

# ENVIRONMENTAL PROTECTION EXPENDITURES-THE GERMAN EXAMPLE

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## INTRODUCTION

In this paper, statistical evidence is provided on the level and structure of environmental damage and protection expenditures in the Federal Republic of Germany, i.e., on the environmental protection investments by industry and government, the capital stock for environmental protection and the total costs of and expenditures for environmental protection. It is argued that the conventional economic accounting systems have not played an enlightening role in statistically revealing the actual damage to the environment. They can, however, be methodologically improved, and must be complemented by assessments of the ecological costs of the production process.

## NEGATIVE EFFECTS OF PRODUCTION, ENVIRONMENTAL PROTECTION EXPENDITURES, AND GROWTH OF THE GROSS NATIONAL PRODUCT

The major indicators of national economic accounting are no longer suitable, if indeed they ever were. Such an evaluation of the rationality of industrial production would presuppose that the growth of the Gross National Product (GNP) could also be interpreted ecologically, but that is not the case. The GNP is not only an economic aggregate of goods and services which are socially desirable, it is a mixture of desirable and undesirable goods and services, the latter being forced upon the individual and society through the deterioration of environmental conditions (and living conditions in general). The increase in the negative ecological effects of production is inter alia, a manifestation of the fact that due to the given level and structure of economic activity, the limits of resource utilization and the carrying capacity of the natural environment are being either reached or exceeded (environmental depletion and/or environmental degradation). The deterioration of environmental quality is, in turn, giving rise to multiple counteractions at all economic levels, in private households, and in the public and private sector. Obviously, the task is to avert the negative effects of production, neutralize existing damage, or to prevent further environmental degradation. The expenditures associated with these counteractions at all economic levels can thus be called compensatory or defensive costs or expenditures.

Just like the others, autonomous expenditures are included in the national economic accounts and enter the statistical computation of the GNP. This practice, of course, affects the interpretation of this important macroeconomic entity. The GNP rises in the wake of a production process that disregards the environment, and it rises still further when the given environmental damages are mitigated through economic activities.

The factors common to all the respective examples is that the reaction of the GNP is exactly the opposite to what one might expect from a welfare indicator. As the traditional economic accounting system makes no distinction between autonomous (real) and defensive (compensatory) expenditures, it is not easily apparent that economic growth registered by the accounts is in part nothing but a compensation for damage done to the environment. This means that part of the economic activities reflected in the GNP proceeds merely from the problematic mode of production used in industrial society.

## ECONOMIC GROWTH, ENVIRONMENTAL DAMAGE, AND CURATIVE ENVIRONMENTAL PROTECTION TECHNOLOGY

The increase in ecological costs associated with the economic process and of the compensatory expenditures triggered by that increase, are due primarily to two interrelated developments: (a) the type and structure of economic growth, and (b) the type and extent of the spatial concentration of production. Environmental damage has accumulated in the wake of a growth process in an economic world in which limited natural resources have been used or burdened, at practically no cost. In this way, an environmentally unsound economic structure has emerged that must now be quickly redesigned and reorganized to operate on a sustainable basis in the long run. This task can be called the ecological modernization of industrial society (Simonis).

Further economic growth might appear questionable from the perspective of welfare if the production increase attainable is insufficient (or barely sufficient) to compensate for the additional environmental damage it causes. This possibility persists even if environmental pollution is treated with added-on ("end-of-pipe") technologies - the hitherto dominant strategy of environmental protection. Based on the existing technological structure of the economy, this react-and-cure strategy is an attempt to regulate environmental pollution through treatment technologies (such as filters and catalytic converters), designed to trap and collect harmful emissions in a concentrated form at the end of the

production process. However, experience has shown that purification costs increase as the level of purification rises. With a basically unchanged technological structure, continued growth in production would thus call for disproportionately high expenditures on environmental protection if the absolute emission level is to be kept constant, and even more so if it is to be reduced.

Apart from the attendant escalation of compensatory costs, curative environmental protection is also problematic from the ecological point of view. It means using end-of-pipe equipment to abate environmentally harmful emissions. This equipment, however, has first to be manufactured, and since its production requires energy and natural resources, it is linked with further, but sometimes different, emissions. The desulphurization of flue gas, for instance, produces gypsum. Energy and material resources are consumed in the operation and maintenance of these installations, too. In short, additional use of resources leads to additional emissions.

