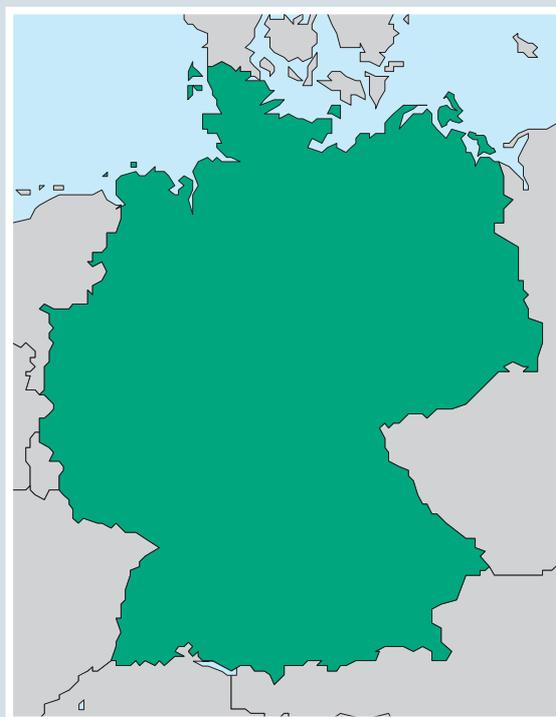


Environmental Protection and Employment

The link for a worthwhile future



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Environmental Protection and Employment

The link for a
worthwhile future

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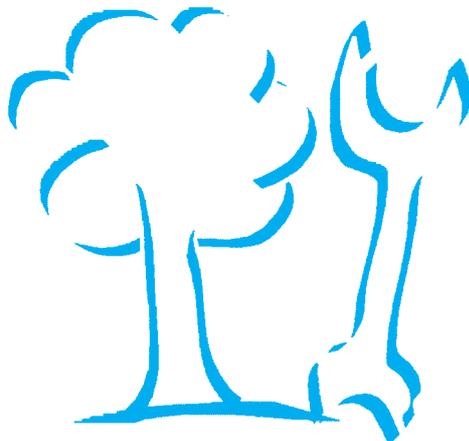
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*„Less environmental protection or indeed
a failure to protect the environment would not mean more
employment in Germany, but, in the long term, less employment.
In the case of environmentally-related structural discontinuities,
it would mean considerably less employment.
It is not true in this regard
that environmental protection costs jobs.“*

Bundespräsident [Federal President] Prof. Dr. Roman Herzog
on United Nations
Environment Day 1997
at Bellevue Palace in Berlin

ENVIRONMENTAL PROTECTION

U M W E L T S C H U T Z



MODERNE WIRTSCHAFT –
ZUKUNFTSSICHERE ARBEIT

MODERN ECONOMY – JOBS WITH A GUARANTEED FUTURE

Contents	Page
1. Outset	7
2. Link	23
3. Employment effects of environmental protection	35
4. Global environmental markets	57
5. Selected fields of activity	79
6. Setting tomorrow's course	107
Appendix	133

Environmental Protection and Employment: The link for a worthwhile future

“Environmental and employment problems are among the most urgent challenges of our times. Over five million competitive workplaces lack in Germany, climatic changes are becoming apparent world-wide, therefore it is hardly surprising that from the point of view of the German population the solution of employment and environmental problems is of prime importance.

Driven by increasing environmental awareness as well as numerous environmental policy measures, the market for environmental goods has expanded over the last few years, bringing a growing number of jobs. A study of leading German economics research institutes shows that the employment effects of environmental protection have attained considerable dimensions, with nearly a million jobs in 1994 alone, with the service sector being the main beneficiary. And of particular importance: in terms of both population and economic performance, the new Länder are in a better position than the old Länder (the former FRG states) in respect of environmental jobs. In the new Länder important impulses towards creating and safeguarding jobs have emerged from environmental clean-up and development.

The concern of this publication is not to promise a job-creation miracle by means of environmental protection alone. Nor is it a matter of legitimising environmental protection in terms of employment policy, for environmental protection does not require employment policy for legitimisation. Rather, the paper wants to provide up-to-date background information to point out the synergies between environmental and employment objectives. It also presents fields of activity which can be helpful to address both environmental and employment policy problems. I do hope that this study can provide some incentives for further action.”

Prof. Dr. Andreas Troge

President, German Federal Environmental Agency



1 Outset

- **Key environmental problems**
- **Key employment problems**

Key environmental problems

Overexploitation of natural resources

In the long term, there are no alternatives to an environmentally-compatible mode of production and consumption. Global warming, the loss (depletion) of stratospheric ozone and tropical forests, marine pollution and soil erosion, world-wide air pollution and the world-wide loss of biodiversity can no longer be denied.

Environmental policy in Germany has led to visible positive results in the last decades. The level of environmental protection is undeniably high by international comparison. Global demographic developments, however, and environmental deterioration, now becoming apparent, commit us to further national and international efforts towards sustainable development.

„Agenda 21“ action program

At the Conference of the United Nations for Environment and Development in 1992 in Rio de Janeiro a program for the 21st century was adopted, the so-called Agenda 21¹ (see Appendix 1). It defines the necessary activities for achieving sustainable development and calls for implementation in all member states „in accordance with their circumstances, possibilities and priorities“.

In its report „Environment 1994 – policy for sustainable, environmentally-compatible development“ the German Federal Government had outlined its strategies for a sustainable development. In June 1996 the Federal Environment Ministry presented its environmental goals and main areas of action in order to place on a broad basis the discussion on the next steps required on the way towards sustainable development in Germany.² According to this in the short and medium run activities are needed in the following areas:

Priority for action

„Protection of the climate and stratospheric ozone“

On the basis of scientific studies it must be assumed that the global climate has already been and is still being changed by human activities. Over the past 100 years the average global temperature has increased by 0.3 to 0.6

Environmental targets and priority issues in Germany

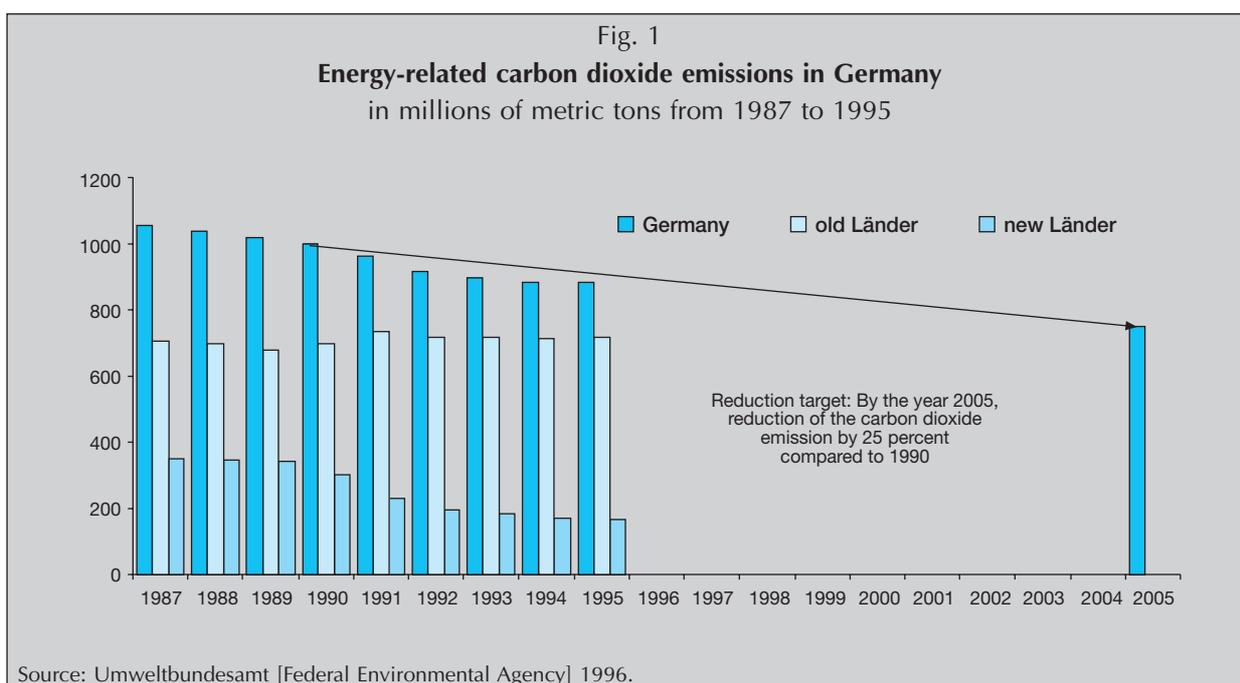
degrees Celsius. Increasing concentrations of carbon dioxide, as well as other gases introduced either directly or indirectly into the atmosphere by mankind, such as chlorofluorocarbons, methane, laughing gas and ozone enhance the natural greenhouse effect.

The results already foreseeable today, such as a sea level rise or detrimental effects on human health will come along with noticeable environmental, social and economic consequences. The Federal Government therefore is putting various climate protection measures into force, like:

- efficiency increase in energy conversion and energy use,
- change-over to energy carriers with low carbon dioxide emission,
- increased use of renewable energies.

The key policy target of the German climate protection program is to reduce national carbon dioxide emission by the year 2005 by 25 percent compared to 1990 emissions (Fig. 1). Other substances that affect the climate both directly and indirectly, such as methane, dinitrogen monoxide and carbon monoxide as well as VOC3 are also to be cut back within the framework of this program. Moreover, the Federal Government supports the implementation and further development of the climate convention.

National climate protection target: reduction of carbon dioxide emission in Germany up to the year 2005 by 25 percent compared to 1990



**Ozone protection target:
rapid world-wide
withdrawal from the
production and use of
CFCs and H-CFCs**

Similarly, the continuous depletion of stratospheric ozone is a serious threat for mankind and nature. The stratospheric ozone layer, which acts as a filter against UV radiation, is becoming ever thinner, not only over the Antarctic but over the European continent as well. From 1968 to 1992, the decline amounted on average to around three percent per decade, and five percent per decade since the end of the seventies. CFCs and halons, which are used for example as propellants for aerosol sprays or as solvents for chemical dry cleaning, are principally responsible for this depletion.

**Overall environmental
quality target:
Protection of biodiversity
and habitats**

Priority for action **„Protection of the Balance of Nature“**

Water, soil and air are still subject to over-exploitation in Germany. Not only does the diversity of species and biotopes suffer from this, but also, for example, agriculture, drinking water supply and tourism. Whereas Germany can show noticeable results in air quality control and water protection (see Appendix 2), a clear need to make up for lost ground exists in soil protection. Important action targets for soil protection are:

- avoidance of pollutant input (especially from diffuse sources⁴ such as agriculture and traffic),
- avoidance of soil contamination and the clean-up of soils and contaminated sites (see Appendix 3),
- reduction of the waste via recycling and treatment,
- further development and implementation of good professional practice in agriculture,
- thrifty and careful soil use by the minimisation of surface area consumption (sealing) and the recovery of sealed surfaces (de-sealing) as well as gentle tillage.

**Key areas of activity:
regional protection and
the establishment of an
interconnected system as
well as „graded nature
protection over the entire
area“**

It is important that high standards in one environmental medium not be achieved at the expense of other environmental sectors. This applies for example to the area of sewage sludge disposal, which has been aggravated by high wastewater purification. In other words, the inter-medium approach must be taken into account: water, air, soil, and the effects of their various conditions on plants, animals and ecosystems will then have to be considered in their interrelationship.

Priority for action **„Protection of resources“**

The de-coupling of resource consumption from economic growth is considered in the long term as a key challenge. The priority effort must therefore be to „think in cycles“, that is to lower the material input in production, use and disposal through the integrative perception of material flows and the closing of material cycles.

Together with educating and informing consumers about environmentally friendly products, the following approaches are important for achieving progress in the field of environmentally benign production and consumption:

- recycling management of materials,
- reduction of material flows,
- use of energy contained in waste,
- thorough distribution of resource-efficient products, particularly in the process of the comprehensive implementation of product responsibility on the part of manufacturers and distributors.

Important criteria for resource-efficient products are, among many: long-life, possibility of recycling, low material and energy input for both production and use, increased use of renewable resources.

Priority for action **„Protection of human health“**

Protection of human health from environmental risks – for example by industrial accidents – has long been the subject of particular attention. Moreover, the subject „environment and health“ has gained further importance by more recent insight into the interconnection between hazardous materials in the environment, excessive noise levels and certain illness symptoms. The following action targets for protection against harmful substances are of priority:

- extension of systematic risk determination and risk assessment of the hazards of synthetic substances,
- reduction of so-called summer smog through reduction of ozone precursor substances (nitrogen oxides, hydrocarbons),
- lowering the health risk from carcinogenic pollutants,
- lowering of the risks from biocides,
- removal or immobilisation of hazardous wastes.

Resource protection target: economic and careful use of renewable and non-renewable natural resources

Special targets: efficient resource input into production processes and products, development of recyclable materials, products and production processes, as well as resource-extensive use of consumer goods

Targets for health protection: protection from hazardous substances, diminishment of health stress by noise, protection from ionising and non-ionising radiation

Priority for action „Sustainable mobility“

The volume of traffic has increased markedly in the past years (see Appendix 4). In Germany the growth of traffic in passenger transportation can be attributed almost exclusively to increases in private transportation. As opposed to this, the rail-traffic share dropped from 7.3 percent in 1990 to 6.7 percent in 1995. Since Germany's unification the shift of freight transport from rail to road has accelerated even further. In the meantime, over sixty percent of freight transport has been taken over by lorries.

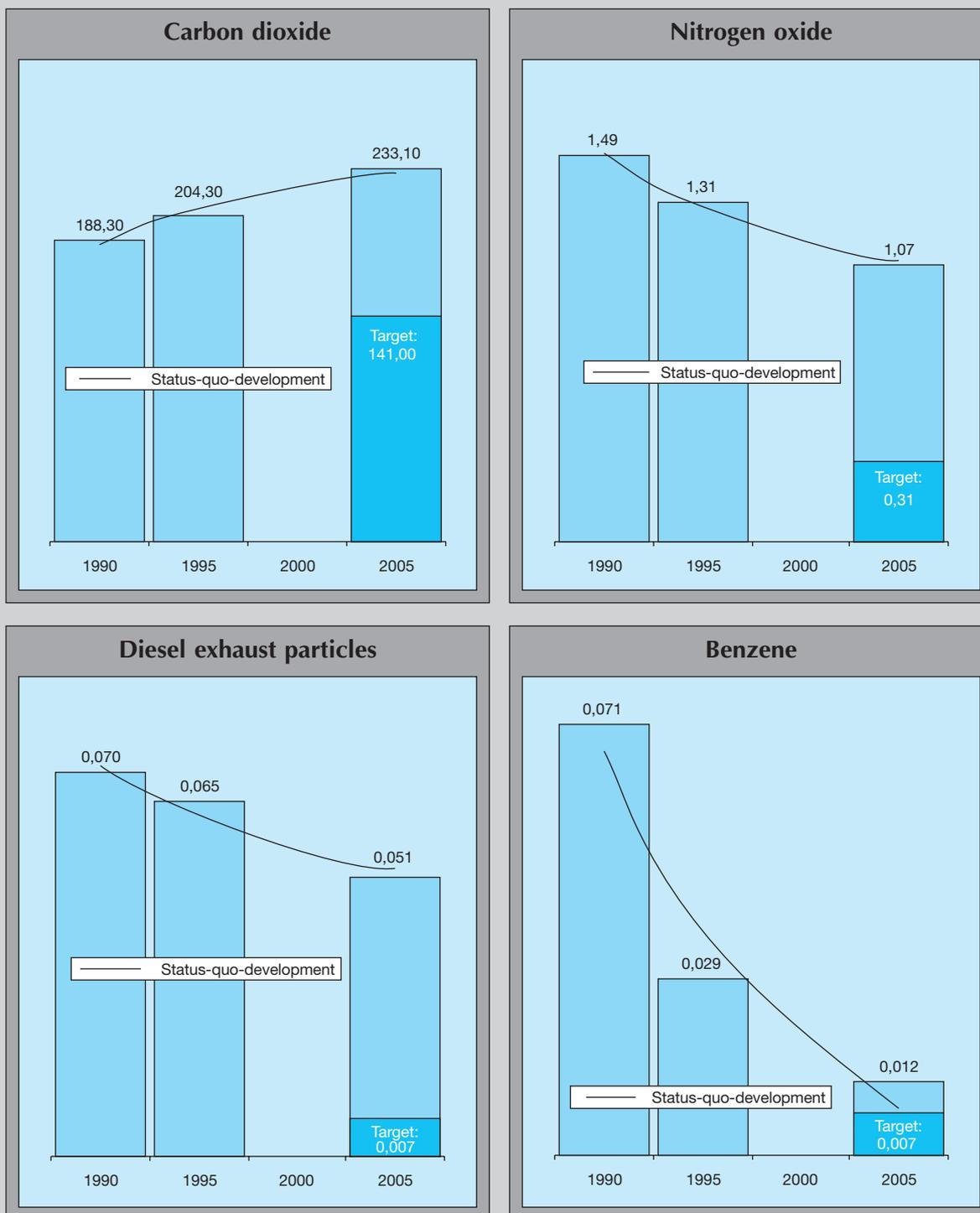
The proportion of low emission cars in the total number of motor vehicles in Germany has grown continuously since 1985. Amounting to a mere 1.6 percent at that time in West Germany, the figure had already reached 81 percent by 1996. Ever-increased driving activity has had the effect, however, that, in spite of improvements in pollution prevention technology, the overall pollution through private transport remains very high. On the positive side, the high proportion of unleaded fuel has led to a considerable decline in atmospheric lead concentrations, above all in urban areas. On the negative side, improved vehicle technology, because of the trend to higher performance and heavier cars, has not led to a corresponding reduction in average fuel consumption. In association with the rapid growth of traffic volume, this has led to a continuous rise in carbon dioxide emissions attributed to traffic (Fig. 2)⁵.

Key environmental policy measures in the traffic sector are improvements of the means of transport and of fuels primarily by:

- Optimisation of fuels from an environmental perspective,
- Purification of exhaust gas (e.g. by introducing a „super catalytic converter“),
- Objective for the next decade: lowering the average carbon dioxide emission of new cars to 120 grams per kilometre (corresponding to a fuel consumption of around five litres per 100 kilometres),
- introduction of low noise and largely recyclable vehicle models.

Fig. 2

Pollutant emission in the transport sector in Germany: Status quo development and target conditions⁶
 – pollutants in million metric tons –



Source: Umweltbundesamt [Federal Environmental Agency] 1997.

Action targets: traffic avoidance, traffic shifting to environmentally more friendly transport, behaviour changes of road users, technical optimisation of vehicles and fuels, environmentally sound road construction

Making use of all existing technological possibilities provides significant potential for emission reduction. However, this is not sufficient for achieving sustainable mobility. Rather, a structural transformation and awareness raising is needed, directed towards an integrated strategy with a combination of measures ranging from regulation, economic instruments, planning to education. In other words, such a process of structural transformation and awareness-raising is only effective in the sense of sustainable mobility if it is reflected in individual behaviour:

- Traffic can only be avoided if the distances driven are reduced. Traffic avoidance demands those changes which most deeply affect regional and economic conditions as well as behaviour, but most important is the long term effect because this approach directly counteracts the generation of traffic and thus slow down the growth of traffic.
- Traffic relocation implies the redeployment of traffic services to pro-environmental means of transport such as bicycles or walking, and to principally less polluting means of transport such as buses, rail or waterways.
- Through the utilisation of all the technical possibilities and behavioural changes (particularly driving patterns) the necessary traffic must be dealt with as much care as possible for the environment.

Priority for action **„Environmental ethics“**

Only if every individual adapts his or her activities to the limits of our environment, can the targets presented here be achieved. In the debate on consumption patterns in industrialised societies it is assumed that at least 30 to 40 percent of all environmental problems can be traced back directly or indirectly to current consumer behaviour. Some facts:

- Private consumption amounted to around 57 percent of gross national product in 1995.
- More than 80 percent of driving activity is allotted to private motorised transport, with half the journeys being made for leisure or holiday purposes.
- About 17 percent of primary energy consumption is directly attributable to private households.
- Many goods of great environmental relevance (for example detergents and cleaning materials, paints, varnishes, paper, refrigerators, washing machines) are mainly purchased by private households.

So that personal attitudes may also become practical environmental activities, the environmentally beneficial behaviour of people must be encouraged, in purchasing patterns and handling of products, in building and lifestyle, as road user and at leisure. The goal is to anchor an environmental ethic based on the conservation of nature. The following strategies for advancing pro-environmental consumer behaviour as steps toward sustainable consumer patterns are of significance:

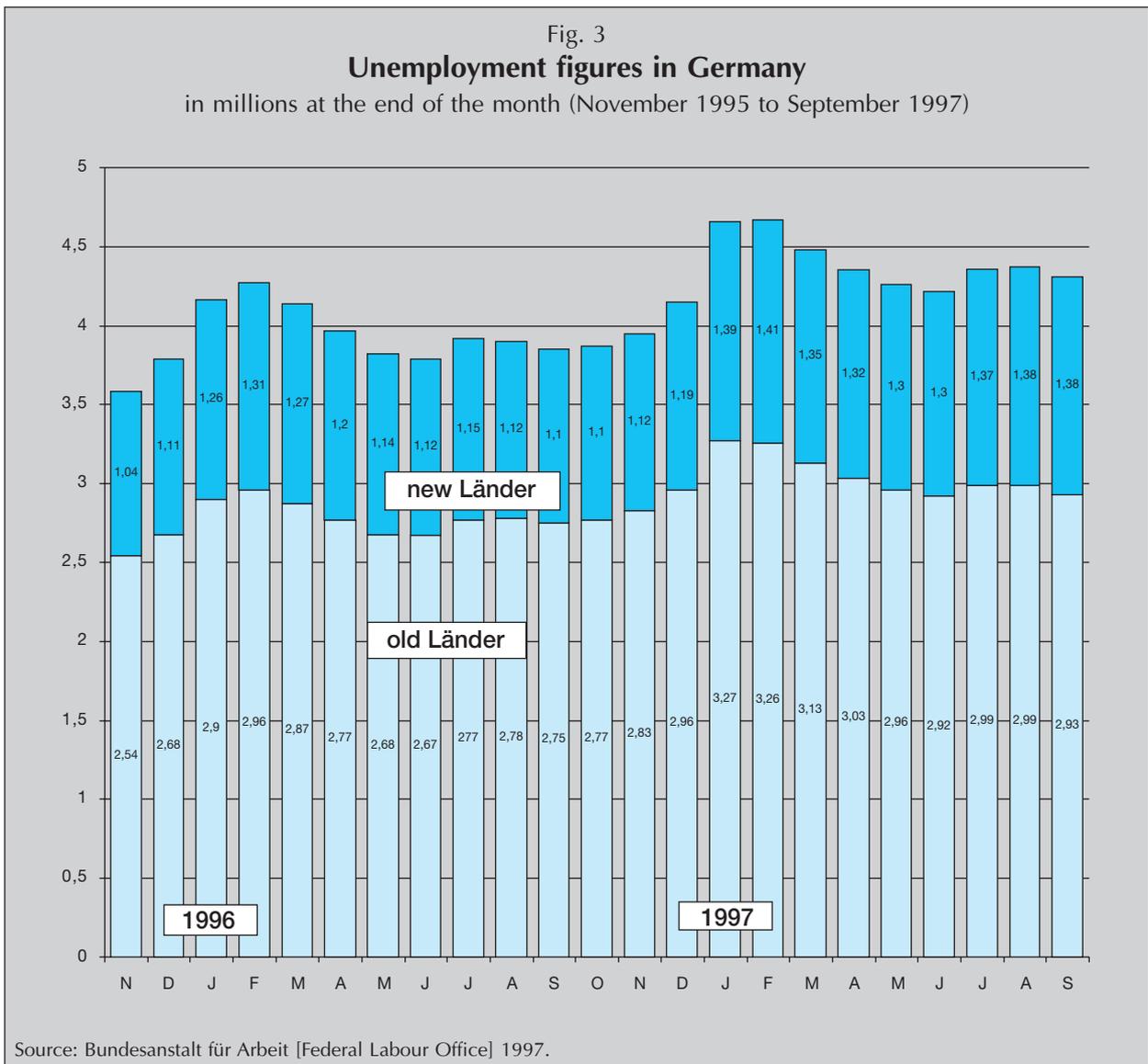
- increased public information,
- further advancement of training, both in the environmental field and in the area of sustainable development,
- further development of environmentally-oriented consumer information and advice.

