmental diplomacy, technology exchange, and most of all effective cooperation. Furthermore a systems approach irrespective of political borders must evolve in order to incorporate into a comprehensive strategy polluters, the media of pollution transportation, and the effected environment, i.e. population, flora and fauna, infrastructure, but also institutions, politicians, scientists and so forth .

Czechoslovakia, Hungary, and Poland manifest very distinct transboundary water pollution problems due to the geography. Almost all rivers in Czechoslovakia have their headwaters there, whereas 95% of Hungary's renewable water resources originate abroad. Hungary's river water quality therefore depends to a large extent on the standards upstream residents impose on the rivers. The Slovak Republic, parts of the Czech Republic and all of Hungary belong to the Danube river basin, one cornerstone of the Black Sea environmental management program. The countries downstream on the Danube, Yugoslavia, Bulgaria and Romania also have to cope with economic and political transition. The financial constraints prohibit these countries from supporting Slovakia or Hungary in order to benefit themselves from cleaner water flowing into their countries.

Poland's major rivers, Vistula and Odra flow directly into the Baltic Sea (see chapter 1). The mutual interest of the countries around the Baltic Sea in the restoration of the Baltic Sea, wealthy Western countries (Sweden, Finland, Germany), and relatively poor economies in transition (the Baltic states, Russia, and Poland), will facilitate the removal of major pollution sources. The marginal cost of pollution reduction in the Baltic Sea will very often be less for Western countries if they invest in clean-up in Russia, the Baltic States or Poland. This should spur considerable financial environmental aid.

Institutional capabilities have been created in order to undertake essential cooperation efforts, to establish priorities, to pool funding, and last but not least to increase

public awareness, because the environmental education of the public will be the major market driver and has long been neglected in Eastern Europe.

Two water systems, among them the Danube River Basin as part of the Black Sea catchment area and the Baltic Sea are of multinational, one could say global, concern and are attracting international attention. Other crossborder issues concern the Elbe river, the Gabcikovo - Nagjmaros power station on the Danube, in short all rivers and lakes small or large crossing the border.

Due to the financial implications and interesting international aspects the pollution of the Baltic Sea is discussed in some detail.

Pollution of the Baltic Sea

Natural Vulnerabilities

The Baltic Sea is naturally vulnerable to pollution due to its semi-closed character and particular hydrography. The shallow, narrow Belts and the Sound permit only a slow water exchange between the Baltic Sea and the North Sea. The water therefore has a long residence period of between 25 and 40 years, which promotes the accumulation of pollutants. Due to this limited and irregular saltwater replenishment from the North Sea as well as its large catchment area, the Baltic Sea is dominated by freshwater inputs. The vertical variations in salinity cause permanent stratification hampering the exchange of oxygen in some parts of the Baltic Sea. In the lower layers of these areas, decomposition of organic material leads to anoxic conditions, rendering these layers virtually lifeless. The size of the bottom areas with impaired conditions for life varies from year to year, but in some years one fourth of the whole Baltic Sea approaches "dead bottom" conditions. [37]

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[37] Conference Secretariat - Helsinki Commission, *Background Document for the Baltic Sea Environmental Declaration 1992 - Diplomatic Conference on the Protection of the Marine Environment of the Baltic Sea Area*, Helsinki Commission, April 1992

The Contribution of Large Nutrient Loads

Eutrophication is a problem of special concern. It is caused by excessive growth of biomass stimulated by the large influx of nitrogen and phosphorus compounds which come from agricultural and forestry runoff, atmospheric transport, as well as discharges from municipalities and industries. The decay of this vast biomass causes oxygen depletion and threatens marine life.

The Accumulation of Toxic Substances

The concentrations of cadmium, lead and nickel in fish and shellfish are higher than the background values and those in the North Sea biota, but have not increased significantly since the early 1980's. Potentially toxic metals (cadmium, mercury, and lead) have been accumulated in sediments in remobilizable form which could be quickly released due to oxidation following strong saltwater inflows to the bottom layer. Currently, annual loads of 2500 tons of lead, and 25 tons of mercury are deposited into the Baltic Sea.

The Human Contribution

The natural vulnerability is aggravated by anthropogenic causes of environmental change and degradation. Although all countries around the Baltic Sea and beyond (due to transboundary air pollution) contribute to the deterioration of the Baltic Sea, Poland's share of the annual nitrogen and phosphorus loads is the largest (see table 2.8). On the basis of per capita pollution though the Western countries take the gloomy lead.

The pollution sources relevant for the Baltic Sea have been described earlier. These are most of all the large scale industrial centers in Upper Silesia (Poland) and Ostrava (CSFR), the lack of adequate municipal wastewater treatment facilities, and the great number of uncontrolled landfills with hazardous and toxic waste of industrial origin. It should also be mentioned that many sources of air pollution located outside the Baltic Sea catchment area, even at great distance, affect the Baltic Sea, depending on wind direction.

The problems in the Baltic Sea complete the tracking of the pollutants from their sources to the point of accumulation.

Table 2.8: The Amount of Nutrient Substances Discharged into the Sea by the Baltic States

	Pollution Loads					
	BOD5		Nitrogen		Phosphorus	
	1000t/y	kg/ca/y *	1000t/y	kg/ca/y *	1000t/y	kg/ca/y *
Denmark	159.7	39.5	69.1	17.1	9.5	2.35
Finland	249.8	55.4	69.5	15.4	4.4	0.98
Germany East	13.3	6.4	3.6	1.7	0.4	0.19
Germany West	22.7	20.6	16.4	14.9	2.4	2.18
Poland	358.4	9	220	5.5	22	0.55
Sweden	361.6	50.2	129.5	18	6.9	0.96
former USSR	504.7	25.9	130.3	6.7	5.9	0.30

* ... kg/caput/year

Source: Polish Ministry of Environmental Protection, Natural Resources and Forestry Protection, The State of the Environment in Poland - Damage and Remedy, Polish Ministry of Environmental Protection, Natural Resources and Forestry, 1991

2.6 Resource Requirements for Clean-up

Unfortunately the resource requirements exceed the financial capabilities of most industries, which have to cope with the market restructuring and reconstruction, a grievous economic downturn, and the breakdown of international trade due to the liquidation of the CMEA. Suffering financial difficulties, many polluters have stopped or postponed their environmental investments. In Poland the environmental ministry has already partially exempted the chemical sector, for up to six years, from fines introduced in 1991 to encourage compliance with legislation. [38]

It is likely that privatization ministers in all three countries are putting pressure on the respective environment ministries to waive certain environmental requirements in order to make plants more sellable.

Due to the financial distress it would be more sensible in many cases to correct malpractices by eliminating the incentives (underpriced water, subsidies for fertilizer and pesticides,...) and to wait for changes before attempting more drastic controls.
As many developed European countries are discovering, the costs of full treatment of municipal sewage to meet high water quality standards are very high. On the other hand, provided that drinking water is properly treated, the costs of such pollution are largely associated with the loss of amenity value of rivers and it is difficult to justify the expenditure of scarce capital resources on better wastewater treatment at the present time.[39]

Chapter 4 will evaluate in greater detail the market which emerges due to the necessity of restoring the environment in Eastern Europe. The resource constraints, which are the key to the development of the environmental market in Eastern Europe, will be discussed in chapters 5 and 7.

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[38] Chynoweth, Emma, *Poland Seeks Solutions to Environmental Nightmare*, Chemical Week Associates, May 27, 1992
[39] Hughes, Gordon, *Are the Costs of Cleaning up Eastern Europe Exaggerated? - Economic Reform and the Environment*, The World Bank, October 1991

Chapter 3

Environmental Technology Environmental Services

In the past, the Eastern European production of equipment for environmental protection purposes was mostly done by state owned companies as part of a more diversified product-mix. The environmental service sector, too, was controlled by government authorities. Due to the privatization efforts, it is expected that in the future privately owned companies will produce or provide environmentally oriented goods or services. This chapter therefore explores the technologies which should be provided by these companies to promote cost effective reduction of the water pollution outlined in chapter 2 and to initiate sustainable development. It will also put emphasis on the availability of these technologies and the development of an environmental service industry. Research and development needs will be highlighted, and market opportunities for international environmental enterprises will be described. Many regard Eastern Europe as a market of the future, but lack appropriate knowledge to determine which technologies are most suitable for the economies in transition.

3.1 Environmental Technology Needs

Technology needs are discussed here isolated from the legislative, financial, political and economic conditions. We must bear in mind, however, that effective solutions to the environmental problems take the interaction and interdependence of these factors into account. The grouping into immediate, medium, and long term technology needs therefore anticipates the arguments in later chapters on which it is based, notably the severe financial constraints, the necessity of raising effluent fees or political friction prohibiting effective management on the national or regional government level.

Immediate/Short Term Needs

Immediately or in the short term (up to two years)

- emergency warning systems,
- monitoring systems,
- equipment such as flow meters or pumps and
- desalination technology

lead the priority scale of environmental goods.

The creation of an efficient environmental service industry is equally important to ensure not only adequate technological consulting, but also powerful environmental management. Since the opening of Eastern Europe many such goods or services have already been provided by local and international companies. They experienced that the implementation of new environmental thinking, the whole restructuring of Eastern Europe in general, is a much more time consuming process than originally thought. The immediate needs therefore were not entirely satisfied until the second half of 1992, which leaves a still unsaturated market.

Emergency Warning Systems

Each year many incidents of accidental oil spills, contamination of aquifers, or discharges of hazardous substances into surface waters occur which expose the uninformed population to extreme health risks. Such risks could easily be minimized by installing warning systems which guarantee immediate spreading of information. Like many other goods (e.g.: monitoring systems) warning systems contribute indirectly to an improvement of the environmental condition. Warning systems stimulate public awareness with regard to environmental problems , which in turn acts as an essential market driver, pushing for environmental legislation and strict law enforcement. The need for many complementary goods reflects the situation in Eastern Europe of having to start from scratch in many respects. Computer and automated control facilities, telecommunication systems, general infrastructure ... many items commonplace in the West must be installed in Eastern Europe.

However, a warning system will not be able to function without comprehensive monitoring systems.

Monitoring Systems

There is an increasing demand worldwide, for the monitoring of water quality.[40] With more stringent legislation in the field, there will be an increasing need by industry and regulatory agencies both to demonstrate compliance and to detect potential problems at an early stage.

The authorities in the CSFR, Hungary, and Poland are introducing regulatory systems including ambient and emission or effluent standards which should be strictly followed by all the potential polluters. The systems need sophisticated measurement and control equipment, flow meters, industrial pH-meters and conductometers (water quality monitors, potentiometric sensors, measurement flow heads, pH-redox measurement converters and movable laboratories) to verify the enterprises self monitoring capabilities and data and to enable a fair calculation of fines or fees.

In many cases environmental monitoring systems need not necessarily be upgraded in terms of sophistication of equipment, but in terms of calibration between measuring

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[40] de Taboada, Annez M., *Future of the Environmental Industry*, Network for Environmental Technology Transfer (NETT), 1991

systems in different regions, standardized methods of analysis, quality control, and network design aimed at achieving information of value in designing policies. Various existing monitoring systems need to be integrated into a comprehensive environmental information system, starting with an assessment of the needs of various users, development of a least-cost strategy for data collection and analysis and initiation of publications of various kinds. The system should permit better public access to information. In the past decade, substantial amounts of data have been collected that are of little value because they were collected without clear objectives in mind.[41,42]

Monitoring equipment has to be provided in the case of drinking water control, too, to ensure high sanitary standards and to avoid dangers to public health. There is also a lack of control and monitoring equipment in regard to lake, river, and ground water uptake.

Specific Monitoring Requirements will include:

- industrial and sewage treatment effluent quality, to ensure compliance with consent limits;
- raw water supply quality, both to demonstrate potability to general consumers and to ensure that it meets the specifications required by industry;
- river, sea, lake, and ground water quality, to detect any build-up of pollutants, particularly micro-pollutants, whether gradual or as a result of a specific incident.

According to a representative of the Polish environmental industry there is a remarkable market for implementation of testing equipment such as sewage content analyzers together with typical controlling instrumentation including flow meters, level indicating units, laboratory and field equipment etc.[43]

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[41] The World Bank, *Poland Environmental Strategy*, The World Bank, April 1992

[42] The World Bank, *Czech and Slovak Federal Republic - Joint Environmental Study: Volume I*, The World Bank, January 1992

[43] Bradecki, Jerzy, *Environmental Technology Needs of Poland-Finance Aspects-Going into Business with Polish Companies*, METALCHEM Co. Ltd, Gliwice, Poland, October 1990

Flow Meters

A very basic item which is required in large quantities is the flow meter, which must be installed to control water flows in general, and to measure drinking water consumption in particular. The communist apartment buildings lacked such control devices because the individual tenants enjoyed free water usage, inevitably leading to excessive water consumption (up to twice the Western European average). Measures have to be taken to make each individual conscious of the value of clean and safe water and to obtain reliable data on water consumption. This of course requires flow meters for each apartment unit. Similar reasoning explains the need for heat flow meters as well as water flow meters for municipal water networks.

Desalinization Technology

As described in chapter 2, salt discharge of coal mines is a typically Polish problem. Due to its extreme negative effects on the water quality of the Vistula and Odra (among other rivers), the contamination sources should be eliminated as soon as possible. Several technical projects were carried out in the last three years and though none was originally accepted as highly suitable for Poland, some progress has been reported recently.[44,45]

Some of the Japanese and Western European engineering companies experienced technical difficulties in trying to offer effective methods of mine water processing. The methods, basing upon brine concentration and either evaporation or reverse osmosis techniques need further investigations, mostly in the area of byproduct utilization. In this particular case the need for highly corrosion resistant equipment must not be ignored.

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[44] The World Bank, *Poland Environmental Strategy*, The World Bank, April 1992

[45] Bradecki, Jerzy, *Environmental Technology Needs of Poland-Finance Aspects-Going into Business with Polish Companies*, METALCHEM Co. Ltd, Gliwice, Poland, October 1990

Environmental Service Industry

During the past several years, numerous, and often small, private consultant firms have emerged in Eastern Europe. They act mainly as intermediates between the demand in the market and actual knowledge present in former state owned companies. Parts of state owned companies are also being privatized to establish consultant and engineering companies. These consultancy firms, in contrast to Western European practices, are often closely related to contractors, suppliers of equipment or ministries. The main issues for consultancy and engineering are:

- Establishing consultancy firms specialized in environmental management, environmental planning and policy.
- Establishing consultancy and engineering firms with greater potential and resources, i.e. larger firms.

Environmental services must also extend to management tasks since knowledge and experience to design environmental management programs and to profitably operate environmental equipment and installations, are lacking in all formerly centrally controlled economies.

The service industry, together with government authorities must establish priorities and focus on the ordering of policies and the timing of implementing regulatory instruments and investments to ensure the greatest benefits in the shortest time and at the lowest cost. There is an unique opportunity to bring about major environmental improvements in the course of economic transformation and industrial restructuring, and every effort should be made to promote the management capabilities which will design and encourage this process in the most efficient manner possible. There certainly will be numerous social and political obstacles to the implementation of an optimal environmental program.

A powerful environmental service and consulting industry should be established as soon as possible. Management skills must be promoted vigorously and environmental education and public communication must be given a more important role in solving environmental problems.

Another pressing need is according to the environmental minister of the CSFR, Mr. Vavrousek, is: information from the EC and other governments in the West about how they are tackling their own problems.[46]

Management and organizational aspects from the public perspective will be discussed in chapter 6.

Education

Education can be looked upon as an environmentally oriented service. Public communication and education play a very important role in solving environmental problems, which is apparent from the following examples:[47,48]

• In sharp contrast to the strong position the public in Eastern Europe takes on some general environmental issues, there still is enormous lack of awareness about the influence of their personal behavior on an environmental improvement. Harmful effects of household practices on the environment, recycling, and so forth are some of the issues they must be concerned about.

• In the CSFR and in Hungary it is intended to solve a shortage of drinking water supply by installing new supply equipment. However, drinking water usage per capita is nearly twice the average of West European cities. Thus, substantial savings must be possible by enlarging the population's awareness about the excessive use of water and ensuring proper operation and maintenance. The new supply equipment would then be superfluous.

Medium Term Needs

Medium term (2 to 5 years) technology needs include:

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[46] Carritt, Tony, *East Europe Says Pollution Killing Its People, Reuters, June 16*, 1990
[47] Euroconsult, *Identifying Market Opportunities in Environmentally Oriented Goods and Services: Hungary*, International Finance Corporation, March 1991
[48] The World Bank, *Czech and Slovak Federal Republic - Joint Environmental Study: Volume II*, The World Bank, January 1992

- Wastewater and sewage treatment technology,
- Specialty chemicals production
- Water supply systems,
- Improved production processes,
- Improved technologies for air pollution reduction or hazardous waste site clean-up.

After identifying the lack of wastewater and sewage treatment plants in chapter 2, it might seem surprising to list the related technology under medium term needs as opposed to immediate needs. In fact no actual clean-up technology (with the exception of the installation of aeration equipment and desalinization technology) was included in the immediate needs category. On the surface this must appear to be a contradiction, but in fact it reveals one of the main arguments for a cautious and go slow approach, which will be mentioned again in later chapters. This argument is shared by leading international organizations, among them the World Bank, writing in general about pollution control in the CSFR:[49]

A cautious approach to industrial pollution control is recommended, in light of the still uncertain impact of economic reform. Polluting industries should first be assessed as to their long-term economic viability, in order that assistance for pollution control can be targeted towards plants which will continue operating under the government's privatization plans. Those which are potentially viable should first carry out an environmental audit to identify low cost means of reducing waste and pollution; dramatic results can often be achieved with improved management and maintenance. Only then should major investments in new technology or treatment plants be considered. Both Republics recognize the need to introduce as quickly as possible improved procedures for environmental assessment of all new project proposals in the public and private sectors, with provision for public participation. ...

This view can be extended to all other Eastern European countries and explains well why a cautious approach should be taken to pollution control in general. There are several

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[49] The World Bank, *Czech and Slovak Federal Republic - Joint Environmental Study: Volume I*, The World Bank, January 1992

other factors, specific to water pollution, which will delay the need for new or additional technology for wastewater and sewage treatment plants even further. These are:[50]

- Water-related investments are far more costly, than those for air pollution control;
- Water pollution does not generally involve significant health costs except in certain limited geographical areas.

Let us look at the medium term technology needs in detail:

Waste Water and Sewage Treatment Technology

The demand for waste-water treatment plants and sewage systems seems to be enormous: The Polish government lists as "necessary undertakings" without time horizon:[51]

- construction of about 1900 large municipal and industrial waste-water treatment plants with a total flow capacity of 18.7 million cu.m/day
- construction of about 8000 rural treatment plants with a total flow capacity of 2.3 million cu. m/day
- construction of about 35 thousand km of municipal sewage systems and about 50 thousand km of rural sewage systems.

As a comparison: In the period between 1983 and 1990 about 1600 waste-water treatment plants with a total capacity of 5.6 million cu. m/day were constructed in Poland.

The need for treatment plants in the CSFR and Hungary is also of exorbitant magnitude and the situation in all three countries is aggravated by the fact that the many facilities which provide only mechanical treatment or which are malfunctioning must be renovated or replaced.

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[50] Ackermann, Richard , *Environmental Action Programme for Central and Eastern Europe - Environmental Policy Issues*, Background Note, The World Bank, April 1992

[51] Polish Ministry of Environmental Protection, Natural Resources and Forestry Protection, *The State of the Environment in Poland - Damage and Remedy*, Polish Ministry of Environmental Protection, Natural Resources and Forestry, 1991

The shear numbers, though certainly (slightly) exaggerated to attract foreign financial aid, reflect the urgent need for:

• low cost solutions,
• research and development,

or, even better,

• a new and radical approach towards economically efficient and environmentally sound technology, providing a solution to widespread pollution problems.

The driving factor behind these arguments is the financial distress which all Eastern European countries (and many other countries with severe pollution problems!) are facing. The slogan for technological development can be described as: "The cost of achieving a safe and clean environment must be reduced".

Low Cost Solutions

The environmental strategy in highly developed countries of applying expensive end-of the pipe solutions, sophisticated water works and treatment plants can and must not be applied in Eastern Europe. Even though these developed countries built expensive infrastructures they are still experiencing problems in satisfying basic needs with respect to the supply of clean drinking water, sound waste water disposal, or maintenance and reconstruction of existing facilities.

Aeration technology to increase the rivers self purifying capacity could be such an economical substitute for expensive treatment plants. Another solution could be the disconnecting of polluting industries from the river and sewage system and to infiltrate biologically balanced waste water to the ground after aeration.[52]

As a wastewater treatment technology chemically enhanced primary treatment is recommended:

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[52] Niemczynowicz, Janusz, *Environmental Impact of Urban Areas-the Need for Paradigm Change* ,Water International, 1991

Chemically Enhanced Wastewater Treatment (CEPT)

CEPT has been used in Western countries for more than 100 years, but fell into disfavor in the 1930s when compared to biological treatment because the large concentrations of metal salts produced large quantities of sludge. In the USA, most of the emphasis on chemical treatment has been on phosphorus removal after biological treatment. However, Scandinavian and other European countries are focusing on phosphorus removal before biological treatment. Again, large concentrations of metal salts are needed to achieve low phosphorus effluents. With the technological advancements in polymer chemistry, it has become worthwhile to reconsider CEPT as a technology to remove total suspended solids (TDS) and biochemical oxygen demand (BOD). By replacing some of the metal salt with polymers, significant increases in TSS and BOD removals, compared to conventional primary settling are possible and less sludge volume. The total sludge amount due to chemically addition is increased by only 15%.[53]

Conventional primary treatment achieves approximate removal rates of 60% for TSS and 20% of BOD. Chemically enhanced primary treatment with addition of ferric chloride and anionic polymers can increase the removal rates to more than 80-90% of TSS and 50-60% of BOD (see figure 3.1). These rates certainly fall short of the achievable levels for activated sludge treatment (primary + secondary treatment), which is almost 100% for TSS and 95% for BOD, but CEPT has remarkable financial advantages, which distinguishes it as an economical and suitable option.

A comparison of the capital, O&M and total costs of CEPT with conventional primary treatment and biological secondary treatment shows that CEPT is only slightly more expensive than conventional primary treatment. The total cost of CEPT is about half that of biological treatment. This means that for the same price, one could build twice as many CEPT plants in Eastern Europe as biological treatment plants. When this fact is taken together with the performance characteristics of CEPT discussed above, one can appreciate potential wide applicability of CEPT for Eastern Europe (table 3.1).

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[53] Morrissey, S.P., Harleman, D. F., Retrofitting Conventional Primary Treatment Plants for Chemically Enhanced Primary Treatment in the USA, M.I.I., 1991

Retrofitting primary treatment for CEPT is also an inexpensive way of increasing the removal of TSS, BOD, phosphorus, and metals over that of primary treatment and also of increasing plant capacity, due to almost twice the overflow rate for CEPT.