In the long run, then, post-treatment of environmental damage cannot provide a reasonable solution, neither economically nor ecologically. Economically, there is the danger of perpetuating an artificial growth process, in which an ever larger part of the GNP is "devoured" by abatement activities. Ecologically, it is unsound to have the construction and operation of environmental protection facilities burdening the environment still further by consuming the very raw materials and energy they are intended to conserve. Ultimately, ecologically sound and economically effective environmental protection can lie only in the systematic prevention of environmentally harmful emissions, i.e., in basically low-emission products and in integrated, clean technologies.

### **COMPUTATION OF ENVIRONMENTAL COSTS AND EXPENDITURES - STATISTICAL EVIDENCE ON THE FEDERAL REPUBLIC OF GERMANY**

In the following case study in the Federal Republic of Germany, several categories of compensatory costs will be ascertained to provide a basis for examining the above presented hypothesis, that the share of compensatory (or "defensive") costs in the GNP is increasing. It would be extremely important to clarify this issue, for the answer might indicate not only the potentially counter-productive trends of industrial society, but also the prospects for its ecological structural adjustment.

The ecological and social costs associated with the production process can be divided into three categories:

- (a) costs whose purpose is either to compensate for past environmental damage or to prevent future environmental damage (compensatory or defensive economic activities);
- (b) production, income, and property losses; and,
- (c) damage to human health, flora and fauna, buildings, and works of art.

In principle, it is possible to assign a monetary value to the first two of these categories and to parts of the third. The costs that fall into the first category represent the defensive economic activities of private households, firms, and the state. Those costs are included in the GNP. The focus in the following sections of this chapter is on defining, operationalizing, and empirically verifying the components of the compensatory expenditures.

The second category deals with production, income, and property losses resulting from environmental and work-related illness, accidents, premature retirement, or death; similar losses caused by environmental damage in the economic sectors; losses of non-renewable resources; and damage to property (such as forest blight or fish death, resulting from environmental pollution).

The third category comprises all real damage not already covered by the first two categories, i.e., all ecological costs that have not been eliminated or avoided by suitable compensatory economic activities. In no case should they be ignored when drawing up a balance of accounts for the industrial society. Given the deficiencies of curative environmental policy, there is ample reason to suggest that this category is crucial to an overall cost assessment. However, statements on the extent and pace of real environmental damage are still subject to debate. The main reason, it seems to us, is that pioneering work on the relationship between economic and ecological systems is still missing. (Statements on this category of costs are particularly difficult to make because of the market-oriented thinking in economics and the resulting "blindness" to ecological costs.)

In presenting the findings of our research on the three categories of costs as they relate to the Federal Republic of Germany, we shall begin with an assessment of the annual environmental protection investments, gross capital stock, and current expenditures for environmental protection. These calculations are the outcome of a research project undertaken at the International Institute for Environment and Society (IIES) of the Science Center, Berlin. They are supplemented by an estimate presented by another German research team on the real annual environmental damage in the Federal Republic of Germany.

#### *Environmental Protection Investments*

Tables 1 and 2 show our findings on the development of environmental protection investments by industry (manufacturing sector) and government (public investments), at both current and constant prices. In 1985, industry's environmental protection investments in waste disposal, water quality control, noise abatement and air pollution control, amounted to DM5.6 billion in current prices; in the case of

governments (national, regional, and local), the level of investment amounted to DM6.8 billion.

From 1975 through 1985, DM33.2 billion was invested by industry and DM68.3 billion by the government. During this period, environmental protection investments in West Germany amounted to about 4% of the total investments of industry and 15% of government.

As can be seen from Table 1, air pollution control investments are by far the largest share of all the environmental protection investments of the manufacturing sector of the German industry.

A detailed analysis of the environmental protection investments by industry showed that in the period under investigation there was no significant increase in the share of integrated or low emission technologies. Their share in the total volume of environmental protection investments by industry rose from 19.6% in 1975 to 24.0% in 1980, sank to 16.3% in 1982, and rose again to 24.0% in 1985.

As can be seen from Table 2, water pollution control is by far the major area of governmental environmental protection activities in the Federal Republic of Germany. In the area of waste disposal, investments started to increase in the second half of the 1970s, whereas government investments in noise abatement did not become notable until the beginning of the 1980s, or are still insignificant, as in the area of air pollution control.