Target: the anchoring of an environmental ethic which encourages the public to conserve nature in its richness and beauty for present and future generations

Key employment issues

Trend towards the wasting of working resources

In February 1997, unemployment reached a new record high in the history of the Federal Republic of Germany with 4.672 million people unemployed. Compared to December 1996, the number of people out of work increased by 510,000 in a single month, and again by more than 13,000 persons from January to February (Fig. 3). The rate increased from 10.8 (December 1996) to 12.2 percent in January and February of 1997. Due to seasonal effects unemployed decreased until the end of June 1997, only to increase again in the two following months. The slight decline in September 1997 to 4.31 million (unemployment rate of 11.2 percent) meant an increase of 460,000 compared to the same month in the previous year.

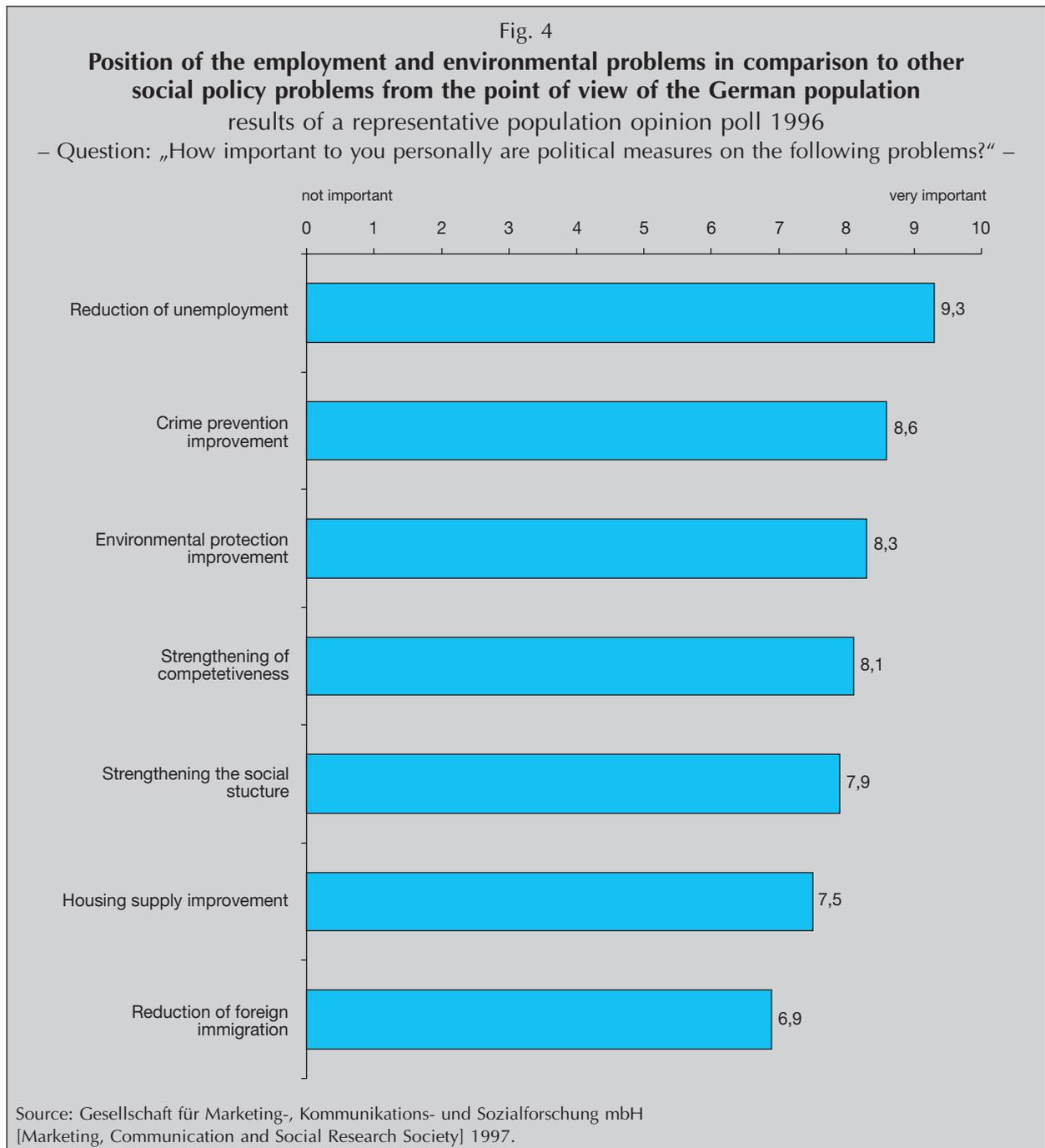


New high

This development – the last time there were more people out of work in Germany was in January 1933 – can only partly be explained in terms of a harsh winter, according to the assessment of the Federal Labour Office. The situation in the building sector is particularly unfavourable. In this sector alone, the number of unemployed increased by 63 percent from December 1996 to January 1997, from 245,000 to a good 400,000 nationally. Along with the cyclical and structural problems in this sector, strong competition as well as rationalisation in the manufacturing sector⁷ are also responsible for the worsening of the labour market situation: according to the figures available so far, employment here declined by 3.4 percent from November 1995 to November 1996, while it decreased by as much as 5.8 percent in the building industry (as opposed to 1.8 percent for all sectors).

In the old Länder the number of unemployed increased by 304,000 between December 1996 and January 1997 to 3.266 million, thus reaching its highest level. The unemployment rate increased over the same period of time from 9.6 to 10.6 percent. In the new Länder in February 1997, the employment exchanges registered 1.414 million unemployed, 227,620 more than in December 1996. The unemployment rate rose from 15.9 percent (December 1996) to 18.9 percent (February 1997 compared to 17.5 percent in the previous year). The labour market situation in the Länder of Saxony-Anhalt and Mecklenburg-Western Pomerania (rise from 18 and 17.3 percent respectively in December 1996 to 21.1 and 20.1 percent in January 1997) is particularly dramatic.

In the „Annual Report on the Economy 1996“ of the Federal Government it is pointed out that over five million competitive workplaces are lacking in Germany, leading to serious economic difficulties for those concerned and for the German economy as a whole. Moreover, many of the unemployed and their families suffer personal stress which can not be expressed in monetary terms. It is therefore not surprising that in recording the relative „importance“ of different social policy problems from the viewpoint of the population, the unemployment problem has attained top priority among the problems named. Also, a high degree of importance is attached to the improvement of environmental protection, as a representative opinion poll⁸ commissioned by the Federal Environmental Agency has shown (Fig. 4).



The calculation of unemployment rates is dependent on supply and demand factors. The example of the old Länder shows that the number of people in jobs increased by well over three million in the growth period from 1983 to 1992. This growth in demand was all but compensated, however, by the increase in those available for employment, in particular through immigration and the rise in the rate of female employment: the number of unemployed only declined by around half a million as a result.

Above all, the phenomenon of the so-called unemployment base has reached a worrying size in Germany and in the rest of western Europe. Whereas since 1970 the European economies have always proceeded into a subsequent recession with an unemployment level which exceeded the initial level of the previous economic cycle, the United States time and time again, succeeds in decreasing the unemployment rate almost to the initial level (Fig. 5).

Unemployment base



In the view of the Federal Government and the majority of experts, the functional disturbances on the labour market can only be reduced with a lasting and sufficiently strong economic growth. As emphasised by the council of economic experts in their assessment of overall economic development already in their annual report for 1995, a sustainable reduction of the high level of basic unemployment cannot be expected to be derived from recovery of the economy alone, for diverse structural reasons and because of competitive conditions which have changed

Employment threshold of economic growth fallen

A differentiated approach to growth

internationally. Nevertheless, the past has shown that lasting powerful growth is, as a rule, combined with effective employment impulses.

From the point of view of environmental protection, growth effects must be judged in a differentiated manner. They are to be viewed with concern if they merely lead to an expansion of production within the existing production structures and thus to a further increase in resource consumption. Growth-resentments are unfounded, however, if the growth process is accompanied by more careful consumption of resources, and if, as a result hazardous environmental impacts are reductive in important areas. This can happen particularly if the growth process is accompanied by:

- changes in the product assortment to the benefit of more resource-efficient goods and services
- replacement of existing and obsolete production technology with new, low-emission and carefully using resources technology.

Criteria of a successful structural change: flexibility, innovation and investment

According to scientific studies, a medium-term and comprehensively-designed strategy mix by both the state and the social partners is required in order to achieve a noticeable reduction in unemployment. The decisive criterion for a lasting success of any employment policy (both in terms of the occupational structure and the occupational level) is structural change. This must be driven forward with flexibility, innovation and investment (see the employment policy guidelines of the Federal Government).

In order to be able to cope with ever faster structural change with the lowest possible friction and the highest possible employment, a large degree of adaptation flexibility is required in Germany. The trend to shift employment from production into the services sector is continuing. To accelerate the necessary structural change, and to be able to create the jobs of the future, all subsidies must be placed on the test-bench. Structure-preserving subsidies can seriously impede the adaptation ability of Germany as a location for business investment, and also to the disadvantage of our environment.

Guidelines of the Federal Government on employment policy

The Federal Government intends to base its employment policy on the following guidelines:

- The sensitivity of the internationally linked commodity and financial markets requires an economic, financial and monetary policy that is credible, sound, consistent and orientated towards stability.
- The international competitiveness of the German industry as well as its investment, innovation and employment dynamics must be reinforced by tax reliefs, reduction in social insurance contributions and other costs, and by consistent deregulation and privatisation.
- Strict discipline at all levels regarding public expenditure and all areas is an essential precondition for the urgently needed cutting of the public-sector share of GDP.
- The reorganisation of the social security system must guarantee its long-term performance, thus strengthening the basis for the lasting preservation of the social consensus in our society.
- The wage agreement partners and the state must overcome structural obstacles to more employment through a moderate labour cost strategy and by adapting flexibly to regional, sectoral, status-related or operational circumstances.
- With the aid of a policy to stimulate competition and innovation, a more favourable climate for entrepreneurial independence must be created, particularly to gain maximum advantage from the structural adaptation capacity of medium-sized businesses as well as the performance and employment potential of those setting up new businesses and of small and medium-sized enterprises.
- In order to benefit from the tremendous growth and employment opportunities from new technologies and services, a policy is needed which consistently modernises education and research, stimulates the development of a competitive base for scientific and technological knowledge in Germany, and creates optimum conditions for new growth sectors, such as the transition to an information society.
- A modern infrastructure as well as future-oriented energy and environmental policy are the foundations of a successful and environmentally compatible modernisation of the economy.
- European integration and international free trade are of central importance, not only for the economic future of our country, but also for a strong Europe in a free, peaceful and economically stable world.

Source: Jahreswirtschaftsbericht [Annual Report on the Economy] 1996 of the Federal Government.



2

Link

- **Cost reduction through integrated environmental protection**
- **Environmental protection changes the world of employment**

Cost reduction through integrated environmental protection

Integrated environmental protection as a pile

World-wide ecological and economic challenges require new attitudes and new strategies in environmental protection. The objectives of integrated environmental technologies are derived from the necessity of uncoupling future economic prosperity and damage to the environment. The following example shows that this is possible: in the old Länder, GDP increased by 75 percent between 1970 and 1994 (price basis 1991). Sulphur dioxide emissions were reduced by 76 percent in the same period. This was primarily due to the increased development in the waste-gas desulphurisation process within the power generation sector as well as the substitution of fuels with very high emission outputs. Carbon dioxide and nitrogen oxide emissions, on the other hand, were only able to be reduced to a slight extent (Fig. 6). The unbridled growth of road traffic in Germany is especially responsible for this.

Catchword „Integrated environmental protection technology“

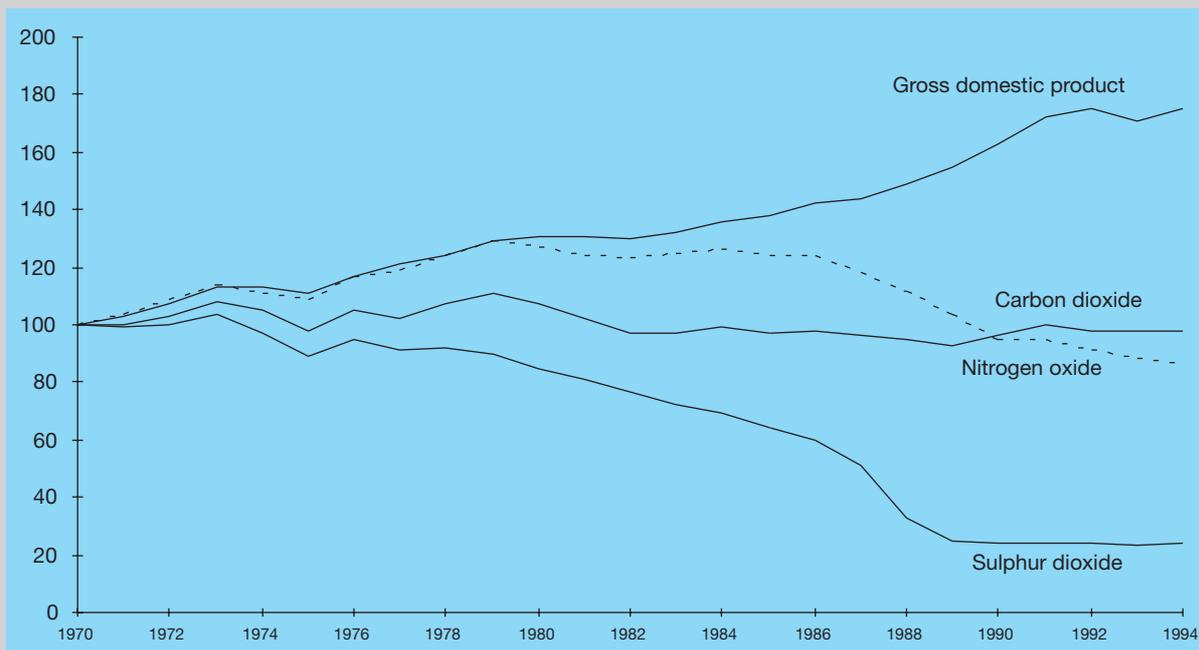
The Office for Estimating the Effects of Technology of the German Federal Parliament [Büro für Technikfolgenabschätzung beim Deutschen Bundestag] considers integrated environmental technologies as characterised by the following properties and criteria:

- efficient energy and material use,
- a recycling process which is integrated within the production process (primary material recovery),
- reduction of unavoidable by-products,
- substitution of environmentally harmful input materials,
- substitution of products and production processes with less environmentally harmful products and processes,
- comprehensive phasing-out of end-of-pipe and additive technologies,
- consideration of preliminary and subsequent phases of a production-process or a product (life-cycle analysis),
- recyclability and environmentally sound disposal of residual materials and products no longer usable.

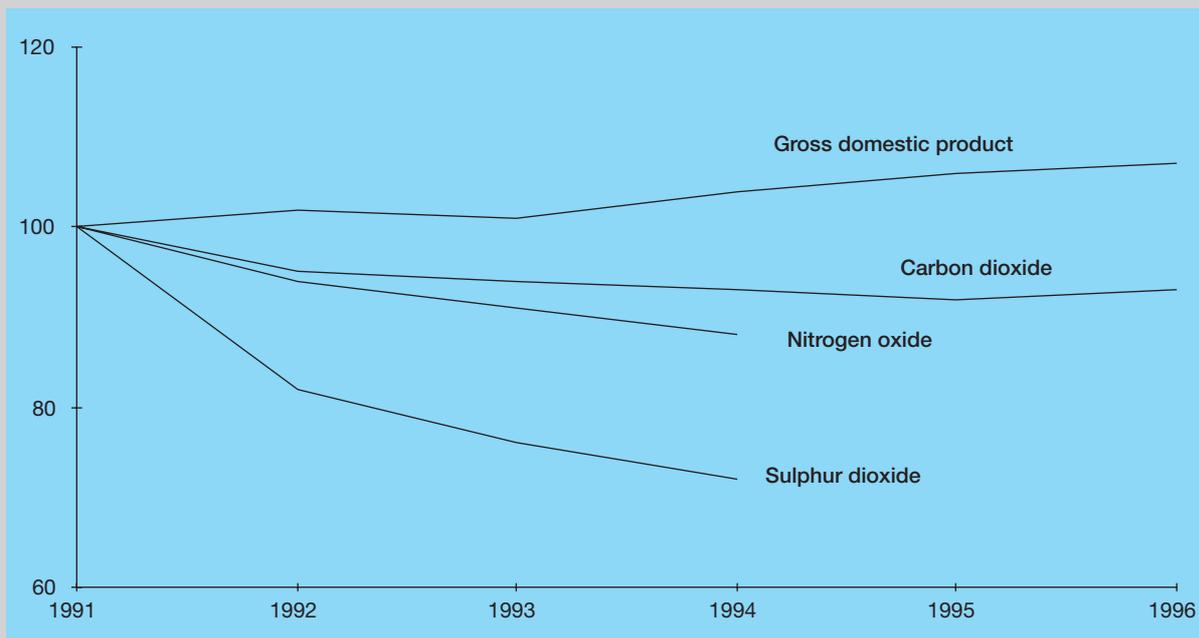
The principal aim of integrated environmental protection technologies is to prevent beforehand any hazardous environmental impact⁹; already within the framework of the production process, to achieve its environmental modernisation. As opposed to the so-called end-of-pipe technologies, such

Fig. 6
Decoupling of economic growth and pollutant emission possible

Gross domestic product (price basis 1991) and emissions of selected air pollutants in the old Länder
 – Index 1970 = 100 –



Gross domestic product (price basis 1991) and emissions of selected air pollutants in Germany
 – Index 1991 = 100 –



Source: Federal Statistics Office 1997 and Federal Environmental Agency 1997.

as filters or treatment facilities (which in individual sectors will of course still be needed in the near future in absence of better solutions), integrated environmental protection strategies and measures have the following advantages:

- **Environmental benefits**

Integrated technologies represent engineering solutions which additive technologies cannot offer. For example: there will never be a filter of whatever type for the reduction of carbon dioxide which can be used in all sectors. Resource-efficient integrated environmental protection which makes provision for processes, technologies and products is required.

- **Economic benefits**

Since environmental pollutants and disposal problems do not arise, there is no need for expensive treatment. In other words, if the avoidance of environmental contaminants leads to corresponding cost savings (for example in the form of lower material, disposal and energy costs) investment in integrated environmental protection does pay off even from a purely economic point of view.

Competitive advantages maintain and create new jobs

National economies which systematically use integrated environmental protection technologies will attain the competitive lead by making the most of cost reducing potentials. This will ultimately lead to positive employment effects through a resulting rise in production.

That environmental protection in business is not simply a cost factor but may actually lead to an increase in economic efficiency has been shown in numerous practical examples. Opportunities for cost reduction are present in particular within the energy sector, the packaging industry, in the procurement and waste sectors, and in production and the sewage sector.

Environmental protection can reduce costs – Guide to Environmental Cost Accounting¹⁰

Time and again, businesses maintain that company-level environmental protection does not pay off. Expenditures for environmental protection, the costs of pro-environmental business management as well as research-costs for new developments of more environmentally beneficial products or production processes seem to have no related returns. In order to show companies that precisely the opposite is true, the German Ministry of the Environment and the Federal Environmental Agency have developed a new tool for medium-sized businesses. With the „Handbuch Umweltkostenrechnung“ (Guide to Environmental Cost Accounting), the cost efficiency of company-level environmental protection measures are made clear to those involved. This aid consists of two core modules:

- An easily understandable guide to environmental cost calculation. Using the guide it is possible to track down and systematically implement measures which simultaneously lower costs and protect the environment.
- Over twenty successful practical examples.

Three examples

⇒ At ABB Calor Emag Schaltanlagen AG in Ratingen, several measures for reducing fresh water consumption by more than 40 percent, associated with investments of 35,000 DM between 1989 and 1993, achieved a savings of 124,000 DM for 1993 alone (based on 1993 water rates).

⇒ By conversion from fresh to industrial grade water for the cleaning of bottle-crates, the middle-sized Berentzen-Gruppe managed to lower their annual running costs by just short of 80,000 DM with relatively low expenditure (investment of 10,000 DM). In this way, 21,800 cubic meters of fresh and waste-water could be saved as well as about 5,000 kilograms in the input of cleaning material.

⇒ At Mitsubishi Semiconductor Europe GmbH, Alsdorf, (MSE, a semiconductor-producing subsidiary of the corporate group with around 300 employees) considerable cost savings were able to be achieved by means of a package of environmental protection measures within the framework of EMAS. Whereas the costs for initial participation in the EMAS came to around 141,000 DM and around 69,000 DM annually for its continuation, as well as an estimated investment of around 165,000 DM in the energy, waste-product and sewage sectors, the annual cost savings through these measures can be estimated at around 734,000 DM. This shows that participation in EMAS pays off. The ecological benefit covers savings of 143,000 cubic meters of natural gas, just short of 3,100 megawatt-hours of power, reduction by 5.8 tonnes of PVC-waste and raw materials as well as water savings of 5,519 cubic meters.

Environmental protection changes the world of employment

Environmental protection concerns (almost) all jobs

The significance of environmental protection for nearly all professions is no longer a matter of fundamental contention. The integration of training for sustainable development thus occupies a special position in nearly all vocational training statutes and syllabuses. In this way, very different professions can make essential contributions to sustainability, for example:

- the farmer who practices organic or integrated farming instead of chemically supported intensive farming,
- the mechanic who tunes a car engine to run at low pollution levels,
- the process control engineer who deals with the residually low combustion of fossil fuels in power stations
- the painter or bricklayer who uses environmentally-friendly materials,
- the radio and television technician who recycles older sets and disposes of the non-recyclable material in an environmentally-friendly manner.

Beyond this, a number of vocational approaches have been developed which are particularly directed towards environmental protection and may be described as „environmental professions“ (Tab. 1). For example, in Germany a nation-wide advanced training program for nature and landscape conservation is in preparation. The need for such a qualification is a result of growth in the field of contractual nature conservation and care of protected areas. A precondition for the examination is the successful conclusion of training in one of the „green professions“ such as gardener, forester or farmer, as well as several years professional practice and participation in an advanced training course.

According to estimates of the German Institute for Economic Research [Deutsches Institut für Wirtschaftsforschung, Berlin], even if such „environmental professions“ make up less than 0.1 percent of the employment total (in 1990 around 40,000 persons were allocated to this vocational group in the old Länder), this does not mean that environmental qualifications are only demanded for exceptional cases on the employment market. Environmental protection knowledge actually represents a typical inter-disciplinary function to which considerable importance is attached in a variety of professions.