Figure 3.1: Chemically Enhanced Primary Treatment - Schematic

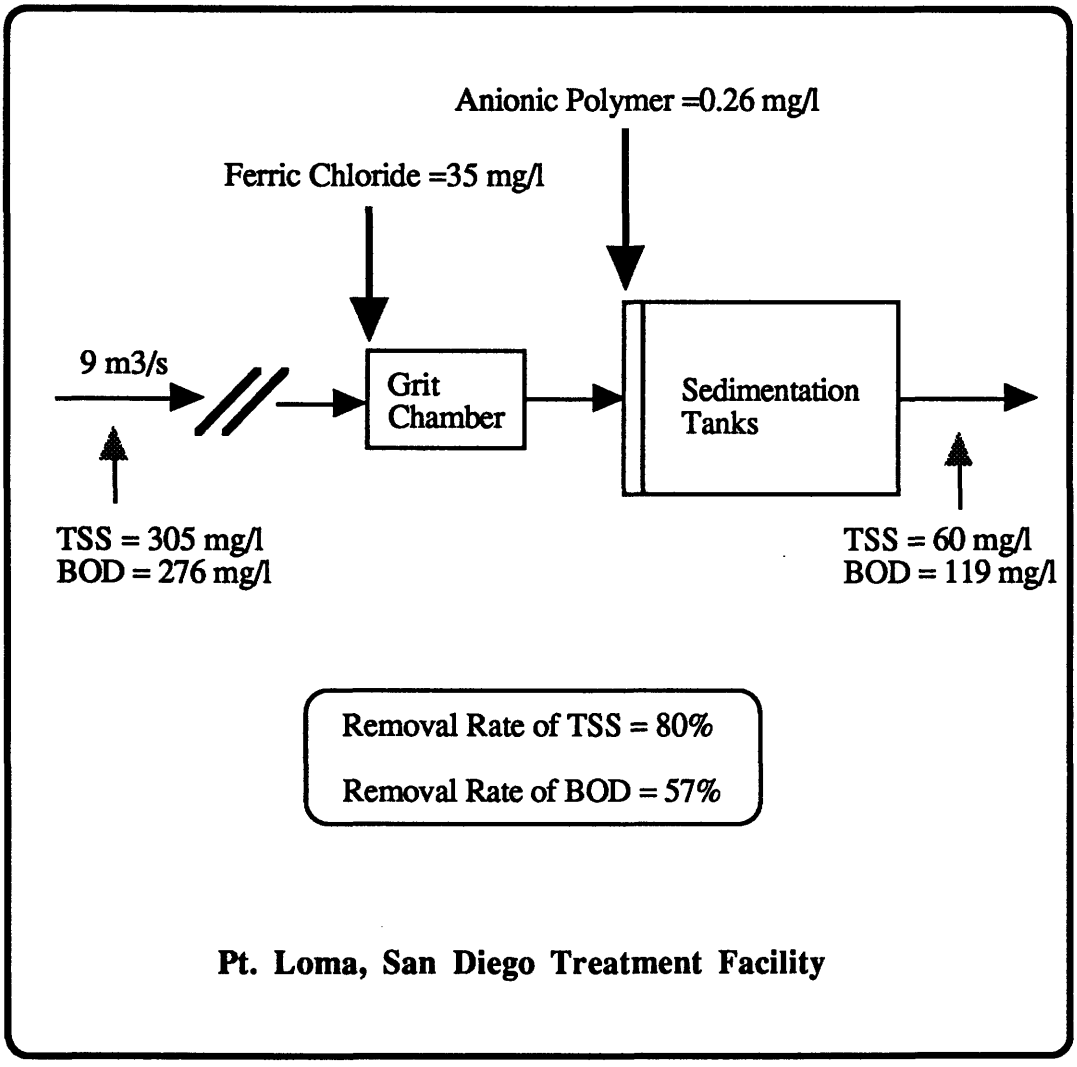

Table 3.1: Comparison of Water Treatment Costs in the United States

	Capital Cost US$/m3	O&M Cost US$/m3	Total Cost US$/m3
Primary	0.09 - 0.11	0.05 - 0.06	0.14 - 0.17
CEPT	0.11 - 0.14	0.06 - 0.07	0.17 - 0.21
Biological Secondary Only (not including primary)	0.11 - 0.16	0.09 -0.11	0.20 - 0.27

However, designing a low cost solution does not necessarily imply that the cost of pollution reduction must be reduced, although such an improvement would be highly favorable, of course. With a well-designed environmental concept and strategic approach which are well balanced with energy, economic, and socio-political concept large sums will be saved and not wasted on inefficient projects, a frequent happening in the West. In the short run, in particular, efficient strategies, depending on human and environmental risk assessment, ensure an optimal use of limited financial resources and can reduce the costs substantially. Many projects can be postponed, because they do not pose dangers to the environment. In order to identify such strategies a competent environmental service industry, emphasized earlier, must be established.

Research and Development

Research and development tasks in Eastern Europe concerning waste water treatment installations are manifold. Together with the modernization of mechanical sludge dewatering, it is indispensable to carry out research and implementation work on chemical

agents, polyelectrolyte type and equipment for production of pure oxygen by the absorption method and equipment for sludge treatment by the pyrolisis method.[54]

Perhaps, instead of refining ad absurdum old expensive treatment methods adapted to the needs of developed countries scientists will have to deal with the big problems in poor countries. Billions of people all over the world are deprived of safe drinking water and/or lack of functioning sewage treatment. The financial difficulties of developing countries exceed even those in Eastern Europe and demand fundamentally new approaches.

Paradigm Change

The developed world experiences the process of departing from the traditional, monodisciplinary approach. The goals of water management are shifting away from end-of-pipe approaches towards sustainable ecological solutions in harmony with nature. This new approach is based on a deeper understanding of the cyclicity of material and energy flows in nature. Multiobjective thinking and implementation of really integrated water management govern the design of solutions, and all pollution generating activities within one, well defined catchment area are taken into consideration.[55] Such a quantum leap in a solution approach necessarily involves the cooperation of all parties involved. Eastern Europe could benefit from the ongoing paradigm change in the West through increased transfer of economically sound approaches and a stronger exchange of ideas.

Even, if such a paradigm change enjoys higher priority in the future and if research and development provides creativity in designing cheaper treatment solutions these dynamic processes will not bring immediate change due to the inertia which is inherent in the adoption of new methods or technology. The demand for conventional treatment technology will therefore still be very high in the medium, and even long run. A large variety of complimentary equipment must also be provided in order to guarantee a satisfactory functioning of treatment plants. The need for the following equipment seems most urgent: Pumps for waste water and sludge, including plunger pumps, transmission equipment, compressors and fans, sedimentation centrifuges, belt-vacuum or low-pressure

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[54] EKONO Environmental Technology, *Market Opportunities in Environmental Goods and Services Poland*, International Finance Corporation, February 1991

[55] Niemczynowicz, Janusz, *Environmental Impact of Urban Areas-the Need for Paradigm Change* ,Water International, 1991

presses, blowers of compression 6m water column, equipment for fermentation chambers and automatic process control systems. A wide range of applications is possible for membrane- and ultra-membrane-type technologies and water cleaning technologies based on reverse osmosis.[56,57,58]

Also related to the waste water treatment technology there is increasing demand for chemicals.

Specialty chemicals

The use of chemicals in water and waste water treatment is a substantial and growing market worldwide, and will be of significance in Eastern Europe as well.[59] Both water supply agencies and industries utilize specialty chemicals for cleaning of water and effluents. Viewed against actual market demand, the following opportunities are most promising:[60]

- Production of active carbon
- Production of poly-electrolytes

Both chemicals are used extensively in waste water treatment plants.

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[56] TMS Management Consulting, *Domestic Environmental Products and services Sectors: Hungary - An Assessment of the Current and Future Potential*, U.S. AID, January 1992

[57] Euroconsult, *Identifying Market Opportunities in Environmentally Oriented Goods and Services: Hungary*, International Finance Corporation, March 1991

[58] EKONO Environmental Technology, *Market Opportunities in Environmental Goods and Services Poland*, International Finance Corporation, February 1991

[59] de Taboada, Annez M., *Future of the Environmental Industry*, Network for Environmental Technology Transfer (NETT), 1991

[60] Euroconsult, *Identifying Market Opportunities in Environmentally Oriented Goods and Services: Hungary*, International Finance Corporation, March 1991

Water supply systems

The construction of additional water supply systems should not be on the top of the priority list due to the overconsumption of water in many parts of Eastern Europe, particularly in the CSFR (see chapter 2). The main focus of activity should therefore be to achieve a substantial water usage reduction in order to avoid additional expensive installation of water supply infrastructure.

In the past, expensive supply systems were installed in many cases, to transport drinking water from distant sources. These investments were necessary, because local traditional drinking water sources had become contaminated and therefore did not meet drinking water standards.[61] Such blatant misconcepts must be avoided in the future and in fact, wherever contamination produces high opportunity costs (such as the expenses for additional installations of water supply systems), a win-win situation can be identified. In these situations the costs of pollution reduction will be compensated by economic benefits.

Urban areas, however, might experience water shortage in the future and the need to fulfill the supply of safe drinking water will generate many small scale construction tasks.[62]

Improved Industrial and Agricultural Processes

The former system of central planning supported the wasteful use of energy, water, raw materials through extensive subsidies. Little or no efforts were made to conserve these goods. The industry therefore had no economic incentives to redesign their production processes from an environmental or resource use perspective. In this respect it is lagging far behind the Western counterparts, although even there water pricing and effluent charges mechanisms are weak.

The paper and pulp industry reveals an extreme example of environmental neglect: Thermomechanical pulping processes were developed in the 1970s and were used initially

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[61] The World Bank, *Czech and Slovak Federal Republic - Joint Environmental Study: Volume II*, The World Bank, January 1992

[62] NTIS, *The Environmental Sector in Poland: Overview and Business Contacts* , U.S. Department of Commerce-National Technical Information Service,1991

in the United States and in Western Europe in response to environmental regulation. That technology was not only less polluting than the earlier chemical based technology but also cut average manufacturing costs in half. Its initial adoption and later diffusion have been significantly quicker in developing countries with fewer trade restrictions. By 1989, however, not a single pulp producer in Eastern Europe had adopted this technology.[63]

Improved technologies for air pollution reduction or hazardous waste site clean-up

Many processes to reduce air production or to clean up hazardous waste sites involve washing processes which necessarily generate large amounts of waste water often discharged to treatment plants. Such processes are: coal washing which increase the heat value of Polish or Czech coal and in consequence reduces air pollution, or soil flushing methods to remove contaminants from the soil matrix.[64] Such clean-up strategies often make sense even though they shift the pollution problem. Air pollution or hazardous waste sites are still considered to be more detrimental in most cases than water pollution. It is a challenge however to develop economical clean up technologies which are not causing secondary pollution.

Long term needs

Although the need for renovation and construction of waste water treatment plants and related equipment will continue to be strong for the next decades, the technology demand in the long term will certainly shift even further to research and development. However it is difficult to determine long term technology needs accurately and all forecasts are based rather on general experience concerning technology innovation and diffusion than on specific knowledge of Eastern Europe.

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63 The World Bank, *World Development Report 1992 -Development and the Environment,* Oxford University Press, 1992

64 International Environment Reporter, *Energy-Saving Center Planned to Help Solve Poland's Environmental Crisis*, The Bureau of National Affairs, Inc., September 12,1990

The inevitable question rises of whether Eastern Europe's industrial capacity, know how, and human assets will be sufficient to provide all the above mentioned services and goods in the specified time horizon.

3.2 Availability of Services and Technology

The belief is wide spread that Eastern European's industry lacks the capability to cope with the surging environmental market. A closer look, however, reveals a somewhat more encouraging picture. It supports the argument that the need for sophisticated international equipment is less urgent than expected and that instead emphasis should be put on organizing and mobilizing all existing capabilities and creating new capability. Nevertheless, international cooperation, information exchange, know how transfer, and even technology transfer, on a large scale still, can serve to stimulate local engineering, consulting, and industrial production related to the environmental market.

Local Environmental Sector

A majority of Eastern European countries, including the CSFR, Hungary and Poland posses their own, fairly well developed industrial and research centers capable of realizing activities such as engineering services and technology supplies. These native companies with sufficient knowledge and responsibility can take an active part in improving the technical conditions in many polluting enterprises. However many are struggling with changes due to privatization and the instability of the economies in general. They have also not adopted their products to meet the current environmental market.

Local Availability of Environmental Engineering, Consulting and Management Services

The environmental services sector has only recently emerged in Eastern Europe's fledging "market economies", and is in a stage of dynamic flux. A few years ago, there were only a handful of "firms" in the environmental consulting and service sector. Today small firms (5-20 employees) emanate from both burgeoning entrepreneurial activity, and from fragmentation of "design Bureaus" which occurs usually during the privatization of these monolithic state enterprises. There are some medium sized firms (Poland: 25-40 with 25-100 employees) and a handful of large firms (i.e.: hundreds of employees), some of which have demonstrated that they can compete in international markets.[65],[66] The spirit of entrepreneurs, in general leads to smaller specialized firms. Privatization may result in some service firms with more critical mass and a greater diversity of services. However, in all Eastern European countries, generous investment in training and new technology is required before the environmental service sectors will be comparable to, and competitive with, Western counterparts.

The encouraging factor is the human potential: The CSFR, Hungary, and Poland have many excellent environmental engineers, particularly in the water related fields. They are qualified to design and construct water and waste water facilities and focus on areas such as sanitary engineering, dairy waste water treatment, or steel industry waste water. This talent pool mainly exists in the mentioned state-run specialized engineering organizations (Design Bureaus). Most of these, have or will be privatized, often resulting in fragmentation and maybe evolving toward small monopolies and little competition.

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[65] TMS Management Consulting, *Domestic Environmental Products and Services Sectors: Poland - An Assessment of the Current and Future Potential*, U.S. AID, October 1991

[66] TMS Management Consulting, *Domestic Environmental Products and services Sectors: Hungary - An Assessment of the Current and Future Potential*, U.S. AID, January 1992

Research Institutions

The excellent academic and research institutions in the CSFR, Hungary and Poland support a staff of environmental scientists (ecologists, water quality experts, ecotoxologists, geohydrologists, public health experts, etc.) who often enjoy worldwide reputation. Most of these scientists have been involved in basic research, and may find the transition to applied science (i.e. consulting) difficult. Also, like their engineering counterparts, they lack the organizational, management, marketing and financial skills required to operate an enterprise in a market economy.

However, the technical skills required to develop a diverse environmental service sector do currently exist. Given organizational and business development assistance, the introduction of financial, marketing and management skills, specialized technical skills, training (e.g. environmental auditing, waste minimization, pollution prevention, hazard and risk assessment), and access to Western technologies, wherever necessary, the CSFR, Hungary and Poland should be able to satisfy the environmental consulting service needs of their economy and society.

Local Availability of Environmental Products and Technology

The environmental products sector is currently very limited in all three countries. In the last 40 years, Eastern Europe did not experience an increase in light manufacturing industries, but kept focusing on heavy industry due to the centrally designed directives of the authoritarian administration. This limited sector may also have resulted from the fact that Eastern Europe was isolated from the technology developments occurring in this sector in the West during the last decade. However, this dearth in the domestic environmental products sector may also reflect the lack of demand for such products.

Nevertheless, by far the greatest number of domestic environmental equipment suppliers serve the water and wastewater segments since the governments' environmental strategies included massive investments in municipal and industrial wastewater treatment to provide cities and industry with water of sufficient quality for use. In addition to packaged

treatment plants, other equipment priorities include sludge dewatering and control equipment, and systems for wastewater treatment plants.

Figure 3.2 depicts the distribution of environmental products and service companies in Poland by area of interest. This summary reflects data from the United Nations International Development Organization (UNIDO), Polish Foreign Investment Agency, Polish Ministry of Industry, and Polish Commercial Counselor's Office in New York. It also includes data from available published surveys. The information is probably not complete, but it represents the current structure of the domestic environmental products and service sectors in Poland.[67]

In Poland the current production of equipment for waste water treatment plants meets some 50% of the needs. Production of installations for mechanical treatment of waste water is the most advanced. The low quality of equipment for the biological part of the treatment plant is often a cause of break-downs.[68]

Although the data for the capacity to install waste water treatment plants and equipment in the CSFR and Hungary is not available, there is strong evidence that the general picture resembles the Polish situation.[69]

What kind of equipment and which services therefore have to be provided by foreign enterprises?

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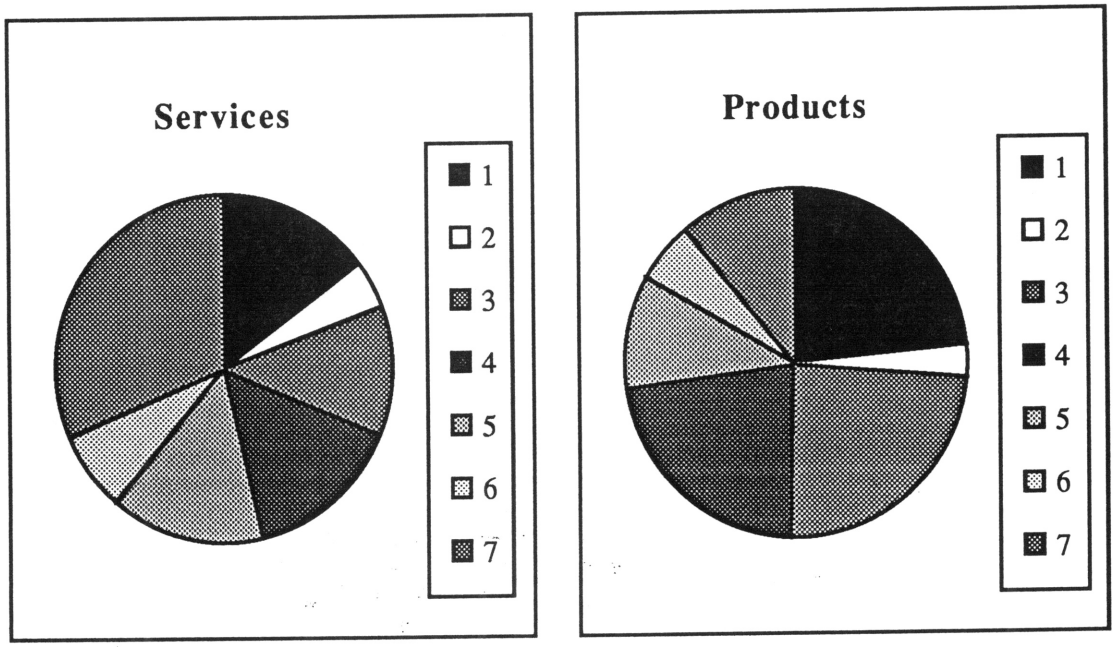
[67] TMS Management Consulting, *Domestic Environmental Products and Services Sectors: Poland - An Assessment of the Current and Future Potential*, U.S. AID, October 1991

[68] EKONO Environmental Technology, *Market Opportunities in Environmental Goods and Services Poland*, International Finance Corporation, February 1991

[69] Euroconsult, *Identifying Market Opportunities in Environmentally Oriented Goods and Services: Hungary*, International Finance Corporation, March 1991

Figure 3.2: Environmental Business Sectors in Poland

	Sector	Services	Products
1	Air Pollution Control	17	42
2	Water Supply	5	6
3	Municipal Wastewater Treatment	14	43
4	Industrial Wastewater Treatment	17	40
5	Industrial Solid Waste	17	19
6	Municipal Solid Waste	8	10
7	Other	36	20
	Monitoring	9	13
	General Consulting/Products	23	7
	Environmental Engineering	10	-



Source: TMS Management Consulting, *Domestic Environmental Products and Services Sectors: Poland - An Assessment of the Current and Future Potential*, U.S. AID, October 1991

Need for International Goods and Services

International Services

Eastern Europe is considered a market of the future and international companies have been very active in the last few years to establish a strong base there. The initial euphoria vanished and many firms experienced that entry into the Eastern European market is a much more time consuming process than anticipated. Working there has to be considered as an investment for the future, maybe 5 to 10 years from now and beyond. The quick profits, especially in the water pollution sector, with Western state-of-the art technology were rare and were mainly achieved when international financial guarantees backed the projects. The financial insecurities proved to be large obstacles.

International services of course must complement the short, medium, and long term needs described earlier in the chapter and must be structured with respect to time accordingly. The consulting activities will continue to dominate in the next few years and the most important services which are not available locally or which require cooperation are:

- management services,
- information (experience) exchange,
- risk assessment, preparation of action plans,
- environmental auditing,
- general consulting activities (also on environmental legislation, policy, economics).

The importance of these services has already been described. The ideal case would be that these international activities include an educational aspect. This can be achieved through long term cooperation rather than through a one time study where the main goal of the international consultant is profit maximization. International agencies which are sponsoring such work should emphasize this essential feature.

Special education and training programs are included in the PHARE-program, the programs of the Regional Environmental Center for Central and Eastern Europe and are fortunately an important feature of many national, international, bilateral or informal initiatives.

International goods

Production of environmental equipment and complimentary goods is still in its infancy. The demand for almost all items listed earlier must be satisfied, entirely or partially, by international companies until local industry will have installed sufficient production capacity. In many cases even less than state of the art equipment and technology are attractive given the need to launch environmental protection as quickly as possible. The challenge to find cost-effective solutions and a wide array of difficult or unsolved problems (e.g. desalinization) allow international companies enormous latitude in offering creative, experimental technologies and equipment.[70]

In the short run the following will provide the best market opportunities
- monitoring systems,
- aeration equipment
- desalinization technology
- large variety of complimentary goods: automated control equipment, pumps, flow meters, warn systems, press, centrifuges etc.

In the medium and long run the market will shift towards
- Industrial and agricultural waste water treatment equipment, biological purification technologies in particular,
- Environmentally sound plumbing and piping
- Waste water recovery systems.

In order to facilitate international cooperation the laws on technology transfer have already been revised and changed. The fear that East-West cooperation would mean an

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[70] Bradecki, Jerzy, *Environmental Technology Needs of Poland-Finance Aspects-Going into Business with Polish Companies*, METALCHEM Co. Ltd, Gliwice, Poland, October 1990

influx of outdated, polluting, industrial technology in general is not justified, although environmental activists are of opposite opinion.[71]

[71] Reuters, *Environmental Groups Fear Impact Of East Bloc Reforms*, Reuters, December 4, 1989

Part II

ENVIRONMENTAL MARKET

Chapter 4

Environmental Market

The questions to be addressed in this chapter are related: first, is the type of environmental projects which have been or will be undertaken in Eastern Europe; secondly is the more general analysis of the environmental market in terms of its size and growth. The study of the projects will indicate the type, size, time frame involved and certainly relates to the critical financing aspects, whereas the market analysis together with an international comparison will provide a good estimate of how serious environmental issues were taken in the past and, even more important, what level of environmental investments have to be achieved to reach "sustainable development".

4.1 Projects

Completed and Initiated Projects

CSFR

Water treatment plants, projects, and investments have been made by the previous communist government. Jirat (1987) described the water pollution protection measures

implemented under the seventh 5-year plan. He concedes that no real improvement in water quality in the seventh 5-year plan was achieved. He attributes this to a restriction in construction work, shortages of materials such as organic flocculates and spare parts, continued use of obsolete plants (e.g., Plzen, Ceske Budejovice, Olomouc), and the admission that "organizations and enterprises continue to underestimate the importance of protecting water purity, and continue to breach regulations and norms." The 1983 Academy of Science report states that the construction of communal water filtering plants in the Czech Republic dropped during this period. Table 4.1 presents more recent water quality investment information indicative of continued "support" for water protection.

Table 4.1: Environmental Investments Related to Water Protection in the CSFR (in million KCS)

Year	Water Protection Action	Waste Disposal and Treatment Action	National Targeted Program	"Z" Programs (Community Improvement)
Czechoslovakia				
1986	1,606	590	463	93
1987	1,830	735	389	174
1988	2,206	787	548	296
Czech Republic				
1986	1,013	401	233	82
1987	1,145	485	120	134
1988	1,432	495	316	210
Slovak Republic				
1986	593	189	230	11
1987	685	250	269	40
1988	774	292	232	86

Source: Reproduced from: The World Bank, Czech and Slovak Federal Republic - Joint Environmental Study: Volume II, The World Bank, January 1992 [Adapted from "Selected Indicators" (Table 13), 1990]

In the 5-year plan period 1981-1985, 159 water purity projects were completed, along with 200 small water treatment projects mostly under the "Z" (community improvement) programs. A new washing line was completed in south Bohemian Paper Enterprise in Vetrni, and pulp plants were closed at Vratimov (north Moravia) and Hostinne (north-central Bohemia). According to Jirat (1987), these actions accounted for reducing BOD by 17 percent compared to 1981 values, and undissolved solid pollution (1987) was reduced by 17 percent in the Czech republic. These figures are estimates, but seem to be confirmed by the monitoring data.

The 1983 and 1989 Academy of Science reports state however that, in spite of all fees, fines, and investments in water treatment projects, water pollution control has not been successful.