TABLE 1

Environmental Protection Investments, Manufacturing Sector,  
Federal Republic of Germany

Year	Total Investments		Waste Disposal		Water Pollution Control		Noise Abatement		Air Pollution Control	
	Current Prices	1980 Prices	Current Prices	1980 Prices	Current Prices	1980 Prices	Current Prices	1980 Prices	Current Prices	1980 Prices
In Millions of DM										
1975	2,480	3,090	170	210	900	1,110	200	240	1,210	1,530
1976	2,390	2,830	200	230	820	960	220	260	1,150	1,380
1977	2,250	2,560	200	230	740	850	210	230	1,100	1,250
1978	2,150	2,370	170	190	680	750	200	220	1,100	1,220
1979	2,080	2,190	160	160	760	800	200	210	960	1,020
1980	2,650	2,650	210	210	910	910	240	240	1,290	1,290
1981	2,340	2,810	230	240	950	910	210	200	1,530	1,460
1982	3,560	3,250	390	360	1,130	1,030	230	210	1,810	1,650
1983	3,690	3,270	290	260	1,100	990	230	200	2,070	1,820
1984	3,540	3,100	270	240	1,040	920	230	190	1,960	1,750
1985*	5,620	4,940	330	280	1,060	910	260	220	3,970	3,530
Average Annual Change in										
1975/84	+ 3.9	- 0.0	+ 5.3	+ 1.5	+ 1.6	- 2.1	+ 1.6	- 2.6	+ 5.5	+ 1.5
1975/79	- 4.3	- 8.2	- 1.5	- 6.6	- 4.1	- 7.3	0.0	- 3.3	- 5.6	- 9.6
1979/84	+ 11.0	+ 7.2	+ 11.0	+ 8.4	+ 6.5	+ 2.8	+ 2.8	- 2.0	+ 15.3	+ 11.4

\* - preliminary

Source: IIBS research project.

TABLE 2

Environmental Protection Investments, Government Sector,  
Federal Republic of Germany

Year	Total Investments		Waste Disposal		Water Pollution Control		Noise Abatement		Air Pollution Control	
	Current Prices	1980 Prices	Current Prices	1980 Prices	Current Prices	1980 Prices	Current Prices	1980 Prices	Current Prices	1980 Prices
In Millions of DM										
1975	4,740	6,410	300	390	4,430	6,020	0	0	10	10
1976	5,270	6,950	290	360	4,970	6,590	0	0	10	10
1977	4,860	6,190	310	370	4,530	5,800	10	10	10	10
1978	5,860	7,020	330	370	5,450	6,560	70	80	10	10
1979	6,940	7,640	390	420	6,440	7,100	110	120	0	0
1980	8,060	8,060	470	470	7,430	7,430	150	150	10	10
1981	7,390	7,150	520	500	6,700	6,460	160	160	10	10
1982	6,500	6,300	570	540	5,740	5,580	180	170	10	10
1983	6,030	5,810	510	470	5,330	5,160	170	170	20	10
1984	5,900	5,590	450	410	5,300	5,050	130	120	20	10
1985*	6,750	6,350	550	490	5,950	5,630	230	210	20	20
Average Annual Change in %										
1975/84	+ 2.5	- 1.5	+ 4.6	+ 0.6	+ 2.0	- 1.9	x	x	x	x
1975/80	+ 11.2	+ 4.7	+ 9.4	+ 3.8	+ 10.9	+ 4.3	x	x	x	x
1980/84	- 7.5	- 8.7	- 1.1	- 3.4	- 8.1	- 9.2	- 3.5	- 5.4	x	x

\* = preliminary

x = statement incomplete

Source: IIES research project.