Table 1 Occupations in environmental protection		
Training possibility	Responsibilities/Activities	Relation to environmental protection
Biology laboratory assistant	<ul style="list-style-type: none"> • Testing reaction processes in the living organism • Participation in studies, above all on small animals, in development and experimental laboratories 	<ul style="list-style-type: none"> • Analysis of agricultural control agents, feedstock additives, agricultural products • Analysis of waste water and ran water for drinking water treatment
Chemistry laboratory assistant	<ul style="list-style-type: none"> • Analyses of water, air and soil, assessment of the results <p>Work in R&D laboratories, in-house and control laboratories, and in application technology departments</p>	<ul style="list-style-type: none"> • Particularly related to environmental protection in agricultural chemistry and in operations with high water consumption • Analysis of environmental effects of agricultural control agents, waste gases and waste water • Participation in emission reduction measures
Fire fighter	<ul style="list-style-type: none"> • Fire-fighting • Rescue of persons, animals and material goods • Elimination of general hazard conditions 	<ul style="list-style-type: none"> • Selective use of fire-extinguishing agents for the prevention of toxic gas formation and/or contamination in fires • Removal of leaking environmentally harmful chemicals
Insulator/insulation fitter	<ul style="list-style-type: none"> • Thermal, cooling or sound proofing insulation of technical equipment, buildings and vehicles • Selection and use of suitable insulation material 	<ul style="list-style-type: none"> • Reduction of emissions (excessive noise, heat) • Minimisation of energy loss, protection of resources
Agricultural technician	<ul style="list-style-type: none"> • Work in water supply and sewage disposal construction projects • Surveying, calculation and the preparation of drawings 	Directly related through dealing with water supply facilities, drinking water treatment, discharge regulation and waste water disposal
Agricultural laboratory assistant	<ul style="list-style-type: none"> • Sample preparation, carrying out studies • According to subject area, seed and feedstocks studies, detection and effects of agricultural control agents, parasitologic and virologic studies 	Demonstration of the effects and consequences on the food chain of environmentally harmful behaviour in the use of materials (seed, feedstock, fertilisers and agricultural control agents)
Agricultural control laboratory assistant	<ul style="list-style-type: none"> • Examination of plant samples, pathogens, fertilisers and pesticides • Work in laboratories, greenhouses and experimental fields 	Directly related by the environmental relevance of the objects examined
Chimney-sweep	<ul style="list-style-type: none"> • Measures for fire and operating safety of firing and ventilation facilities (sweeping, cleaning, servicing, checking) • Use of various pieces of cleaning equipment and measuring instruments 	<ul style="list-style-type: none"> • Inspection of heating facilities with the associated tanks for compliance with building regulations, correct settings and sealing • Measurement and assessment of emissions
Supply and disposal engineer	<ul style="list-style-type: none"> • Operation and servicing of technical facilities • Sampling and analysis • Organisational activities • Work in water-works, clarification facilities, waste-tips, refuse incineration facilities and industrial facilities 	<ul style="list-style-type: none"> • Directly related through dealing with waste, water, waste water or sewage sludge • Responsibility for the safe handling of environmentally hazardous materials
Hydraulic engineer	<ul style="list-style-type: none"> • Maintenance and repair work on natural and artificial waterways, servicing of river training works • Collaboration in the construction of port facilities and dikes; cleaning, laying out and correction of river-courses 	<ul style="list-style-type: none"> • Protection of nature and landscape conservation as part of his or her activities • Bearing in mind ecological relevancy in the design and maintenance of the embankments

Source: Summary based on the „Jobs in Environmental Protection“ vocational science information sheets of the Federal Employment Office [Bundesanstalt für Arbeit]

Competent staff is required by public and private enterprises not only for the fulfilment of legal obligations or for voluntary environmental protection measures but also for the development and setting up of environmental protection facilities, in so far as this is both sensible and possible. Occupations in the field of environmental protection include:

◆ **Operation and maintenance of environmental protection facilities**

The maintenance and cleaning of company waste-water networks, operation of company waste-tips or incineration facilities, maintenance of air filter systems.

◆ **Measuring and monitoring functions**

Exhaust air control and excessive noise measurements within and outside the company grounds, sampling, individual measurements and laboratory analyses to determine the harmfulness of the in-company sewage or waste material. Operation of mobile monitoring stations, monitoring vehicles and laboratory equipment. Compiling and updating emission and/or uptake registers.

◆ **Research, development and trials**

Development and testing of new disposal facilities and processes for in-company purposes. Development of new recording and analysing techniques for emission monitoring, consultation with research, development and production with a view to the application of pro-environmental processing, production or energy technologies, or the manufacture of environmentally sound products.

◆ **Administrative tasks**

Supervision of compliance with all relevant environmental regulations, assistance with official approval procedures for the erection and running of production facilities, in-company informational and training measures, public relations work.

The trend to integrated environmental protection should lead to a continuous renewal of capital stock and will also require special professional qualifications. The following courses of study are more or less strongly related to environmental protection:

- Natural sciences: biology, chemistry, geography, geo-ecology (landscape ecology), geology, mineralogy, geophysics, physics, meteorology, oceanography and agricultural engineering;
- Planning-related: architecture, regional planning, landscape conservation/landscape planning (and related courses), horticulture, forestry science/economics and ecotrophology;
- Technical: technical environmental protection, mechanical engineering/process engineering, civil engineering, electrical engineering, information processing and bio-technology/bio-process engineering;
- Arts and humanities: economics and law as well as sociology, political science, and psychology (pedagogy, philosophy, history, linguistics and literature as well as theology are also increasingly assimilating the concept of sustainability and making important contributions to the corresponding discussions);
- Medicine.

High training demands

Voluntary Ecological Year (Freiwilliges ökologisches Jahr – FÖJ)

With a model project in Lower Saxony in 1987 the project 'Voluntary ecological year' was initiated. On September 1st 1993, the respective legislation (Gesetz zur Förderung eines freiwilligen ökologischen Jahrs – FÖJG) took effect. The voluntary ecological year is intended for young people between 16 and 27, offering the opportunity of developing personality as well as environmental awareness and, at the same time, working for nature and the environment. It is estimated that today over 1000 young people participate, either at an ecology station, a public facility, or with a recognised environmental association. The following statistics are for the period 1996–1997:

Land	Number of FÖJ places	Land	Number of FÖJ places
Baden-Württemberg	60	Lower Saxony	130
Bavaria	72	North-Rhine Westphalia	100
Berlin	94	Rheinland-Pfalz	40
Brandenburg	94	Saarland	no data
Bremen	10	Saxony	no data

Hamburg	5	Saxony Anhalt	60
Hesse	no data	Schleswig-Holstein	35
Mecklenburg-Vorpommern	80	Thuringia	114

In Article 1 of the FÖJG the grant conditions are described. In Section 1 subsection 2 it says: „The voluntary ecological year will have a instructional component. The instructional component will be guaranteed by the central office of an approved support organisation; it will consist of issue-related introduction and individual supervision and training by the provider and by the support organisation staff, as well as seminary work. The seminars are to be held for the participants of the voluntary ecological year; the participants will have an influence both on content and procedure of the seminar. An introductory, an interim and a concluding seminar are to be held for a period of at least five days each. The overall duration of the seminars, related to twelve month participation in the voluntary ecological year, will account for at least 25 days. The seminar time is considered as working time. Participation in the seminars is obligatory.“ Remuneration may be provided for accommodation, provisions, work clothes and appropriate pocket-money, as well as compensation for contributions to the obligatory state pension insurance scheme.

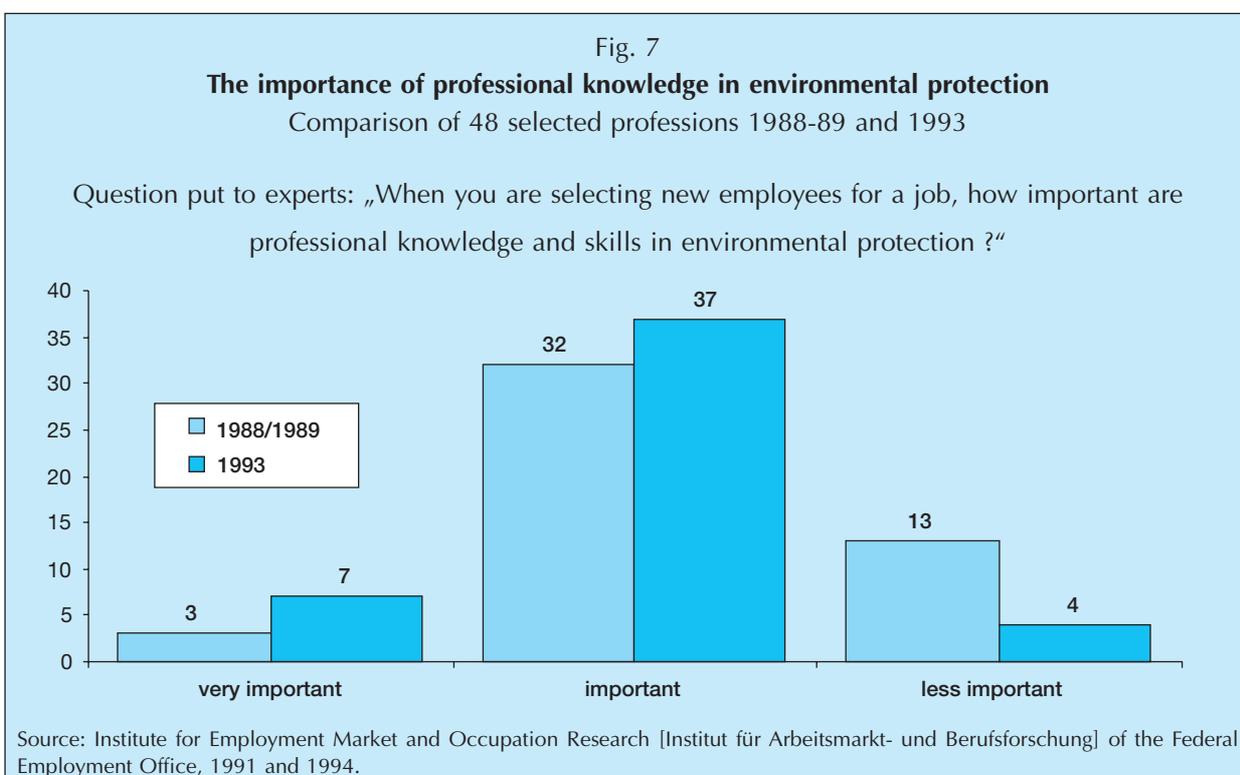
Note: detailed information is contained in the brochure „Voluntary Year Social Year – Voluntary Ecological Year. Young People Make their Contribution“ [„Freiwilliges Jahr Soziales Jahr – Freiwilliges Ökologisches Jahr. Junge Leute beteiligen sich“] published free of charge by the Federal Ministry for Family, Senior Citizens, Women and Youth [Bundesministerium für Familie, Senioren, Frauen und Jugend].

Environmental knowledge is gaining importance

Since the end of the eighties, the Institute for Employment Market and Occupational Research [Institut für Arbeitsmarkt- und Berufsforschung] of the German Federal Employment Office has been dealing with calculations of industry experts on employment prospects as well as on training requirements in recognized trades.¹¹ These include sales staff, shipping agents, office assistants, milling workers, locksmiths, professional drivers, electricians, bricklayers, joiners, tailors, painters, farmers, bakers and cooks. In this process, it has been shown that environment-related knowledge and skills are becoming ever more important (Fig. 7). The experts consider environmental knowledge to be „very important“ for the following occupations:

- chemistry specialists,
- trade packers,
- steel workers
- chemistry laboratory assistants,
- supply and disposal workers,
- machinists,

- motor mechanics,
- finishing shop workers,
- metalworkers,
- workers in the car body and vehicle construction industry,
- industrial electronics workers,
- measurement and control mechanics,
- road maintenance workers,
- book binders,
- forestry workers,
- housekeepers.

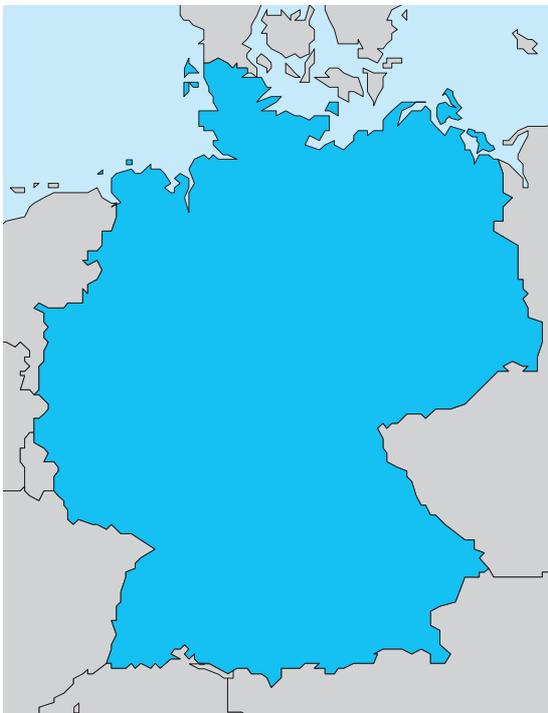


The increasing significance of environmental protection for the economy can no longer be ignored. Whether:

- as a personal qualification
- both as a prerequisite and as driving force for the development of future oriented technologies, or
- as a cost factor to a changing regulatory and economic framework.

Early recognition of these developments makes it possible for Germany and its industry to attain a key technological and economic position, thereby securing jobs and fostering pioneer economic gains in the long term.

Interim conclusion



3

Employment effects of environmental protection

- **Significance of environmental protection for the job market**
- **Environmental protection induced employment in 1994**
- **The quality of environmental jobs**
- **Outlook**

Significance of environmental protection for the job market

Direct and indirect effects

Environmental protection measures influence employment in a variety of ways (see Appendix 5):

- Direct effects on employment arise if people are employed by the organisation carrying out an environmental protection measure.
- Additional employment emerges – as it does for every other increase in demand – through the purchase of pro-environmental goods or services.
- Indirect employment effects arise in firms which supply the producers of pro-environmental goods with capital goods or services.

„Multiplier effects“

And these issues above do not yet cover all the possible employment effects of environmental measures. Such activities can lead to employment in „distant“ areas of the economy through follow-on effects in price, production and income structures. Of particular importance are „multiplier effects“ which emerge when additional demand leads to permanent additional household income and thus to further demand.

Negative employment effects

Detrimental effects on the job situation, however, as a result of environmental measures are also conceivable, for example, on the grounds of

- cost related loss of competitiveness,
- bottlenecks in personnel capacity or training
- the obstruction of private activities by increased state borrowing.

Environmental protection costs are of secondary importance

Although annual expenditure for environmental protection in Germany has probably reached 60 billion DM (see Chapter 4), there can be no question of „serious economic disadvantages“ on account of environmental protection costs which are too „high“, for the following reasons:

- Environmental protection expenditure does not amount to even two percent of gross domestic product.
- More than half of all environmental expenditure is borne by the public sector. In 1995 this was distributed as follows:
 - public sector, around 55 percent,
 - manufacturing industry, around 45 percent.

- When discussing environmental measures of companies as a cost factor, it must not be forgotten that a portion of these costs are covered by public subsidies. In other words, the financial assistance of the public sector provides a cushion against upward pressure on costs. In the past two years, the German Federal Government alone has provided tens of billions in support for investment in environmental protection.
- The considerable costs which can arise through the neglect of environmental considerations can only be avoided through consistent environmental protection. Practice has shown that accidents and/or neglect of company-level environmental protection can lead to high costs for the business concerned. The expenses which may have to be borne by the firm itself, extend from the costs of the production shortfall, through the damage elimination costs, through to the costs arising from a tarnishing of the company image. The latter occurs, for example, when it becomes necessary after an accident to convince both the public and customers, for example through expensive advertising measures, that the existing negative assessment is not justified.
- Private enterprises can more often than not adapt to environment regulations in a form which is most cost-favourable for them. The introduction of integrated technologies is of particular interest here, both from an environmental and an economic point of view.
- Environmental protection costs are not of a significant magnitude, neither in international comparison, nor in comparison to other macroeconomic cost units. (Fig. 8).
- Sometimes it is argued that high environmental costs in specific sectors lead to cost increases in other interrelated sectors. However, on the contrary, by distributing the burden over many sectors, it is actually reduced.
- In general, most companies do not have heavy environmental cost burdens to bear. Measured against turnover, overall costs to the manufacturing industry for environmental protection amount to less than an average one percent annually, in industries with comparably high environmental costs they account for three to four percent.
- Investments for environmental purposes alone are rare. Rather they are made in conjunction with production related investments („synchronous investments“).

Fig. 8
Significance of environmental protection costs

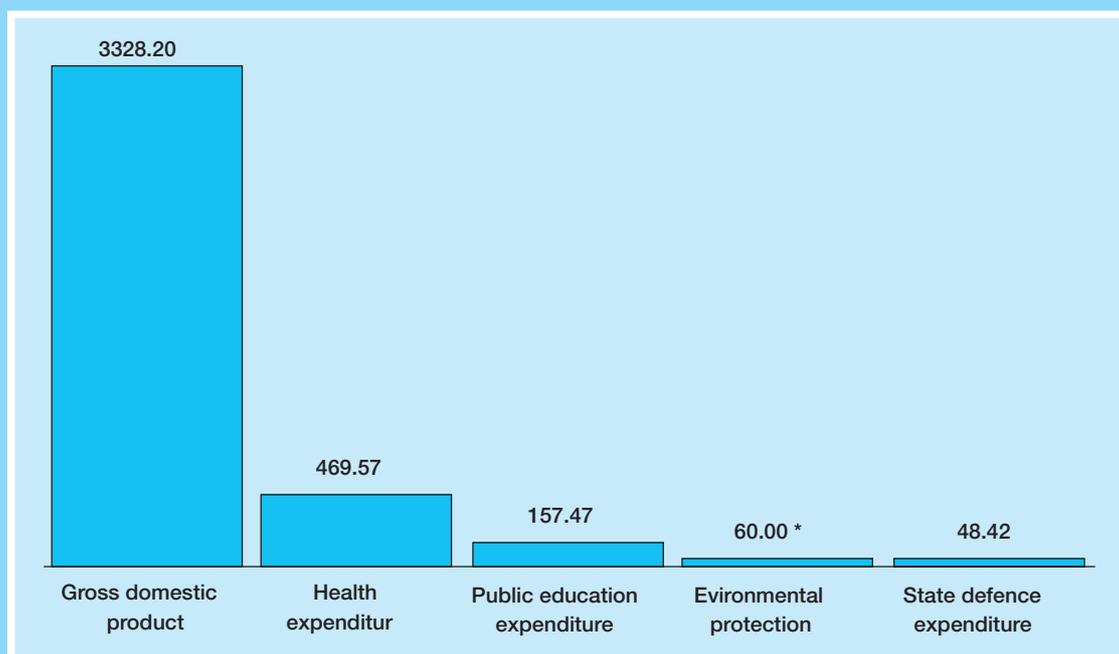
International comparison of environmental protection costs							
Country	Share of environmental protection costs in gross domestic product (in percent)						
	1988	1989	1990	1991	1992	1993	1994
Australia	..	..	0.6	0.7	..	..	..
Austria	1.7	..	2.0*	2.1*	..	..	2.0
Canada	..	0.9	..	..	..	..	..
Denmark	..	0.5	0.5	0.6	..	..	1.1
France	1.2	1.2	1.2	1.2	1.2	..	1.4
Germany ^{a)}	1.6	1.6	1.6	1.6	1.8*	1.8*	1.8*
Italy	..	0.9	..	..	..	..	0.9
Netherlands	..	1.4	1.7	1.8	1.9	..	2.3
Portugal	0.5	0.5	0.8	0.7	..	..	0.8
Sweden	..	..	..	..	1.2	..	..
Switzerland	..	..	..	..	2.1*	..	..
Spain	0.5	0.6	0.6	0.6	..	..	0.5
United Kingdom	..	..	1.4	..	..	..	1.1
United States	1.4	1.4	1.5	1.5	1.5	..	..

*) estimated ..) not available a) until 1991 old Länder

Source: OECD 1997, EU 1997; internal calculations on the basis of data from the OECD or EU

Comparison of environmental protection costs to other national economic cost units

– in billions DM in Germany (1994) –



Source: Federal Statistical Office 1997 * estimate.

„Environmental protection and the quality of business location“

Relocation for reasons of environmental protection?

At the beginning of the nineties, various industrial and trade associations declared that Germany's comparatively strict environmental regulations would lead to companies relocating abroad. A number of studies on the importance of environment costs in locational decisions have since become available. The key message of a study commissioned by the Federal Environmental Agency on „The Influence of environment-related locational decisions on investment decisions“ (cf. REPORTS [BERICHTE] 1/93 of the Federal Environmental Agency) is that there were on balance no indications that environmental policy had had an adverse effect on the quality of Germany as a location for business and industry.

In 1996 the OECD also came to the conclusion that environmental requirements did not lead to any discernible industrial relocation to countries with lower environmental protection standards.¹² After reviewing current research on these subjects, the OECD agreed that the net effect of environmental policy on international competitiveness was not negative.¹³ A survey of 1,000 multinationals carried out by the OECD and the World Bank is particularly informative in this regard. Nearly 70 percent of the corporate groups questioned revealed that they apply their own relatively stringent environmental standards even when these are stricter than standards in the host countries.¹⁴ There is thus no question of businesses relocating to countries with lower environmental standards.

German environmental protection demands not a decisive motive for foreign investments

From a corporate standpoint sales market factors, lower labour costs and the circumvention of trade barriers and import restrictions are the decisive motive for foreign investments. The main reasons listed are the opening up and cultivation of new markets. „Lower environmental requirements“ play almost no role as a motive for foreign investment by German industry, as is repeatedly shown in corporate surveys. A current study by the Institut der deutschen Wirtschaft on „German corporate investment motives for locations in central and eastern Europe“ underlines this message. Although the states of central and eastern Europe are generally seen as locations with environmental standards of below average stringency – particularly compared to Germany and western Europe – „environment regulations“ as an investment motive play practically no role. German firms engage themselves in central and eastern Europe above all in order to develop new sales markets and secure existing markets. Next in importance come low labour costs as the most important location related motive (see Appendix 6).

German foreign investment as a measure for locational quality?

Other aspects have to be taken into consideration in assessing German foreign investment:

- ◆ In general it is questionable to take the level of German foreign investment as a meaningful yardstick for the quality of Germany as a location for industry. Individual large investments, such as the take-over of Rover by BMW, the engagement of Mercedes Benz in automobile production in the United States, or the sale of Boehringer Mannheim to the Basle Roche Group are rather strategic, globally-oriented decisions, and not conclusive evidence of the weakness of Germany as a location for business.
- ◆ It is also not necessarily the case that German foreign investment eliminates domestic jobs. According to a 1996 study by the Rheinisch-Westfälisches Institut für Wirtschaftsforschung German companies increasing the numbers of employees abroad are also expanding their workforce at home. The reason for this is to be found in the nature of the German economy. It is not new business start-ups, but rather the take-over of and/or participation in existing enterprises which predominates. The main motives are the opening of new markets and the lowering of labour and administrative costs.
- ◆ It has been shown that in the highly developed economies at the upper end of the high-tech countries, a tendency to increase direct foreign investment is evident. Firms are thus following the world-wide trend towards globalisation in expanding their traditional foreign markets and opening new markets. Germany cannot stand back from this trend, so that in future high direct foreign investments are to be expected, regardless of locational deliberations.