The most important wastewater treatment plants started in the Czech Republic include:[72]

- National Committee Projects:
    1) Prague-Horni Pocernice
    2) Tabor-Sezimovo Usti (south Bohemia)
    3) Klatovy (west Bohemia)
    4) Louny (northwest Bohemia)
    5) Chrudim (east Bohemia)
    6) Pec pod Snezkou (northeast Bohemia) and
    7) Spindleruv Mlyn (northeast Bohemia)

- Ministry of Forestry and Water Economy:
    1) Cesky Krumlov (south Bohemia)
    2) Havlickuv Brod (east Bohemia) and
    3) Hulin (south Bohemia)

- Ministry of Health
    1) Olomouc in the Farmakon enterprise (north Moravia)

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[72] The World Bank, *Czech and Slovak Federal Republic - Joint Environmental Study: Volume II*, The World Bank, January 1992

- Ministry of Agriculture and Food
    1) Brezhad at a meat industry complex, and
    2) Opocno at dairy plant (southeast Bohemia)

- Ministry of Industry
    1) An underground protection project in Koramo Kolin (central Bohemia), and
    2) A waste water treatment plant in Jablonec and Nisou at Bizuteria enterprise (north Bohemia)

- Federal Ministry of Fuels and Energy, with three unidentified projects

- Federal Ministry of Electrical Engineering Industry, and

- Mohelnice at a MEZ enterprise (central Moravia).

Unfortunately cost estimates or financing plans are not available for these projects, but investments in water treatment facility account for the major share of all environmental investments. From 1986 to 1988 the annual environmental expenditures averaged 3720 million korunas out of which an average of 1880 million korunas or 50% were spent on water protection actions (compare tables 4.1 and 4.6).

Hungary

No adequate information could be gathered concerning the Hungarian activities in the recent past or present. Polish authorities on the contrary publish more information.

Poland

Water pollution control in Poland during the communist regime was not successful either. However, the National Environmental Policy approved by the Economic Committee

of the Polish Council of Ministers on November 19, 1990 outlines an ambitious program, which requires considerable political will, not to mention financial resources, to implement. In fact, it appears likely that resources will be sufficient for only a fraction of the proposals, and that the objectives of the policy may therefore not be met. [73]

The necessity of priortization resulted in the preparation of a list of 80 "highest threat" industries by the Ministry of Environmental Protection in 1990. These industries are usually large-scale, and pose transboundary or at least regional pollution problems of a multifaceted nature. Not all projects will be carried out as some plants will be closed due to the industrial restructuring. Furthermore the National Policy imposed a time limit which requires the programs to be implemented within 3-5 years, or the polluting production processes (including entire establishments) will be closed down.[74] No financial information is available to estimate the required resources, but many polluters are also included in the Environmental Program for the Baltic Sea (tables 4.2, 4.3, 4.4) which provides financial data.

Later on, the national list of 80 "highest threat" industries has been completed with regional ones, comprising about 800 industries in voivodships.

According to the report of the Supreme Audit Chamber, the clean-up obligations of the 80 largest polluters are duly fulfilled by 70% of industries involved. The industries devoted approximately 1,600 billion zloty (approx. US$150 million) from their own funds to environmental protection projects in 1990; corresponding expenditures in 1991 probably reached 2,000 billion zloty (US$180 million). As mentioned in chapter 2 some industries have been granted extensions or even exemptions from these environmental obligations which supports the forecast that the financial resources will not be sufficient.

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[73] The World Bank, *Poland Environmental Strategy*, The World Bank, April 1992

[74] Polish Ministry of Environmental Protection, Natural Resources and Forestry, *National Environmental Policy of Poland*, Polish Ministry of Environmental Protection, Natural Resources and Forestry, 1991

Table 4.2: Baltic Sea Program: Summary of Estimated Investment Costs for Hot Spots by Country

	Country	Costs	
		Preliminary Cost Estimates	$US equiv. (approx.)
		Million ECU	1ECU = 1.25 $
1	Belarus	31 (incomplete)	38.75
2	CSFR	113.6	142
3	Denmark	312.5	390.625
4	Estonia	1555	1943.75
5	Finland	424.7	530.875
6	Germany	360	450
7	Latvia	427.3	534.125
8	Lithuania	512	640
9	Normay	0	0
10	Poland	4043	5053.75
11	Russia (St. Petersburg Region)	1077.8	1347.25
12	Russia (Kaliningrad Region)	319.2	399
13	Sweden	451	563.75
14	Ukraine	214	267.5
	Estimated Total	**9841.1**	**12301.375**

Source: Conference Secretariat - Helsinki Commission, Background Document for the Baltic Sea Environmental Declaration 1992 - Diplomatic Conference on the Protection of the Marine Environment of the Baltic Sea Area, Helsinki Commission, April 1992

Table 4.3: Baltic Sea Program: Summary of Estimated Investment Costs by Program Element

	Element	Phase I Millions ECU	Phase II Millions ECU	Total Millions ECU
1	Policies, Laws and Regulations	5	5	10
2	Institutional Strengthening and Human Resource Development	70	140	210
3	**Investment Activities**			
A	*Point Source Pollution*			
i	Immediate Support and Warning Systems	50		50
ii	Municipal Wastewater Treatment	1000	2000	3000
iii	Combined Municipal and Industrial Wastewater Treatment	1600	4000	5600
iv	Pulp and Paper Industry Environmental Control	400	1000	1400
v	Environmental Control at Other Industries	300	1000	1300
vi	Solid and Hazardous Waste Management	200	800	1000
vii	Air Quality Management	460	1200	1660
B	*Non-Point Source Pollution*	800	2700	3500
4	Management Programmes for Coastal Lagoor and Wetlands	100	120	220
5	Applied Research	10	20	30
6	Public Awareness and Environmental Educati	5	15	20
	Total	5000	13000	18000

Source: Conference Secretariat - Helsinki Commission, Background Document for the Baltic Sea Environmental Declaration 1992 - Diplomatic Conference on the Protection of the Marine Environment of the Baltic Sea Area, Helsinki Commission, April 1992

Table 4.4: Baltic Sea Program: Summary of Preliminary Costs at Hot Spots in Poland and the CSFR

Priority Hot Spots	Location	Name/Site	Type	Total Cost Million ECU	Investment cost Foreign Million ECU	Investment cost Local Million ECU	Operating Cost Million ECU/Year
			Vistula River Basin/Baltic Coast of Poland (1)				
	Poland						
x	Baltic Coast	Kozalin	Municipal & Industrial	44.2	12.2	32	2.5
x	Baltic Coast	Gydnia-Debogorze	Municipal & Industrial	21	17	4	4.1
x	Baltic Coast	Gdansk-Wschod	Municipal & Industrial	129	41	88	7.3
	Vistula	Swiecie	Industry (Pulp & Paper)	13	5.7	7.3	1
x	Vistula	Bydgoszcz-Fordon	Municipal & Industrial	42.7	14.6	28.1	2.1
	Vistula	Bydgoszcz-Kapusciska	Industry (Chemical)	75	22	53	3.5
x	Vistula	Torun	Municipal & Industrial	95	27.7	67.3	7.3
x	Vistula	Wloclawek	Municipal & Industrial	31.5	11.4	20.1	1.5
	Vistula	Warsaw-Czajka	Municipal & Industrial	76	21	55	4.7
x	Vistula	Warsaw-Siekierki	Municipal & Industrial	119	36	83	5.6
	Vistula	Warsaw-Pancerz	Municipal & Industrial	232	75	157	11.6
	Vistula	Lublin-Haidow	Municipal & Industrial	18	7	11	5.2
x	Vistula	Krakow-Plaszow	Municipal & Industrial	95	32	63	7.6
x	Vistula	Krakow-Kujawy	Municipal & Industrial	100	31	69	5.4

Table 4.4: cont'd

Priority Hot Spots	Location	Name/Site	Type	Total Cost Million ECU	Investment cost Foreign Million ECU	Investment cost Local Million ECU	Operating Cost Million ECU/Year
x	Vistula	Katowice-East (2)	Municipal & Industrial	153	50	103	23
	Vistula	Jaworzno Organico Azot	Industry (Chemical)	1.7	0.6	1.1	0.1
	Vistula	Zgierz-Boruta Dyestuffs	Industry (Chemical)	3.5	1.4	2.1	0.3
	Vistula	Oswiecim-ZCHO Chem.	Industry (Chemical)	16.5	6.6	9.9	tbd
	Vistula	Zaklady Gorniczo	Industry (Metal)	7	2.8	4.2	1
x	Vistula	Agriculture/Livestock	Agricultural Runoff Prog.	1300	1150	150	tbd
	Vistula	Upper Basin (3)	Salt Control	tbd	tbd	tbd	tbd
			Oder/Odra River Basin (1)				
	Poland						
x	Oder/Odra	Szczecin	Municipal & Industrial	83.6	16.7	66.9	6.7
x	Oder/Odra	Szczecin	Industry (Fert, P&P)	13.6	2.7	10.9	1
	Oder/Odra	Poznan	Municipal & Industrial	128.8	25.8	103	10.3
x	Oder/Odra	Lodz	Municipal & Industrial	202.9	40.6	162.3	16.2
	Oder/Odra	Zielona Gora	Municipal & Industrial	38.8	7.8	31	3.1
x	Oder/Odra	Legnica-Glogow	Industry (N-Fer., Food)	108	44	64	tbd
	Oder/Odra	Wroclaw	Municipal & Industrial	149.7	29.9	119.8	12

Table 4.4: cont'd

Priority Hot Spots	Location	Name/Site	Type	Total Cost Million ECU	Investment cost Foreign Million ECU	Investment cost Local Million ECU	Operating Cost Million ECU/Year
	Poland/Germany						
x	Oder/Odra	Odra Lagoon Mgmt	Management Programme	20	5	15	tbd
	CSFR/Poland						
	Oder/Odra	Upper Basin (3)	Salt Control	tbd	tbd	tbd	tbd
	CSFR						
x	Oder/Odra	Ostrava	Municipal & Industrial	78.6	15.7	62.9	6.3
x	Oder/Odra	Ostrava Area	Industry (Chem, P&P)	35	7	28	2.5

(1) ... Air quality management programs for Poland and the CSFR are not included

(2) ... Cost estimates does not include industrial pretreatment costs which would be significant

(3) ... Figures for salt control programs will be added upon completion of studies of control alternatives presently being conducted with funding from PHARE and World Bank

Source: Reproduced from: Conference Secretariat - Helsinki Commission, Background Document for the Baltic Sea Environmental Declaration 1992 - Diplomatic Conference on the Protection of the Marine Environment of the Baltic Sea Area, Helsinki Commission, April 1992

Recent Water Protection Actions

There is some evidence of improvement as the years 1989 to 91 witnessed a reduction in the discharged volume of untreated sewage by about 20%.[75] There were about 900 treatment plants commissioned within this period, with total capacity of approximately 3 million m^3per day. From this number 300 plants with a capacity of 1 million m^3/day have been commissioned in 1991. There are about 800 treatment plants (mainly mechanical and biological) under construction, the capacity of which will amount to 8 million m^3/day. This includes 260 plants in towns; about 120 of these projects, the ones of fundamental importance for protection of Polish rivers, are being subsidized from the National Fund of Environmental Protection. Projects which improve the condition of Baltic waters win foreign support (see Action Program for the Baltic Sea). Altogether, the construction of about 20 modern waste water treatment plants is made possible by financial and technical aid from abroad. It is remarkable that only 6% (US$50 million) of the total environmental expenditures in Poland in 1991 was derived from foreign assistance. Chapter 7 will highlight this fact again.

It is estimated that, when all the waste water plants now under construction become operational, the total volume of sewage discharged without treatment or treated only partially, will be reduced by 35%. Since this is still not enough, great expectations are being associated with the implementation of the European Baltic Sea environmental program.

Progress has also been reported concerning the desalination of the Polish rivers. The first, modern installation for desalinization of waters from Debiensko mine is under construction with US technology and NFOS (National Fund of Environmental Protection). Other, less expensive methods are being studied at the same time. The method of pumping the saline water back into the ground seems most promising.

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[75] Polish Ministry of Environmental Protection, Natural Resources and Forestry, *National Environmental Policy of Poland*, Polish Ministry of Environmental Protection, Natural Resources and Forestry, 1991

Future Projects

The environmental programs for the Baltic Sea and the Danube River Basin (Black Sea) are the most comprehensive environmental action plans in Eastern Europe. They provide financial, institutional, and technical guidelines, a conceptual and time framework as well as the basis for international cooperation. The environmental declarations for the Baltic Sea and the Danube River Basin mention the following goals and principles:[76,77]

The objective is to establish an operational basis for strategic and integrated management of the Baltic Sea Catchment Area and the Danube River Basin, respectively, while focusing initially on priority environmental issues. The strategy is based on several key principles:

- The approach should be integrated - ecological systems approach.
- The approach should be participatory, and therefore must reflect the riparian countries' own priorities.
- The approach should promote a mix of actions in the public and private sectors.
- The approach should be coordinated.

Due to these principles and the collaboration of the international community with Eastern European countries, it is clear that the work plans for the Baltic Sea and the Danube River Basin provide good information for the future priorities and projects in Eastern Europe.

Baltic Sea Work Plan

The degradation of the Baltic Sea is described in chapter 2. The catchment area comprises 14 countries (table 4.2), but the lions share (more than 40%) of environmental

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[76] The World Bank, *Environmental Programme for the Danube River Basin - Programme Work Plan*, The World Bank, February 1992

[77] Conference Secretariat - Helsinki Commission, *Background Document for the Baltic Sea Environmental Declaration 1992 - Diplomatic Conference on the Protection of the Marine Environment of the Baltic Sea Area*, Helsinki Commission, April 1992

investments (total approximately US$12,300 million) to clean-up the "hot spots" in the catchment area must be undertaken in Poland according to the preliminary cost estimates. This agrees with the fact that Poland releases the greatest amount of contaminants into the Baltic Sea. The investments in the CSFR related to the Baltic Sea clean-up will be small, due to the small region in the CSFR which is part of the Baltic Sea catchment area.

Elements of the Action Program (table 4.3)[78]

Policy and Regulatory Measures

This component of the program focuses on putting in place the policies and regulatory measures that establish a long-term framework and system of incentives and legal requirements. This new policy and regulatory framework will lead to incremental improvements over a period of two decades or more. Some of the major initiatives are:

- Revise and harmonize environmental standards and guidelines on a regional and national basis;
- Implement the Polluter Pays Principle and adopt realistic user charges;
- Devise and implement effective systems and mechanisms for assessment and collection of local revenues to finance environmental improvements.

Institutional Strengthening and Human Resource Development

The strategy includes support for:

- Strengthened management and planning capacity of national and local environmental authorities;
- Support for development of effective water, wastewater and solid waste management utilities;
- Implementation of effective systems for environmental monitoring, data collection and analysis;

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[78] Conference Secretariat - Helsinki Commission, *Background Document for the Baltic Sea Environmental Declaration 1992 - Diplomatic Conference on the Protection of the Marine Environment of the Baltic Sea Area*, Helsinki Commission, April 1992

• revision of economic plans and management approaches with a view to restructuring industrial sectors to be more environmentally friendly;
• Case by case implementation of Best Environmental Practice and Best Available Technology;
• Expansion of applied research.

The costs for policy and institutional strengthening combined accounts for only 1.5% of the total estimated costs. It is interesting to note that almost all environmental financing efforts of international institutions have focused on these two elements since the political restructuring of Eastern Europe. For example, no major municipal or industrial wastewater treatment plant has so far been financed by the World Bank in Eastern Europe.

Investment

The program encompasses a multi-year investment plan of specific measures to control and manage point sources, non-point sources, and conserve environmentally sensitive areas and resources. The major constraint affecting the setting of priorities, and the choice and sequencing of investments, is the limited capacity to mobilize financial resources to meet capital and recurrent costs. Control of point sources will therefore focus on "hot spots", areas of acute environmental concern. Control of non-point source pollution, particularly from agriculture, forestry, transportation and products containing hazardous substances which might be disposed of in landfills or burned in incinerators, will be promoted by more effective regulation, appropriate systems of incentives, and expanded availability of effective low-cost technology for improved environmental management.

Investments for municipal and industrial wastewater treatment plants will account for 50% of total investments, reflecting the enormous costs of end-of-pipe water pollution control. The cost of non-point source pollution control must not be underestimated. They will account for approximately 20% of the total investments.

(a) Management programs for coastal lagoons and wetlands, (b) applied research, and (c) increasing public awareness, environmental education and political commitment form the

last three elements of the Baltic Sea action program. These three elements combined account for only slightly more than 2% of the total investment costs.

The expected timing and total investment costs will be as follows: Implementation of the entire long-term program is estimated to cost at least 18.0 billion ECU over a twenty year period. It will be implemented in two phases: the first phase (1993-1997) is estimated to cost 5.0 billion ECU; the second (1998-2012) is estimated at an additional 13.0 billion ECU.

The program will focus on 132 "hot spots". The "hot spots" and associated estimated investment and operating costs in Poland and the CSFR are listed in table 4.4. 38 "hot spots" are identified in Poland and the CSFR combined, out of which 21 are "priority hot spots". The total investment costs for the 38 "hot spots" amount to 4156.6 million ECU (compare table 4.4). 3375.4 million ECU will be necessary to accomplish the "priority hot spots". Foreign investment costs account for 44% of the total cost. As only 6% of the total environmental expenditures in Poland are currently financed by foreign sources this figure seems rather high.

The action program for the Baltic Sea neglects several key issues which characterize the Eastern European ability for pollution abatement. This might be done on purpose in order to accelerate the process, by spreading optimism, but could also result from the consensus which has to be reached with Eastern European countries. They often continue to think of environmental management quality as being expressed by the number of treatment plants. First of all, heavy investments in expensive municipal and industrial wastewater treatment plants are scheduled for the near future, without waiting for the economic restructuring to be fully implemented. Due to the financial constraints this seems inappropriate. Secondly, the investment activities account for 96% of the total costs. The need for improved management systems, research to develop inexpensive technologies and the essential role of public awareness as a market driver are being neglected in financial terms. Applied research for example is mentioned, but accounts for only 0.2% of the total costs in phase I. Thirdly, the importance of external assistance is overestimated. On the other hand one must of course acknowledge the initiatives to fight pollution of the Baltic Sea, and the essential efforts to coordinate a large number of countries.

It is however noted in the Baltic Sea declaration[79] that the absence of creditworthy borrowers, either sovereign or individual, constitutes a great challenge and threat to the timely implementation of the program.

Besides the listed elements complementary actions have to be taken: Funding of feasibility and pre-investment studies, which is not included in the financial projections is critical for the rapid implementation of the program. It is estimated that the initial sum required for the preparation of feasibility studies, including detailed environmental audits of industrial facilitates, will be approximately 30 million ECU. The launching of the feasibility studies for specific investments would be subject to decision on a case by case basis, after identification of a project sponsor with the necessary implementation and fund-raising capabilities, and an expressed willingness to undertake the project. The Danube River Work Plan concentrates in its first phase on feasibility and pre-investment studies to design an effective Strategic Action Plan.

Danube River Work Plan

The Danube River work plan although very similar to the one for the Baltic Sea in terms of goals and principles follows a different timing and has not scheduled major investment activities during phase I of its action plan. This fact accounts for the difference in financial requirements by 2 orders of magnitude compared to the Baltic Sea work plan (48 million ECU compared to 5000 million ECU!). Phase I is expected to last three years whereas phase II will require long-term cooperation. However no time period or estimated costs are mentioned for the second phase.

The Three Year Action Plan (phase I) will address amongst others the following issues in an integrated manner:

• Development of national Focal Points

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[79] Conference Secretariat - Helsinki Commission, Background Document for the Baltic Sea Environmental Declaration 1992 - Diplomatic Conference on the Protection of the Marine Environment of the Baltic Sea Area, Helsinki Commission, April 1992

• Pre-investment studies and complementary special studies to support the development of a Strategic Action Plan;
• Fact finding, institutional strengthening and human resources development activities, including:
- harmonization of legislation and standards;
- preparation of inventories of emissions and biological resources;
- short term action plans based on existing data (accident prevention, clean-up, high risk area identification, restoration, etc.); and
- strengthening and extension of monitoring programs, laboratory and data management facilities.
- establishment of networks of specialized institutions, experts and non governmental organizations.

Phase II of the program still has to be elaborated, but would include large scale investment activities, further institutional strengthening and continued human resource development. This phase would serve to implement the recommendations of the Strategic Action Plan and pre-investment studies prepared under phase I.

The proposed timing of the Danube River Basin work plan distinguishes itself from the Baltic Sea action plan. The three year period to design a Strategic Action Plan seems more realistic than immediate heavy investments. The realization of both action plans however is believed to depend strongly on international financing commitments. 83% (41 million ECU) of the required funding for phase I of the Danube River Basin will be in foreign currency(table 4.5)! The Commission of the European Communities, in its role as G-24 Coordinator, will take responsibility for the program coordination.

With a sense of the type, size, financing, and expected timing of environmental projects which are and will be carried out in Eastern Europe, the stage is set for a more general perspective: the size and growth of the environmental market in general.

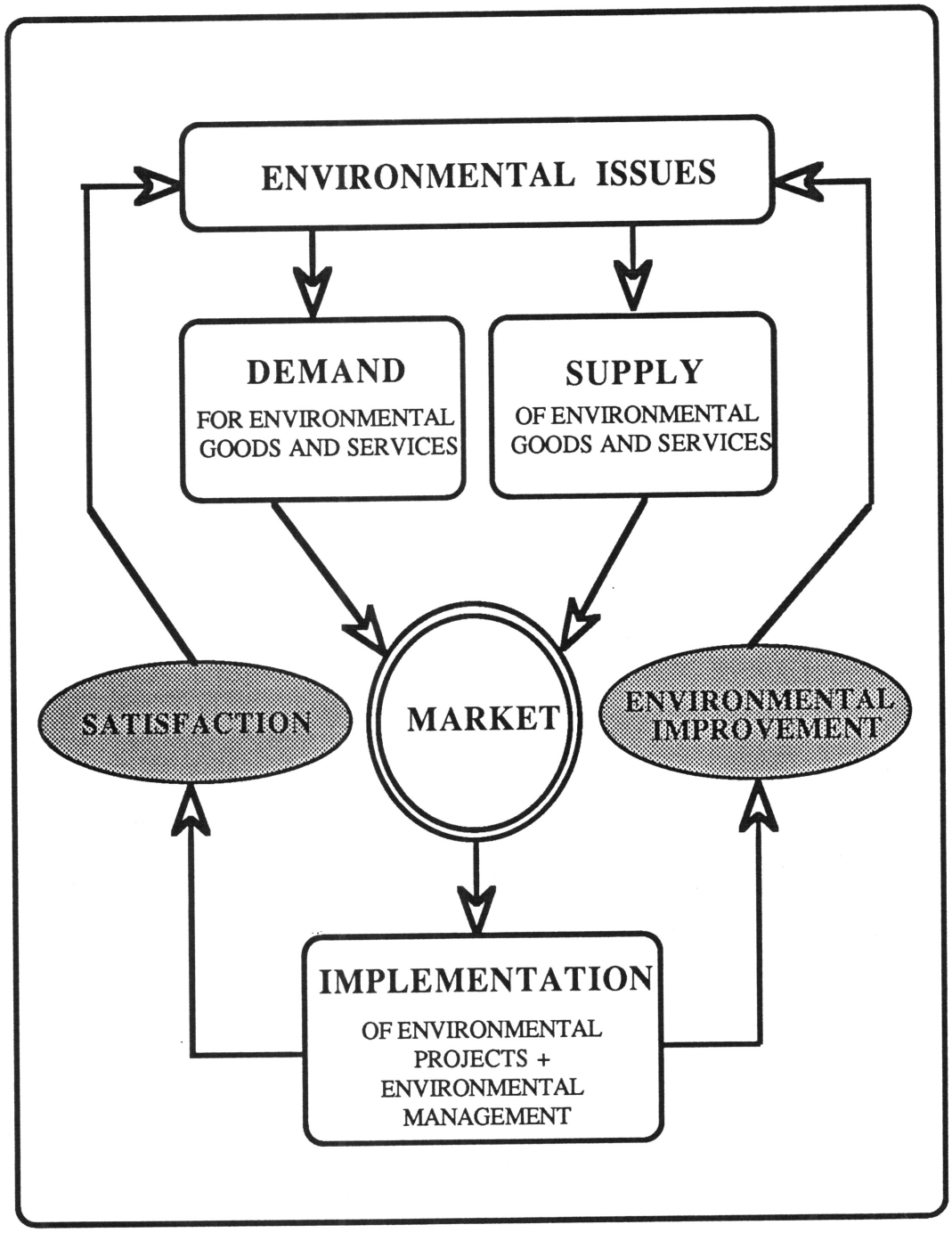
Table 4.5: Environment Program for the Danube River Basin: Indicative Comprehensive Budget - Phase I (millions of ECU)

Programme Element	Foreign Currency (1)	Local Curr. (2)	Total
1. Programme Coordination Unit	2	0	2
2. Short Term Actions (3)	1	1	2
3. Development of a Strategic Action Plan			
i. Strategic Action Plan	0.6	0	0.6
ii. National Reviews	0.1	0.5	0.6
iii. Inventory Studies	3.5	0.5	4
iv. Pre Feasability Studies for Priority Areas	5.6	1	6.6
v. Regional Studies	1.8	0.5	2.3
Subtotal	**11.6**	**2.5**	**14.1**
4. Analytical Tool for Planning and Management			
i. Regional Review & Meeting (4)	0.2	0.1	0.3
ii. Legislation and Standards	0.8	0.2	1
iii. Data Management	3.2	0.5	3.7
iv. Monitoring and Analysis	10.2	1	11.2
Subtotal	**14.4**	**1.8**	**16.2**
5. Strengthening of Networks, institutions, Huma Resources and Nongovernmental Organizations	6	1	6.2
6. Applied Research	5.5	0.7	7
7. Contingency and Administration	0.5	0	0.5
TOTALS	**41**	**7**	**48**
Available Funding	27	7	34
Additional Funding Required	14	0	14

(1) Includes 5.0 million ECU from CEC PHARE Programme as a projected allocation
(2) Includes contributions in kind and services
(3) Includes only costs for Accident Emergency Warning System
(4) Includes costs associated with September 1991 meetings in Sofia, Bulgaria

Source: The World Bank, Environmental Programme for the Danube River Basin, The World Bank, February 1992

Figure 4.1: The Environmental Market



4.2 Environmental Market Size and Growth

The emerging environmental markets in Eastern Europe mirror the state of the chaotic and rapid economic, social, and political transition occurring throughout the region. Characterization of these markets may be obsolete before they are complete and the relevance of the conventional "Western" market paradigm (figure 4.1) to these markets is questionable. The extent to which the demand generators, public awareness, environmental laws and policy (and their enforcement), and financing exist varies between countries and each component must be carefully considered when analyzing and characterizing the environmental markets in Eastern Europe's countries.