TABLE 3

Gross Capital Stock for Environmental Protection (1980 Prices),  
Federal Republic of Germany

Economic Sectors	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986*
In Millions of DM												
Industry	28,590	31,030	33,100	34,730	36,110	37,180	38,330	39,390	41,580	43,290	44,610	47,730
Energy & water utilit., mining	4,210	4,520	4,900	5,090	5,320	5,610	5,980	6,040	7,000	8,710	9,860	12,330
Manufacturing	23,490	25,970	27,640	29,090	30,390	30,930	31,920	32,670	33,250	33,880	34,230	36,830
Construction In- dustry	490	540	560	590	600	620	630	620	610	600	580	570
Government	101,340	108,370	113,090	118,500	124,690	131,450	133,060	144,710	149,940	156,810	158,990	164,040
Industry and Government	129,930	139,400	146,190	153,270	160,800	168,630	177,090	184,340	191,600	197,900	203,630	211,770
Index (1975 = 100)												
Industry	100	109	116	122	126	130	135	140	146	151	156	167
Energy & water utilit., mining	100	107	116	121	128	133	142	158	165	207	234	293
Manufacturing	100	109	116	122	128	129	134	137	139	142	143	146
Construction In- dustry	100	110	114	120	122	127	129	127	124	122	118	110
Government	100	106	112	117	125	130	137	143	148	153	157	162
Industry and Government	100	108	113	118	126	130	137	142	148	153	157	163

\* = preliminary

Source: IIES research project.

### Capital Stock for Environmental Protection

The data provided in Table 3 traces the real growth of the gross capital stock for environmental protection over 12 years. They provide an overview of the fixed assets for environmental protection in various economic sectors, not including the extent to which these fixed assets had already been depreciated. In 1986, these assets amounted to nearly DM48 billion for industry and DM164 billion for the government sector.

From 1975 through 1986, the volume of fixed assets in each of these two sectors rose by more than 60%, the increase of investment in air and water purification being especially marked. Since the total capital stock of Germany industry amounted to approximately DM1,200 billion in

1975 and to DM1,500 billion in 1985, the share of the capital stock for environmental protection was about 2.4% in 1975 and 3.0% in 1985. In the government's case, that share was in the range of 10% of total capital stock.

In 1986, nearly 60% of industry's total capital stock for environmental protection (DM47.7 billion) was concentrated in the chemical industry (DM11.7 billion), energy, water utilities, and mining (DM10.2 billion), and metal production and processing (DM6.3 billion).

Breaking down the fixed assets for environmental protection into the categories of environmental sectors and individual branches of industry, a somewhat diversified picture emerged. In the government's case, some 95% of the fixed assets were committed to water pollution control, an outcome of the large number of canalization and water purification plants set up by municipal and regional authorities. In industry, environmental protection equipment was installed primarily for air (49%) and water pollution control (36%), while only 8% of it was installed for waste disposal, and 8% for noise abatement. Water pollution control facilities accounted for the largest share of investment in the chemical industry (55%) and the crude oil processing industry (47%). By contrast, air pollution control assets accounted for most (70%) of the investments reported for the energy industry, water utilities, and metal production and processing industries.

### Costs of Environmental Protection

We calculated the costs of environmental protection, defined as the depreciation of the fixed assets over time, and the operating expenses of environmental protection facilities; Table 4 shows the operating expenses for industry and the government in current prices and in the form of an index (1975=100).

**TABLE 4**

Operating Expenses for Environmental Protection,  
Industry and Government,  
Federal Republic of Germany

Economic Sector	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985*
in billions of DM											
Industry	2,200	3,810	3,920	4,240	4,800	5,180	5,920	6,550	6,830	7,390	7,920
Energy & water											
Electric., mining	160	420	430	480	550	620	760	812	1,180	1,250	1,520
Manufacturing	2,040	3,390	3,490	3,760	4,250	4,560	5,160	5,738	5,790	6,140	6,400
Construction In-											
dustry	30	40	40	40	40	50	50	60	60	60	60
Government	1,000	1,280	1,550	1,920	2,410	2,890	3,120	3,293	3,810	4,130	4,410
Industry and Government	3,200	5,090	5,470	6,160	7,210	8,070	9,040	9,843	10,640	11,520	12,330
Index (1975 = 100)											
Industry	100	173	178	188	218	231	270	297	306	337	359
Energy & water											
Electric., mining	100	262	269	294	344	388	475	500	738	781	950
Manufacturing	100	166	172	183	208	223	258	282	284	301	319
Construction In-											
dustry	100	133	133	133	133	167	167	200	200	200	200
Government	100	128	155	192	241	289	312	329	381	413	441
Industry and Government	100	159	170	195	225	254	282	307	330	354	376

\* = preliminary

Source: IZES research project.