Beyond this, well-known domestic locational weaknesses must be addressed more sensible than in the past. These include

- ◆ high wage costs (particularly the high ancillary and social costs),
- ◆ bureaucratic regulation density (delaying investments and thus the creation of new jobs),
- ◆ narrowing of the employment market, particularly by work and wage-agreement regulations (hampering the adjustment of employment to match current orders) and
- ◆ the high corporate tax burden as compared internationally.

This necessity is underlined by a current study of the American Chamber of Commerce in Germany. Critical for Germany as a business location, in the view of these top American executives, are high personnel costs (93 percent), the strict industrial legislation (67 percent), the high level of taxation and public charges (52 percent), the power of the unions (44 percent) and an inflexible bureaucracy (38 percent). The relatively high German environment standards are **not** a barrier to investment.

Contribution of environment policy to locational quality

There are a variety of arguments showing that environment policy contributes positively in many ways to the locational quality of Germany:

◆ **Environmental protection: a feature of German quality**

The label „Made in Germany“ still has the best image in Europe. A representative study by the University of Bern obtained this result from around 3,420 international executives in 1997. On an international scale, German products hold the second position together with the United States, behind Japan. It is incontestable that products and production of environmental interest, which have attracted considerable attention in many German firms since the middle of the eighties within the framework of environmentally oriented management, have developed into an important quality attribute.

◆ **No location marketing without modern environmental protection infrastructure**

The example of the new Länder clearly shows the value of environment policy Germany has as a location for business and industry. Inadequate environmental infrastructure (for example, lack of sewage treatment plants) and unsolved problems in the clean-up of contaminated sites were still among the most commonly named barriers to investment up until the mid-nineties – particularly in heavily polluted regions such as Leipzig, Bitterfeld, Halle and Merseburg. This statement is supported by the OECD/World Bank study mentioned above. This study shows that neglect of environmental protection in the central and eastern European countries represented an important barrier to investment in the eyes of western investors, with the fear of unknown dangerous toxic waste playing a particularly important role.

For this reason, the development in some Asian countries appears to be problematic as well. Economic growth and environmental policy in these countries are insufficiently co-ordinated. According to a report by the Asian Development Bank, the greater part of the continent will become more polluted, louder, more deforested and biologically less diverse without a conscious change of environmental policy. In the long term, this will considerably decrease the locational quality.

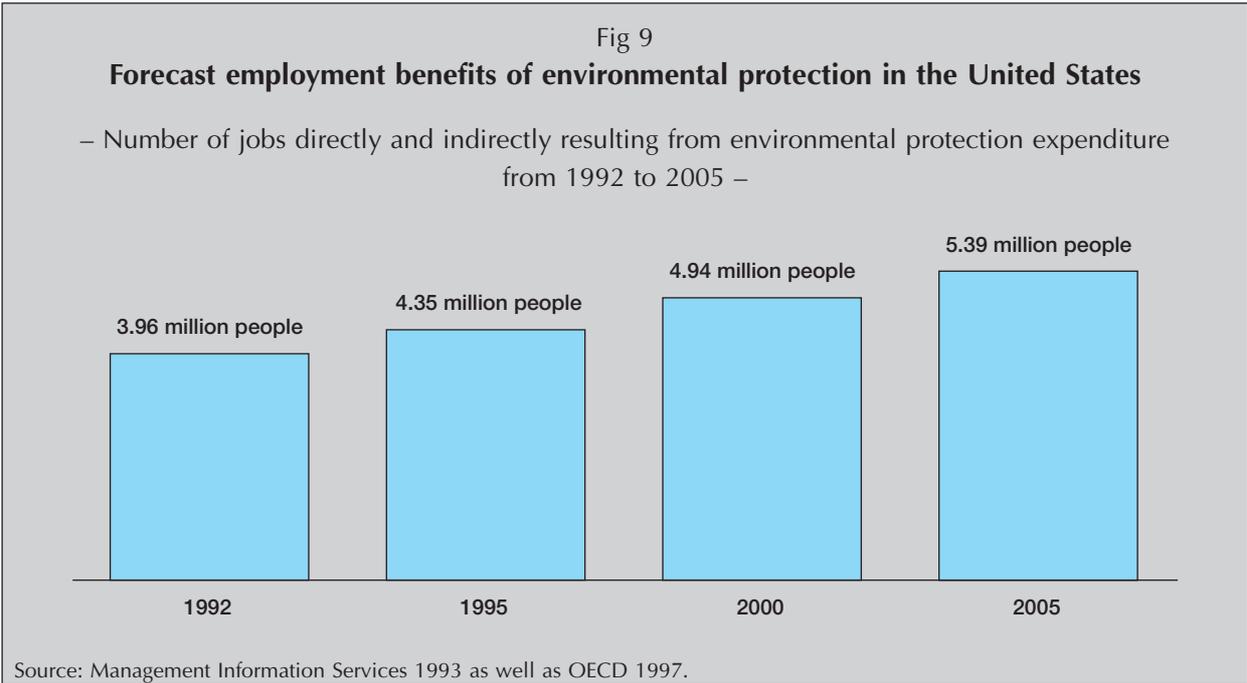
◆ **Trade and industry need environmental protection**

A number of industries need particularly favourable environmental conditions. An intact environment is of great importance for agriculture and fisheries, drinking water suppliers and tourism. Also, environment standards and healthy living conditions are an important factor for locational decisions on the part of the producing sector. The supply of qualified employees, an important motive for location choice, will be more or less strongly influenced by the environmental condition of the location. It is hardly questionable these days that the „environmental image“ of a region or community is of great significance for obtaining qualified staff, not only at executive level.

Estimates and forecasts

Already at the beginning of the nineties the importance of environmental protection for the labour market had been demonstrated in a study by the German Institute for Economic Research (Deutsches Institut für Wirtschaftsforschung) in Berlin. There it was estimated that in 1990 approx. 680,000 people were employed nationally in environmental protection, and it was also predicted that this figure would have increased by the year 2000 to at least 1.1 million (BERICHTE 5/93, German Federal Environmental Agency) – under the assumption, that environment policy would be continually further developed.

Considerable employment benefits from environmental protection are also predicted in other countries. In an OECD study entitled „Environmental policy and employment“ it is referred to an American report according to which in 1992 just short of four million people in the United States were engaged directly or indirectly in environmental work, approx. three percent of those engaged in gainful employment. For the year 2005, as many as around 5.3 million were expected to be employed in environmental protection (Fig. 9).



Such estimates and forecasts can be associated with considerable uncertainties. For example, estimates of the market volume for environmental protection goods in 1989 lay between 25 and 50 billion DM. A reason for such large differences is that environmental protection is difficult to register statistically. In addition, the measuring concepts used to determine environmental protection induced employment inadequately estimate the effects of integrated environmental protection.

We also encounter difficulties in the assessment of important parameters influencing the environmental market. On the basis of empirical investigations, the following are generally seen as particularly decisive in the demand for environmental goods:

- new environmental legislation,
- enforcement of existing regulations,
- corporate environmental awareness,
- domestic economic situation,
- financial endowment of the state,
- financial assistance for public measures,
- environmental policy of other countries,
- environmental awareness of individuals,
- economic situation abroad.

Employment resulting from environmental protection in 1994

In order to be able to judge the importance of environmental protection for the employment market, in November 1995 the Federal Environmental Agency commissioned a joint project from leading economics research institutes (Deutsches Institut für Wirtschaftsforschung, DIW Berlin / Institut für Wirtschaftsforschung, ifo München / Institut für Wirtschaftsforschung Halle, IWH / Rheinisch-Westfälisches Institut für Wirtschaftsforschung, RWI Essen) to provide an expert opinion on the „Updated calculation of employment resulting from environmental protection in Germany“ (the study was published in September 1996 by the Federal Environmental Ministry).¹⁵ The study mainly follows a „demand oriented“ compilation of employment effects primarily concentrated in the following areas:

Demarcation problems

Joint expert opinion of leading economics research institutes

**Employment effects
evaluated represent a
lower limit**

- employment effects deriving from the use of personnel on immediate environmental tasks,
- employment effects deriving from the demand for industrial equipment intended for environmental protection,
- employment effects deriving from the demand for ancillary and operating materials, power, repair and maintenance services associated with the operation of environmental protection facilities.

The employment benefits compiled here for 1994 can for a number of reasons be considered estimates at the lower end, since

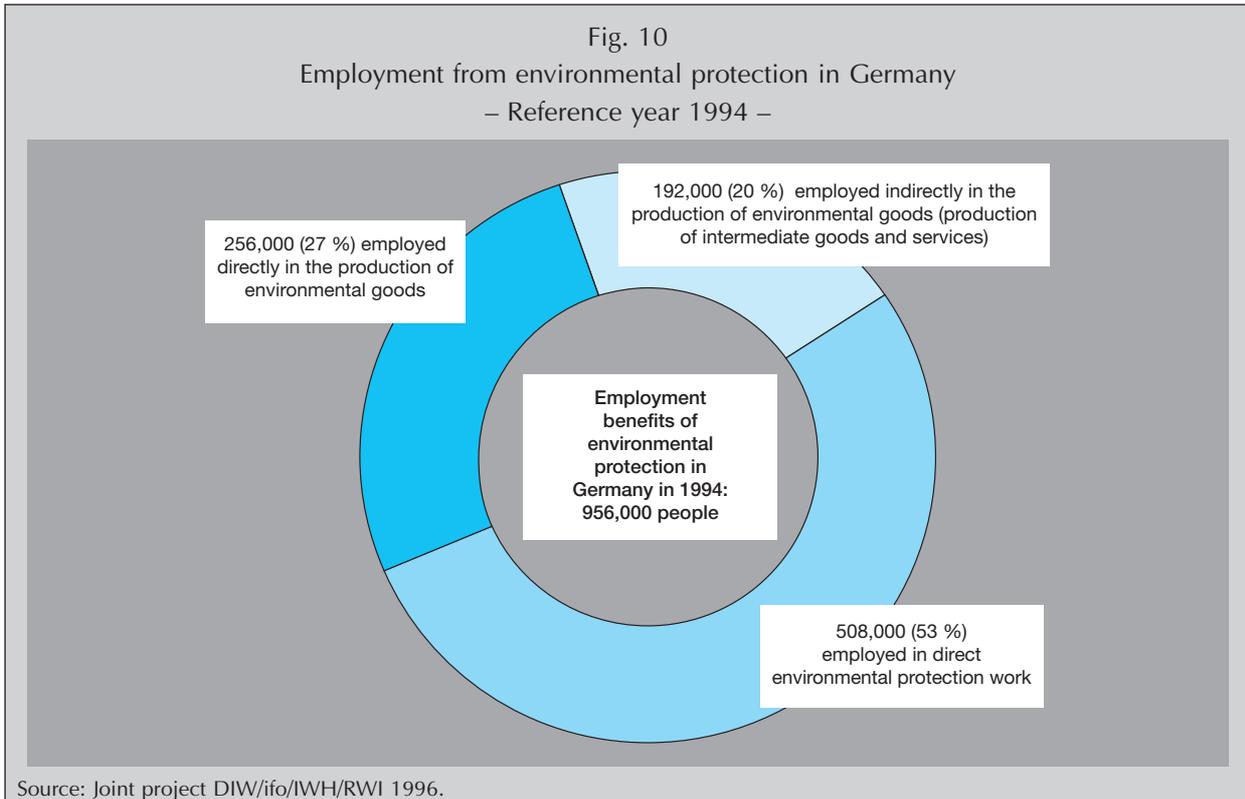
- environmental measures were very narrowly defined (for example, measures for the supply of water, the saving of energy and the use of recyclable energy sources were excluded),
- there is no systematic data-collection available for certain environmental expenditure beneficial to employment (for example, clean-up of contaminated sites and public parks),
- employees in the old Länder involved in environmental protection work through job creation schemes, in the framework of a voluntary ecological year or the civil alternative to military service were not taken into account for lack of statistical data,
- in some business sectors (for example the service sector) environmental expenditure beneficial to employment is only partly specified,
- the official statistics of production and product integrated environmental protection were not adequately registered.

Here are the most important results:

Almost a million jobs in the environmental field

According to current estimates, around 956,000 jobs were directly or indirectly dependent on environmental protection in 1994 (Fig. 10). This is around 2.7 percent of the entire working population, or approx. every 37th member of the working population. The employment benefits resulting from environmental protection can no longer be ignored.

**The number of
environmental jobs is
equivalent to that of road
vehicle production in
Germany**



Viewed in terms of the nature of expenditure (capital investments, current material and personnel costs), in 1994 around

- 448,000 jobs were at full capacity from domestic and foreign demand for environmental protection related capital goods, operating materials and resources,
- 508,000 people were involved directly in environmental protection work.

About 200,000 of the latter in Germany were employed by regional public bodies such as planning, administration and enforcement authorities (Tab. 2). Here, the occupational sectors with the most employees are sewage and waste disposal including street-cleaning (around 70,000 persons), care of parks (around 57,000 persons) and the planning, administration and enforcement sectors (around 52,000 persons).

Table 2 Employees involved directly in environmental protection in Germany (1994)			
Sector	total	old Länder	new Länder
Regional public bodies	193,500	143,900	49,600
• Planning, administration and enforcement authorities	51,700	40,000	11,700
• Universities and advanced training institutions	11,500	10,000	1,500
• Sewage, waste disposal, street cleaning	71,600	57,000	14,600
• Parks and public gardens	57,400	36,000	21,400
• Nature and landscape conservation	1,300	900	400
Public and private waste disposal companies	72,800	46,800	26,000
Waste material wholesaling	21,200	18,800	2,400
Other services	32,500	26,000	6,500
• Environment consultants	5,500	4,000	1,500
• Chimney sweeps	5,000	4,000	1,000
• Building cleaners	22,000	18,000	4,000
Crafts	•	•	•
Manufacturing sector	50,000	40,000	10,000
Non-profit organisations	9,500	8,000	1,500
Job promotion organisations and measures	128,300	•	128,300
• Job creation schemes	55,000	•	55,000
• Measures according to Section 249 h of the Employment Promotion Act [AFG]	73,300	•	73,300
Total (sectors covered)	507,800	283,500	224,300

Source: Joint project DIW/ifo/IWH/RWI 1996.

Relatively high employment benefits in the new Länder

In relation to population and economic performance the new Länder look better in regard to environmental jobs than the old Länder. The employment ratio old/new Länder is about four to one in demand for capital goods and operating resources for environmental protection. For employees directly involved in environmental protection the figures in the old Länder are only about 60,000 more than comparable figures in the new Länder (Tab. 2). The following picture emerges viewed sectorally: in comparison to the old Länder, the environmental engineering industry in the new Länder has a below average presence in the construction industry, electrotechnical and mechanical engineering and the optical industry and an above-average presence in the steel and light metal construction sectors, the rock, stone and related minerals industries and plastic product manufacturing.

Service sector as main beneficiary

In the field of environmental jobs the service sector has shown itself to be the main winner (Tab. 3). With around 530,000 full-time jobs directly or indirectly involved in environmental protection – about 56 percent of all environmental jobs – a tertiary restructuring appears to be under way in the ecological modernisation of our national economy. The steel, machinery and automobile sectors (around 108,000 employees), and the construction business (around 90,000 employees) show particularly high employment benefits within the producing sector as a whole with its total of around 420,000 environmental jobs.

Tertiary restructuring

Sectors with jobs resulting from environmental protection	Germany overall 1994		
	in thousands at work	in percentage of the environmental protection dependent working population	in percentage of the sector working population
Agriculture and forestry	2.8	0.3	0.3
Producing sector	421.1	44.1	3.4
• Electricity, gas and water supply	9.0	0.9	3.0
• Mining	27.6	2.9	11.0
• Chemical industry	33.9	3.5	5.7
• Plastics production, rock, stone and related minerals	27.2	2.8	4.4
• Metal production and processing	27.1	2.8	3.9
• Steel, machinery and vehicle construction	107.9	11.3	3.8
• Electrotechnical, precision engineering	37.7	3.9	2.2
• Construction business	90.5	9.5	3.0
Services	532.0	55.6	2.5
• Service industries	268.6	28.1	1.9
• Regional public bodies	253.3	26.5	4.5
Total (sectors covered)	955.9	100.0	2.7

Source: Joint project DIW/ifo/IWH/RWI 1996.

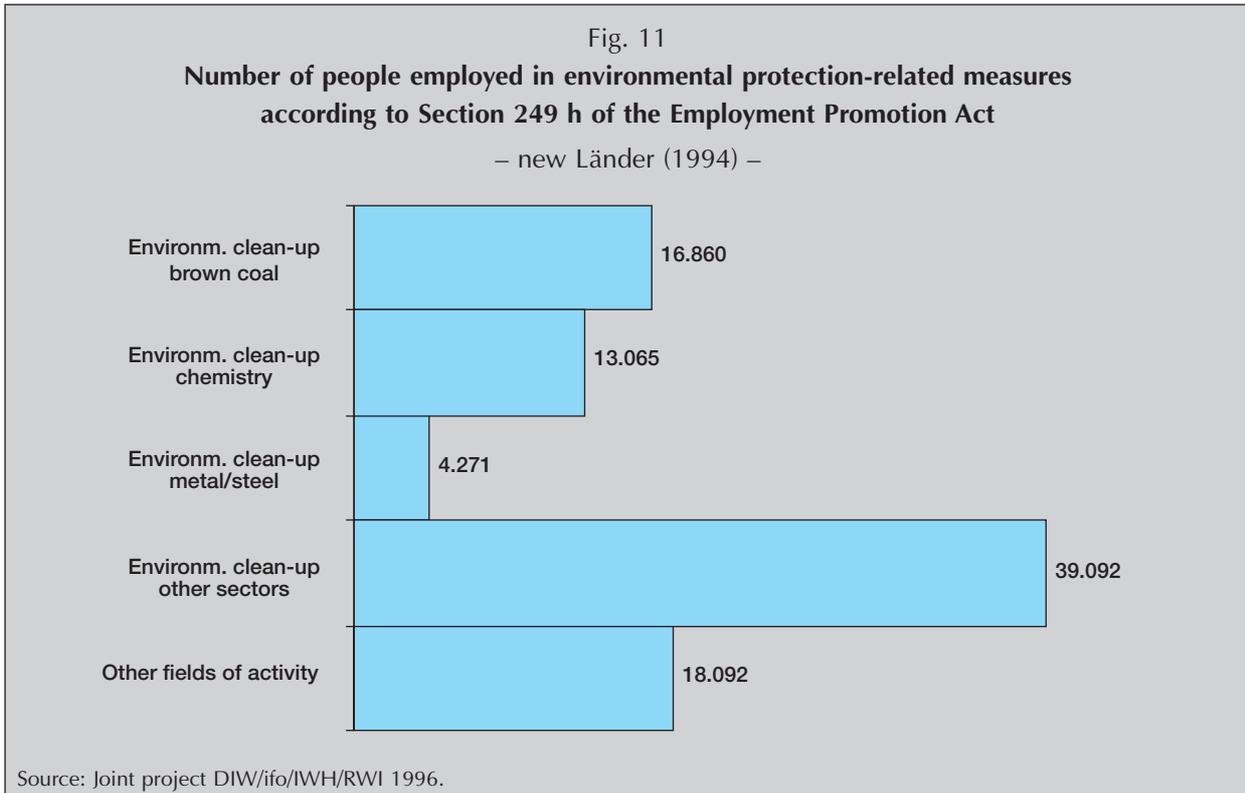
On the quality of environmental jobs

With the increase in employment resulting from environmental protection the question of the quality of the jobs created in the environmental protection sector frequently arises. Attention is drawn to the following in this regard:

◆ **Environmental protection supports the „second job market“**

In view of high unemployment, the so-called „second job market“ is of special significance. The Federal Environmental Agency looked into the importance of environmental protection for Federal job creation schemes (Arbeitsbeschaffungsmaßnahmen – ABM) in the mid eighties. It was shown that the share of the ABM workforce in environmental protection, related to the total number of ABM employees was approx. 40 percent, and that particularly favourable conditions for the employment of ABM workers were to be found in environmental protection.¹⁶

In view of the continuing high unemployment in the new Länder, the possibility of the use of job creation measures in accordance with Section 249 h of the Employment Promotion Act was created. In line with this, since 1 January 1993, the Federal Employment Office has been able to promote the employment of specific target groups in the new Länder (receivers of unemployment benefit, former participants in general job creation schemes and some short-time workers) in measures to improve environmental protection and social and youth welfare services with flat-rate wage subsidies. Since 1 August 1994 measures to facilitate sports, cultural events and the preservation of historical monuments have also been included. An average of around 73,000 people annually have been grant-aided in measures for environmental clean-up and improvement according to Section 249 h of the Employment Promotion Act in 1994 (Fig. 11). Around 80 percent of all employees supported in terms of Section 249 h of the Employment Promotion Act were assigned to environmental protection related projects. Priority was given to the areas of „brown coal“ (around 19 percent), „chemical industry“ (around 14 percent), „metalworking/steel making“ (around 5 percent) and „environmental rehabilitation in other areas“ (around 43 percent).



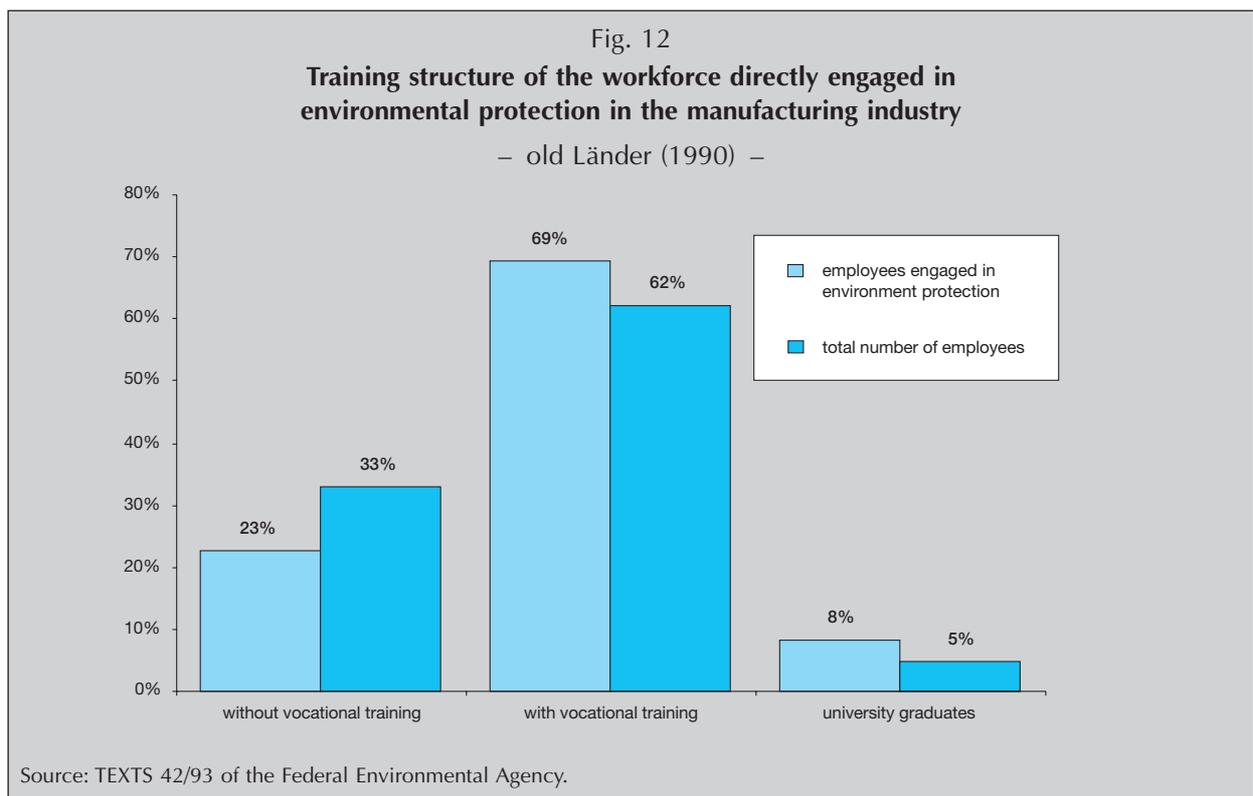
On balance it must be noted that environmental protection in general provides a considerable potential for employment promotion measures in the environmental protection sector. Particular opportunities for environmental ABM positions are seen, as before, in the conservation of nature, forest and landscape conservation, separated waste utilization, extension of district heating systems and noise protection as well as in the further development of sewage disposal in rural areas. Environmental redevelopment through employment promotion and job creation measures in the new Länder is of great significance for three reasons:

- It makes an effective contribution towards the solving of urgent environment problems.
- It provides an indispensable contribution to the solution of urgent job market problems.
- It contributes to fostering the economy in the new Länder, for within the framework of environmental redevelopment measures in the new Länder, closed businesses and abandoned military areas are to be redeveloped through restorative and clean-up measures, and disused

brown coal open-cast mining sites made safe and re-cultivated, thereby creating a basis for the establishment of new, future-oriented enterprises.