The approach of the thesis therefore does not follow figure 4.1 by analyzing the market as a consequence of the market driving forces, but rather discusses the market first. It seems more reasonable to determine the market size which should be aimed at in order to fight water pollution, first and then to derive the necessary forcing functions, market drivers and mechanisms, which will be discussed in the following chapters.

Past Environmental Investments and Projections for the Future

CSFR

Table 4.1 presents the environmental investments during the years 1986 to 1988. However, as stated earlier, in spite of the investments in water treatment projects, water pollution control has not been successful. Table 4.6 covers a greater time period. Public investment in environmental protection has averaged about 0.4 percent of GDP during the 1975-85 period, declining from 0.5 percent of GDP in 1971-75 to 0.3 percent in 1980-85. These figures, while not insignificant, are, however, below comparable public environmental investment levels in other Western industrialized countries where much of the investment burden is carried by the private sector. Furthermore, the institutional inability to set clear, sustainable priorities resulted in an investment portfolio aimed at treating symptoms, not causes of environmental problems - including, for example sewage

treatment, and particulate control on power plants rather than correcting pricing distortions. While environmental protection related investment expenditure were projected to increase to nearly 2 percent of public investments for the 1986-90 period and 0.6 percent of GDP, in the absence of improved macroeconomic policies, such investments can not be expected to have the desired effect.

Table 4.6: Investment in Environmental Protection in the CSFR

	1971-75	1976-80	1980-85	1985-90
Environmental Investments (billion Kcs)	8.2	9.7	7.5	18.3
Share of Total Investments (%)	1.35	1.27	0.92	1.92
Share of GDP (%)	0.5	0.4	0.3	0.6

Source: Reproduced from: The World Bank, Czech and Slovak Federal Republic-Joint Environmental Study, The World Bank, January 1992

As there is no complimentary information available explaining the figures, the method of derivation, or defining "expenditures" the numbers can only be treated as guidelines. Furthermore, due to the difficulties in converting the Eastern European currencies to US dollars the percentage-of-GDP figure seems more appropriate as a yardstick. The current commercial rate is 1US$ = 27.5 Koruna.

In 1991 the environmental expenditures amounted to $410 million, or 3% of the combined Czech and Slovak total budgets.[80]

[80] Cutter Information Corp., *Environment Watch-East Europe, Russia, Eurasia* , Cutter Info Corp., October 1992

Hungary

Environmental protection expenses also remained at a low level in Hungary (table 4.7). Throughout the last decade the ratio of environmental inputs to GDP did not exceed 1.0% and even declined in 1989 and 1990, due to the severe economic difficulties the country was (and still is) experiencing. The slow growth trend up to 1988 did not generally diminish environmental pollution because the economic structure basically remained the same and the terms of trade continued to worsen. Hungary and the CSFR have not published goals or estimates for future environmental expenditures, but it can be assumed that a strong growth trend will not be activated in the next one or two years and therefore, the environmental expenditures are expected not to exceed 1.0% in the near future. Water protection measures will continue to account for more than 50% of investments.

Table 4.7: The Ratio of Environmental Inputs to GDP and the Total Inputs from 1980 to 1990 in Hungary

Year	Ratio of Environmental Inputs	
	to Total Inputs [%]	to GDP [%]
1980	2.5	0.7
1981	2.2	0.5
1982	2.0	0.5
1983	2.6	0.5
1984	3.4	0.7
1985	3.7	0.7
1986	5.5	1.0
1987	4.8	1.0
1988	4.6	1.0
1989	4.5	0.9
1990	4.3	0.7

Source: The Government of the Hungarian Republic, National Report to the United Nations Conference on Environment and Development, The Government of the Hungarian Republic, December 1991

Poland

Due to Poland's size and population, and the the ambitious environmental goals the largest Eastern European market will emerge there. During 1985-90, environmental expenditures in Poland were relatively flat and averaged some 6500 billion zlotys annually (US$450 to 700 million, depending on the method of currency conversion). Expenditures in 1989 and 1990 were declining compared to 1985-87, but due to the governmental environmental efforts, expenditures in 1991 are estimated to have reached 10,000 billion zlotys which is about 1.25% of national income. Only 6% of this amount (US$50 million) was derived from foreign assistance. The majority of the funds came from the National Fund for Environmental Protection and Water Management (35-40%) and from industries and municipalities. Resources in the National fund are likely to decline in the near future because of decreased industrial activity, and the level of funding appears not likely to be maintained.

Poland is the only Eastern European country which provides somewhat reliable projections for environmental expenditures. The national Environmental Policy includes priorities for the medium- and long-term, with an implied cost that could exceed US$200 billion over the next 25-30 years. The costs for pollution abatement alone, excluding industrial and energy restructuring, have been estimated by the ministry of Environment at over US$70 billion equivalent. the Ministry proposes to spend almost 75% of this on water protection and 15% on air quality management (a large portion of which would be for flue-gas desulfurization.[81]

In the short-term the ecological policy from September 1990 estimates the total cost of the planned actions to be US$7,370 million during 1991-95 (Figure 4.2). The estimate for 1991 which amounted to US$1001 million was not reached, but still high compared to previous years as explained above. The numerous projects for water supply and water protection measures which the Polish government pursues as mentioned earlier in this chapter will account for more than 50% of the total environmental expenditures. Figure 4.3

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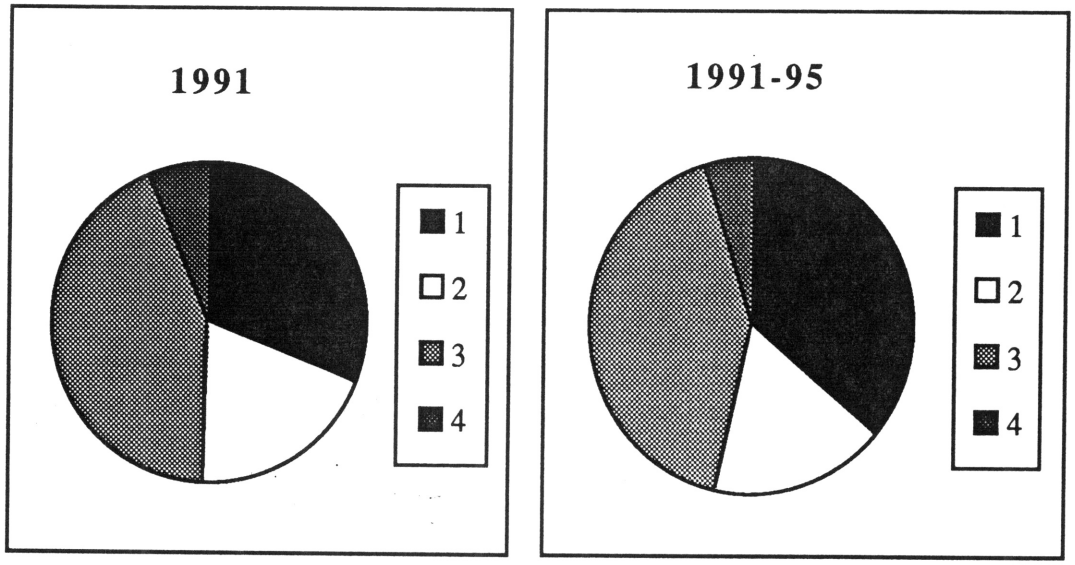
[81] TMS Management Consulting, *Domestic Environmental Products and Services Sectors: Poland - An Assessment of the Current and Future Potential*, U.S. AID, October 1991

provides a more detailed list of the environmental expenditures during 1991-95 and shows clearly the domination of the water supply and water protection sectors.

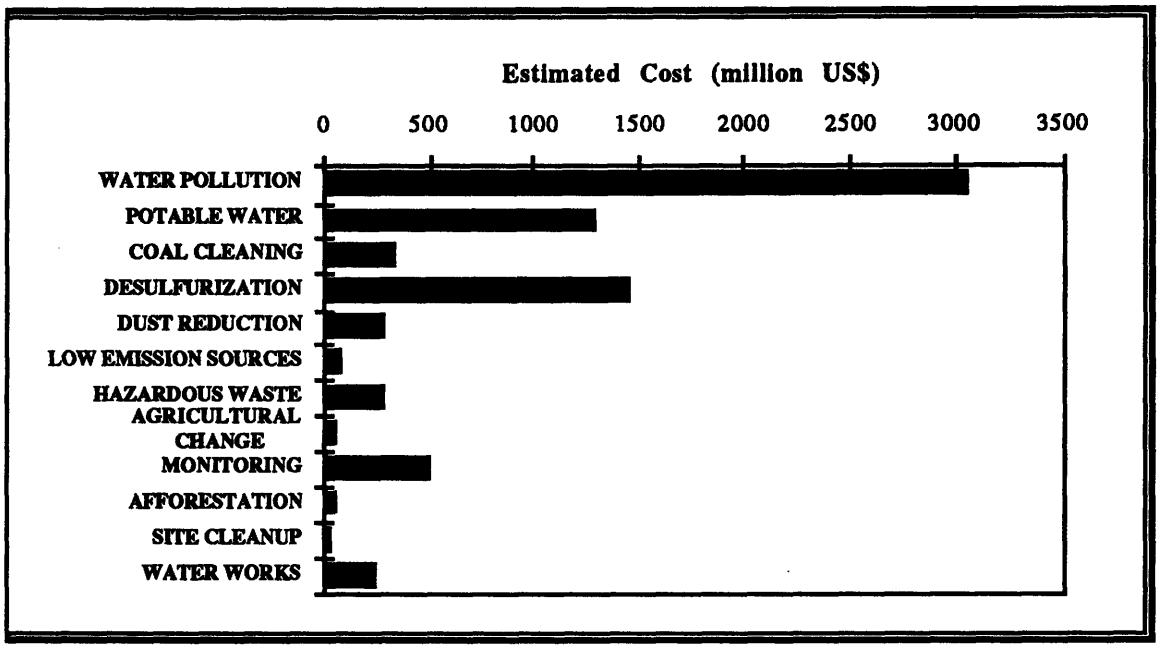
Figure 4.2: Estimated 1991 and 1991-95 Domestic Polish Environmetal Investments

	Sector	1991	1991-95
1	Air Pollution	313	2670
2	Water Supply	195	1290
3	Water Protection	430	3050
4	Industrial Waste	63	360
		1001	7370



Source: Reproduced from: TMS Management Consulting, Domestic Environmental Products and Services Sector: Poland, U.S.AID, October 1991

Figure 4.3: Distribution of Environmental Protection Cost in Poland during 1991-95



Source: Polish Ministry of Environmental Protection, Natural Resources and Forestry Protection, The State of the Environment in Poland - Damage and Remedy, Polish Ministry of Environmental Protection, Natural Resources and Forestry, 1991

Such ambitious investment programs must be appreciated and praised on the one hand, on the other hand it is doubtful whether the heavy investment path uses the limited financial resources in the most efficient way. As Eastern Europe lags behind western countries in their environmental activities, it is difficult to argue that many investments especially in the expensive water sector should be postponed until a sound, integrated, and comprehensive action plan has been elaborated. Nevertheless it is necessary to do so due to the financial constraints and to propose a more cautious, integrated, thus novel approach emphasizing management, institutional strengthening, or simply awaiting industrial restructuring, the later although the later might not have significant positive effects on water pollution. For many projects the human health and ecological risks in case of a clean-up deferment are low and the economic losses due to water pollution are lower than losses due to air or land contamination (see chapter 2).

Western Environmental Markets

A comparison of Eastern European environmental markets with western figures is useful, if not the only possible way to estimate the backlog in environmental expenditures to make up for the environmental neglect in Eastern Europe in the past decades.

However, the lack of a precise definition of the environment industry and market or statistical classification of its sectors hinders the description and analysis of market trends and makes an international comparison difficult. Such a definition could be "the costs incurred in preventing and modifying the emissions of pollutants to the environment as well as costs of either repairing the damaged environment or preventing future damage occurring".[82] Such costs, funded by either the public or private sector, could include the following components:

- The acquisition of plant and equipment, excluding major process plant engineering for pollution control purposes;
- The commissioning and installation of equipment for the purposes of pollution control (installation costs), excluding major civil engineering works;
- The operation and maintenance of pollution control plant and equipment (operating costs), including the payment of charges on the "Polluter Pays Principle"; and
- The funding of environmental protection and improvement schemes, including land use and nature conservation, environmentally sensitive agricultural practices, water quality improvement and urban environment initiatives.

The recognition of the environment industry as a separate industrial sector on an international basis will be increasingly important to analyzing developments and formulating relevant industrial and trade policies. Even though the validity of the comparison suffers somewhat due to the differences in statistical classification systems it provides important insight.

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[82] DocTer, *European Environmental Yearbook*, DocTer International, London,1991

Environmental markets in the western industrialized countries have grown steadily in the last two decades in real terms. The European market for environmental goods and services was estimated at US$54 billion in 1990 with Germany accounting for over 30 percent. The market consists predominantly of expenditure for water and wastewater treatment and air pollution control, but waste management and land reclamation are expected to become relatively more important. Overall growth is forecast at 4.9% per year with marked variations among countries. Southern European countries such as Greece, Portugal and Spain are projected to have the highest growth rates as they initiate compliance with EC environmental directives and standards. Environmental expenditures as a percentage of GDP did not exceed 0.5% in 1978 (no recent figures available) for these Southern European countries[83], whereas Germany, France, the UK, the Netherlands surpassed the 1% mark (table 4.8). The basic ranking order which puts water ahead of air, waste, and noise, is likely to remain unchanged for the foreseeable future, although future expenditure associated with waste is likely to become a larger percentage of the total, due to increased disposal and land contamination costs.

The market for water and effluents treatment plants and equipment is projected to have the slowest growth due to its current status as the largest market segment and the maturity of the technologies employed. However, continuing public concern regarding water quality and strict enforcement of water pollution control regulations should ensure future market growth of at least 4 per cent.

Within the water sector, higher than average growth is expected in new ground water clean-up systems such as computer monitoring, air injection and aerobic methods to remove contaminants. Wastewater treatment techniques, including secondary and tertiary treatment facilities and computerized instrumentation systems, should also show strong growth.

The American environmental market resembles the European market, at least West Germany's, in terms of market trends, market maturity, and basic ranking of water ahead of air, land, chemicals, and multimedia (table 4.9). In 1990 the medium water accounted for 42% of the total market. However EPA (Environmental Protection Agency) forecasts a slow decline of the importance of the water sector, meaning that just like in Europe, the growth rate for the water sector will be lower than the one for other media, land(waste) in

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[83] DocTer, *European Environmental Yearbook*, DocTer International, London,1991

particular. The total annualized costs for all U.S. pollution control efforts were $100 billion in 1990 and are expected to grow at 5.0%.[84,85] The annualized U.S. water pollution control costs are projected to reach $64 billion in the year 2000 (table 4.9).

Table 4.8: Capital plus Operating Expenditures as a Percentage of Gross Domestic Product (GDP) for some OECD Countries

Country	1975	1980	1985
Austria			
Non-household expenditures	1.09	1.13	
Finland			
Non-household expenditures		1.31	1.32
France			
Non-household expenditures		0.87	0.85
All expenditures			1.1
West Germany			
Non-household expenditures	1.37	1.45	1.52
Netherlands			
Non-household expenditures		1.11	1.26
United Kingdom			
Non-household expenditures	1.66	1.57	1.25
United States			
Non-household expenditures	1.6	1.6	1.44
All expenditures	1.87	1.83	1.67

Source: Carlin, Alan et al., Environmental Investments-The Cost of Cleaning Up, Environment, March 1992

[84] OECD, *The OECD Environment Industry: Situation, Prospects and Government Policies*, Organisation for Economic Co-operation and Development, Paris 1992

[85] Carlin, Alan et al., *Environmental Investments-The Cost of Cleaning Up, Environment*, March 1992

Table 4.9: Annualized Costs for all U.S. Pollution Control Efforts (in millions of 1986 US Dollars)

Medium	1972	1976	1980	1984	1986	1988	1990	1992	1994	1996	2000
Air and Radiation											
Air	7916	12528	17635	22109	25077	27238	27588	29692	34905	38212	44049
Radiation	18	158	219	215	355	353	441	525	613	705	896
Subtotal	**7934**	**12686**	**17854**	**22324**	**25432**	**27591**	**28029**	**30217**	**35518**	**38917**	**44945**
Water											
Water quality	9110	16125	22763	28700	32386	35241	38823	42571	46295	50085	57563
Drinking water	802	1294	1982	2586	2979	3250	3587	4319	4917	5684	6571
Subtotal	**9912**	**17419**	**24745**	**31286**	**35365**	**38491**	**42410**	**46890**	**51212**	**55769**	**64134**
Land											
RCRA (1)	8436	10389	13612	14737	17107	19388	24842	30139	31787	33106	38055
Superfund (2)				235	404	930	1704	2816	4050	5296	8093
Subtotal	**8436**	**10389**	**13612**	**14972**	**17511**	**20318**	**26546**	**32955**	**35837**	**38402**	**46148**
Chemicals											
Toxic substances (3)		9	429	245	402	456	600	960	1104	1174	1234
Pesticides	92	340	461	440	420	454	979	1170	1305	1407	1658
Subtotal	**92**	**349**	**890**	**685**	**822**	**910**	**1579**	**2130**	**2409**	**2581**	**2892**
Multimedia											
Subtotal	**108**	**729**	**868**	**657**	**918**	**1180**	**1603**	**1989**	**2065**	**2138**	**2298**
Total Costs	**26482**	**41572**	**57969**	**69924**	**80048**	**88490**	**100167**	**114181**	**127041**	**137807**	**160417**
Percentage of GNP	0.88	1.28	1.58	1.74	1.87	1.91	2.14	2.34	2.5	2.61	2.83

(1) Includes solid waste, hazardous waste, and underground storage tank costs in all economic sectors
(2) Program was not in existence until 1981
(3) Program was not in existence until 1974
Note: The projected costs assume the full implementation of pollution control programs

Source: Carlin, Alan et al., Environmental Investments-The Cost of Cleaning Up, Environment, March 1992

It is also expected that the percentage of total environmental expenditures to GDP will level off between 2 to 3% at the beginning of next century (table 4.9). Many analysts and environmentalists regard a percentage close to 3% as a realistic figure in order to achieve sustainable development. In this sense, the figure can provide a benchmark.

Evaluation of Eastern European Environmental Market and Comparison with Western Market

The figures reveal that western industrialized nations (of which the most environmentally concerned spend around 2% of GDP on environmental protection) as well as Eastern European countries (slightly below 1%) will have to increase expenditures in order to overcome an environmental crisis. It would be wrong to believe that the crisis has been solved in the West! On the contrary, a lot of money has been wasted there due to uncoordinated investment activities, heavy spending on end-of -pipe solutions, and environmental mismanagement in general, which was able to exist persist in the prosperous past.

It seems however, that Eastern Europe is about to commit the same mistakes as the West by neglecting new, more effective approaches such as relying on pollution control at the source, market mechanisms, well defined Strategic Action Plans to increase efficiency, support coordination and environmental management, and low cost solutions. Due to the exorbitant cost of water treatment, the water sector accounts for more than 50% of total investments, most of which are end-of-pipe solutions. All efforts have to be united to lower these costs which would free resources for land management, municipal and hazardous waste (accounting for only 6% of total projected expenditures in Poland from 1991-95), and air pollution control, areas which pose the highest human and ecological risks.