In 1975, the operating expenses and the depreciations (total costs) amounted to DM4.7 billion for industry and DM4.9 billion for government (see Table 5). In 1985, these sums rose to DM11.1 and 10.8 billion, respectively, thereby increasing the total costs of environmental protection in the Federal Republic of Germany from DM 9.6 billion in 1975 to DM21.9 billion in 1985.

### Total Expenditures for Environmental Protection

Finally, we calculated the total expenditures for environmental protection, comprising the investments and the operating expenses for environmental protection facilities (see Table 6). In 1985, the sum for the Federal Republic of Germany amounted to nearly DM13.6 billion in industry and DM13.2 billion for government, totalling DM26.7 billion for both sectors. For the other economic sectors, like agriculture, forestry, trade, transport, communication, and other services, it is assumed that at least DM0.7 billion went into environmental protection investments, and the same into operating expenses. Total expenditures for waste disposal, water and air pollution control, and noise abatement in West Germany can thus be said to amount to at least DM28.1 billion for 1985.

### Extended Accounting

If one is willing to follow certain statistical conventions and to focus on the actual expenditures for environmental protection, the quantitative findings of our research project provide some clues to the economic magnitude of the environmental problems of the Federal Republic of Germany. This concept can, of course, be improved further, but different concepts of monetary environmental reporting can be proposed as well. These two possibilities should now be briefly investigated.

Further improvements in the concept of monetary environmental reporting presented here can be first envisaged by incorporating information on environmental protection expenditures incurred in the sectors of agriculture, forestry, trade, transport, communications, and other services. Unfortunately, so far no adequate data is available for these sectors. Neither is there reliable statistical information available on the environmental protection activities of private households.

For a more comprehensive concept of environmental reporting not restricted solely to economic factors, it would be commendable to link the data on expenses and capital investments for environmental protection with non-monetary data on the emissions in the various sectors of the economy. The possibilities of an integration of monetary and non-monetary data are currently being discussed in the perspective of setting up "satellite systems" to complement conventional national economic accounting.

TABLE 5

Total Costs of Environmental Protection,  
Federal Republic of Germany (in Millions of DM)

Year	Industry			Government			Industry and Government		
	Current expenditures	Depreciations	Total costs	Current expenditures	Depreciations	Total costs	Current expenditures	Depreciations	Total costs
At current prices									
1975	3,200	1,520	4,720	3,000	1,920	4,920	6,200	3,440	9,640
1980	5,160	2,250	7,410	4,690	3,390	8,080	9,850	5,640	15,490
1985	7,930	3,160	11,090	6,430	4,340	10,770	14,360	7,500	21,860
At 1980 prices									
1975	4,050	1,870	5,920	3,790	2,570	6,360	7,840	4,440	12,280
1980	5,160	2,250	7,410	4,690	3,390	8,080	9,850	5,640	15,490
1985	6,230	2,640	8,870	5,340	4,030	9,370	11,570	6,670	18,240

Source: IIS research project.

TABLE 6

Total Expenditures for Environmental Protection,  
Federal Republic of Germany

Year	Industry		Government		Industry and Government	
	Current prices	1980 prices	Current prices	1980 prices	Current prices	1980 prices
In Millions of DM						
1975	5,680	7,140	7,740	10,100	13,420	17,340
1976	6,000	7,190	8,850	10,940	14,550	18,130
1977	6,150	7,180	8,410	10,340	14,590	17,520
1978	6,390	7,200	9,780	12,470	16,170	18,670
1979	6,740	7,190	11,350	12,380	18,090	19,370
1980	7,810	7,810	12,750	12,750	20,560	20,560
1981	8,860	8,160	12,510	11,940	21,370	20,100
1982	10,110	8,820	11,890	11,130	22,060	19,990
1983	10,620	9,070	11,640	10,720	22,360	19,790
1984	10,890	9,090	11,830	10,630	22,720	19,720
1985*	13,550	11,170	13,180	11,690	26,730	22,860
Average Annual Change in %						
1975/84	+ 7.3	+ 2.7	+ 4.8	+ 0.5	+ 6.0	+ 1.4
1975/80	+ 6.6	+ 1.8	+ 10.5	+ 4.6	+ 8.9	+ 3.5
1980/84	+ 8.7	+ 3.9	- 1.9	- 4.4	+ 2.5	- 1.0

\* - preliminary

Source: IIS research project.