♦ **Training level above average in comparison with the manufacturing industry**

The German Institute for Economic Research in Berlin, in a study commissioned by the Federal Environmental Agency, looked at the training and occupational structures of those employed directly in the field of environmental protection in the new Länder at the beginning of the nineties.¹⁷ The study showed that the qualification level of that workforce lies above the average of this sector of the economy. The share of employees with comprehensive professional training is above average, that of unskilled and semiskilled people clearly below average (Fig. 12).



The above average qualification of the workforce in the environmental sector is primarily based on the fact that there is a high demand for university graduates in the areas of research and technology and that a relatively large number of skilled workers for servicing and repair work are required among those engaged in environmental protection in the manufacturing industry. This can be confirmed by the following comparisons with the old Länder:

- In 1990 around 36 percent of employees in the industrial sector were employed in manufacturing. In this sector, closely akin to production, construction material producers, ceramists, chemical workers, fitters and carpenters, and often unskilled workers are engaged. At around 25 percent, the share of environmental jobs lies well below average of this sector of the economy.
- This is exactly the reverse in the field of „maintenance/repair“, which mainly includes such occupations as printers, turners, fitters, electricians, painters and mechanics. At approx. 29 percent, the share of environmental jobs is well above average of the manufacturing industry, which is around a mere 20 percent.
- The difference in the business-oriented services (consulting, research/technology and management) is even more pronounced. Only 13 percent of the employees in the manufacturing industry were employed in these fields in 1990, but a good 22 percent of those directly employed in environmental protection.

◆ **Higher proportion of workers in the public sector**

A contrary picture to that of the manufacturing industry emerges in the public service sector. In regional public bodies there are above average numbers of environmental jobs (Tab. 4). This can be attributed above all to the primary importance of waste and sewage disposal as well as road cleaning and care of parks and gardens in the framework of communal services. At the same time, civil servants and senior and high-ranking staff are clearly represented below average.

Table 4 Employment tenure and career-status groups of those directly employed in environmental protection in regional bodies - old Länder (1990) -		
Employment sector	Environmental sector	Regional bodies total
Civil servants, government employees (senior rank)	8.0 percent	19.6 percent
Civil servants, employees (higher)	17.8 percent	28.9 percent
Civil servants, employees (middle)	21.6 percent	35.4 percent
Civil servants, employees (ordinary)	2.2 percent	1.8 percent
Workers	50.3 percent	14.4 percent
Total	100.0 percent	100.0 percent

Source: TEXTS 42/93 of the Federal Environmental Agency.

Outlook

An expansion of the number of environmental jobs in the near future in Germany, as described by the German Institute for Economic Research (DIW) in Berlin, presupposing additional impulses through further development of the environment policy of the eighties, does not appear likely for a number of reasons. In its study about the „Tendencies of employment resulting from environmental protection“¹⁸ at the beginning of 1997 DIW came to the conclusion that:

- in the old Länder there are at present no visible signs of additional employment impulses, and
- in the new Länder a decline of employment resulting from environmental protection must be expected in the medium term.

Old Länder

Here, a marginal decrease in statistically registered environmental protection expenditure has become noticeable since 1993, out of the following reasons:

- The building of an environmental capital basis for protecting waters and waste disposal has advanced a good deal since the retrofitting of older installations in the air quality control sector at the end of the eighties.

For this reason environmental protection investment by the producing sector has declined markedly since the beginning of the nineties. The decline amounted to more than 40 percent in the years 1990 to 1994 alone.

- Because of the tight economic situation, the state itself consumes less environmental protection goods than in the past. This development has been reflected above all in a decline in environmental protection investments.

New Länder

Employment patterns such as above average staffing in environmental administration and abundant environmental job creation measures which have both experienced above average development in comparison with the old Länder will inevitably lead to a decline in environmental jobs in the new Länder on account of financial shortages. In addition, the public sector can now only take over environmental protection tasks in special cases, even in the new Länder.

Employment effects of integrated environmental protection

The correlation between employment and integrated environmental protection technology have not yet been researched in detail. Statistically effects of integrated environmental protection on the job market can only be inadequately registered.¹⁹ Theoretical considerations lead to the derivation of a number of both positive and negative employment effects (Fig. 5). These questions are being studied in a research project being carried out by the Zentrum für Europäische Wirtschaftsforschung in Mannheim, commissioned by the Federal Ministry of Education, Science, Research and Technology. Preliminary results were expected by end of 1997.

A shift towards integrated environmental protection will likely lead to losses in the number of jobs in the field of clean-up and end-of-pipe technologies. By the anticipated energy and raw material savings, production and employment declines are expected in the energy sector as well as in the manufacturing industries, and in the capital goods industry which supplies these businesses. On the other side employment gains by the suppliers of energy and resource efficient technology as well as by the mediatory and

consulting agencies for integrated environmental protection can be expected.

Table 5 Employment effects from the increased use of integrated environmental protection	
Possible negative effects	Possible positive effects
<ul style="list-style-type: none"> • Employment losses by the operators of follow-up environmental protection technology • Employment losses by the suppliers of additive (follow-up) environmental protection technology • Employment losses in energy recovery and conversion, and in raw material extraction and processing through decline in production • Employment losses in the capital goods industry supplying the energy and raw material sectors • Employment losses from increased work productivity possibly associated with the implementation of integrated environmental protection 	<ul style="list-style-type: none"> • Employment gains for mediatory, consulting and financing agencies for integrated environmental protection (e.g. contracting services for energy-saving measures) • Employment gains for the suppliers of integrated environmental protection technology and energy and resource efficient technology • Employment gains in cases of „win-win options“ by utilisation of the saved resources in other fields • Employment gains on account of increased competitiveness through the deployment of production and product integrated environmental protection technology • Less displacement than in the use of additive technologies
Source: Zentrum für Europäische Wirtschaftsforschung 1996. ²⁰	

Employment gains can also be expected from the increase in services in the field of energy efficiency, (contracting, least-cost planning). Energy and resource efficient measures can result in positive employment effects if these measures benefit both the environment and the economy (win-win options). Also, since integrated technology is mainly implemented within the framework of modernisation investments, frequently combined with productivity enhancement, employment declines could then occur which would, however, be attributed to the rationalisation measures. On the other hand, a company's competitiveness can benefit from modernisation, which can contribute to competitive strength and thus to positive employment benefits. Since, as opposed to additive environmental protection measures, no displacement of other investments is effected as a result of integrated

environmental protection, the employment losses accompanying investment displacement should not occur.

The implementation of production and product integrated environmental protection technology should in the long term prove to be an essential precondition for strengthening competitiveness and protecting jobs. Positive employment effects are particularly to be expected if the export markets for integrated environmental protection technology can be expanded.

Final conclusion

In Germany employment resulting from environmental protection has reached a total of almost one million jobs. Nevertheless, an expansion of the employment benefits clearly attributable to environmental protection can no longer be assumed in the coming years. Important in this regard will be the increasing importance of integrated environmental protection technologies. However, the employment effects of these technologies will prove difficult or even impossible to register. If environmental protection is to continue to make a contribution to reducing unemployment, the synergies between environmental and employment policies must be used to a greater extent. Against this background, a number of fields of activity will be identified in the second part of this publication which can assist in the solution of both environmental and employment policy problems.

- **An expansion of export volumes for environmental protection capital goods can in the short term lead to favourable employment impulses in Germany (see Chapter 4 „The Global Environmental Protection Market“).**
- **The „Energy“ field offers a variety of opportunities to increase employment in the short and medium term, and to develop new, future-oriented fields of employment (see Chapter 5 „Selected fields of activity“).**
- **Additional permanent jobs will arise in the long term through the linking of environment, work and future technologies (see Chapter 6 „Setting the course for tomorrow today“).**



4

Global Environmental Protection Markets

- **Competition for market shares**
- **Export opportunities for German firms**

Competition for market shares

Environmental protection - an economic asset

Environmental protection has developed into an important economic and locational asset in Germany over the past two decades. In 1994 alone state and industry invested some 23 billion DM in waste disposal, water protection, noise abatement and air quality control in the old and new Länder, with an additional 37–38 billion DM estimated in current environmental protection expenditure. The volume of German environmental protection expenditure for 1994 corresponds to

- the turnover of the rock, stone and related minerals industry, or
- a quarter of the turnover of the building industry, or
- 1.4 times the gross domestic product of Saarland, or
- one fifth of the gross domestic product of Sweden.

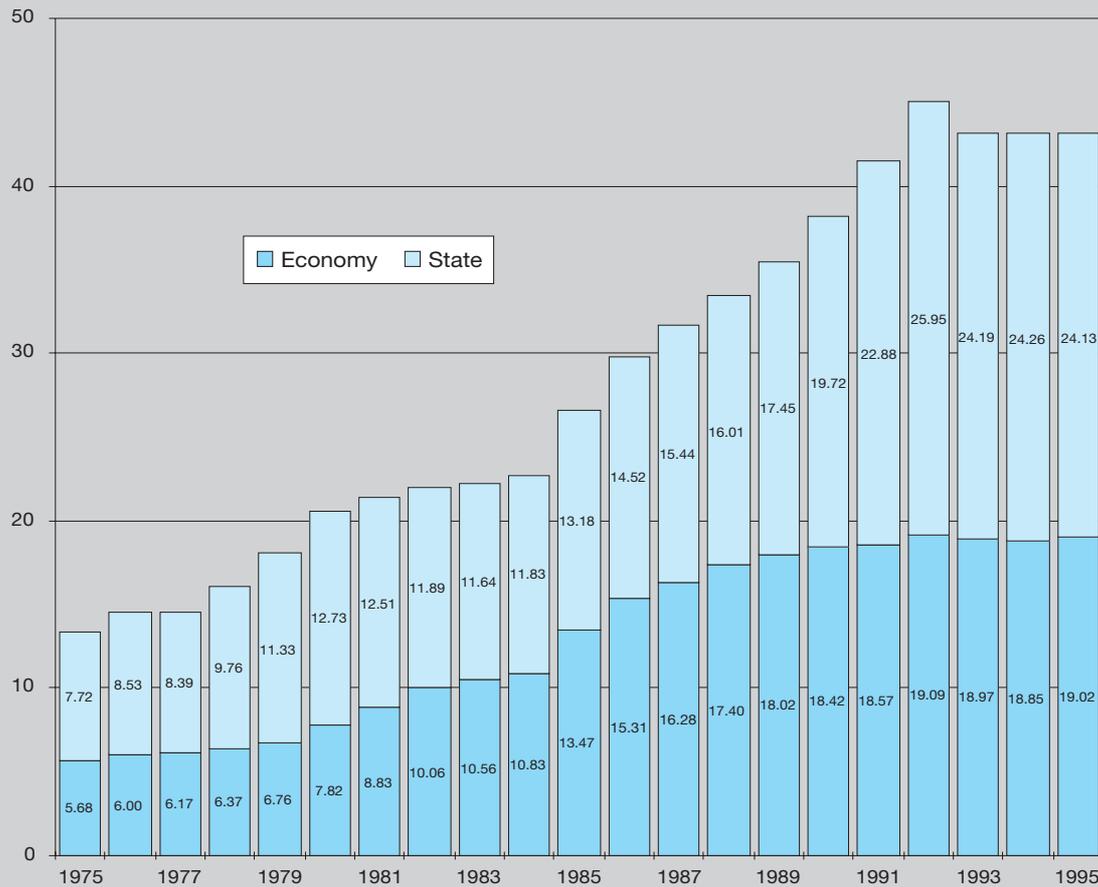
While only 13.4 billion DM was spent by the state and industry (manufacturing sector) in 1975 for environmental protection in the old Länder at the prices of the time, environmental protection expenditure reached a highest mark in 1992 with around 45 billion DM (Fig. 13). Altogether, well over half a billion DM were spent from 1975 to 1995 in the old Länder for air quality control, water protection, waste disposal and noise abatement. Adjusted for inflation, expenditure grew in this period by an average annual level of 2.6 percent (price basis: 1991).

The environmental protection priorities of state and industry vary greatly. While the state invested nearly nine billion DM in water conservation in 1994 in the old Länder, investments by the manufacturing sector²¹ in this area only amounted to 1.5 billion DM. On the other hand, public spending on air quality control was negligible, while the producing sector invested around 2.5 billion DM.

Fig. 13

Environmental protection expenditure in the old Länder

Environmental protection expenditure (investments and current expenses) of the economy (manufacturing sector) and the state in billion DM at current prices from 1975 to 1995



Source: Federal Statistical Office 1997.

The considerable ecological recovery and development needs in the new Länder are reflected in the environmental protection expenditure incurred there. The manufacturing sector in the new Länder have invested over-proportionally – in terms of population and economic performance – compared to the old Länder (Tab. 6). Environmental protection investments increased from 1.5 billion DM in 1991 to 3.8 billion DM in 1994, at existing prices. The share of environmental protection investments in investments as a whole in the new Länder was clearly above comparable figures in the old Länder. With a good 13 percent, the environmental protection share in 1994 was almost three times higher there than in the old Länder. This can be put down to the wish of the Federal Government to establish as quickly as possible the uniformity of environmental living

conditions called for in the Unification Treaty through the adoption of the environmental legislation and generous environmental promotion programmes in force in the old Länder.

Table 6
Environmental protection investments in the old and new Länder
Environmental protection investments of industry (manufacturing sector) and the state in billion DM at current prices from 1990 to 1994 in the old and new Länder

Year	Industry				State	
	old Länder		new Länder		old Länder	new Länder
	in billion DM	in %*	in billion DM	in %*	in billion DM	in billion DM
1990	7.2	5.9	–	–	10.4	•
1991	6.5	5.0	1.5	7.6	11.8	•
1992	6.3	4.8	2.5	9.6	13.5	2.5 (a)
1993	5.5	5.0	3.0	10.9	11.4	3.1 (a)
1994	4.8	4.7	3.8	13.3	10.8	3.3 (a)

* Share of environmental protection investments in investments as a whole (a) communal investment expenditure: waste water and refuse
Source: Federal Statistical Office 1997.

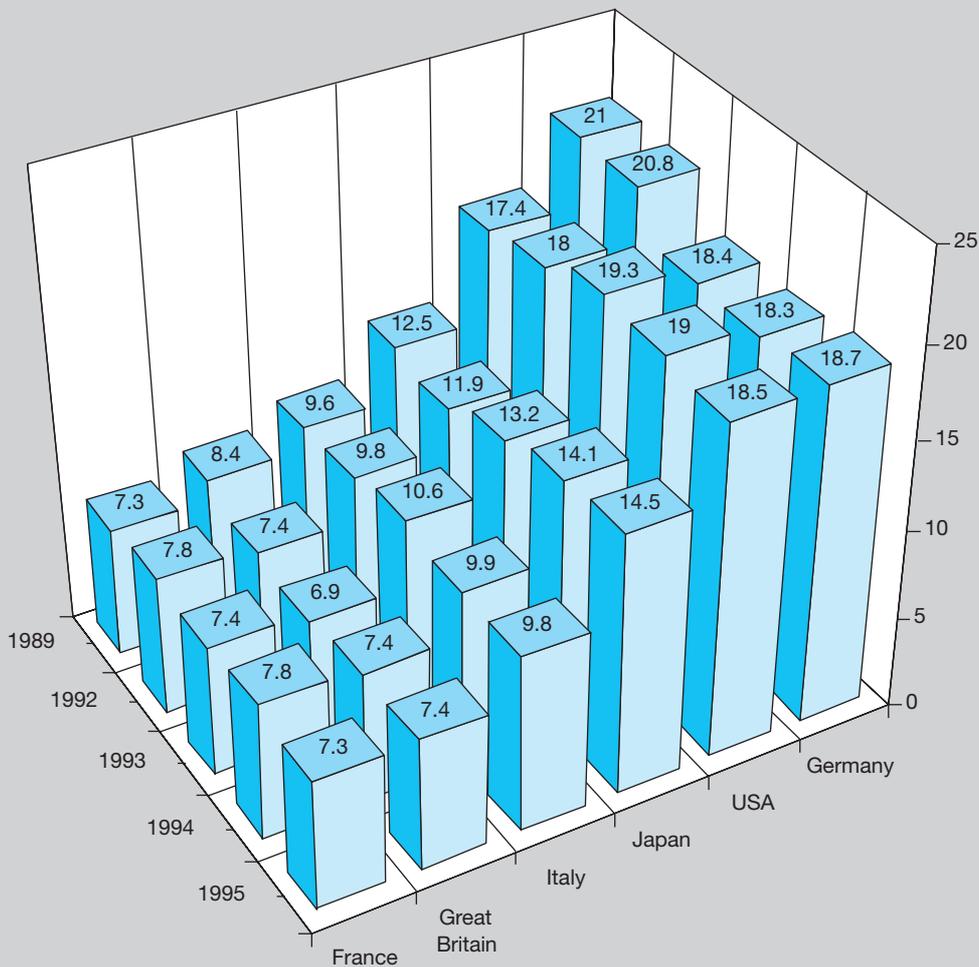
Export share in the world market for environmental protection goods falling slightly

Although Germany has been regarded as the international leader in the export of environmental protection technology for years, the most recent figures suggest that the world market position of the German environmental protection industry is under attack, and that important competitor nations could be improving their positions (Fig. 14). In the years 1993 and 1994, Germany had to relinquish its top position to the United States but could regain its leadership with a slight increase in 1995²². The world trade share amounted to 18.7 percent, followed by the United States in 2nd place (18.5 percent) and Japan in 3rd position (14.5 percent). The United States was first in 1994 with a world trade share of 19 percent, followed by Germany in 2nd place (18.3 percent) and Japan in 3rd position (14.1 percent). In interpreting these figures one must keep in mind that for the most part only the traditional „additive“ (i.e. follow-up) environmental technology could be included. No reliable conclusions can be drawn about Germany's position in the competition for „integrated environmental protection“.

The declining development of the German export share in the world market goes hand in hand with general economic developments: a decline in Germany's overall export volume was noted in 1993 compared to the

previous year, while the United States and Japan showed a marked increase. The general economic situation in the principal purchasing nations (for Germany, other European countries) was noticeable here. In 1994 and particularly in 1995, however, Germany was once again able to increase its export volume appreciably. The export volume of environmental protection goods, at 31.5 billion DM in 1994, again reached 1992 levels. Environmental protection goods had a 4.6 percent share in Germany's overall export volume in 1994, principally water and waste water technologies and measurement and control technology for environmental protection plant.

Fig. 14
World trade shares of environmental protection goods suppliers
 – in percent –



Source: Niedersächsisches Institut für Wirtschaftsforschung (NIW) 1997.

Export promotion strategies

The United States and Canada in particular have developed far-reaching strategies for the targeted promotion of the export of domestic goods and services. For example, the United States has recognised the interconnection between world-wide environmental questions and its own environmental protection industry. In 1993 the US government, as well as Canada, began to develop a concept to support the export efforts of American companies in the environmental protection industry, both nationally and internationally. With the „Environmental Technologies Exports: Strategic Framework for US Leadership“ strategy (Tab. 7), a series of measures were made available to help attain the following goals:

- strengthening the partnership between the US environmental protection industry and the government;
- enhancement of developments in the area of environmental protection technology and the ability of the US environmental protection industry to market these technologies
- support for the environmental protection industry in order to be successful in existing markets and at the to same develop future markets;
- co-ordination and improved adjustment between government export programmes and resources and the priorities of the environmental protection industry.