Polish sources certainly exaggerate the financial needs when stating: "Poland is so greatly indebted to its environment that in order to make up for the lost time it would have

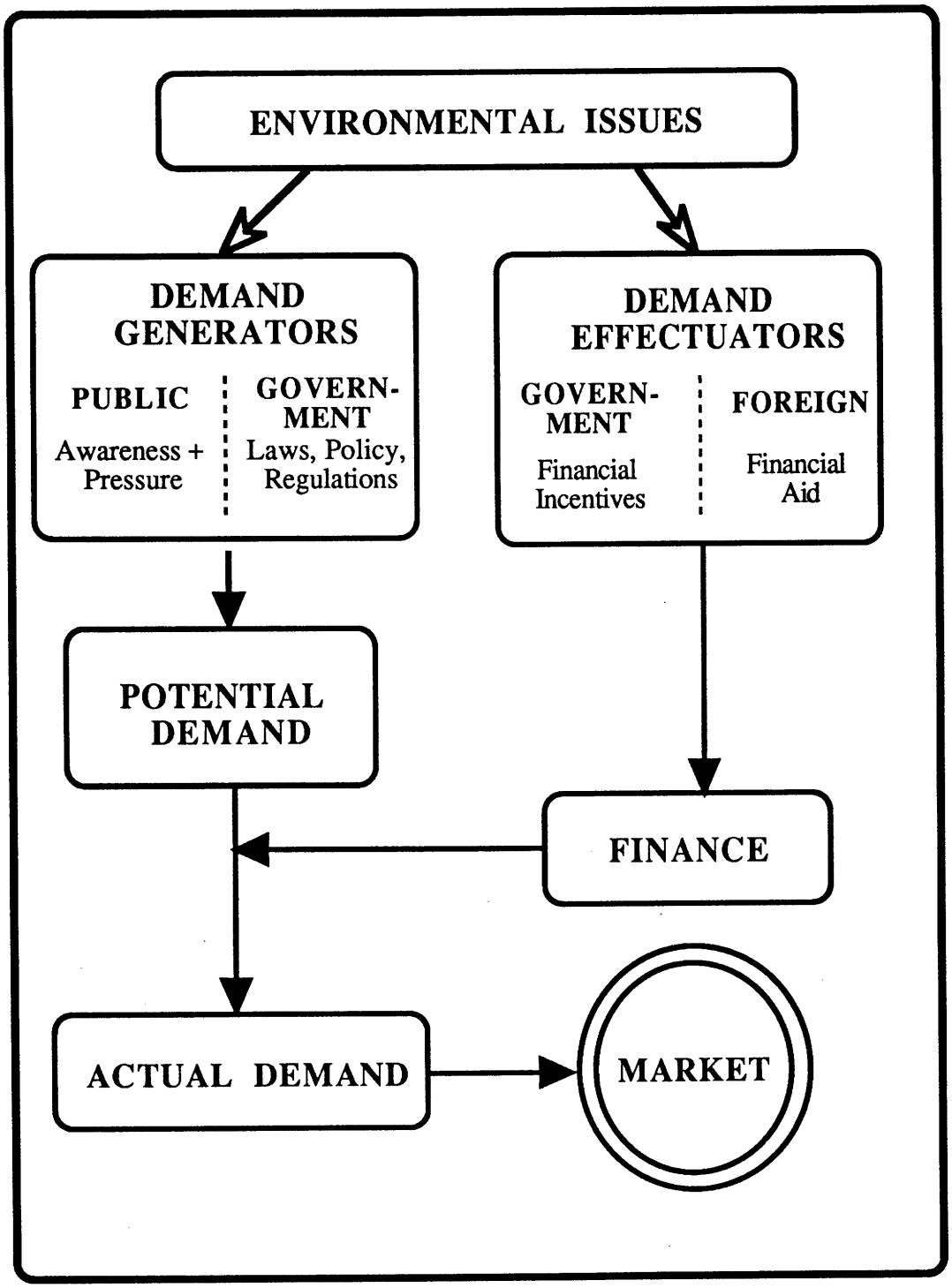
to spend up to 4-5% of our national income on environmental protection and the process would still take about 20 years".[86]

In order to be able to adopt to EC standards, which they are likely to use as guidelines, Eastern Europe will have to increase expenditures to at least 2% of GDP annually. Southern European countries will face similar challenges. Expensive water pollution control should be postponed wherever there are no immediate human or ecological threats until economic restructuring and improvement allows more financial flexibility.

In order to achieve such a goal, forceful market drivers (figure 4.4) have to be in place and they will be discussed in the following chapters.

[86] Polish Ministry of Environmental Protection, Natural Resources and Forestry Protection, *The State of the Environment in Poland - Damage and Remedy*, Polish Ministry of Environmental Protection, Natural Resources and Forestry, 1991

Figure 4.4: The Demand Side - Market Drivers



Part III

MARKET DRIVERS

Chapter 5

Economic and Political Aspects

This chapter will provide an overview of the most important industrial figures, the market reforms, and socio-political circumstances which relate to the environment. A general understanding of these factors is essential to the integration of environmental problems into the broader framework of challenges facing Eastern Europe. The chapter deals with all aspects of pollution and therefore provides a broader picture which points out the effect which macroeconomic restructuring will have on contaminant discharge loads. The chapter also discusses the strong links of public environmental awareness to the economic situation and finally the privatization process as an unexpected environmental driving force.

5.1 Industrial Figures

The Gross National Product (GNP) (table 5.1), the external debt (table 5.2) and the energy intensity (table 5.3) characterize the economic condition of Eastern Europe best and relate directly to environmental problems. The level of output could only be maintained by an excessive use of natural resources (energy in form of coal and oil, water), which were subsidized heavily.

Table 5.1: Industrial Figures

						for comparison:	
	Bulgaria	**CSFR**	**Hungary**	**Poland**	**Romania**	**Austria**	**France**
GDP (mill. $)	51200	123200	26086	70444	79800	117450	898438
global rank	37	20	53	31	27	21	5
GDP/capita ($)	5710	7878	2460	1860	3445	15530	16080
inflation (yearly) [1991]	298% (1990)		≈ 30%	>100%	0.8	3%	3%
unemployment	NA	6-10%[1]	4-6%[1]	12-15%[1]	4%		

1... estimates: world economic survey 1991

Source: The World Bank, World Development Report 1992 -Development and the Environment, Oxford University Press, 1992 - and -World Resource Institute, *The 1992 Information Please Environmental Almanac*, Houghton Mifflin, 1991

The per capita GNP[87] places the Eastern European nations in the middle income countries[88]. The difference in per capita GNP compared to Western nations reflects a major gap in productivity . But this situation might also result in an economic boom; However, this boom has yet to come and the current outlook for the near term does not promise very prosperous years. On the contrary the drop in economic activity in the region in 1990 was the worst since the period of stabilization after the Second World War.[89]

Czechoslovakia's and Hungary's economic contraction is milder than the one in Poland, which has been on the order of 10 to 13% in the last two years. Like all statistics about Eastern Europe, these figures are endlessly disputed and have to be taken with precaution.

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[87] The GNP figures vary considerably across different sources (compare figure 1.2). Inflation and monetary convertibility are the main sources of inaccuracies. The magnitude and the trend are of major importance here not a statistical analysis.

[88] The World Bank, World Development Report

[89] see world economic survey 1991, p34

The sharp decline of industrial output had several causes:

• First is the economic transformation process itself. Changes in the governmental management system, reorganization of State-owned enterprises, controversies about privatization could not but disrupt industrial growth. This came on top of already low levels of labor productivity associated with inefficient use of labor and capital, a remnant of central planning.

• Second, stabilization policies reduced the overall level of demand for domestic products and regional imports.

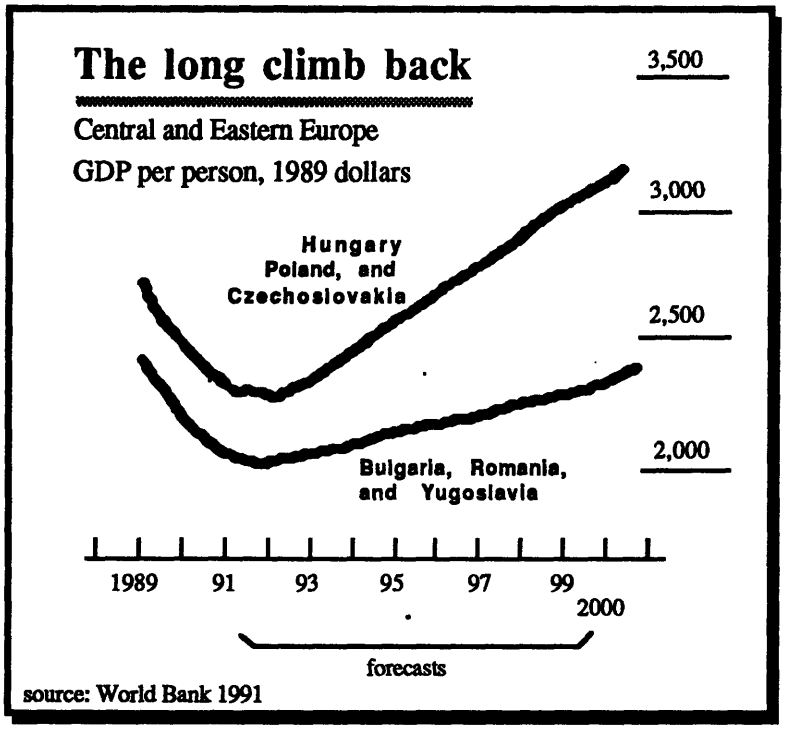
• Third, restructuring policies required substantial cuts in subsidies, raising costs and discouraging purchases from regional suppliers, especially for the output of heavy industrial enterprises.

• Fourth, the collapse of the trade and payments system used for transactions among the Eastern European countries, and with the USSR, severed traditional links between buyers and sellers.

• Fifth, bottlenecks in Soviet oil and raw material deliveries worsened an already precarious situation. Oil deliveries to Eastern Europe under long-term agreements were cut about 30 per cent.

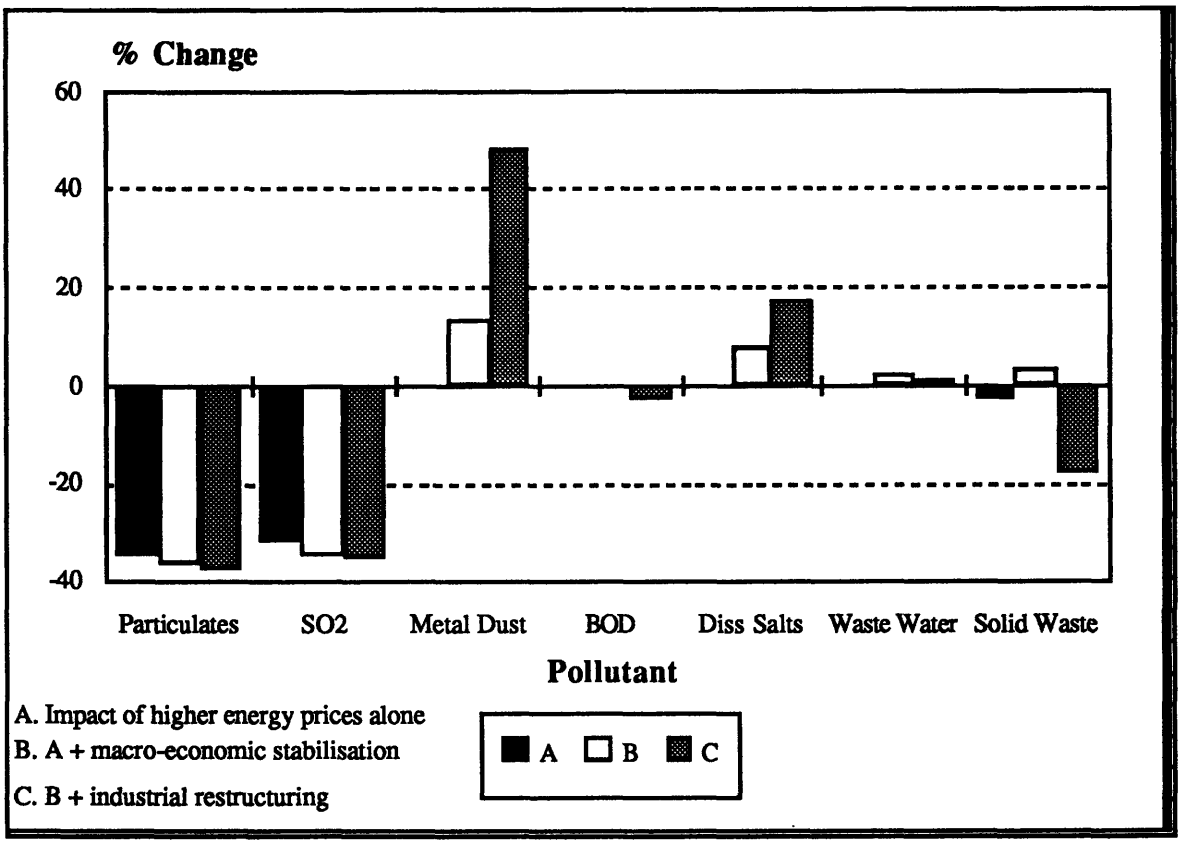
Eastern Europe is in the grip of a prolonged and savage recession. There are regional differences as explained earlier, but figure 5.1 summarizes the growth expectations for Eastern Europe as seen from the World Bank perspective. The World Bank predicts that per capita output in Eastern Europe may not recover to 1989's level until 1996 or later.

Figure 5.1



From the environmental perspective this output decline had very positive effects. The air quality in the coal mining and heavy industry regions of Poland and Czechoslovakia improved considerably over the last two years as factories were shut down. The least reliable and uneconomical factories and industries were also among the most polluting and wasteful of natural resources. Water pollution however is less affected by the economic restructuring since industrial sewage only decreases slightly, municipal sewage remains constant, and agricultural malpractices persist. An increase in energy prices to market levels, in particular, would have very positive effects on air pollution (figure 5.2), however higher energy prices will not create a safer water environment. Water fees have to be adjusted to realistic prices, which have to include not only the cost of supply, but also treatment costs. The elimination of the substantial subsidies which were always taken for granted during the communist regime, will meet significant public opposition, just as increases in gasoline prices in the United States remains a political taboo.

Figure 5.2: Sources of Changes in Polish Emissions up to 1995
(Change in Emissions as % of 1989 level)



Source: Hughes, Gordon, Are the Costs of Cleaning up Eastern Europe Exaggerated? - Economic Reform and the Environment, The World Bank, October 1991

In all Eastern European countries inflation is still destructively high, while unemployment (hardly existing under the communist regime) is rising rapidly (see table 5.1). The social stakes of the reforms will be discussed later together with other socio-political aspects.

This thesis builds in great parts on the financial constraints which Eastern Europe is experiencing. This constraint is best described by the level of indebtedness as indicated by the numbers in table 5.2: With the exception of the CSFR (where debt equals 16.7% of GNP) and Romania, all Eastern European countries are heavily indebted; Poland at 70.2% and Hungary at 82% of GNP. The burden which the indebtedness puts on the budgets is

heavy. The reader must be reminded that these GNP figures should be viewed with precaution due to the necessary currency conversion. However Hungary and Poland stand out as the most indebted countries of all.

Poland has sought debt relief on a large scale. On 1 March 1991, the Polish Ministry of Finance announced to the international press that it would not make payment on its interest arrears to foreign banks until they agreed to a major reduction of its debt. The arrangement for Poland is ground breaking. The Governments meeting in the Paris Club agreed to forgive half the $33 billion that Poland owes them, and the plan provides for a cut in interest payments by 80% between 1992 and 1994.

Hungary tries hard to maintain its creditworthiness by repaying debts, but illiquidity might become unavoidable in the near future.

Table 5.2: National Debt Related to Gross National Product in Eastern European Countries in 1990

($US Billion)

Country	Total External Debt	GNP	Debt/GNP (%)
Soviet Union	52.4	na	-
Poland	49.4	70.4	70.2
Hungary	21.3	26.0	81.9
Yugoslavia	20.7	59.4	34.8
Bulgaria	10.4	19.8	52.5
CSFR	8.2	49.2	16.7
Rumania	0.4	38.0	1.0

Source: The World Bank, World Development Report 1992 -Development and the Environment, Oxford University Press, 1992

Although energy statistics relate better to air than to water pollution they are included here, since an economic description of Eastern Europe without them would not be complete. The energy statistics disclose a major source of concern and environmental danger. The Eastern European countries are among the most wasteful users of energy (table 5.3). The energy intensity is five times higher than in the high income countries of the West, meaning that Eastern European nations use five times more energy for the same amount of national output.

Table 5.3: Energy Statistics

	Bulgaria	CSFR	Hungary	Poland	Romania
Energy production:					
solids (trillion BTUs)	479	1643	211	4500	709
liquids (trillion BTUs)	3	6	98	8	385
gas (trillion BTUs)	0	26	220	136	1050
biomass (trillion BTUs)	17	14	26	29	31
nuclear (gigawatt hours)	2695	24578	13889	0	0
hydroelectric (gigawatt hours)	2687	4274	155	3761	12627
Energy consumption:					
total (trillion BTUs)	1222	2589	1076	4795	2887
per capita (milliuon BTU	145	180	120	128	132
per capita (global rank)	23	16	29	27	26
Energy intensity:					
(BTUs/$1987 GNP)	47794	52278	51394	76374	56016
global rank	22	17	18	7	14

Source: The World Bank, World Development Report 1992 -Development and the Environment, Oxford University Press, 1992 - and -World Resource Institute, *The 1992 Information Please Environmental Almanac*, Houghton Mifflin, 1991

The predominant use of coal for power generation and heating fuel in Poland and Czechoslovakia caused the most severe air pollution in Europe, which is comparable to the situation in the coal mining areas of West Germany and the United Kingdom 20 or 30 years ago. Hungary, less dependent on coal, produces a fair amount of nuclear energy as does Czechoslovakia. However both countries have not developed their hydroelectric potential, but instead have canceled cooperation in a crossborder power plant project along the

Danube. Poland is not producing nuclear energy, which might be a relief for the West worrying about the safety of the reactors in Eastern Europe and the former Soviet Union.

In addition, the wasteful energy use creates severe economic and political problems during the current transition as all Eastern European countries are dependent upon oil and gas imports from the former Soviet Union (Russia). But Russia itself is experiencing supply constraints and has increased prices close to world prices. Eastern European countries can no longer take advantage of the favorable trading conditions it enjoyed through the CMEA.

5.2 The Market Reforms

There are two opposed views on how the transition to a market economy should be undertaken.[90] Both seek to end up with a new economic structure that has no inflationary bias. The first, strongly favored by the International Monetary fund (IMF), is to move as quickly as possible toward the new economic structure, the type of "shock therapy" that has been applied in Poland. The second path of transition entails a gradual movement to an economy with prices that are flexible enough to clear markets. In either case, a package of policies is involved, including:[91]

- price and trade liberalization;
- reducing the monetary overhang through sales of various State-owned goods and assets;
- dismantling monopolies and reducing State ownership;
- modernizing the banking system and introducing a capital market; and
- enhancing the convertibility of domestic money into hard currencies.

[90] see world economic survey 1991, p40
[91] world economic survey 1991

An important part of the reform strategies is the foreign financing approach. The Eastern European countries, with the exception of Czechoslovakia and Romania, are severely indebted and all countries in the region are now viewed as potential credit risks by bankers.

Poland

In the "shock therapy" applied in Poland, the authorities imposed a ceiling on wage increases, cut budget subsidies, enforced financial rules on firms (making bankruptcy a real possibility), raised interest rates, devalued the zloty against the dollar and deregulated numerous prices , among other measures.[92] State enterprises managed to bypass some of the reforms and competition and supply have to be bolstered, through more complete privatization and other measures.

Hungary

Hungary opted for a more gradual approach to price reform, believing that lasting improvements in the effectiveness of monetary policy were dependent on prior fundamental changes in the economic system. A legal framework for private economic activity was put in place. In addition, 90 percent of imports have been liberalized, putting competitive pressure on domestic producers and a new anti-monopoly law was enacted in 1991. Announced monetary and fiscal targets are followed, interest rates have been raised and wage increases are limited. Yet, as in Poland, the supply response has thus far been slow to materialize.

Nevertheless Hungary initialized economic and social reforms earlier than other Eastern European countries and in 1991 it was still ahead of them with market reforms (see figure 5.3)

Czechoslovakia

Czechoslovakia has committed itself to a strict monetary and fiscal policy and a fairly quick transition to a market economy. Some are convinced, that in a rigid economy like Czechoslovakia, expansionary policy cannot provoke a positive supply response. [93] Structural adjustment thus has priority. So far the banking system was reformed, new

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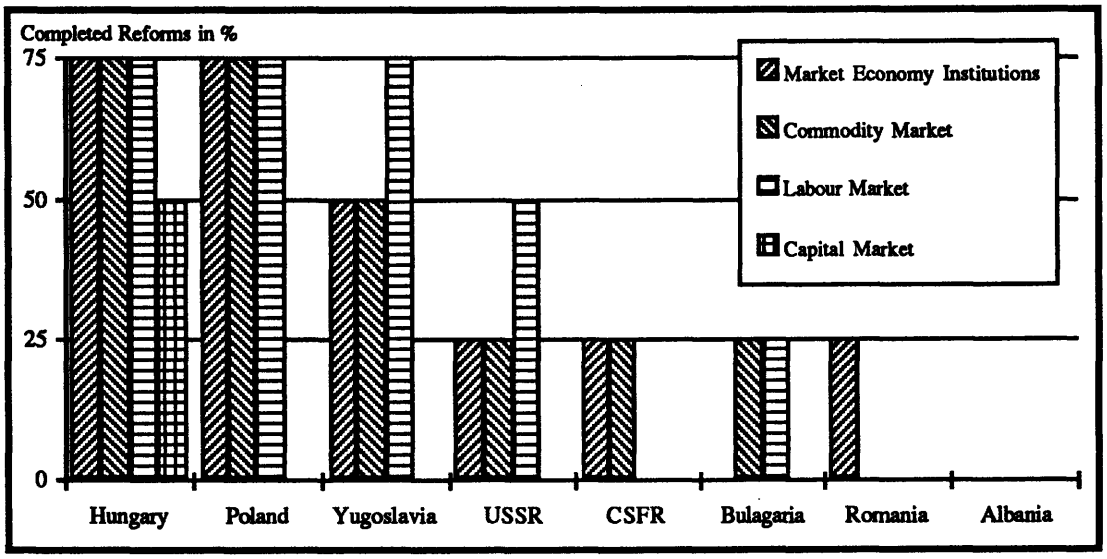
[92] see world economic survey 1991, p41
[93] see world economic survey 1991, p41

legislation supporting the private sector was initiated, money supply growth was kept around zero, the State budget moved into surplus, the national currency was significantly devalued several times, consumer and producer subsidies were cut and food prices were increased. Auctioning off State assets has been started, the implementation of privatization of large State enterprises is still slow, impeding domestic competition and supply adjustment. Although the speed of reforms in Czechoslovakia is not as breathtaking as in Poland, investors in general assess Czechoslovakia to be a safer ground than Poland, mainly due to its more favorable foreign debt position.

Figure 5.3: State of Market Reforms in Eastern Europe



Market Economy Institutions: inter alia: Reform of property, contract, and trade law (for example: privatization, liberation of foreign trade, price reforms); Reform of tax and social security system; Installation of commercial banking system and financial markets (i.e. currency convertibility, stock exchange opening); opening of the closed labor markets;

source: Süddeutsche Zeitung July 14th 1991

5.3 Political and Social-Political Aspects

A political discussion will be avoided in this thesis although the turmoil in Eastern Europe would foster a hot and lively exchange of arguments. The CSFR will split by the beginning of 1993, and the prior political struggle paralyzed the country. Economic and environmental issues therefore moved down on the priority list. Poland changes prime ministers, and therefore governmental policies positions more often than even Italy, hindering the continuity which is necessary for any politically productive at all. Hungary enjoys a somewhat more stable political situation, which might be the ultimate reason for the faster introduction of market reforms.

Therefore instead of analyzing political happenings alone, it is more meaningful to relate politics or social-politics directly to the environment. International politics and diplomacy plays an important role as the environmental discussion becomes increasingly global, as illustrated by the Baltic Sea Declaration and the Danube River Work Plan. Political relations have considerable influence on financing issues, debt-swaps, international financial aid, only to mention a few. Thus the focus here is on national politics, and two issues in particular which are important as environmental market driving forces: (1) environmental groups and public awareness and (2) industrial privatization. Environmental management tasks will be treated in the context of environmental legislation and policy.

Environmental Groups and Public Awareness

Perhaps the greatest omission in the past in Eastern Europe was a failure to recognize the importance of environmental concerns (which, for a long time, was also the situation in Western industrialized countries). However, in Poland and, particularly, the CSFR, concern about environmental problems began to be officially expressed in the 1970s and 1980s, although academic and non-governmental concern had been manifest before that. The turning point came after the Chernobyl disaster. The accident produced a wave of protests throughout Eastern Europe. As a result of this development, environmental organizations were mushrooming throughout Eastern Europe. They were and still are questioning the legitimacy of existing strategies of development and political

foundation. They became, in many countries, the first independent organizations to the challenge the communist party's monopoly of power. Events in 1989 in Eastern Europe indicated that these environmental organizations were in the forefront of revolution in most of these countries. In fact the "green" shell often camouflaged their political spirit.[94],[95] The fear of environmental groups that Eastern Europe will be flooded with outdated and polluting technology from the West has not come true.[96]

Although the number of environmental groups and green parties increases in Poland, the CSFR, and Hungary, in particular, public environmental awareness is still weak and certainly does not translate into a willingness to pay for a less polluted environment. "The majority of people don't want to (and certain social groups are not able to) make any more sacrifices for the sake of the environment at the expense of their declining living standards."[97]

A nationwide Polish survey, where 900 adults responded to face to face interviews in January 1992 points this out clearly:[98]

• Virtually no one in Poland cites the environment first when asked to name the most important problem facing the country. The Polish public is preoccupied primarily with the country's economic problems: seven in ten name either unemployment, the cost of living, order in the economy or economic reform as the most important problem.
• Nine in ten Poles judge the quality of the environment in their country as bad. A smaller majority say this is the case for their own community, The larger the city of residence, the more likely a Pole is to rate the quality of his or her immediate environment as bad.
• Despite a broad consensus that pollution is a serious problem and that it has a considerable effect on health, just one in four claims to pay much attention to environmental problems.