Systematic reporting on the emissions in the various economic sectors would indicate their share in the total pollution load. In addition, it would allow us to better analyze the links between economic production, environmental damage, environmental protections, and environmental policy. Connecting the emission data with the input-output table of the economy would make it possible to calculate the indirect emissions originating from certain production and consumption activities induced by the demand for intermediary goods and services from other sectors.

### **ESTIMATION OF ENVIRONMENTAL DAMAGE**

Our research shows that actual environmental protection expenditures in the Federal Republic of Germany amounted to about DM28.1 billion in 1985. Since then, the respective expenditures have continued to increase. Nevertheless, these figures are far below the estimated levels of the annual current damage to the environment. Due to methodological problems, however, environmental damage so far can only be roughly estimated.

Such estimates are by no means superfluous. They are difficult in the sense that they have to be generated outside traditional statistical conventions. Since damage to the natural environment is not automatically registered by the traditional accounting systems, estimating the damage depends on auxiliary concepts and categories, particularly on assumptions about the economic significance of environmental damage and about people's willingness to pay for the elimination or reduction of such damage.

Wicke et al. have estimated the annual environmental measurable damage induced by air pollution, water pollution, soil contamination, and noise. The methodological problems involved cannot be elaborated on in this context, but the estimates are both interesting and surprising. They indicate the economic significance of environmental damage, albeit on the basis of somewhat inconsistent methods.

Table 7 presents the aggregated compilation of the estimates for the four conventional environmental sectors (air, water, soil, and noise). The Republic of Germany is enormous: DM103.5 billion, or roughly 6% of the country's annual GNP. This (fictitious) figure is almost four times that for the (actual) total annual expenditures for environmental protection. In other words, the damage to the environment is still immense despite the large sum of protection expenditures spent annually. It should immediately be added, of course, that the Federal Republic of Germany most certainly is not the only industrialized country with such high annual environmental damage.

TABLE 7

Environmental Damage in the Federal Republic of Germany ("Measurable Damage" in Billions of DM per Year)	
ENVIRONMENTAL SECTORS	ENVIRONMENTAL DAMAGE
<b>AIR POLLUTION</b>	ca. 48.0
Health hazards	between 2.3 - 5.8
Material Damage	more than 2.3
Degradation of vegetation	more than 1.0
Forest blight	between 5.5 - 8.8
<b>WATER POLLUTION</b>	far more than 17.6
Damage to rivers and lakes	more than 14.3
Damage to the North Sea and Baltic Sea	far more than 0.3
Contamination of ground water	more than 3.0
<b>SOIL CONTAMINATION</b>	far more than 5.2
Costs of Chernobyl disaster	more than 2.4
Rehabilitation of "yesterday's waste"	more than 1.7
Costs of preserving biotopes and species	more than 1.0
Other soil contamination	far more than 0.1
<b>NOISE</b>	more than 32.7
Degradation of residential amenities	more than 29.3
Productivity losses	more than 3.0
"Noise rents"	more than 0.4
<b>Grand total of damage</b>	<b>more than 103.5</b>

Author's note: The figures are based on recent studies conducted both in Germany and abroad. Existing gaps were filled with author's own estimates.

Evaluation: Extremely cautious estimates of all environmental damage.

Source: Wicke et al. (1986: 123).

## OUTLOOK

The traditional economic accounting systems have not helped much to ascertain the damage done to the environment. These systems cannot sufficiently distinguish between economic processes that are harmful to the environment and those that are not, thereby reinforcing the (false) impression that environmental protection is possible only through further economic growth. Therefore, the ecological modernization of industrial society (and the ecological orientation of economic policy) requires a broader information base than those systems provide. To us it seems especially important that the conventional accounting systems (both at the micro-level and the macro-level of the economy) be complemented by assessments of the ecological costs incurred by the production process.

However, it would be illusory to believe that improved assessments of costs would automatically enhance environmental quality. One must not take it for granted that the attention to ecological principles, being a prerequisite for the long-term sustainability of industrial society, will easily be implemented. Private as well as bureaucratic interests could well insist on the continuation of cost-intensive, curative environmental protection instead of quickly adopting preventive environmental policy by promoting low-emission products and clean technology. In short, the question of how to harmonize ecological imperatives and economic interests will persist.

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