Study on measures to strengthen exports of the German environmental protection industry

In order to examine the possibilities of a targeted export offensive in the environmental protection sector, Schitag Ernst & Young Umwelt-Management GmbH were commissioned by the Federal Environmental Agency to undertake a study on export strengthening measures for the German environmental protection industry.²³ The possibilities for small and medium-sized enterprises and businesses in the new Länder were to be particularly borne in mind. The study consisted of an analysis of

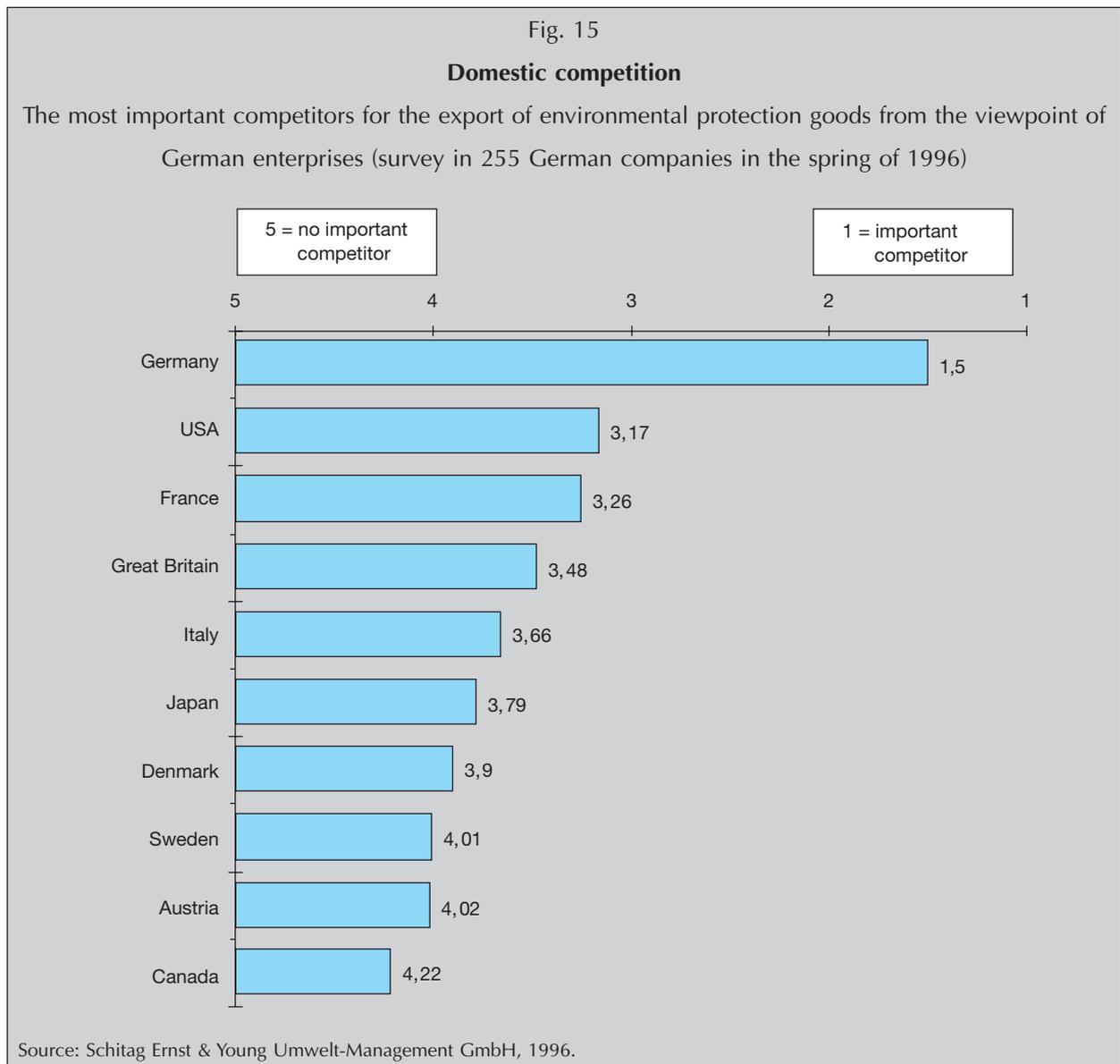
- the environmental and economic significance of the environmental protection industry and its exports,
- current export promotion for the environmental protection industry,
- the export experience of German companies,

Table 7
US environmental protection technology export promotion strategy

No.	Measure	Strategic approach
1	Establish a close co-operation between the Department of Commerce, the Environmental Trade Working Group of the Trade Promotion Co-ordination Committee (TPPC) and the industry as well as other active groups.	Organisation and responsibilities
2	Establish mechanisms by the Federal Co-ordinating Committee for Science Engineering and Technology in order to ensure effective co-ordination of all state programmes supporting the development and commercialisation of environmental protection technologies.	Organisation and responsibilities
3	Rapid commercialisation of environmental protection technologies by private industry.	Financing, organisation and responsibilities
4	Reworking of environmental policy and guidelines to lower barriers to the commercialisation and development of environmental protection technology and to stimulate development and commercialisation.	Environmental legislation and enforcement
5	Identify markets and develop export market plans in order to make use of export promotion programmes for marketing current environmental protection technologies in particularly promising markets.	Information and financing
6	Establish a TPCC Latin American Environmental Initiative to define a comprehensive strategy for export promotion in this region, particularly Mexico.	Information and financing
7	Establish effective and co-ordinating measures to guarantee and increase the international visibility of the US environmental protection industry and its access to foreign markets.	Information, organisation and responsibilities
8	Enhance US presence and expertise in the environmental protection industry sector by training US Commercial services staff.	Information
9	Develop a survey of internationally important environmental protection projects as well as important environmental protection exhibitions and events.	Information
10	Increased training of export programme personnel in regard to know-how in the environmental protection industry.	Information
11	Identify the data needs and information for the environmental protection industry and the government and development of suitable methods for distributing the information.	Information, organisation and responsibilities
12	Increased publicity for possible export promotion within the environmental protection industry.	Information, financing
13	Transfer of the responsibility for monitoring the export efforts of the environmental protection industry to the TPPC Environmental Trade Working Group.	Organisation and responsibilities
14	Selection of a high ranking government representative to supervise environmental protection technology export strategy and monitor activities.	Organisation and responsibilities
15	Nomination of a high ranking representative of the Department of Commerce in order to monitor the Public Private Partnerships within the framework of the strategy.	Organisation and responsibilities
16	Review of existing export promotion programmes by the TPPC Working Group together with other institutions and the development of recommendations especially for exports of the environmental protection industry.	Environmental legislation, enforcement, financing
17	Exchange of experience and know-how in regard to the environmental protection industry among government authorities.	Information
18	Develop indicators for evaluating the effectiveness of export promotion with a view to the formulation of regional strategies.	Environmental legislation and enforcement

- the activities of important competitor nations in the export promotion of the environmental protection industry (Austria, Canada, Denmark, France, Japan, Sweden, United Kingdom, United States).

The study shows that German exporters continue to fear domestic competitors the most: other German enterprises in the environmental protection industry are seen as by far the most important competitors by German exporters of environmental protection technology, environmental protection services and proenvironmental products. After the domestic competition come suppliers from the United States, France and the UK (Fig. 15).



The study comes to the following conclusions in connection with the status of export promotion:

❑ **Deficits in the export promotion institutions**

Only a tiny share of exporting enterprises are adequately informed about the various export promotion institutions („promotion measures and the promotion institution jungle“). Very few promotion institutions possess personnel with the know-how to support specifically the transfer of products and services of the environmental protection industry.

❑ **International Transfer Centre for Environmental Technology**

Export promotion institutions specifically directed towards the environmental protection industry are almost non-existent. Only the SMB-oriented International Transfer Centre for Environmental Technology in Leipzig would come under consideration (see Appendix 7).

❑ **Price disadvantages**

Price disadvantages in comparison to foreign competitors and the high costs of export preparation and marketing are viewed as serious impediments to the export of environmental protection goods. Additional obstacles include lack of political support by the German authorities, lack of financial resources and a low level of environmental consciousness in the target country.

❑ **Deficits**

Extreme difficulties are sometimes encountered, particularly in the realisation of export promotion. A very large proportion of businesses is neither informed about export promotion possibilities nor in a position to really and effectively use them.

❑ **Desired support**

Medium-sized and especially small businesses wish above all for assistance in establishing contacts in the target country. Increased support and sending of SMBs in particular to trade fairs abroad would therefore be desirable.

Competitor analysis**□ Approaches to improvement**

The following five approaches to improving export promotion were identified: information, financing, environmental legislation and enforcement, business co-operation, organisation and responsibilities.

Export promotion measures in the selected competitor countries of Denmark, France, the United Kingdom, Japan, Canada, Austria, Sweden and the United States are similar to or the same as those in Germany in many aspects. The measures in Canada, the United States and the United Kingdom appear to be of particular interest for the development of proposals for improving export promotion in Germany. The United States and Canada concentrate very strongly on the environmental protection industry and have developed wide-ranging strategies to promote the export of goods and services from this cross-sectional sector. The United Kingdom, on the other hand, does not focus directly on the environmental protection industry, but possesses a broadly based export promotion system with strong emphasis on the preparatory phase of export transactions.

Export opportunities for German companies**Employment impulses**

An expansion of the export volume in environmental protection goods would certainly lead to increased employment. In Germany there are at least 5,000 suppliers of environmental protection technology, environmental protection services and proenvironmental products today. These are mainly smaller companies.

Patent specialisation

Germany shows a very high degree of patent specialisation in the environmental protection technology sector (Tab. 8). The United States and Japan have less patented inventions in this sector than is otherwise usual. The share of patents in the environmental protection technology sector are higher than for patents as a whole only for Canada, Sweden, the Netherlands and Switzerland. Germany's overall favourable patent position in environmental protection technology extends to nearly all

technical areas, in particular to air and water quality control, noise abatement, waste disposal and recycling. An exception is nuclear waste disposal.

Table 8
Patent specialisation in environmental protection technology
 – RPA values* –

Environmental protection technology sectors							
Country	Specialisation 1990 to 1993						
	Air	Water	Noise	Waste	Recycling	Nuclear waste disposal	Measurement technology
United States	-29	-23	-32	-19	-31	-45	20
Japan	19	-57	-27	-76	-66	-44	-66
Germany	43	23	35	45	53	-56	1
United Kingdom	2	19	16	-32	-32	54	60
France	-32	1	-26	5	-10	86	53
Switzerland	-24	20	34	5	18	-20	-3
Canada	-51	71	5	25	88	44	-45
Sweden	7	49	-36	16	-27	0	-55
Italy	-13	-10	59	2	25	-14	-86
Netherlands	-49	39	2	43	23	0	8

Source: ISI 1996.

Environmental protection technology as a whole			
Country	Specialisation 1984 to 1992		
	1983 to 1986	1987 to 1989	1990 to 1992
USA	-22	-22	-17
Japan	-62	-50	-35
Germany	40	38	37
United Kingdom	-31	-34	-4
France	31	18	-13
Switzerland	-7	-9	5
Canada	61	33	37
Sweden	42	43	24
Italy	-41	-18	-23
Netherlands	-2	-18	22

Source: ISI 1996.

* The RPA indicator was developed to better determine the degree of specialisation of patents. A plus sign means that the share of patents in this sector is higher than for patents altogether. For example, the German RPA value of plus 43 (for the air environmental protection sector) indicates that Germany has a very high share of patent applications in this area compared to the world average.

Considerable export potential

The export share of environmental protection goods and services has generally been lower than that of Germany's typically high export quotas for the producing sector. This could be attributed to the strength of demand on the domestic market, among other factors. The volume of environmental protection exports is still very low in the new Länder in particular. This gives rise to the supposition that it would be possible for many German enterprises to open up new global markets. In this regard, the environmental protection technology sector is considered to be more strongly export oriented than the proenvironmental products and environmental services sectors.

Global Environmental protection markets: unused export potential in the new Länder

A considerable supplier base of about 2000 companies has become established in the new Länder in the past years. The severe environmental problems in this region were seen as an opportunity and a challenge by those setting up small businesses in eastern Germany.

East German suppliers of environmental protection goods and services are (very small) small and medium-sized businesses in the majority. According to a survey carried out by the ifo Institute under the auspices of the Federal Environmental Agency and based on interviews with suppliers, these companies achieved a total turnover of around six billion DM²⁴ with environmental protection goods and services in 1995. Approximately half of environment-related turnover was in the services area. The number of service providers in the new Länder is thus clearly higher than in the old Länder.

The environmental protection industry is still strongly directed to the regional market, as is trade and industry in the new Länder in general. Almost two thirds of turnover was attained in the new Länder themselves, just short of 27 percent in the old Länder and a mere 7.6 percent abroad. On grounds of geographical proximity and historically developed business contacts, opportunities are seen for suppliers from the new Länder particularly on the central and eastern European markets. The greatest hindrance for the export of environmental protection goods into east European countries is the lack of money. Poor knowledge of target markets and export opportunities and a simple lack of contacts abroad also act as strong checks to development. In the assessment of different eastern European export promotion measures, the „arrangement of business contacts and co-operation partners in the import country“, and the „arrangement of contacts with foreign ministries, public authorities and associations“ are accorded the highest priority.

More confidence in entering into co-operation is to be recommended to eastern German businesses in order to help breakdown barriers to development and improve chances on the environmental protection market. Co-operation should take place both within the environmental protection industry and between environmental protection firms and those from other sectors and from abroad. Co-operation within the environmental protection industry could take the form of the exchange of information, logistical support, formation of project/supplier groups, marketing joint ventures and similar measures to at least partially compensate for the competitive advantages of large west German concerns. Complementary environmental consulting and planning services from eastern German companies could be brought into the overall package in co-operation with general contractors carrying out infrastructural measures in the transport or power sectors in east European countries. The advantage of working together with partners from central and eastern Europe is that these partners can look after existing contacts because of their knowledge of the language, and take over part of the work incurred locally. A high level of value added can be integrated through subcontracting in the target country, since the overall price can be lowered through systems solutions and foreign governments' need to support their domestic economies can be taken into account.

Particular attention should be given to the following points for a more targeted improvement of exports by the German environmental protection industry:

❑ Realistic estimation of actual demand

Global environmental protection markets are seen as growth markets with associated high expectations for growth and export opportunities for German companies. The German environmental protection industry does in fact offer an attractive sales potential. However, the chances and risks of the global market should be realistically assessed.

An environmental protection market is a market in which the demand for buildings, equipment, process technology, operating resources, know-how and services for environmental protection encounter a corresponding supply. The market volume corresponds to the quantity of environmental protection goods and services which from a cost viewpoint, in other words by weighing up various financing possibilities,

Limitations

can be translated into actual demand on the environmental protection market. Market potential is oriented towards the environment rehabilitation needs of a country, in other words towards the investment needs necessary to attain a certain environmental protection level. Market potential is as a rule considerably higher than actual demand because of a lack of the necessary purchasing power to convert the needs into environmental protection goods and services. This is particularly true for the central and eastern European states. Financing problems are the primary cause, alongside political factors (different attitudes towards environmental protection, political stability).

□ Often only the „technological core“ is exportable

According to a study by the ifo institute in Munich²⁵, building-construction accounts for a considerable share of environmental protection investments (Tab. 9). Between 1991 and 1994, the producing sector and the state in the new Länder made environmental protection investments of approximately 20 billion DM. The amount for equipment however was only about 8 billion DM. Around 70 percent of this was allocated to air quality control technology and approximately 20 percent to water protection technology.

Environment sector	Building construction in percent	Equipment in percent
Water protection	85	15
Waste disposal	60	40
Rehabilitation of contaminated sites	47	53
Noise abatement	60	40
Air quality control	8 to 10	at least 90

Source: ifo Institute 1997.

For the producers of environmental protection goods this means that expectations in regard to the international environmental protection market have to be qualified. In general only the so-called technological core of larger plant and the corresponding engineering know-how can be regarded as export relevant. In other words, only these components of environmental protection plant investments contribute to value added in Germany – and

are thus ultimately effective in creating jobs. A large part of the technology and, as a rule, building-construction services is purchased on location in so far as package solutions are not on offer. Thus German companies exporting environmental protection technology also create jobs in the import country as well, particularly in the local construction industry.

□ **Down-grading can make good sense**

Germany is still considered to be the world leader in high-tech environmental technology. The German economy has a top position in both environmental protection technology and in environmental biotechnology in regard to inventions relevant to the international market. Germany is particularly well-positioned for further expansion of the international demand for environmental protection goods. It should however be noted that often simple solutions are required which are adapted to local conditions. Export opportunities for German companies are then dependent on whether a successful down-grading of technological solutions is possible.

□ **Growing significance of integrated technologies**

The expanding use of integrated technologies leads to further difficulties in the forecasting of future market opportunities. These are not however explicitly identified as environmental protection measures: the share of investments for environmental protection cannot be separated in terms of value from the share serving purely production purposes. Although the Office for Technology Assessment at the German Parliament assumes on the basis of its analyses that the deployment of additive technologies will continue to predominate in the long term, additive and integrated environmental protection technologies tend to have a substitutive relationship with one another. This can also be seen in the results of a survey of suppliers of additive and integrated environmental protection technologies carried out by the ifo Institute at the end of 1993. The Institute concluded that the partial replacement of so-called end-of-pipe technology with integrated solutions is already clearly evident in the supply spectrum of the German environmental protection industry.

There are signs that the German environmental protection industry is undergoing a process of radical change. Shifts in the individual market segments will occur as a result. The increasing supply of integrated environmental protection technology will clearly be at the expense of the producers of additive environmental protection plant. The employment effects of environmental protection are thus becoming increasingly apparent in technical sectors not traditionally considered classical environmental protection technologies.

Perspectives: the environmental protection market of the future

Despite all limitations, the possibilities for development in the global environmental protection markets are good for Germany, particularly compared to other market sectors. The various forecasts for the development of future international demand vary widely (Tab. 10), since assessment of future market volumes is ultimately dependent upon the weighting

Favourable growth forecasts

Institution	Germany	Western Europe	Central/ Eastern Europe	Asia (without Japan)	Japan	United States	Latin America
OECD ^a	3.0 % ^d	3.8 %	3.4 %	5 to 7 %	5.0 %	3.8 %	
ECOTEC Research and Consulting Ltd. ^a		7.1 %	7.5 %	11.6 %	4.9 % ^e	5.0 % ^e	10.9 % ^e
HKU Helmut-Kaiser-Unternehmensberatung	6.1 %	6.8 %	5.1 %	9.2 %		5.7 %	6.8 %
ETDC Environmental Technologies Development Corp. ^a	12.0 %	11.6 %	5.3 %		10.5 %	4.9 %	
BIPE Bureau d'Informations et de Previsions Economiques ^b	3.6 %	4.4 %					
EBI Environmental Business International ^{a,c}			11.6 %	13.8 %	6.7 %	5.0 %	8.9 %

Remarks:
The annual growth rates are based on estimates for the period 1990 to 2000, unless otherwise indicated; ^{a)} environmental protection goods (equipment) and services were estimated; ^{b)} BIPE estimates for the period 1993 to 2000; ^{c)} EBI estimates for the period 1992 to 1998; ^{d)} 1990 old Länder, 2000 Germany as a whole; ^{e)} estimated on the basis of 1992 to 2000.

Sources: Federal Environment Ministry 1997/ifo Munich 1997 (unpublished)/internal calculations.

given to the different demand determinants. Even the cautious estimates of the OECD assume clear market growth. The OECD predicts a rise of 27 billion DM (1990, old Länder), 37 billion (2000, Germany as a whole) for Germany and a rise from around 320 billion DM (1990) up to around 480 billion DM (2000) world-wide. The OECD assumes the following forecast values for the global market in the year 2000, within the different sectors of the environmental protection industry:

- waste water treatment: 134 billion DM,
- waste disposal: 102 billion DM,
- air quality control: 68 billion DM,
- other equipment: 52 billion DM,
- services: 129 billion DM.

Focal Point „Energy“

Strong growth is also expected in the market for renewable energy. A study commissioned by the Office for Technology Assessment shows that in the middle to longer term (about ten to 15 years) a world-wide investment volume of about 165 billion DM for plant technology in this area can be expected. This includes 6.0 to 7.5 billion DM for German exports in the year 2005, as well as services with a value of several 100 million DM²⁶. In other words, the energy sector would provide a particular focus for the strengthening of exports of the German environmental protection industry. This in turn would offer a threefold benefit (see Chapter 5 of this brochure):

- a decisive contribution can be made to climate protection through rational energy utilisation internationally.
- costs can be substantially lowered with energy saving measures.
- considerable additional employment can be created by means of an innovative energy policy.

Focal Point „Environmental biotechnology“

Biotechnology and the area of environmental biotechnology are also of particular interest as part of a strategy of sustainable development. Biological transmutations take place under extraordinarily gentle conditions: low temperatures, normal pressure, very low energy consumption. Environmental biotechnological processes are often more environmentally compatible for this reason and as a rule more cost effective than conventional physical or chemical processes. Environmental biotechnology can be

Energy sector is particularly interesting

applied among other things to waste water purification, in the area of soil decontamination and in air quality control.²⁷

In addition, biotechnological processes for the production and transformation of materials have a considerable potential for integrated environmental protection. They show the following advantages:

- they reduce the consumption of raw materials and the emission of pollutants because of high specificity and selectivity.
- they can reduce energy consumption and the input of environmentally hazardous materials since they work under mild reaction conditions.

Industrial sectors in which biotechnological processes are already being used in integrated environmental protection and where they have led to marked environmental relief, are the chemical and pharmaceutical industry, food industry, textile and leather industry, and the wood pulp and paper industry.

In view of the low financial strength of many potential importing countries, the export opportunities for the more proenvironmental and cost effective environmental biotechnological processes should be good. For this reason, the focus should be directed on the further development and use of cost effective environmental biotechnology processes of particular interest to these markets. In particular, the technologies employed in Germany for soil decontamination should be of significance for the central and eastern European markets.

Export opportunities in the area of environmental biotechnology

The United States has been a leader in biotechnological patent applications in the past. In the area of environment biotechnology, however, most patent applications have been coming from Germany for some time. Here, it is a matter of translating high technological competence into market success and job creation (Appendix 8 contains information on the „environmental biotechnology network“, the formation of which is being promoted by the Federal Ministry of Education, Science, Research and Technology).

Financial aid

Investment program for the reduction of environmental pollution

Investments with a demonstration character and aimed at reducing environmental pollution have been promoted by the Federal Environmental Agency through funds of Federal Environment Ministry (formerly the Ministry of the

Interior). Concerned primarily with plant upgrade until 1986, since then new processes and technologies have been in the foreground. With the help of interest rate and investment subsidies, companies are supported in making use of innovative processes, in order to demonstrate the technical feasibility of new solutions for the avoidance and reduction of environmental pollution. Eligible are model

- environmental protection plant,
- disposal, supply and treatment plant,
- environmentally sound production processes (integrated environmental protection processes),
- plant for the production or use of proenvironmental products or environmentally sound substitute materials,
- proenvironmental products or environmentally sound substitute materials in so far as investment expenditure/costs arise,

and from their use

- the emission of pollutants into air, water or soil, or
- excessive noise emission, or
- damage to the soil and its consequences

are substantially reduced (environmental protection effects).

Environmental protection and integrated processes generally applicable to all media, which do not even give rise to environmental pollution, are of great importance. The share of integrated environmental protection technology from among the total measures sponsored has risen to around 50 percent in the last few years. The practical suitability and performance capacity of new production plant, process technology and products was

Note

Appendix 9 to this brochure contains further information on important Federal environmental protection promotion programmes²⁸

- investment programme for the reduction of environmental pollution,
- Deutsche Bundesstiftung Umwelt (DBU) environmental programme,
- ERP environment and energy saving programme,
- Deutsche Ausgleichsbank (DtA) environmental programme,
- environmental protection guarantee programme,
- Kreditanstalt für Wiederaufbau (KfW) environmental programme.

On location presence required

able to be concretely documented in a number of cases by supporting model investments for the reduction of environmental pollution. This is a decisive prerequisite for the spread of new environmental technologies.

Customer orientation as a success factor

Successful conformance with customer wishes is a central prerequisite for success, especially on the internationally contested environmental protection goods market. This does not have to represent an insurmountable hurdle for small and medium-sized businesses either. Working together with the International Transfer Centre for Environmental Technology (ITUT), regional environmental protection technology company pools are now emerging, whose objective is securing the active presence required on location through common measures (such as co-operation and joint ventures, common exhibition participation, central technology marketing, etc.).

Political engineering

The commitment of German embassies and agencies abroad is of fundamental importance in this connection since they can establish important links with their contacts in the country in question, and help to „open the door“. This so-called „political engineering“, close co-operation between state institutions and businesses, is often indispensable, particularly in the awarding of foreign contracts and should be strengthened.

Need-oriented offer instead of technology-oriented solutions

Taking local requirements into account is always important: for example, estimated costs in relation to the targeted environmental protection result must be considered along with personnel qualifications. In principle need-oriented offers should be given preference over technology-oriented aimed at attaining optimum environmental benefits.

Customers demand complete package including financing solutions

Customers from newly industrialised and threshold countries as well as the transition states of central and eastern Europe continue to expect, to an increasing extent, an offer which also includes financial services or even operation of the delivered plant. Demand is decreasingly directed towards isolated bids, in the services sector in particular. On the contrary, a structural shift in demand away from individual components and services towards complete packages such as operator models (BOT, BOOT)

including financial services is to be observed. This presents a challenge to German suppliers to adapt to these changing customer wishes.

„Operator models“

BOT or BOOT signify contracts in which the producer of a plant not only delivers and if necessary installs the plant, but additionally, as service provider, guarantees operation of the entire system (BOT *build, operate, transfer*), or even remains owner of the entire system (BOOT *build, operate, own, transfer*). In this way, a producer of waste treatment technology not only delivers domestic refuse collection vehicles and refuse compactors, but also organises operation of the local domestic waste disposal service, or even takes over full responsibility for domestic refuse disposal as a private supplier.

No essential changes are anticipated in the medium term with regard to the regional distribution of the international turnover of environmental protection goods (Tab. 11). The most important target countries for environmental protection technology and environmental protection services are the United States, Western Europe and Japan.