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94 Bochniarz, Zbigniew, *The Ecological Disaster in Eastern Europe: Background, Current Aspects and Suggestions for the Future* , The Polish Review, Vol. XXXVI1,1992
95 The Royal Institute of International Affairs -Energy and Environmental Programme, *Environmental Issues in Eastern Europe: Setting an Agenda*,World Conservation Union,1990
96 Reuters, *Environmental Groups Fear Impact Of East Bloc Reforms*, Reuters, December 4, 1989
97 International Environment Reporter, *Nations Urged to Revamp Prioities for Environment, Look at Low-cost Solutions*, The Bureau of National Affairs, Inc., January 15, 1992
98 Mac Iver, Martha A., *Public Opinion on Environmental Issues in Poland*, United States Information Agency Research Memorandum, April 1992

• Pro-environmentalism among the Polish public is higher among the well-educated and those with high political interest.

In the light of the gloomy economic condition, these results are not surprising at all. Didn't even the American president ease environmental legislation as one of several measures to spur the economy trapped in a "recession" of zero growth lasting for more than 2 years? In the short-run pro-growth might not be pro-environment, and if it is not in America how can we expect Eastern European to fulfill the essential shift in thinking that the environment and development are linked inseparably.

Privatization and the Environment

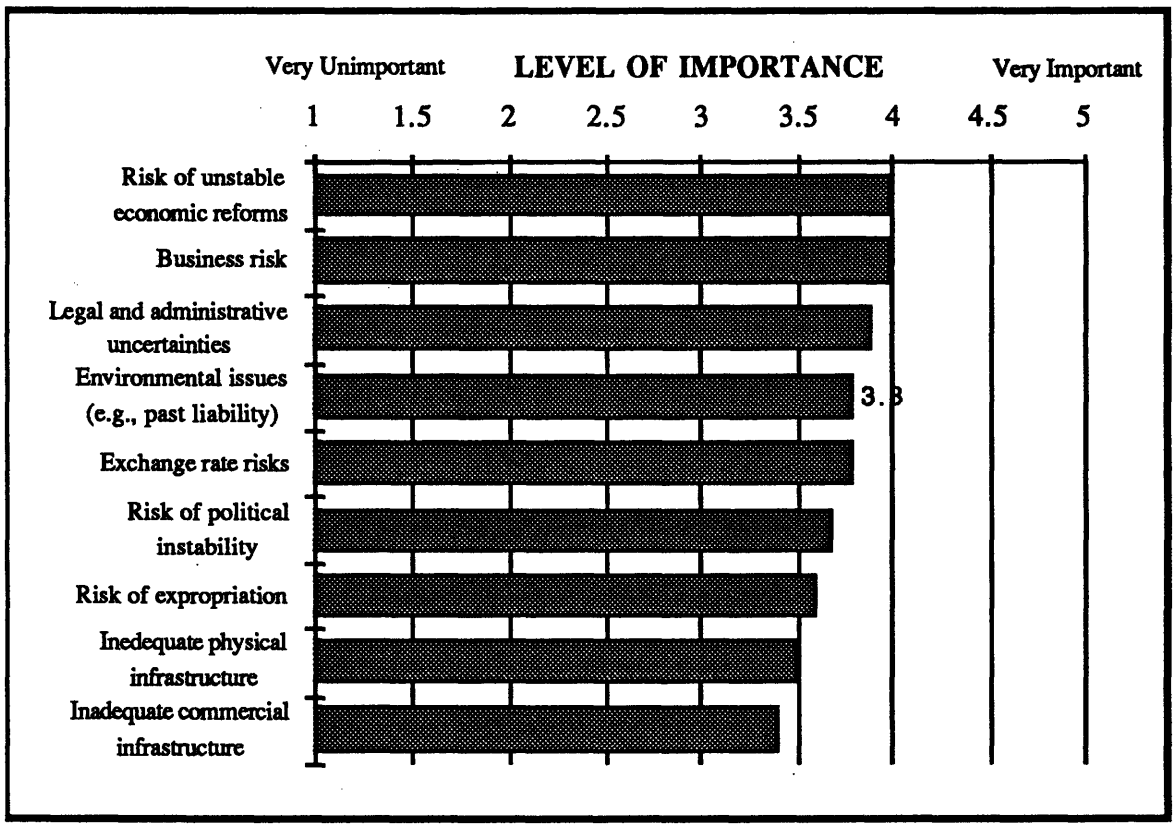
The governments in Eastern Europe are under pressure to make many substantial changes in a very short time. Consequently, environmental issues, including major policy issues, are being resolved concurrently with market reforms, and often within the context of specific actions, for example privatization transactions.

The privatization process requires considerable political, economic and social insight as past and future environmental liability have to be resolved and many other environmental issues arise such as law compliance, environmental fines and fees, technology transfer, necessary change in production processes, and so forth. However, there is no evidence that the ministries of environment were involved in writing the privatization laws or anticipated its importance to the environment. The privatization ministries were surprised when environmental issues were raised by prospective investors. None of the currently required economic and financial evaluations of firms that are being prepared for privatization seem to have been written with environmental costs or requirements in mind.

Nevertheless, the costs of environmental cleanups, potential liabilities, and compliance are significant elements in the total economic picture that must be considered in privatization. Although environmental concerns were first raised by potential foreign investors (figure 5.4), environmental uncertainties are of almost equal importance to local purchasers. There is evidence that the privatization ministries put pressure on their

environmental counterparts to ease environmental requirements in order to facilitate the selling of state-owned-enterprises.

Figure 5.4: Key Issues Impending Western Direct Investment in the CSFR, Hungary, and Poland by Rank of Importance



Source: 1992 World Bank/OECD Corporate Survey on western Direct Investment and Environmental Issues in Central and Eastern Europe

Privatization can act as a forceful market driver. Important steps in resolving the investors concerns are: Implementation of an effective and predictable system of environmental regulation; adding routine environmental audits to the analyses done to prepare enterprises for privatization. If sale prices for enterprises are adjusted to account for clean-up costs or costs for controlling future emissions, the purchase agreement must be backed by a system that ensures that the purchaser pays these costs and implements any agreements. There must be some assurance that the purchaser will perform the appropriate

duties. this is important from the point of view of everyone affected by the transaction-the government, the purchaser, other investors, and the public. Experience shows that even in a mature system of environmental regulation, the threat of enforcement is often necessary to assure compliance.

The privatization topic leads us directly to environmental legislation and policy.

Chapter 6

Environmental Law and Policy in Eastern Europe

Next on the list of major market drivers is environmental law and policy which is discussed in this chapter. first, the practice under the "old regime" is scrutinized, because lessons can be learned from it which applies directly to the new environmental management systems about to be designed and put into action. Secondly the emerging environmental law and policy is described and discussed, with emphasis on economic tools and institutional implications.

6.1 Law and Practice in the Communist Regimes

After the waves of industrialization during the 1950s, 60s, and 70s, environmental deterioration became more visible in more industrialized zones, affecting large urban areas and causing shortage of fresh water and crowding. A small but growing group of environmentalists vocalized their concerns This development, as well as some international initiatives motivated most socialist countries to establish environmental protection policies. Prior to that time, environmental policy as a separate part of socio-economic policy did not exist. It is worthwhile to note that the Eastern European countries started to address problems of the environment simultaneously with many of their West European counterparts.

Legislation and Standards

The law or legal instruments set the external framework for economic decisions. Legal instruments determine the permissible degree of economic or any other human interventions into the natural environment. Thus legal regulations determine the nature of exploitation and a degree of accessibility for different groups of users (urban communities, industrial firms, farmers) and indicate the responsibility of users, as economic units, to neutralize all negative side effects.

The highest level of environmental regulation in Eastern European economies is found in national constitutions. In the 1970s, many countries amended the constitutions to delineate state and citizen responsibilities for the national environment. For example, a paragraph in Poland's constitution reads:

"The Polish People's republic will ensure the protection and rational development of the natural environment, which constitutes both a national resource and part of the common heritage".

Apart from constitutional regulation, there are two principal kinds of regulation in Eastern Europe:

- Comprehensive environmental statues, or
- Regulations (acts, decrees, resolutions, etc.) and guidelines dealing with particular components of environment.

Poland and to some extent Hungary utilized the first type of regulation, whereas the CSFR adopted a system of regulations and guidelines.[99]

Poland

In January 1980, the Sejm (Polish parliament) passed the law on Protection and Development of the National Environment, ending fragmentation of environmental

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[99] Bochniarz, Zbigniew, *The Ecological Disaster in Eastern Europe: Background, Current Aspects and Suggestions for the Future* , The Polish Review, Vol. XXXVI1,1992

regulations. It also created the basis for rules governing the usage of environmental resources, as well as specified the rights and responsibilities of units exploiting the environment. The legislation protected all of the most important components of the environment, such as: air and waters, land and mineral resources, and flora and fauna. The law contained several kinds of instruments for environmental protection, as well as principles of environmental management organization and coordination. It also served as the foundation for other environmental regulations. In addition to this law, the Sejm passed two important bills in the 1980s: in March 1982 the Law on Protection of Arable and Forest Land,[100] and in July 1984 the Law on Land Use Planning, incorporating environmental problems into the national planning system.[101]

Hungary[102]

In 1976, the Hungarian Parliament passed the Act on the Human Environment.[103] This quite comprehensive piece of legislation protected air and water, land, landscape and urban environment, as well as fauna and flora. It did not however, protect health of the labor environment. The law provided general guidelines for organization of environmental protection and liabilities related to violation of the law.

CSFR

A different approach was taken in the CSFR. Environmental protection in the CSFR consists of over 300 laws, governmental decrees and ministerial guidelines.[104] Among them, the most important were: the Water Act of 1973, the Law on the Care of the Health of the People of 1966, the Law on Creation and Protection of Sound Living Conditions of 1966, the Law on Measures against Air Pollution of 1967, the Law on Soil Protection of 1966 (amended in 1976), the Law on forests of 1977, the Law on Forest Management of 1977, and finally, several laws on state protection of nature. Additionally,

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100 Dziennik Ustaw PRL (1982), No. 11, pos. 79

101 Dziennik Ustaw PRL (1984), No. 35, pos. 185

102 Hinrichsen, D. and Enyendi, G., eds., *State and Protection of the Hungarian Environment*, Hungarian Academy of Science, Ministry for Environment and Waste Management,1990

103 Magyar Kozlony (1976), No. 26

104 The most important were published in Sbirka zakonu Czechoslovenke Socialisticke Republiki (1956), No. 40; (1960), No. 166; (1966), No. 20 and 56; (1973), No. 138

environmental standards regulated air, water, and soil quality, as well as noise pollution and protection of flora and fauna.[105]

The trend in the CSFR is to replace many environmental laws and decrees with more comprehensive statutory law and simultaneously to create a central agency responsible for implementing environmental protection.

Experience with Environmental Planning and Economic Mechanisms for Environmental Protection

Besides regulatory measures, the Eastern European countries tried to implement over the last decades some form of environmental planning and economic instruments for efficient use of natural resources and environmental protection. In the past, environmental planning was limited to the problems of environmental protection encountered in development planning and in most Eastern European countries, environmental protection was made a separate component of central plans.

A number of similarities dominated these efforts in environmental planning. The plans were characterized by a lack of precisely formulated objectives for environmental protection. They were structured in terms of investment outlays and physical (natural) effects (e.g., a number of sewage treatment plants or their capacity), an approach characteristic of a bureaucratic and technocratic style of management. The description of Polish environmental accomplishments (several hundred sewage treatment plants, etc.) since 1989 still reflects this command style (see chapter 4). Planning tasks for environmental protection were usually regarded as less important than other tasks, especially those concerning production. It was often difficult to meet the requirements of investment in environmental protection (compare chapter 4), giving competing demands for labor and equipment. Finally these plans failed to create incentives for production units and individuals to engage in environmental protection.

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[105] Gottlieb, M. et al. , *The Czechosloval Socialist Republic* in Enyedi et al.

Pricing of Water Resources/Fees and Fines

Most Eastern European countries were far from realizing an effective pricing system for natural resources. For water resources, in the CSFR for instance, legislation required that charges for water use should have covered the total cost of water supply and protection. Water use and effluent charges were differentiated according to the location and quality of water.[106] In Hungary water charges were established in a similar way, but fines for the discharge of excessively polluted water were much higher than in the CSFR.[107] In Poland, waste water charges depended on the type and concentration of pollution, as well as on the quality of the surface water and were differentiated according to location. In Katowice voivodship, for example, waste water charges were 100% higher than average.

Example: The CSFR

As explained the CSFR adopted numerous pieces of legislation between 1965 and 1980 defining and setting ambient standards for most major pollutants. A number of these standards, such as the ambient water standards, were frequently more rigorous than those currently embodied in Western industrial countries' legislation. Although the CSFR had adopted pollution charges, fines and user fees, they played a marginal, if any, role in implementing the national ambient environmental standards. Revenues from charges, fines and fees were earmarked to finance environmental investments.[108]

Water pollution fees were established that allowed for discharge of wastewater (i.e., BOD, TDS, TSS, and oils) into surface water. Water permits are required and set forth the content and waste load discharged. If the permit is exceeded, an additional fee is paid that increases depending upon the level of pollution. The fees for polluting (total amount) have fluctuated from year to year, with an overall increase in the CSFR from 1985 to 1988 (table 6.1 XXX). This increase is due to the increase of fees from the Czech

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[106] Federal Committee for the Environment - Prague, et al., *State Ecological Policy*, Federal Committeee for the Environment - Prague, 1991

[107] Khozvaistvenny mekchaizm funktsionirovania stssiallisticheskkoi ekonomiki (Economic mechanism of functioning in socialist economy), Moscow 1982

[108] The World Bank, *Czech and Slovak Federal Republic - Joint Environmental Study: Volume I* , The World Bank, January 1992

Republic in 1988. Information on the number of enterprises paying the fees, the changes in amounts of fees, and differences between republics are not available.

Table 6.1: CSFR: Summary of Water Management Fund Fees for the Period 1985 to 1988

(in million Kcs)

Year	Total	Reimbursement for Water Pollution	Fund Application Total (1)
1985	1,104	1,022	1,049
1986	1,069	1,042	1,026
1987	1,129	999	1,131
1988	1,168	976	1,206

(1) ..... Further explanation needed

Source: The World Bank, Czech and Slovak Federal Republic - Joint Environmental Study: Volume II, The World Bank, January 1992

Table 6.2 XXX summarizes the reported number and amount of penalties or fines for water pollution during the period from 1985 to 1988. the number of fines rose 136%, with a 141% increase in the Czech Republic and 125% increase in the Slovak Republic. The average fine in the Czech Republic ranged from 23,000 to 34,000 Koruna (Kcs), or approximately $1,500 to $2,000, at the official exchange rate of 15 Kcs/$US in 1990, an amount far too low to be effective.

Table 6.2: CSFR: Summary of Fines for Water Management Violations for the Period 1985 to 1988

Year	Number	Total (1,000 of Kcs)	Average Penalty Amount (KCS)
1985	1,521	35,281	23,196
1986	1,737	50,590	29,125
1987	2,104	74,401	35,362
1988	2,065	70,058	33,926

Source: The World Bank, Czech and Slovak Federal Republic - Joint Environmental Study: Volume II, The World Bank, January 1992

Approximately 2,300 exemptions were granted between 1957 and 1970 to permit enterprises to release untreated wastes. These exemptions were often renewed indefinitely and were used to avoid necessary investments in pollution control (Albrecht, 1987).[109]

Critical Review

In practice, the principles declared have not been enforced and the system did (does) not work in the intended manner. The general political and economic targets have been in sharp contrast with the declared goals of environmental policy. The political leadership refused to take unpopular measures by reallocating economic resources for environmental purposes at the expense of living standards. On the level of environmental

[109] The World Bank, *Czech and Slovak Federal Republic - Joint Environmental Study: Volume I* , The World Bank, January 1992

policy there was no way to cope with paralyzing factors such as a sluggish market, overcentralized management, as well as the contradiction that the state as environmental authority is supposed to prevent its own companies from polluting and wasting resources.

"The lack of a local tax base meant that some local governments were highly dependent on one or a small number of large enterprises, which had direct ministerial support in their production efforts, for the resources required to fund the communal services provided locally. It was therefore almost impossible for the local administration to take decisive action against those enterprises to reduce the level of their emissions if the management of the enterprises were reluctant to proceed or felt that the economic penalty was excessive. The local officials were also entirely dependent upon the enterprise for information about the costs and economic penalties involved in reducing emissions, so that they were unable to challenge the position adopted by the enterprises. This lack of independent sources and information and assessment was replicated at the national level where ambient standards tended to set on an arbitrary basis without reference to any kind of cost-benefit analysis of alternative standards. The consequence of this uneven balance of information and responsibility was that unrealistic ambient standards were established giving the existing circumstances and the levels of resources available to reduce emissions. Local governments then felt obliged to agree to permitted emission levels which implied ambient concentrations of the main pollutants much higher than the national standards and levels which might have been regarded as economically reasonable."[110]

The system of fees and fines has not provided the intended incentive to cut emissions because enterprises were much more concerned to meet their production targets than with their financial performance. Indeed the price setting procedure meant that they were able in effect to build the cost of any fees and fines into the cost base that was used to determine the levels of prices charged by enterprises for domestic sales. Furthermore, the fees and fines have consistently been set at levels well below the average cost of reducing emissions and they have not been systematically adjusted to inflation so that they have been reduced to trivial levels in real terms over time, even though there was an initial incentive to reduce emissions.

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[110] Hughes, Gordon, *Are the Costs of Cleaning up Eastern Europe Exaggerated? - Economic Reform and the Environment*, The World Bank, October 1991

Many changes will be necessary to overcome these weaknesses, in fact the whole framework of environmental protection will have to change and the success of environmental policy will also depend upon progress in other aspects of institutional and economic reform.

Eastern European countries therefore are about to adopt a new environmental legislation system and a new, hopefully more efficient and effective, approach to environmental planning.

6.2 Creation of New Law and Policy Environment

The capital constraint (and the heavy indebtedness in the case of Poland and Hungary), together with a serious shortage of implementation capacity, implies an urgent need to establish priorities, which focus on: the ordering of policies, the timing of implementing regulatory instruments, and the sequence of investments to ensure the greatest benefits in the shortest time and at the lowest cost. A new legislative framework and regulatory system have to be designed concurrently with the implementation of Western market and political mechanisms. For instance, environmental constraints to the privatization process have to be overcome to encourage foreign and local investments.

Guiding Principles

A state ecological policy, elaborated, for instance in the form of a program, will define the particular aims which the society wants to achieve in various time periods, and will propose strategies for implementing these goals. The state, however, cannot bear the direct responsibility for removing the immediate causes of environmental destruction, as was the case when the governments in Eastern Europe made reluctant and unsystematic attempts within the centrally controlled system of the economy. This responsibility must be inseparably linked with production, consumption and other activities influencing the quality of the environment. Organizations as well as individuals must be aware of this responsibility, for only this can lead to the desirable changes in their conduct. Hence, the

state must create the conceptual, legislative, economic, institutional, and information resources which will serve as an incentive for organizations and citizens to care for their environment and to remove the "old" sources of pollution - and at the same time to penalize those who disturb the environment.

The basic goals for the changes being introduced on this global scale are outlined below:[111]

The environmental policy must

- be an integral part of an overall conception of development, and simultaneously,
- be in accordance with all international obligations,
- assure feasibility of duties imposed and practicability of rights granted,
- be clear and explicit in the language adopted.

The main principles which should govern the design of the advocated new regulatory framework are:[112],[113]

- The principle of universality of environmental protection, expressed by the unified imposition of duties towards all subjects, including administrative organs and any other organizational units and physical persons.
- The principle of sustainable development, demonstrated in particular by the concept that the duty of environmental protection cannot be treated as one which remains in conflict with the interests of the economy, but which constitutes an element of proper economic management.
- The principle of an integrated management system on the basis of cross-media scientific and economic analysis, as outlined in chapter 3.
- The principle of including the environmental protection requirements in planning activities.
- The principle of cost efficiency meant as the attempt to implement environmental goals at the lowest cost possible to the public under efficient application of market mechanisms.

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[111] Polish Ministry of Environmental Protection, Natural Resources and Forestry, *National Environmental Policy of Poland*, Polish Ministry of Environmental Protection, Natural Resources and Forestry, 1991

[112] Hinrichsen, D. and Enyendi, G., eds., *State and Protection of the Hungarian Environment*, Hungarian Academy of Science, Ministry for Environment and Waste Management,1990

[113] Federal Committee for the Environment - Prague, et al., *State Ecological Policy*, Federal Committeee for the Environment - Prague, 1991

• The principle of the polluter's responsibility for the infraction or menace to the environment incorporated into a diversified ans specific system of sanctions of civil, administrative, penal and labor legislation.
• The principle of active participation of citizens and public, non-governmental, organizations, expressed by various forms of public inspection of environmental protection, the universal right to advance claims aimed at abandoning violations against the environment, and the universal right of access to information about the state of the environment and the means of its protection.
• The principle of regionalization of environmental protection provided by the transfer of the majority of ruling rights to the local administrative organs and by leaving only the general, state rights, to the central authority.

The above principles are intended to establish an integrated, decentralized environmental management system. The realization of these principles will depend on an effective use of legal, administrative and economic tools coupled with an adequate institutional building to perform inspection, monitoring, information and enforcement tasks.

Adoption of EC Standards

It is possible in many respects to apply the experience from Western industrialized countries toward the solution of the problems in Eastern Europe. However, the Western system itself is far from being optimal and the same premises prevailing in the West during the times of environmental policy formulation and implementation do not apply for Eastern Europe today. Foremost among these differences: environmental policies in the West were developed at a time of relative capital abundance, and under the conditions of a more or less functioning system. The absence of a serious capital constraint in the Western industrialized countries in fact led to the application of relatively inefficient environmental policies which did not until recently make adequate use of the available market system. The environmental policy, especially in the case of water pollution control, relied entirely on very expensive end-of-the pipe technology.

Furthermore, many of the mentioned principles are not reflected in the environmental practices of the Western industrialized countries either. Only recently, there have been efforts to establish a more anticipative (as opposed to reactive) legislation on a

prevention rather than cure basis, or the concept of an integrated approach still is not well-rooted in the minds of the environmental administration, nor is the often used, but seldom practiced concept of "sustainable development".

Nevertheless, with the growing interaction of environmental experts from East and West, there is a tendency in Eastern Europe to try to adopt Western models virtually on a "first come -first served" basis, without a good understanding of the advantages and shortcomings of the different systems. Unfortunately, bilateral technical assistance arrangements may in some cases aggravate the problem - however well-intentioned they may be.[114]

Due to the slowly but surely emerging European common market, Eastern European countries, especially the CSFR, Hungary, and Poland have expressed their intentions to move towards adopting EC "standard". This has important implications that are frequently not well understood. The EC framework is more than simply a set of specifications of ambient and emission limits.[115] It involves targets (some of which are not specified in numeric terms) which need to be converted to workable objectives to be implemented over specified periods. To the extent the EC has established specific standards, these are usually associated with a lengthy phasing-in period with intermediate targets. In other words, the EC framework is as much a process as a product. An interesting conclusion can be drawn from the EC practices: It suggests that Eastern European countries can and should adopt the framework of EC environmental directives (EC standards for short) immediately and abolish the existing sets of standards - with the exception that the dates of conformance with certain specific EC directives be extended.[116] Although the environmental strategy of the EC needs further improvement the adoption of the framework by Eastern European countries makes sense as it ensures consistency with neighboring countries, takes the long-term goal of EC membership into account, but also allows an implementation of laws and standards in phases taking into account technical and economical feasibility. A distinction should be drawn between "new" and "existing" pollution sources. "New" sources, whether financed by the Eastern European itself or internationally, should be expected to comply immediately with all laws to the extent

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114 Ackermann, Richard , *Environmental Action Programme for Central and Eastern Europe - Environmental Policy Issues*, Background Note, The World Bank, April 1992

115 At least seven types of standards are diffentiated: Biological, exposure, envioronmental quality (ambient), emission, process/operating, and product standards, and standards for total emissions.

116 The World Bank, *Poland Environmental Strategy*, The World Bank, April 1992

appropriate, and should be required to receive a permit before beginning operation. Phasing should only apply to existing sources. Several criteria seem particularly important to the specific determination regarding length of phasing-in time. these are: nature and extent of the pollution threat to human health and the environment; technical and economic viability of implementing controls; administrative enforceability; and public demand. Effectively applying these criteria requires a mix of actions including risk assessment, identification and analysis of pollution sources, and economic analysis.

Economic Instruments

Since changes in economic policies and management currently underway, in particular the adjustment of prices for natural resources and energy, will not have major beneficial impact on the water environment, direct economic tools provide the only option to reinforce the regulatory measures. From an economic point of view, environmental protection is most efficient when its costs are internalized through competitive market pricing of goods. It is thus an attractive policy to estimate the cost of pollution control and clean-up associated with product development, then establish mechanisms for ensuring that those costs are included in the market price of industrial and commercial actions. An important first step in this approach is to identify and correct subsidies, non-competitive markets, or other policies which distort the relationship between market prices and environmental costs. While this should be done whenever possible, it often involves complicated analysis and market prediction.[117]

A more practical short-term approach for Eastern European countries would rely on a balance between use of market mechanisms and "command-and -control" methods. Marked-based instruments rely inter alia on pollution charges, tradable emission permits, deposit refund systems, taxes, tax credits and subsidies while command-and-control policies include inter alia emission regulations, regulations of processes as well as inputs and outputs, with fines and criminal penalties for non-compliance. Credible enforcement of environmental law is the bedrock of every environmental management system. Developing a strong enforcement system may be particularly critical for Eastern Europe given the history of the past 45 years, during which there was such a large discrepancy between

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[117] The World Bank, *Czech and Slovak Federal Republic - Joint Environmental Study: Volume I* , The World Bank, January 1992

strong laws and highly ineffective implementation. But before investigating institutional and organizational aspects, let us study the economic tools closer.

The extent to which Eastern European countries will rely more heavily on command-and -control tools over market-based instruments, and on a centralized versus decentralized environmental framework, will affect the overall cost the economy will have to bear and pace at which its environmental goals will be met. In Western industrialized countries it has been demonstrated that use of market-based tools, where practicable, ensures that Remediation is done at least cost to society as the costs of pollution abatement are shifted to the polluter. The more important of these tools are briefly described below.

Pollution Charges

Their effectiveness to change the behavior of polluters and to generate revenue for environmental protection will depend on the rate structure as well as on the efficiency of the collection. Pollution charges need to be substantially increased.

User charges

For instance, the current rate for drinking water for households and industry is generally below the operating and maintenance costs of the water utilities. This has resulted in a rather wasteful use of water in households, industry and the public sector, and thereby created excessive demand for costly water projects such as reservoirs, water delivery systems to shift water from one region to another. At the same time however, little notice was given to water quality and to the maintenance of water supply networks. Water rates will have to be raised to fully reflect delivery, treatment and opportunity costs, and consumption metered so as to lead to more efficient resource use.

In general the charge levels should be geographically differentiated to reflect the assimilative capacity of the environment an d at the same time be consistent with the regional environmental investment program adopted by the taxpayers of that region. In the event charges are set centrally there will be the real risk of over- or under-charging. It is

also evident that the particular level at which the charges, fines and fees will be set and gradually introduced, will affect the speed at which there will be compliance.[118]

Fines

Fines for non-compliance with environmental permits (levied on after-tax earnings, or in case of public sector from the budget) will also be earmarked for environmental expenditures. Fines should be set at levels which reflects their punitive nature for non-compliance and their possible direct negative ecological effects. They can be set ten times higher than respective fees.

Taxation and Subsidies

Fiscal policy, using broad-based taxes, could also be envisaged such as, a tax on the production of hazardous materials industries (as with the U.S. Superfund).

Subsidies are used as payments and financial incentives to support the goals of environmental policy when the existing system of economic and regulatory instruments is not sufficient to internalize social environmental costs into consumption and production decisions. Direct subsidies have been widely used in some Western countries for water treatment, and to promote "end of pipe" solutions. The experience from these countries shows that subsidies do not promote efficient environmental solutions. "End-of-pipe" solutions supported by subsidies do not alter polluter behavior and there is thus no incentive to seek environmentally sound technologies.[119]

Example: Poland - Charges and Fees

The Polish Environmental Policy, for instance, has included the market mechanism in its concept:[120]

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[118] This will only be true if direct and cross-subsidies are eliminated, State monopolies broken-up, and bankruptcy allowed for.

[119] The World Bank, *Czech and Slovak Federal Republic - Joint Environmental Study: Volume I* , The World Bank, January 1992

[120] Polish Ministry of Environmental Protection, Natural Resources and Forestry,*The Environmental Policy*, Polish Ministry of Environmental Protection, Natural Resources and Forestry, May 1991, p. 16

"During the process of addressing environmental problems that have built up over the years, the "polluter pays" principle will be applied with some limitations. The role of ecological charges in this case will essentially mean the collection of funds, which in turn will be used selectively, depending on the urgency of particular tasks, to co-finance environmental protection projects. For this purpose the rates of charges and penalties will be raised by 150% and the procedure of collection will be modified in such a way which would secure receipts at the level of 5.5 billion zloty in 1991." The word "billion" is used here probably in its European sense meaning American "trillion".

Let us scrutinize the numbers: The most important fee levels in 1991 are shown in Table 6.3. Premia of 40% and 25% are added to these fees for discharges into water quality I and II, respectively, while all fees are doubled for discharges in Katowice.\

Table 6.3: Basic Water Effluent Fees in Poland in 1991

Source	Pollutant	Fee [zl/kg]
Industrial plants	BOD	2,430
	COD	1,620
	Lead/Cadmium/Mercury	67,500
	Chromium (Cr3)	12,960
	Chloride salts (Cl)	810
	Ammonia/Phosphates/Nitrates	2,430
Mines	Chloride salts (Cl)	135
	Sulfates (So4)	135
Residential, Municipal & Social	BOD	200
	Total metals	3,375
	Heavy metals	5,625
	Phosphates	200

Source: Reproduced from: The World Bank, Poland Environmental Strategy, The World Bank, April 1992, Table C2

The general structure of the fees is similar to that operated in the Federal Republic of Germany. In Germany, conversion factors are applied to different types of pollutant to express them in terms of a standard damage unit. The conversion factors imply that mercury emissions are penalized at over 2,200 times the rate applied to the same weight of COD. The Polish fee structures for water, as well as air emissions do not penalize heavy metal emissions as severely as the German one; the ratio of the fees for mercury emissions to those for cadmium is 1, as compared with 5 for water emissions in Germany. For COD, the German charges were equivalent to DM 0.264 per kg in 1982 and increased to DM 0.88 per kg in 1986. At the current exchange rates, these were equivalent to zl 1,815 and zloty 6,050 per kg. as an illustration of the difference in the level of the emission charges between the two countries, the 1986 German charge for COD was 3.7 times the fee currently applied to emissions from industrial plants in Poland.

Pollution charges in the Netherlands are several times those in Germany and are certainly high enough to induce enterprises and other emission sources to make significant investments to reduce or eliminate their discharges. The level of charges in Southern European countries is not as elevated as in the Northern European countries. Nevertheless the conclusion is clear that fees for water pollution in Poland would need to be increased to between 10 and 20 their levels to provide an effective incentive to control water pollution.[121]

It is not possible to compute the total potential revenue from water discharge fees because detailed information on sources of discharges are unavailable. As an illustration, if the rate of zl 2,430 per kg were applied to the total volume of BOD emissions in 1984 (172,000 tons), the potential revenue would have amounted to zloty 417 billion (American) or US$38 million in 1991. This figure is only 1/10 of what the Polish government projected (zloty 5500 billion) for 1991 and trivial in relation to the magnitude of the discharges and the total costs of the industries and other institutions responsible for them. Even allowing for the decline in the real value of the fees since 1988, it is clear that they have been much too low throughout the last decade.

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[121] The World Bank, *Poland Environmental Strategy*, The World Bank, April 1992

The significance of water effluent charges relative to the value of gross output by industry is small, if not negligible, too. In one industry, paper and pulp, the potential fees for BOD discharges in 1988 amounted to zl 9.7 per zl 1,000 of gross output, but in all other industries the water effluent fees were less than 0.1% of gross output. For a small number of mines, the fees for saline water discharges are also potentially important, but even in these few cases the potential fees are relatively small compared with other costs. Similarly, the fees have been inmost cases well below the marginal costs of reducing discharges, so that again the incentive to invest in cleaning up the effluent from most plants has been small or nonexistent.[122]

Saline Mine-Water Discharges

As mentioned in earlier chapters, a solution to this problem would have a very significant impact on overall water quality in Poland. What are the environmental policy implications of this specific Polish problem? The objective of government policy should be to ensure that the managers of these coal mines have a strong incentive to act in a manner consistent with the general public. Targets for the reduction of saline water effluents could be formulated, but the most cost-effective method of meeting these targets will vary from mine to mine, so that key decisions should be taken by local mine management with access to such information.

Two economic tools are currently under consideration: The first relies on effluent fees that mines are required to pay for saline water discharges to a level equal to the total benefit of reducing water salinity. The second worth considering is the use of transferable discharge permits because the problem of saline water discharges from mines shares various characteristics with the successful, though limited, experiments in the use of transferable permits to control water pollution in the United States.[123,124]

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[122] The World Bank, *Poland Environmental Strategy*, The World Bank, April 1992

[123] Caldwell, Lynton K., *International Environmental Policy-Emergence and Dimensions*, 2nd edition, Duke University Press, 1990

[124] The World Bank, *Poland Environmental Strategy*, The World Bank, April 1992

Organizational Structure and Management Capabilities

Decentralization

After discussing the setting of laws and standards, their enforcement and its feasibility is examined. Coordination, information and international responsibilities have to be dealt with at ministry level. The question arises to what extent laws and standards should be established and enforced at the regional and local (community) level. Pollution control is more efficient, the closer to the polluter source, but there must be controls to prevent "pollution heavens". Decentralization, subject to binding national standards would enhance economic efficiency as the local authorities would be able to assess the priority problem and the pace at which these problems will be addressed. The ministries or national governments must set laws and standards to address pollution problems with possible transboundary effects, but to allow reasonable development of commerce. Local communities could develop stringent local standards, and other environmental protection responsibilities could be left to community authorities.

It is recommended that local governments have at least the following roles:[125]

- Supervision of water supply and sewage;
- Operation of non-toxic solid waste collection and disposal systems;
- Monitoring of local environmental conditions;
- Inspection of smaller enterprises.

A gradual introduction in the transition period of an integrated environmental management model assumes a move towards a decentralized economic system for environmental protection. Under a decentralized management model the use of basic economic instruments for environment protection would be determined by river-basin boards, a regional authority. Local communities would form eco-parliaments and decide on an environmental strategy for their river-basin. The pace at which they would decide to comply with national environmental ambient standards would in turn, influence the cost of

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[125] Federal Committee for the Environment - Prague, et al., *State Ecological Policy*, Federal Committeee for the Environment - Prague, 1991

pollution abatement, and reflect their willingness to pay through pollution and user charges. Since in the end the pollution abatement and the cleaning up of the environment has to be paid by the local communities, and this will have an impact on income distribution, the public approval for these actions must be obtained.

It is essential that river basin boards and local government units be assigned taxing authority or share the proceeds of national level environmental taxes and charges for the funding of water pollution projects.

Decentralization will not be an easy task but Western experience can prove its usefulness. In order to provide the required services regional and local authorities must have the technical and management skills which have been fostered in the West through two decades of environmental management. In Eastern Europe, authorities often lack the financial knowledge as they had no financial responsibility under the centrally and hierarchically controlled system and have no experience in handling information systems or cooperation with non-governmental organizations and the public, respectively. They must be able to set priorities for allocating resources and therefore need risk assessment skills. The staff needs training in legal and other dispute resolution procedures such as informal mediation.

There are many aspects to the institutional building: Information systems, links to other sectors of the economy (private, financial), links to restructuring, the role of non-governmental organizations, environmental assessment, project selection criteria, or priority setting criteria, among others. A specific example drawn from Hungary illustrates the complexities and difficulties inherent in institution building and restructuring.

Example: Hungary

Institutional Restructuring

In 1989 the water resources sector has built into it a strong environmental protection and regional development. This agency has taken responsibility for enforcing pollution controls from the agencies that formerly had managed water and wastewater and all other water resources. The regional development focus of the ministry also requires that it manage river quality in basins through its regional environmental inspectorates and its nature conservation directorates.

Parallel to the overall decentralization and devolution of services, former government services such as water provision, state research institutes, and industrial ownership have been moved toward self-sufficiency, privatization, or devolution. Unfortunately, with all the movement and restructuring, confusion is occurring at operational levels. Individuals who worked for county water and wastewater companies, which operated as subsidized state enterprises, must now shift their loyalty to a municipal company or limited shareholding company that must operate to cover its costs. Moving towards financial and commercial operations is new. The process of billing and collecting, setting tariffs, and operating as a business without state subsidies has thrust new responsibilities on local institutions that have no experience in running water and wastewater companies to cover costs.

The discussion of the economic tools leads to the financing aspects and though they are put at the end, they are certainly not less important.

Chapter 7

Financing

Financing is the bottleneck of environmental market development! This chapter deals with the local and foreign sources of financing which are available or are being created for environmental investments. Concerning local sources of financing, this chapter examines the structure and level of charges and fines, and discusses the Polluter Pays Principle as well as the creation of environmental funds which are emerging as the main financing agencies during the transition period. A short discussion of the debt-nature swaps applied to the Polish debt leads to the description of the international commitment to environmental investments in Eastern Europe.

7.1 Financing - The Principal Constraint

Concern for the environment does not necessarily imply a budgetary cost to pay for: improving environmental management, establishing meaningful priorities for environmental policy, and making environmentally sound decisions during the course of economic restructuring which might reduce the cost of a clean and safe environment substantially.

However, it would be foolish to think that achieving sustainable development and correcting past environmental damages will be an easy path to follow, even though the

image of Eastern Europe as an entire environmental disaster zone proved to be exaggerated

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The magnitude of the environmental market size which should be aimed at, and its relationship to available resources are reiterated in the following paragraphs:

Environmental protection and remediation costs for Czechoslovakia can be expected to be in the order of US$50-100 billion, distributed over several decades. Similar estimates for Poland are respectively US$100 billion and US$20-40 billion for Hungary.

Assuming a 20 year time span to carry out the required investments, the annual resources available fall far short of the needs (US$2.5-4.0 billion for the CSFR, US$4.0 billion for Poland and US$1-2 for Hungary). Domestic resources available for environmental expenditures in 1991 were estimated to be about Kcs 8 billion (about US$ 300 million) for the Czech Republic and Kcs 3 billion (about US$110 million) for the Slovak Republic, which sums to a total of Kcs 11 billion (US$410 million) for the CSFR or about 3 percent of the combined total budgets, including resources of the Republic Environment Fund.[126] This amount of about Kcs 11 billion represents about 1.5 percent of projected GDP (which of course has declined dramatically due to the severe recession). 1.5 percent is less than the 2 percent of GDP rule-of-thumb, derived from a comparison with OECD member states. The most environmental conscious nations spent approximately 2 to 3 percent of their GDP on environmental protection, which might still be too low for sustainable development.

Total environmental expenditures in Poland are estimated to have soared and have reached 10,000 billion zlotys (US$900 million) in 1991, about 1.25 percent of GDP, but resources are likely to decline in the near future, so that the projected environmental investments of $US 7 billion in the period 1991-95 probably will not be reached.

More than 50 percent of the environmental investments in Eastern Europe are spent in the water sector.

The financial needs for environmental management and projects are enormous. But on the other hand, the dramatic economic restructuring has limited the creditworthiness, particularly of Hungary and Poland, and reduced the capacity to produce goods and services, even of such basic items such as energy, food, or medicine. Public willingness to

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[126] By comparison, the average cost of meeting EC environmental standards of a 400MW coal fired power plant has been estimated at about US$200 million.

pay for environment protection in many cases by reducing the standard of living therefore plunged.

The poor initial stage of Eastern European countries economies, unstable internal markets, tendencies to growing inflation, together with high debt ratios, do not provide much encouragement. Thus a clear conclusion emerges: financing is the principal constraint to environmental market development.

However, it would be wrong to overemphasize the need for external assistance. Only 6 percent of the environmental investments in Poland in 1991 was derived from foreign assistance. But before investigating international financing further, back to local sources of financing, which have already been touched on in the previous chapter discussing the economic tools of environmental policy are discussed. This time a slightly different perspective is highlighted.

7.2 Local Sources of Financing

The Government

The governments in Eastern Europe will need to adopt a number of strategies to finance the environmental expenditures and overcome the limitations of slow growth, tightly constrained budgets, and competition for limited financial resources from other important and productive sectors. These strategies may include the whole variety of sources of revenue: taxes and user charges; earmarked revenues from fines, permits, and user taxes on potentially polluting substances such as fertilizers and pesticides. The approaches to project financing must often be accompanied by policy and regulatory reforms that establish adequate authority, effective mechanisms and appropriate incentives.

The Industrial Sector

The greatest opportunity to shift the burden of environmental financing away from the public budget, and reduce the absolute cost of environmental management, is to

incorporate pollution control at the source into industrial privatization, restructuring and modernization process that is an integral part of the ongoing transition to a market economy. Of course these environmental investments are clearly conditional on each industrial enterprise's economic and financial viability. All investments in industry, including those for environmental improvements, are therefore largely determined by this restructuring process. In Poland the environment ministry has already partially exempted the chemical sector, for up to six years, from fines introduced in 1991 to encourage compliance with legislation.[127]

The Municipal Sector

Responsibility for key public services including environmental management is devolving to local governments. These changes have presented the municipal authorities with new requirements in terms of modern management in all technical and financial aspects of their operations. Collecting user charges following the Polluter Pays Principle (PPP) is one possibility of paying for at least operation and maintenance costs of environmental management facilities such as wastewater treatment plants. However, more innovative approaches such as joint ventures and long term concessions may be needed, at least for the mid-term, until users and local authorities are better able to support direct financing. The use of contracts between municipalities and private sector firms for the management and operation of water, wastewater and solid waste facilities presents an important opportunity to decrease demands on municipal government and improve performance.

It can be expected that as industry contracts or is restructured over the following one, two, three years the two major sources of revenue (public enterprise profit taxes and payroll taxes) will stagnate or even decline. Projected commitments to environmental investments are not likely however to much exceed the 1991 projected commitments.

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[127] Chynoweth, Emma, *Poland Seeks Solutions to Environmental Nightmare*, Chemical Week Associates, May 27, 1992

It is therefore essential that the resources generated from pollution and user charges be increased through higher charges and stricter enforcement in the coming years in order to meet financial requirements of environmental protection. This will reduce the pressure on general budget financing, while at the same time shift burden to polluters and thus encourage behavioral change. It should also be noted that, even if charges for air pollution or water fees were immediately increased by on average by about ten fold as seems necessary, their impact on the cost of production, and thus inflation, will be negligible.

Poland shall serve as an example.

Example: Poland

Poland officially adopted the Polluter Pays Principle (PPP) in November 1990. Under the Polluter Pays Principle, individual polluters are financially responsible for providing the equipment necessary to meet environmental requirements and for compensation for damages to the environment. There are, however, several limitations to the PPP. One is that it is enforcement intensive, and the institutional capabilities have not been developed to fulfill this task satisfactorily. It is difficult to monitor the discharges and expenditures of polluters, or potential polluters. Also some polluters lack the financial resources required to fulfill their individual obligations under the law. Lastly, it is difficult to make the current polluters pay for their past neglect.

Therefore, both equity and financial realism require public sources of funds to address certain environmental issues. In Poland, charges to current polluters provide funds to finance that portion of environmental restoration that cannot be adequately financed under the PPP. However, as polluters pay, the general taxpayer is relieved of the additional tax burden.[128]

It is difficult to apply the PPP principle for water pollution, as joint treatment activities are necessary. Therefore user charges will be the main source of financing for water. Such charges should be designed to ensure self-supporting water management systems at the regional level. The charges, fees and fines were examined in the previous

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[128] TMS Management Consulting, *Domestic Environmental Products and Services Sectors: Poland - An Assessment of the Current and Future Potential*, U.S. AID, October 1991

chapter where it was shown that they are still too low to stimulate water conservation, and do not provide necessary funds (table 6.1 and 6.2).

The single most important source of financing in Poland is the National Fund of Environmental Protection and Water Resource Management (NFEP): For 1990 the NFEP's special accounts for project financing were estimated (at that time) over 116.6 billion zlotys (US$12.5 million).[129]

In 1991 the funds skyrocketed, and 35-40% of the total environmental expenditures of approximately 10,000 billion zlotys (US$ 900 million) came from the NFEP. The rest was provided by industries and municipalities. 40% of the fees and fines are channeled to the NFEP to be recycled into environmental investments.[130] This led to some questions at the voivodship level about the efficiency with which the money is utilized at the national level. The National Fund (NFEP) has been used to make both direct grants, especially for water-related investments, as well as low-interest loans.

Caution may be called for in the area of water investments, where a special effort is required to ensure that the investments will indeed accomplish the intended objective. Therefore, cleaning wastewater before discharging it into highly polluters rivers may be of questionable priority. This is even more so due to the high costs of water treatment technology. The introduction of new institutional capacity and capability in the water sector should help clarify priorities in the future.

But the National Fund has also been used to initiate innovative and useful programs at the municipal level and has put pressure on local and regional governments to develop investment programs that are urgent and that at the same time will be self supporting in the future (through provision of revenue raising, etc.).[131]

The National Fund is the co-organizer and principal shareholder of the newly created Environmental Bank (a joint venture). The Bank is also providing loans for environmental investments, but functions as a regular commercial bank, as well, with

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[129] Bradecki, Jerzy, *Environmental Technology Needs of Poland-Finance Aspects-Going into Business with Polish Companies*, METALCHEM Co. Ltd, Gliwice, Poland, October 1990

[130] Polish Ministry of Environmental Protection, Natural Resources and Forestry, *Environmental Protection in Poland in the Year 1991*, Polish Ministry of Environmental Protection, Natural Resources and Forestry,December 1991

[131] The World Bank, *Poland Environmental Strategy*, The World Bank, April 1992

branches in the provinces. During the 1991, the Environmental Bank planned to issue loans amounting to as much as US$100 million equivalent, including subsidized loans for environmental investments - the subsidy of 20-80% being compensated for by the National Fund.

Providing subsidized loans may send many wrong signals, however. It eases the budget burden for enterprises since they can expect to get a refund of a portion of the fees and fines they have paid. It robs the provincial authorities of the possibility of pursuing a strategic program where on-budget grants via the National fund may be necessary, such as in the case of investments in water treatment. Subsidized loans can also provide an incentive to invest in expensive end-of-pipe equipment because it can easily be justified as "environmental", whereas it is hard to rationalize industrial process changes which are both economically and environmentally sound.

The environmental strategy in the CSFR and Hungary match the Polish example in several key areas: The financing of environmental policy should be based as much as possible on the Polluter Pays Principle, with exceptions in the transitional period, and national funds have been established as major sources of environmental financing.

In the long run, the creation of environmental funds seems not desirable as it leads to an overdependence on the assumption that money is readily available for environmental clean-up.[132] An October 1991 workshop in Budapest, organized by the Hungarian government, OECD, and under the auspices of several UN economic advisory groups as well as subsequent meetings during 1992 reinforced this conclusion.