Table 11 Distribution of environmental protection market volume according to region					
Region	1990		2000		Annual growth rate in percent
	in billion DM	in percent	in billion DM	in percent	
Western Europe	85.8	26.5	124.9	25.8	3.8
Eastern Europe	24.2	7.5	33.9	7.0	3.4
United States	126.0	38.9	183.0	37.8	3.8
Canada	11.3	3.5	19.4	4.0	5.6
Japan	38.8	12.0	63.2	13.0	5.0
Other countries	37.4	11.6	60.1	12.4	4.9
World	323.5	100	484.5	100	4.1

Source: OECD 1992.

Note

The appendix to this brochure contains further information on

- Institutions providing assistance in the preparation and realisation of business transactions abroad (Appendix 10),
- Forecasts, trends and expectations in connection with environmental protection markets
 - „Western Europe“ (Appendix 11),
 - „United States, Canada, Mexico“ (Appendix 12),
 - „Central and Eastern Europe“ (Appendix 13),
 - „Asia“ (Appendix 14).



5

Selected fields of action

- Energy
- Corporate environmental management

Action field „Energy“

Threefold dividend

A sustainable energy policy can generate threefold benefits for society:

- a decisive contribution can be made to climate protection, resource efficiency, the reduction of air pollutants and other environmental contaminants through an efficient use of energy and the use of renewable forms of energy („ecologic revenue“).
- substantial cost reductions can be achieved with the help of energy saving measures („economic revenue“).
- considerable additional employment can be created by means of an innovative energy policy which targets efficient energy use and the use of renewable forms of energy („social revenue“).

In this respect, it can be understood that the energy sector plays a key role in the discussion on environmental protection and employment.

Encouragement of labour-intensive sectors

Opportunities for employment with a sustainable energy policy

The field of energy offers a variety of opportunities to increase employment and develop new fields of employment with a promising future. Efficient energy use is the focal point. As a rule, measures related to energy saving investments positively impact on demand and employment, even taking into consideration resulting decline in energy demand, since they tend to favour labour-intensive sectors such as construction, mechanical engineering and handicraft, and thus contribute to the replacement of imported energy sources with domestic added value.

Results of scientific studies

There are a number of both domestic and foreign studies dealing with the employment effects of energy saving measures. The results of these studies vary considerably because of differing assumptions and methodological approaches, but come almost unanimously to the conclusion that jobs can be created by energy saving measures (see Appendix 15). According to a rough estimate by the German Fraunhofer-Institut für Systemtechnik und Innovationsforschung (ISI) in Karlsruhe, an energy saving of one petajoule²⁹ would on average create around one hundred additional jobs. The Enquete Commission on the „Protection

of the Earth's Atmosphere“ of the German Parliament has estimated an existing and technically feasible energy saving potential by the year 2005 of 4,650 to 5,000 petajoules. Thus up to 500,000 jobs could be created in Germany in the next few years through a more rational use of energy. Although it must be realistically assumed that the actually realisable potential is clearly less, a policy promoting efficient energy consumption could make a substantial contribution to the reduction of unemployment. This is also clear from a study commissioned by the Enquete Commission on the „Protection of the Earth's Atmosphere“ of the German Parliament (DIW/ISI, 1994)³⁰. According to this study a climate protection policy aimed at lowering carbon dioxide emissions by 40 percent between 1987 and 2020 would raise employment by an average of approximately 90,000 annually.

Saving energy can also contribute to strengthening the international position of German business and industry:

- As shown in numerous examples considerable financial savings can be achieved if enterprises adopt efficient energy management practices.
- Integrated environmental protection technologies will gain increasing significance because of their cost efficiency. Energy saving technologies, new highly efficient power plants and the increased use of renewable energy will play a key role in future – against the background of international efforts to restrict the greenhouse effect as well. If Germany succeeds in taking over a leading role in these areas of technology, substantial medium and long term employment benefits are to be expected.

Other countries have also recognised the strategic significance of new energy technologies. Japan hopes to increase the use of photovoltaic technologies twenty-fold by the millennium through massive government subsidies and to become the world leader in such technologies by drastically lowering production costs.

**Location safeguarding
through sustainable
energy use**

New Länder to profit in particular

The new Länder should profit in particular from a policy promoting systematic energy saving, for two reasons:

- On the one hand, the savings potential in the new Länder is higher compared to the old Länder, in spite of the progress already made in efficient energy use. This applies both to the buildings sector and industrial production.
- On the other hand, the employment situation in the construction industry in the new Länder is particularly dramatic, and this sector would benefit most from energy saving measures.

Actors and fields of action

An energy strategy directed towards sustainability should include all sectors (i.e. private households, industry, transport and the energy industry) and have available the most suitable measures from a range of instruments to make possible the carbon dioxide reductions required for climate protection. The complexity of the task of climate protection is apparent, among other things, from the fact that the Federal climate protection programme alone includes more than 150 measures, and that further measures were adopted by the Federal cabinet in 1997 in order to achieve the carbon dioxide emission reduction target (down 25 % by 2005 compared to 1990) set by the Federal Government. Against this background, fields of action and measures will be selected which make an important contribution to sustainable energy consumption and at the same time offer the opportunity of improving the employment situation.

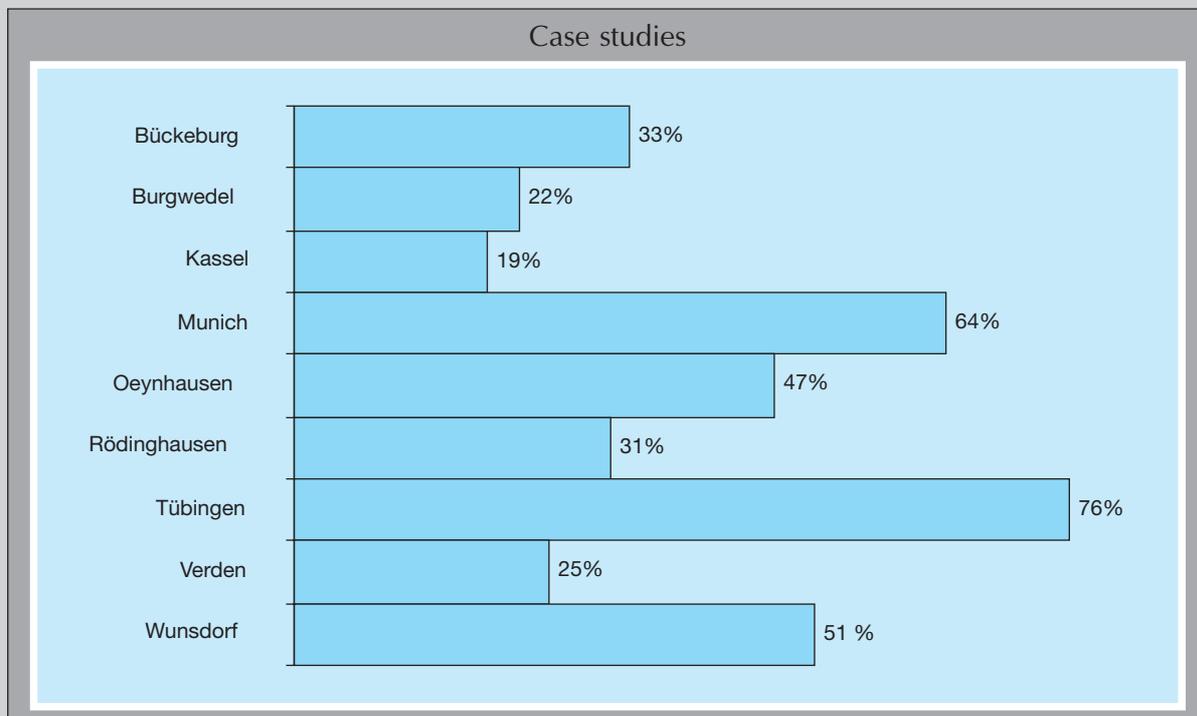
◆ Energetic upgrade in the building stock

Almost a third of final energy requirements in Germany are for heating. It is plain that this sector is of central importance in climate protection policy. In addition, the energy saving potential in the buildings sector is particularly high. According to studies by the Institut Wohnen und Umwelt (IWU) in Darmstadt, a technical energy reduction potential of between 71 and 77 percent could be achieved by energy-related technological modernisation measures. Measures associated with disproportionate expenditure were not taken into consideration. However, the available technical savings potential can only be partially utilised because of a variety of obstacles (e.g. low energy prices,

High savings potential

unfavourable legal framework and lack of information on the opportunities and cost effectiveness of modernisation measures). Nevertheless a savings potential of 30 percent still ensues at present day average fuel prices according to the IWU estimate. With a rise in fuel prices from the current average of 4.5 pfennigs per kilowatt-hour to 6.2 pfennigs per kilowatt-hour, the savings potential would in fact increase to 38 percent in the old Länder and to 53 percent in the new Länder. Upgrades in older buildings confirm that savings of this order of magnitude can easily be realised in a cost-efficient manner (Fig. 16).

Fig. 16
Proven heating cost savings in building stock (single family dwellings)
 – consumption reduction through upgrades in percent –



Source: Enquete Commission „Protection of the Earth's Atmosphere“ 1995.

Measures to increase the energy efficiency of buildings makes sense not only from a climate policy viewpoint but also because of their employment effects. The modernisation of buildings is very labour intensive. While the labour factor only accounts for about 30 percent of the total financial volume in new buildings it accounts for around 70 percent for modernisation measures. Today, work on existing buildings is

Organisation of the measures determines the employment effects

playing an increasingly important role in the development of the construction sector in comparison to new building construction. The energy updating of buildings can thus make an important contribution to the securing and creation of jobs in the construction sector and related trades, with the employment benefits arising locally and in small and medium-sized businesses.³¹

The extent to which additional jobs are created very much depends on the nature of the measures with which the energy updating of buildings is encouraged. Consideration of the following aspects is of particular importance:

- concentration of promotion on the most ecologically and economically efficient renewal measures,
- integration of energy updating measures in existing renewal measures,
- avoidance of overheating demand in the construction sector.

Positive employment effects do not stand alone but depend to a great degree on the skilful organisation of the measures. This is underlined in a study by the ifo institute, Munich, and the Rheinisch-westfälisches Institut für Wirtschaftsforschung³². In the study it was assumed that the total older building stock would be upgraded within eight years in compliance with thermal insulation regulations. The consequences of such a headlong approach would be a short term boom in the construction industry, followed by longer term employment losses because of the lack of follow-up demand. In addition, the specific costs for energy saving would be about four times higher with such a process than for thermal insulation within the framework of the normal renewal cycle³³.

◆ Efficient use of energy in the processing sector

In view of the many areas of energy use in the processing industry there exist a wealth of options for improving efficiency. These include

- avoidance of consumption caused by the idling of machines or the overheating of premises,
- thermal insulation of heat engineering plant,
- energy optimised material choice,

- energy efficient lighting,
- improvements in energy use efficiency through the use of control technology and a need-optimised equipment layout,
- use of power-heating coupling and heat exchangers as well as
- process conversions (e.g. the substitution of evaporation processes with reverse osmosis).

The employment effects associated with the development of the savings potential are very difficult to record, simply because of the non-uniformity of the measures. In addition, these typically involve integrated environmental technologies, the determination of the employment effects of which presents particular difficulties. A DIW study of the employment effects of the increased use of heat exchangers nevertheless permits the conclusion that measures for a more efficient use of energy can lead to substantial employment benefits.

Example: „Waste heat utilisation by heat exchangers“

Within a study commissioned by the Federal Environmental Agency on the subject of „Employment Effects of Environmental Protection – Status and Forecasts up to the year 2000“ (TEXTE 42/93, Umweltbundesamt), the German Institute for Economic Research (DIW) in Berlin analysed the employment effects of integrated environmental technologies on the basis of a case study, using a technology oriented and micro-economic research approach. The extent to which the use of modern heat exchangers could be promoted through adoption of a waste heat utilisation ordinance, and the resulting employment effects were examined. The study came up with the following results on the basis of a scenario analysis:

- additional investment for heat exchangers of 6.7 billion DM (1990 to 2000),
- energy savings of 250,000 gigawatt-hours annually in the year 2000 (this corresponds to roughly a third of the energy consumption of German households in 1995),
- energy costs saved: 49 billion DM (1990 to 2000, in 1980 prices),
- net employment effect: employment increase by an annual average of around 70,000 (1996 to 2000).

Cost reduction opportunities for medium-sized enterprises

The opportunities for reducing production costs through more efficient energy use have so far been inadequately taken advantage of on account of gaps in training and deficits in information, particularly in small and medium-sized businesses. This is verified by the following studies:

- A survey by the Fraunhofer Institut für Systemtechnik und Innovationsforschung revealed that businesses with 200 employees or less had realised only about half of the profitable energy saving investments.
- A survey by the North Rhine-Westphalia Energy Agency showed that six out of ten industry chief executives in medium-size enterprise could not even provide approximate estimates for their energy costs.
- In medium-sized industries only every third or fourth company used an independent energy consultant, whereas every second large company consults external expertise for the lowering of energy costs.

In order to take full advantage of the available energy and cost saving potential it is therefore necessary to introduce energy costs into the operational cost accounting and controlling system, particularly for small and medium-sized enterprises (see Chapter 2 of this brochure). Companies receive assistance in this from the public sector since on-site consultation for SMBs by energy advisors is financially aided.

◆ Energy management in the public sector

In the state sector there also exist a variety of possibilities for saving energy which have not yet been utilised. A good example should be set, and an active contribution made to climate protection at Federal, Land and local level. The following benchmark figures make clear how important it is to develop this potential :

- Public facilities account for approximately five to six percent of total energy consumption in Germany.
- According to estimates, the energy costs at local level alone amount to around five billion DM per year.
- Practice shows that approx. 25 to 60 percent of the heating energy (according to the initial position) and at least ten percent of the electricity consumed can be saved by consistent energy management in public facilities and buildings.

Energy management and energy audits are invaluable not only for reasons of environmental protection, but also from an economic point of view, since the cost savings aimed at are frequently a multiple of the expenditures (Tab. 12). Energy saving measures can thus also contribute to relieving the pressure on public budgets.

A further reason for energy management lies in their employment effects. Better thermal insulation of public buildings or the fitting of more efficient heating provides work for skilled people. The Amt für Arbeit und Wirtschaft in Munich, for example, assumes that over 5,000 new jobs could be created in Munich alone by the year 2010 if climate protection were to be massively promoted.

In spite of these advantages, energy management systems are only just emerging. According to a survey carried out in 1995 in the town of Goslar, only 25 percent of towns with between 20,000 and 100,000 inhabitants are engaged in more or less consistent energy management. For local authorities not yet involved in energy management or with difficulties putting it into effect, the guideline on „Climate Protection in Local Authorities“, drawn up for the Federal Environmental Agency by the Deutsches Institut für Urbanistik contains useful information in the form of check-lists and practical examples.³⁴

**Local energy
management just
beginning**

Town/city	Period	Expenditure (personnel costs and capital servicing) in DM	Savings in DM	Net savings in DM	Ratio of savings/expenditure
Bonn	1979 – 1992	31,500,000	53,620,000	22,120,000	1.7
Bremen	1978 – 1988	10,635,000	105,600,000	94,965,000	9.9
Duisburg	1977 – 1995	23,700,000	161,900,000	138,200,000	6.8
Frankfurt/Main	1990 – 1993	2,222,000	13,721,000	11,499,000	6.2
Freiburg	1979 – 1991	6,192,000	21,200,000	15,008,000	3.4
Hamburg	1979 – 1988	56,000,000	217,000,000	161,000,000	3.9
Hanover	1980 – 1988	21,150,000	75,000,000	53,850,000	3.5
Kassel	1979 – 1988	5,000,000	18,000,000	13,000,000	3.6
Mainz	1980 – 1988	3,615,000	14,163,000	10,548,000	3.9
Mannheim	1984 – 1990	3,816,000	27,720,000	23,904,000	7.3
Mönchengladbach	1977 – 1987	17,600,000	28,200,000	10,600,000	1.6
Nuremberg	1979 – 1994	16,000,000	59,000,000	43,000,000	3.7
Saarbrücken	1980 – 1992	12,868,000	48,042,000	35,174,000	3.7
Stuttgart	1976 – 1990	23,540,000	153,680,000	130,140,000	6.5

Source: based on the Deutsches Institut für Urbanistik, Berlin, 1997.

◆ Contracting – a new growth market

Although energy saving investments pay off, they are frequently not carried out. There may be various reasons for this: lack of capital, lack of technical know-how or risk aversion. The market for contracting developed from this realisation. In contracting, the energy saving measures, and if necessary the servicing and operation of new or modernised facilities are not taken care of by the energy user himself, but by a third party (the so-called contractor). The investment and servicing costs are then payed off through the achieved energy savings. Special contracting companies as well as power suppliers, banks, energy agencies, plant manufacturers and craft enterprises can function as contractors.

The following advantages accrue to the user of contracting services:

- reduction of energy costs,
- cost efficient implementation of the energy saving measures through better contractor know-how ,
- transfer of the risk of the energy saving measures to the contractor, and
- reduction of capital outlay.

It is thus not surprising that the contracting market has grown significantly over the past few years. Project investment volume has been around 200 million DM to date, with contracting so far concentrated on large plants (power stations, district heating plants, building management systems) and administrative buildings³⁵. This investment volume, however, only corresponds to a fraction of the estimated market potential of around 10 billion DM per year for Germany. There are several reasons for this discrepancy, including the novelty of the process, information deficits among potential suppliers and users and legal constraints.

Untapped potential

◆ **Integrated resource planning**

The basic idea of integrated resource planning (IRP) is that it can make better sense not only ecologically, but also economically, to reduce electricity consumption than to erect new power stations. In the United States integrated resource planning has been common practice for years now. The power companies in 24 states are meanwhile obliged to engage in IRP. This means that every two years and before the construction of a new power station electricity suppliers have to examine whether investments in energy saving projects are the more cost efficient solution. This has led to a fundamental change in entrepreneurial attitudes for the power suppliers, since they are increasingly adopting the character of energy service providers³⁶.

In Germany, the Hanover department of works has become the first local authority electricity supplier to make use of integrated resource planning. The Öko-Institut in Freiburg and the Wuppertal-Institut für Klima, Umwelt, Energie have elaborated a case study, commissioned by the European Union, the Federal Environmental Agency and the Land of

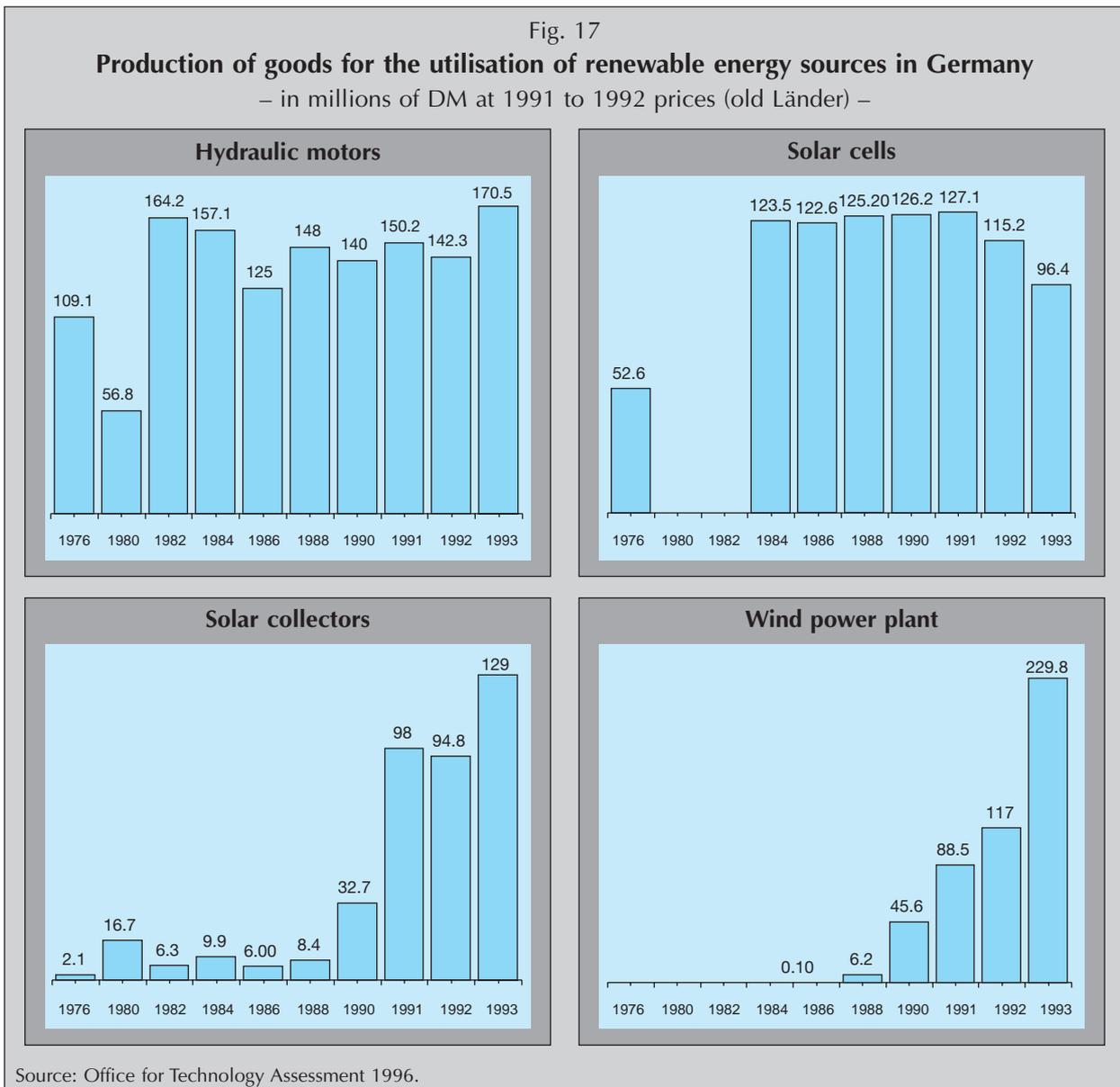
Lower Saxony, to sound out the possibilities. The study contains the most comprehensive conceptual representation and effectivity analysis of integrated resource planning in Europe so far.

The study revealed that approx. 2.4 billion kilowatt-hours of electricity could be saved in Hanover within 15 years by means of a total of nine energy saving programmes. An economic advantage of 154 million DM would result over the running time of the model IRP programme (up to 250 million DM, taking into account the avoidance of the external costs of environmental pollution). Electricity consumers would have to invest 104 million DM in energy saving technologies, but would on balance save 170 million DM in costs through lower electricity consumption. This already takes into account the fact that electricity prices would have to rise in order for the Hanover department of works to balance the costs for implementing the energy saving programme and the revenue deficit brought about by reduced sales of electricity. The employment balance would also be positive according to the specialist appraisal. They assume that around 160 permanent jobs could be created in the region by the savings programmes.

◆ **Increased utilisation of renewable energy**

In 1993 a total of 625 million DM worth of goods related to the use of renewable forms of energy were produced in Germany (Fig. 17). This includes solar cells, solar collectors, hydraulic motors, and wind power plants. With an average annual growth rate of six percent between 1976 and 1992, this sector expanded at double the rate of industry as a whole. Exports increased by an average of 18 percent annually in this period. Employment in this sector has also increased markedly in the last few years, with the greatest increase in the wind energy sector. Around 10,000 jobs have been created in this sector in just a few years: approx. 5,000 in companies directly manufacturing wind energy plant, and about 5,000 indirectly in related fields.