One specific Polish source of financing was created through debt-for-nature swaps. The examination of this arrangement will lead us to the eastern European environmental commitment of international financial institutions and foreign .

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[132] Cutter Information Corp., *Environment Watch-East Europe, Russia, Eurasia* , Cutter Info Corp., June 1992

7.3 Debt-Nature Swap

As mentioned earlier, the national debt of Poland and Hungary has reached US$ 50 billion and US$20 billion, respectively. As has happened in the past, a combination of foreign and national institutions can use large foreign debts for debt equity conversions or "debt swaps". The "Bolivian debt-nature swap", performed by the World Wildlife Fund and the Conservation Foundation is a well known example. They succeeded in buying Bolivian debts for only a fraction of the official value, since the creditors had little faith in their debtor's ability to repay the loans. After acquiring these rights, they agreed with Bolivian authorities that these debts were to be paid off in local currency to a domestic recipient organization, which in turn used the money for nature conservation purposes inside Bolivia.

In 1991, the Paris Club of western creditor countries agreed to waive at least half of Poland's official debt obligations of US$33.5 billion. Creditor countries agreed to consider a debt swap facility operated on a voluntary basis, the total amount on which could represent an additional 10% of the original (pre-reduction) Paris Club debt. The Polish Government would use this voluntary facility to implement the debt-nature swap program via a so-called "Environment Fund".[133] In principle, the 50% debt reduction provides US$350 million annually for the Environmental Fund.

The U.S. has already committed to an additional 20% debt reduction over and above the 50% provisionally agreed by the Paris Club, and the Polish authorities have decided in principle to use half of this unconditional incremental amount (i.e., 10% of outstanding U.S. debt), to contribute to the Environmental Fund. If all Paris Club creditors were to participate by providing an additional 10% debt reduction, this would give rise to an initial annual contribution of about US$120 million. This amount would increase over time in line with the annual debt service profile under the Paris Club.

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[133] Reuters, *Western Creditors Seek Polish Debt-For-Nature Swap*, Reuters, April 12, 1992

France and Scandinavian countries have expressed interest but there are no formal agreements yet. Poland's biggest creditor, Germany, has expressed no interest because of its obligations to clean up Eastern Germany.[134]

The four main priorities of the Environmental Fund will be developing projects to reduce transboundary pollution flows, reducing pollution in the Baltic Sea, reducing greenhouse gas emissions, and enhancing nature conservation such as protection of wetlands or primeval forests. Because the fund would therefore only indirectly address the highest priorities within Poland, every effort should be made to ensure complimentarity with other investments dealing with air and water pollution, and waste management.

Why are debt-nature swaps not carried out for Hungarian debt?

Until now, the Hungarian National Bank (HNB) has refused to reschedule the foreign debts. The trustworthiness of Hungary is regarded as too important to be engaged in such activities. for the same reason, it is unlikely that the Hungarian National Bank would currently consider participating in debt equity conversion.

Hungary's fairly good reputation as a debtor has also prevented debt swaps occurring. The potential discount of approximately 40% on Hungarian debts is then too low to cover the costs of putting a debt-package together, especially since Hungarian debts are widely spread among numerous creditors. In Japan for instance, a big creditor of Hungary, debts are spread among many individuals, who would all have to be approached and persuaded to cooperate.[135]

However, if the trustworthiness of Hungary decreases in the near future, debt equity conversion might be a good way to improve the environmental situation in the country.

Another reason why debt-nature swaps might not have the same scope in Eastern Europe as in Latin America is the following: Most Latin American debt is owed to commercial banks, while official creditors are more important in Eastern Europe. Whereas

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[134] International Environment Reporter, *First Debt-For-Nature Scheme Involving Several Nations Launched*, The Bureau of National Affairs, Inc., April 22, 1992

[135] Euroconsult, *Identifying Market Opportunities in Environmentally Oriented Goods and Services: Hungary*, International Finance Corporation, March 1991

commercial banks, which may already have set aside reserves against the loans, can boost their public image by forgiving debts for ecological purposes, governments have to answer to their taxpayers. In fact, the novel element in the Polish debt-nature swap is the multilateral aspect.

7.4 International Sources of Financing

Stanislaw Sitnicki of the Polish ministry of environment explains: "Eastern Europe should put more trust in the market than in international charity".[136]

This statement certainly has its validity, and even more so considering the fact that only an estimated 6% of environmental expenditures in Poland during the year 1991 came from foreign sources. Table 7.1 lists the financial (environmental) commitments of foreign governments to Poland as of July 1991. US$55.6 million for the year 1991 equals approximately the mentioned 6%. It must be noted however, that 1991 was only the second year of financial environmental support for Poland and there is a rising tendency in the level of financial assistance. Furthermore, table 7.1 does not include assistance from the European Bank for Reconstruction and Development, which was only established in April 1991, the Nordic Investment Bank, and the European Investment Bank.

Considering only financial aspects we should not overemphasize the importance of the Western industrialized countries at the present time. However, foreign assistance to Eastern Europe will be a long time effort. Its importance in terms of percentage of environmental expenditures might increase substantially in the future only if Eastern European countries do not meet their envisaged environmental investment targets due to diminishing local funds. Foreign assistance will hardly be a major share of environmental expenditures, if they exceed 1-1.5% of GDP.

Despite the recessions and tight budgets in most Western industrialized countries, and fierce competition among regions for the resulting limited international development assistance, some combination of normal and concessional development lending, supplemented by outright grants, will be needed from the international financing agencies.

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[136] Fuhrmann, Peter, *Breathing the Polish Air*, Forbes, Inc., June 24, 1991

The absence of creditworthy borrowers, either sovereign or individual, constitutes a great challenge. It is obvious that environmental projects in Eastern Europe will have to depend upon a multiplicity of financing sources for their realization. In mobilizing diverse sources of financing, sometimes for a single project, the sharing of financial risks will be an important principle. Official support and participation in project capital financing in such cases could take the form of sovereign guarantees that assume a part of the financial risk. This approach to public participation in project financing may also have the beneficial effect of lowering the overall cost of financing.

Table 7.1: Foreign Financial Aid for the Protection of the Environment in Poland as by July 1991

Source	Amounts of Funds in million				At disposal of		Period of Disburs	Funds per Year [US$
	Currency	Total	Credit	Grant	MEPNRI	Sponsor		equiv.]
International Organisation								
1. World Bank	US$	18	18	-	18	-	90/93	6
2. EC								
Phare I	ECU	22	-	22	22	-	90/91	27.5
Phare II	ECU	30	-	30	30	-	91/93	18.8
Bilateral Aid								
1. USA	US$	36.7	-	36.7	-	36.7	90/94	4.2
2. Switzerland	SFr	8.4	-	8.4	-	8.4	91/92	7.1
3. Sweden	SEK	204.7	-	204.7	-	204.7	91/93	17.3
4. Belgium	FB	65	-	65	-	65	90/92	1
5. Netherlands	DG	4.2	-	4.2	-	4.2	90/91	2.5
6. Norway	NOK	13	-	13	-	13	91/93	1
7. Denmark	DK	22.2	-	22.2	-	22.2	90/91	4.3
8. Finland	FMA	10.4	-	10.4	-	10.4	90/91	2.1
9. G. Britain	FS	0.2	-	0.2	-	0.2	91/92	0.3
						Total:	**90/91**	**47.6**
							91/92	**55.7**

Source: reproduced from: Ministry of Environmental Protection, Natural Resources and Forestry, Poland, The State of the environment in Poland, Warszawa 1991

International co-operation will help Eastern Europe overcome many of the initial difficulties and provide useful inputs based on the experience of Western industrialized countries in environmental management. The methods and forms of utilization of foreign assistance should be an example and model for solutions to be implemented by Eastern Europe's own means. The assessment of the feasibility of multiplication and distribution of acquired technologies, equipment and instruments, as well as know-how and experience, are to be regarded as the basic criteria for the selection of projects for implementation.

In general the targeted uses for foreign environmental assistance have been the following:

- Transfer of environmental protection technologies not applied within the countries as yet (e.g. desulphurization and denitrification of combustion gases, utilization of toxic waste, desalinization of water, etc.) including the construction of pilot projects;
- Promotion of domestic production of environmental protection equipment, among others, through joint undertakings (joint venture); and
- Organizational assistance, improvement of management, and training of qualified staff, including assistance in the establishment of consulting enterprises.

International Aid and Water Pollution Control

Water pollution control is not one of the top international priorities, in fact, with the exception of the Baltic Sea work plan, which admittedly encompasses a great many important projects in the water sector, international programs have concentrated more on air pollution abatement, transboundary air pollution in particular. The energy sector attracted most of the attention for pollution abatement projects. Therefore, there is a certain discrepancy between the expensive investments in the water sector of Eastern European countries (more than 50% of total expenditures) and the lack of interest of international financing agencies for such projects. During the last three years, no large wastewater treatment plant has been financed by an international financial agency (World Bank,

European Bank for Reconstruction and Development, etc.) which have concentrated more on financing of consulting activities related to the water sector. In this respect the thesis supports the position of international organizations, mainly on the basis of the financial constraints and the low immediate risks of water pollution.

The Baltic Sea efforts might put an end to the cautious approach.

Baltic Sea Work Plan

As mentioned in chapter 4, the work plan for the Baltic Sea encompasses a multi-year (20 years) investment program of specific measures to control and manage point sources, non-point sources, and conserve environmentally sensitive areas and resources (tables 4.2 and 4.3). However, there are no firm financial commitments for the estimated 5 billion ECU and 13 billion ECU to be invested during phase I (1993-97), and phase II (1998-2012), respectively. Arrangements to finance and implement projects identified in the work plan require more detailed feasibility studies. These studies will only be undertaken where there are real probabilities of implementation. Two key conditions that need to be met are the availability of project sponsors and their willingness to invest within a sufficiently short time horizon to insure that a feasibility study undertaken over the next year or two will remain valid for the period of implementation of the project. Concurrently, the work plan proposes to actively support as a high priority the strengthening of local capacity to finance investments identified by the work plan.

The Background Paper on the Baltic Sea Environmental Declaration, 1992, proposes the following activities to mobilize financial resources for investment activities:[137]

"The mobilization of local, national, bilateral and multilateral financial resources to meet capital and recurrent costs for all aspects of the Program will be critical for its successful implementation. The cooperating multilateral financial institutions should support the

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137 Conference Secretariat - Helsinki Commission, *Background Document for the Baltic Sea Environmental Declaration 1992 - Diplomatic Conference on the Protection of the Marine Environment of the Baltic Sea Area*, Helsinki Commission, April 1992

mobilization of resources in the context of their lending programs on both a sectoral and project-specific basis. ... Recognizing the serious constraints presently encountered by the countries in the eastern and southern portions of the region (Baltic Sea), the potential levels of grant funding and allocations under lending programs should be reviewed.

To this end, and in order to provide for the broadest possible financial support, it is proposed to organize an international conference in late 1992 or early 1993. .... In addition to the bilateral and multilateral financing institutions represented on the Task Force, invitations might be extended to selected members of the G-24 group, as well as private, semi-public, and public merchant banks specialized in privatization and in financing environmental improvements, export credit agencies, and risk capital financiers that could invest in domestic enterprises to manufacture the equipment and supply the services necessary for the Program."

Poland naturally puts great hopes in the rapid implementation of the work plan and related additional foreign assistance, as it is the largest single polluter of the Baltic Sea. The projects identified for phase I and II will cost more than 4 billion ECU (US$ 5 billion).

Danube River Work Plan

In contrast to the Baltic Sea work plan there are already firm international commitments for phase I of the Danube River Work Plan. Even though phase I does not contain any large scale commitments 48 million ECU will be necessary to carry out this three year action plan. Foreign assistance plays a major role in the implementation of the work plan. 85% of total funding will be international. Bilateral Institutions (16 million ECU), the Commission of the European Community (PHARE- Program 14.5 million ECU), the Global Environment Facility (7.1 million ECU) and the European Bank for Reconstruction and Development (3.2 million ECU) are the most important foreign sources. It is difficult to forecast the importance of the international sources for phase II, which will be much more investment intensive.

Bilateral Funds

As we have seen in table 7.1 the bilateral commitments to Eastern European environmental problems are numerous. But bilateral assistance is often linked to specific projects, which might not be of high priority for the recipient country.
"That's the problem with aid money: Most of it is tied to particular pet projects that benefit the donor countries. Sweden allocated US$50 million recently to clean up the Baltic coast of Poland, but much of the money will stay in Sweden for surveys and consulting work."[138]

The debt-nature swaps are also tightly linked to transboundary pollution problems which might benefit Poland only indirectly. Other European governments are not making the situation easier. The European Community is making $100 million available this year to Eastern Europe for environmental cleanup programs. But the Community is also making self-serving demands. Poland, Hungary and Czechoslovakia must agree to reduce emissions of sulfur dioxide by 30% in the next eight years, bringing them up to the EC's own standards.

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[138] Fuhrmann, Peter, *Breathing the Polish Air*, Forbes, Inc., June 24, 1991

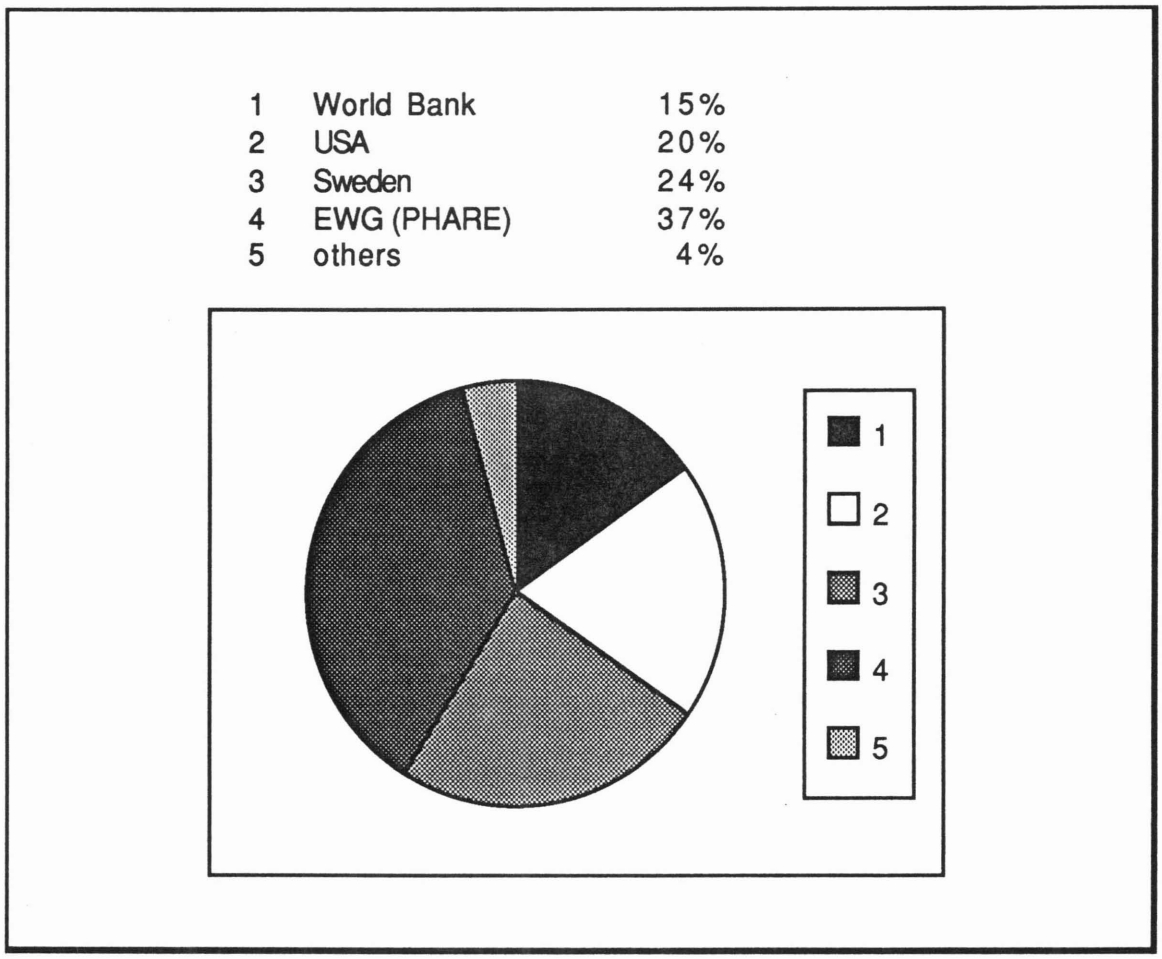
This is fine in theory, but doing that will require $4 billion to $6billion in smokestack cleaning equipment, the main suppliers of which will be German, French and British companies.

International Organizations and Institutions

Once again let us take Poland as an example and examine the international financial assistance. Figure 7.1 compares the level of assistance from different sources. Like table 7.1 these are July 1991 figures and do not include the European Bank for Reconstruction and Development, nor the Nordic Investment Bank.

The European Community is the single largest donor, followed by the Sweden, USA and the World Bank.

Figure 7.1: Structure of Financial Aid to Poland in 1991



Source: TMS Management Consulting, *Domestic Environmental Products and Services Sectors: Poland - An Assessment of the Current and Future Potential*, U.S. AID, October 1991

PHARE-Program

Industrial restructuring and the privatization on industry takes top priority in the European Community's PHARE assistance programs for most East European states. However individual programs for helping economic reform drawn up by the Commission and the national authorities, do give some attention to the environment and energy policy.

However, the environmental assistance is especially targeted on the organization of expertise, studies and institutional support to help prepare a national energy and environment strategies. Actual clean-up projects are rarely financed, and if so, in the energy sector (air pollution) rather than in the water sector.

The conclusions and recommendations will highlight the major financing issues.

Chapter 8

Conclusions and Recommendations

"Our democracy is very young and fresh. We are all beginners."

Vaclav Havel at the World Economic Forum in Davos, Switzerland, February 1992

The main conclusions and recommendations drawn from the analysis in this thesis are based on many factors which are all interconnected, but the following are the most conspicuous:

- Eastern Europe has to start from "scratch" in many respects. This extents far beyond the political restructuring to a democratic society, mentioned by Vaclav Havel, to the introduction of a market-based economy, but also to a reorganization on all institutional levels.
- Decades of environmental neglect caused serious water pollution. It is necessary to rectify the damage done to the environment in the past and to ensure "sustainable development" in the future.
- The estimates of losses due to the environmental damage have been overestimated by Eastern European commentators. Instead of the 5 - 10% of GDP published by these commentators, it seems more reasonable to conclude that the production cost approach to

measuring the losses due to environmental damage associated primarily with air and water pollution yields an estimate in the range of 2.5 - 3% of GDP. Approximately 1-1.5% of GDP is due to health and ecological effects of air pollution, and 0.5-0.8% of GDP is due to water pollution.[139]

• Eastern Europe is in the grip of a prolonged and savage recession. The World Bank predicts that per capita output in Eastern Europe may not recover to 1989's level (which is low compared to Western industrialized nations) until 1996 or later. This economic downturn by itself puts strict constraints on public and private budgets, but the heavy indebtedness, especially of Poland and Hungary, aggravates the financial situation.

Timing and Priorities

Macro-economic price and budget reforms and industrial restructuring and privatization programs in Eastern Europe need to play out during the transition before the bulk of the major, costly investment program for water pollution abatement is undertaken. These macroeconomic reforms will undoubtedly result in substantial realignments in fundamental supply and demand, including the closure of many polluting industries, in the metallurgy and mining sector in particular, because they are often the least economical. Polluting industries should first be assessed as to their long-term economic viability, in order that assistance for pollution control can be targeted towards plants which will continue operating under the governments' privatization plans. Those which are potentially viable should first carry out an environmental audit to identify low cost means of reducing pollution. In many cases dramatic results can often be achieved with improved management and maintenance.

Macroeconomic changes will have insignificant effects on municipal waste water. Nevertheless, due to the financial difficulties of most cities and rural communities a cautious approach is also recommended for investments in municipal sewage treatment plants. Major investments in new plants should be postponed until the economic situation has improved. In order to increase efficiency and efficacy water pollution abatement should focus on the adoption of low cost solutions, outlined below.

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[139] The World Bank, *Poland Environmental Strategy*, The World Bank, April 1992

The most suitable approach to set priorities is to use risk to human populations and ecosystems as a guiding principle. Other, non-risk based, criteria, such as public support or willingness to pay, should also be considered. The analysis of the pollution status quo suggests, that due to the ubiquitous nature of the exposure, the toxicity of the pollutants that have been found, and the nature of the effects that are caused, the primary focus should be on air pollution, with a secondary focus on water and waste issues.

The initial focus in water management should be on securing reliable drinking water supplies, applying low-cost technologies to enhance the recuperative capacity of river systems (weirs, artificial wetlands, and so forth) and rehabilitating and/or completing upstream sewage treatment plants that are already partially completed.

Low Cost Solutions

As the experience in Western countries shows, investments in sewage treatment will be very expensive. In the short-term aeration technology to increase the rivers self purifying capacity could be an economical substitute for treatment plants. Weirs and artificial wetlands in rural areas can also be considered as possible solutions, but in most cases treatment plants will be unavoidable. Chemical primary treatment is therefore proposed due to the substantial reduction in investment costs and the possibility of retrofitting existing treatment plants with mechanical treatment facilities only.

A low cost solution will rely heavily on a well designed environmental concept and an approach which integrates air, water and land pollution. In the short run, in particular, emphasis should be put on the design of efficient strategies depending on human and ecological risk assessment, the introduction of market based system of fees and fines, coupled with the adequate institutional capacity and capability to enforce the emerging environmental law.

Financing

The gradual adoption of the "polluter pays principle", together with the privatization of industry, will eventually pass on the cost of environmental protection to the consumer

through the price of goods and services. Remediation of past pollution will continue to be largely carried out by the public sector, either through direct budgetary support or from environmental funds. Historic environmental investment levels which have been less than 1% of national income need to be doubled.

The total investment needed to achieve acceptable environmental standards in Poland, the CSFR and Hungary has been estimated at around US$200 billion for the three countries combined, with roughly 50% for water pollution abatement. Even if the recommended increase in the charges, fees and fines and new taxes result in a doubling or tripling of resources available to environmental programs, it will be several decades before an environmental acceptable to the people of Eastern Europe is achieved.

Most of the environmental investments will be financed through national sources, i.e. without foreign aid. Current expenditures, essentially all in the public sector at present, total about US$1.5 billion per year for the three countries combined. External public and private sector funding, especially through government incentives to private investment, could increase the total environmental expenditures.

Western aid targeted for the environmental sector in Poland, the CSFR and Hungary accounts for approximately US$100 only. Borrowing for environmental protection at a time of great economic uncertainty seems risky and Western countries are reluctant to loan due to the extremely low creditworthiness especially of Poland and Hungary. The role of the West has been overestimated in financial terms. The aid will increase in the future, especially related to the Baltic Sea and Danube River Work Plans, but the major contributions of Western assistance will be not only be of financial nature.

The Role of the West

Western industrialized countries have experienced similar environmental problems in the past, and continue to do so. To some extent they have coped with them comparatively successful, although "sustainable development" has not been achieved. Besides the financial cooperation, technical assistance and cooperation with Eastern Europe will be essential, especially through the provision of know-how, operating expertise, and cleaner plant and equipment. However emphasis shall be put on training, especially related to management and organizational matters and the development of the environmental

industry in Eastern Europe itself, instead of providing expensive state-of-the art technology which they have to pay for in foreign currency. The West can certainly learn lessons applicable to its own environment. Pilot projects can facilitate the transfer of know-how and the development of local management skills on site. Careful coordination of Western efforts is also highly desirable due to the great number of bilateral arrangement between Eastern and Western countries in order to avoid dissipation and duplication.

Individual Western companies investing and operating in Eastern Europe must ensure that they do not add to existing environmental problems, but rather contribute through better management and greater operating efficiency, to the observance of better pollution-abatement practices there. New investments in general should comply with the new standards, whereas old production capacity should have to adjust to the new standards in phases. The fact that Eastern European countries aspire European Community standards of prosperity and technological development, will require them to ultimately attain European Community environmental standards.

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