Powerful growth in the market for renewable energy is also to be expected in future for the following reasons:



- Technological progress and the transition to mass production will lead to a considerable lowering of costs in many renewable energy technologies, resulting in improved competitiveness in relation to other energy sources.
- The predominance of fossil fuels for power supply is not in the long run compatible with sustainable climate protection. Within a few years renewables will have to form the backbone of the supply of power. In this regard, the prospects are favourable that the political will exists for the creation of better economic framework conditions

"Wind power" as a growth industry

for renewable forms of energy in the medium to long term³⁷. This is also indicated by the fact that not only in Germany, but in other countries as well, programmes already exist for the promotion of renewable forms of energy

Only a rough estimate can be made as to how the market for renewable energy will develop in future. These developments depend on a variety of factors largely unavailable for exact forecasting, such as technological development and economic and political conditions. The forecasts available nevertheless come to the unanimous conclusion that powerful growth is to be reckoned with in the next few decades. The World Energy Council³⁸ for example, assumes that even at a very conservative estimate, the exploitation of wind energy will increase world-wide by a factor of 29, and the use of solar energy by a factor of 3.5 between 1990 and 2010. Growth will be even greater if – as assumed within the framework of an environmental scenario by the World Energy Council – regenerative forms of energy are more strongly promoted by the state (Fig. 18).

Based on the World Energy Council study, a study commissioned by the Office for Technology Assessment shows that

- the world-wide investment volume for capital goods in the renewable energy sector will reach a value of at least 165 billion DM by the year 2010, and
- a German export share of 6.5 to 7.5 billion DM together with services worth several million DM in 2005 can already be assumed.

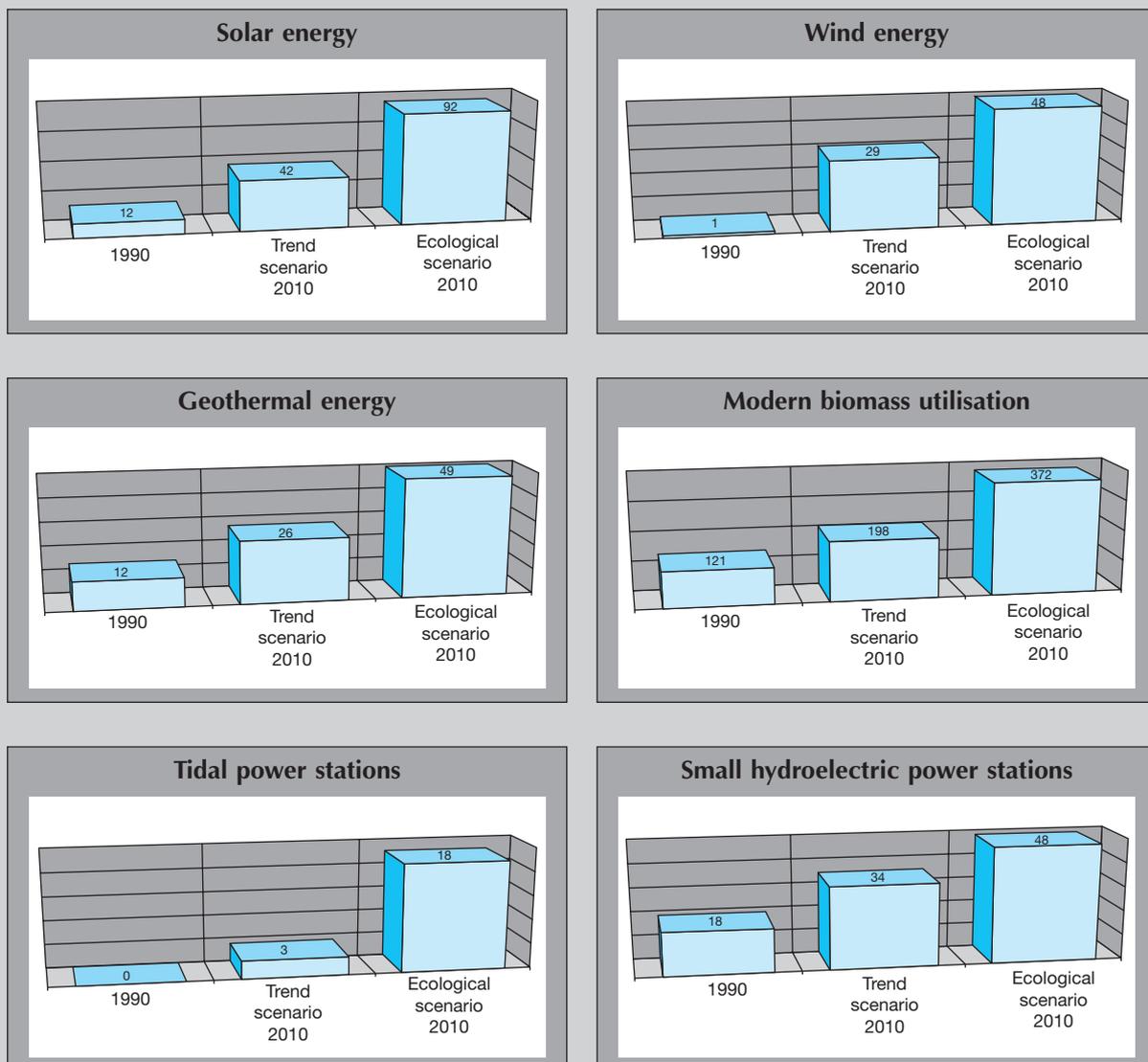
Germany is at the leading edge in most technologies for the utilisation of renewable forms of energy. The prerequisites for German companies to play a leading role in renewable technologies in the future are favourable. It is thus even more important that the state accelerate the market introduction of these technologies through consistent promotion, thus preparing the way for the markets of tomorrow.

This would also result in direct positive repercussions on the employment market. A study by Greenpeace, in co-operation with the Fraunhofer-Institut, Freiburg, and the Institut für Luft- und Raumfahrt in Stuttgart, concluded that around 20,000 jobs could be created or maintained up to

the year 2010 through targeted promotion of solar and wind energy, and that it would appear possible for a self-supporting market to be developed within this period.

Fig. 18

Forecasts of energy consumption from renewable forms of energy
 – in million metric tons of crude oil units (1990 to 2010 world-wide) –



Source: World Energy Council 1994.

Action field „Corporate environmental management“

Competitive advantage
through environmental
management = job
creation in future
industries

A systematic development of environmental management systems can provide companies with numerous advantages: more reasonable insurance, better credit terms, preference in the awarding of public contracts, improvement of the corporate image and the like. Above all, environmental management contributes to intelligent solutions for product and process design and appropriate organisational structures. In this way, the environmental quality of the products can be improved and new markets developed. In addition, environmentally-oriented management can help to lower costs. In other words, successful environmental management contributes to long-term modernisation of the economy and creates jobs in future industries. It is thus a significant competitive factor in the course of the advancing globalisation of the world economy.

Corporate environmental management has recently gained significant importance as a modern management tool in two respects:

□ EU Eco-Management and Audit Scheme (EMAS)

With the EMAS regulation which came into force in 1993, companies were encouraged to develop environmental programs and environmental management systems on a voluntary basis, carry out environmental audits and prepare environmental statements. Experts estimate that up to 8,000 companies will take part in the system at EU level in the next few years. Since the coming into force of the EMAS Regulation in Germany in 1995, over 850 small, medium-sized and large enterprises have already successfully participated in the European Union system (Fig. 19). This means that around 75 percent of the total number of companies participating in the EMAS system are from Germany. Most participants are from the food industry, followed by the chemical, plastics and rubber industries and mechanical engineering.

□ ISO 14001

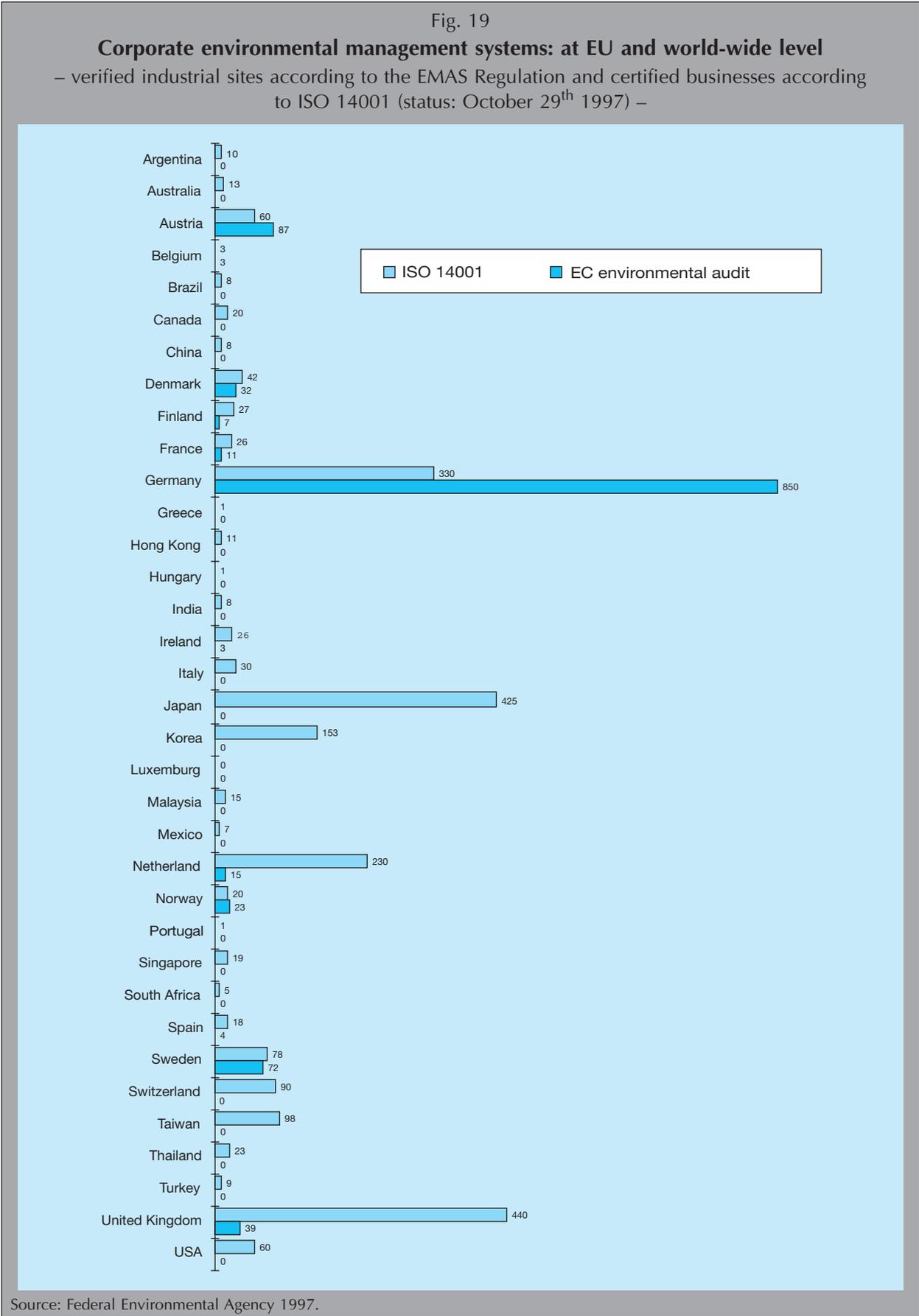
In order to support companies in the implementation and expansion of corporate environmental management systems, the International

Standards Organisation (ISO) developed the internationally valid ISO 14001 standard. DIN EN ISO 14001 „Environmental management systems – Specification with guidance for use“ has had the status of a German standard since October 1996. In the introduction to DIN EN ISO 14001, it is expressly pointed out that the standard is not intended to be used to create non-tariff trade barriers or to increase or change an organization’s legal obligations. A system of this kind enables an organization to establish, and assess the effectiveness of, procedures to set an environmental policy and objectives, achieve conformance with them, and demonstrate such conformance to others. The overall aim of the standard is to support environmental protection and prevention of pollution in balance with socio-economic needs. Over 2,000 firms had been certified according to ISO 14001 by October 1997 (Fig. 19).

The Umweltgutachterausschuß (UGA; environmental verification committee on EMAS in Germany), representing an important part of the German accreditation system with respect to EMAS, carried out a survey among 465 companies registered in accordance with EMAS regulations. The main reasons for taking part in the EMAS system (Fig. 20) were given as follows: improvement of operational environmental protection, increase of legal security and improvement of the company image were judged to be most important. The participation of competitors was judged to be of least importance.

The question as to what advantages had in fact become apparent was answered as follows: just short of 90 percent of all companies were convinced that corporate environmental protection had genuinely improved by participation. Public image had been improved in almost 60 percent of cases, in the opinion of those surveyed. An increase in legal compliance and cost savings were cited as further advantages for the majority of the participants.

Interview-survey enterprises by the Umweltgutachterausschuß



The period of time between the decision to take part in the EMAS system and registration was

- up to half a year for 10 percent of the interviewees,
- up to a year for 44 percent of the interviewees, and
- more than a year for 45 percent of the interviewees.

The implementation costs differed greatly depending on the location: average costs for the introduction of the environmental management system were given as around 100,000 DM (minimum: 6,000 DM; maximum: 800,000 DM). Validation costs by environmental experts were just short of 16,000 DM on average (minimum: 1,500 DM; maximum: 126,000 DM). Registration costs were about 1,000 DM (minimum: 20 DM; maximum: 5,000 DM). Asked whether the expenditure had been worthwhile, 81 percent replied „Yes“, six percent „No“ and the rest had no definite opinion.

The following measures were considered necessary by those interviewed in order further to improve the system:

- deregulation (i.e. enterprises which have successfully taken part in the EMAS system might be given some relief in other fields),
- awareness raising about EMAS (particularly among consumers),
- more pronounced consideration of EMAS-registered businesses in public procurement procedures and particular advantages for loans and insurance premiums.

The question „EMAS and/or ISO 14001 ?“ is of particular interest for the future development of corporate environmental management. From the point of view of those surveyed, the following picture emerges (Fig. 21):

- Only 23 percent of the sites do not want to receive certification according to ISO 14001. The rest have either received their certification already, are planning to obtain it or are as yet undecided.
- Little or very little additional time or expenses are estimated to be required for ISO 14001 certification. Not even 10 percent of the locations interviewed assume high or very high costs.
- Most of those interviewed (45 percent) would decide on both systems today and only seven percent for ISO 14001 alone.

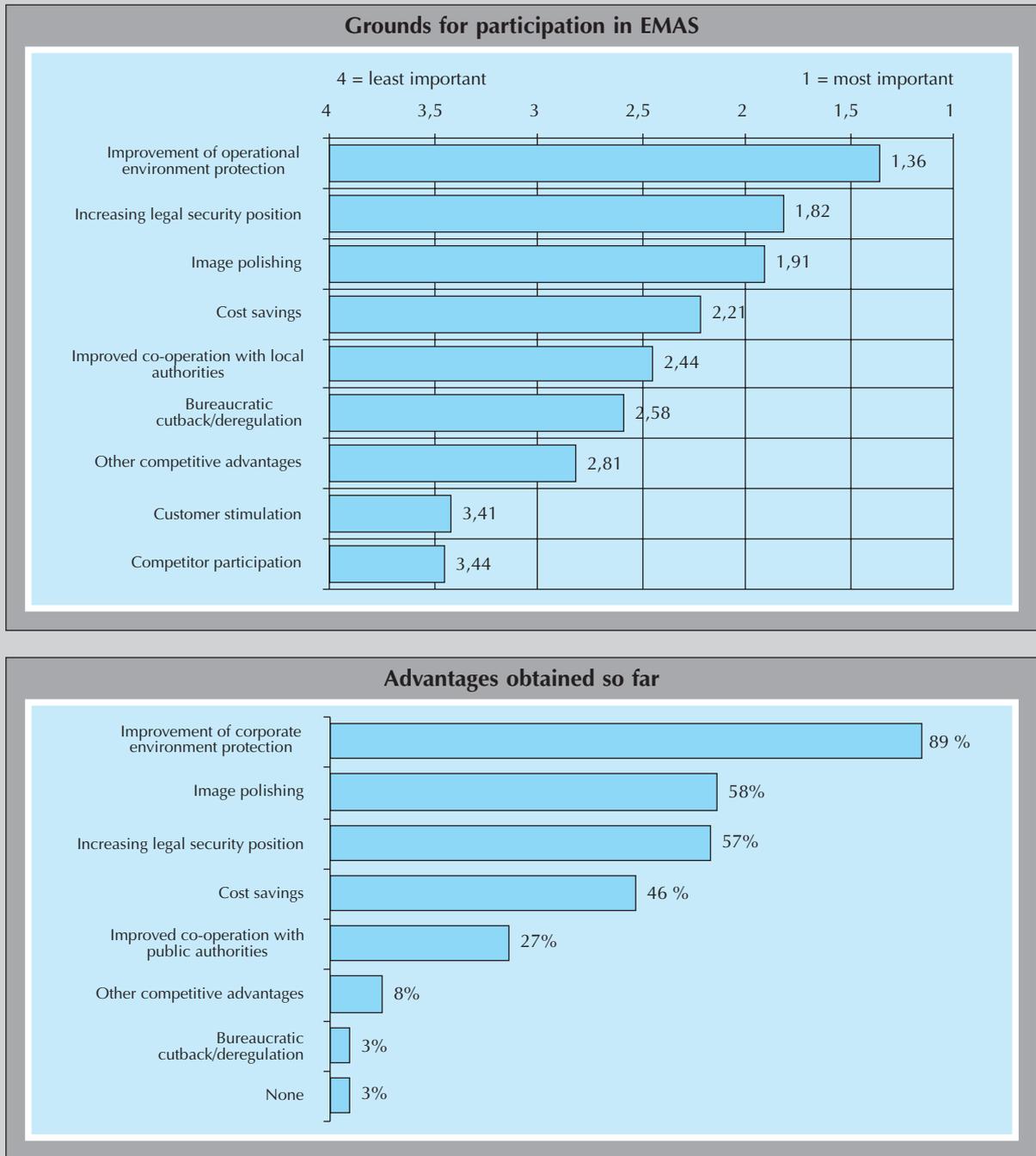
Positive cost/earnings ratio

EMAS and/or ISO 14001?

Fig. 20

Why German enterprises voluntarily participate in the EMAS system

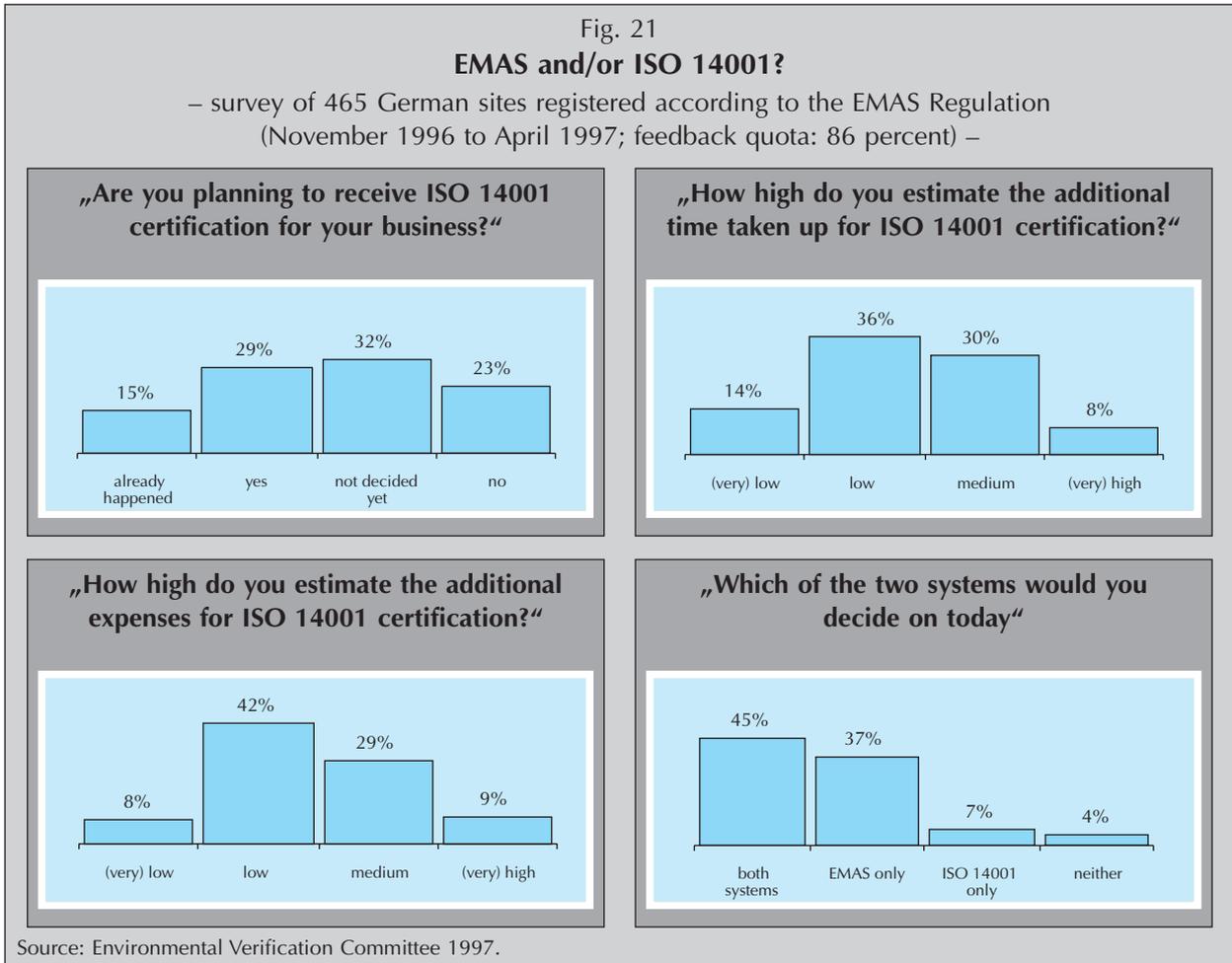
– survey of 465 German sites registered according to the EMAS Regulation
 (November 1996 to April 1997; feedback quota: 86 percent) –



Source: Environmental Verification Committee 1997.

Beyond environmental auditing: Environmental controlling

With the „Environmental Controlling Handbook“ [Handbuch Umweltcontrolling]³⁹, published in 1995 by the Federal Environment Ministry and



the Federal Environmental Agency, an instrument was developed which is particularly intended for small and medium-sized businesses. It is particularly intended for firms which cannot or do not wish to acquire a comprehensive environmental management system, but would prefer to begin gradually with environmentally-oriented management.

Corporate environmental controlling has gained increasing importance in the past years as an instrument for the successful control and long-term security of businesses. Environmental controlling includes the planning, directing and monitoring of business operations, taking environmental interests into account. It not only reveals environmental costs and savings potential, but also environmentally-relevant risks and opportunities. An effective environmental controlling system can apply to all levels of business in a firm.

Operational environment controlling:
interdisciplinary and interdepartmental instrument, supporting the executive and covering information, planning, control and co-ordination functions within corporate environmental management

How can the „environmental performance“ of a business be measured?

- It should assist the executive business level to integrate environmental protection in overall planning and objectives, to create an effective position for environmental protection in the business operation, to control and intensify environmental protection related activities at lower corporate levels, and to carry out an analysis of possible environmental threats through corporate operations by the company.
- It should assist the middle management to determine and co-ordinate individual projects, to represent the company in environmental questions, and to provide an analysis of ‚environmental weak-spots‘.
- It should assist the lower business level to carry out environment related projects, supervise environmentally-hazardous plants and make the staff more sensitive to environmental questions.

Corporate environmental indicators: tools for environmental controlling

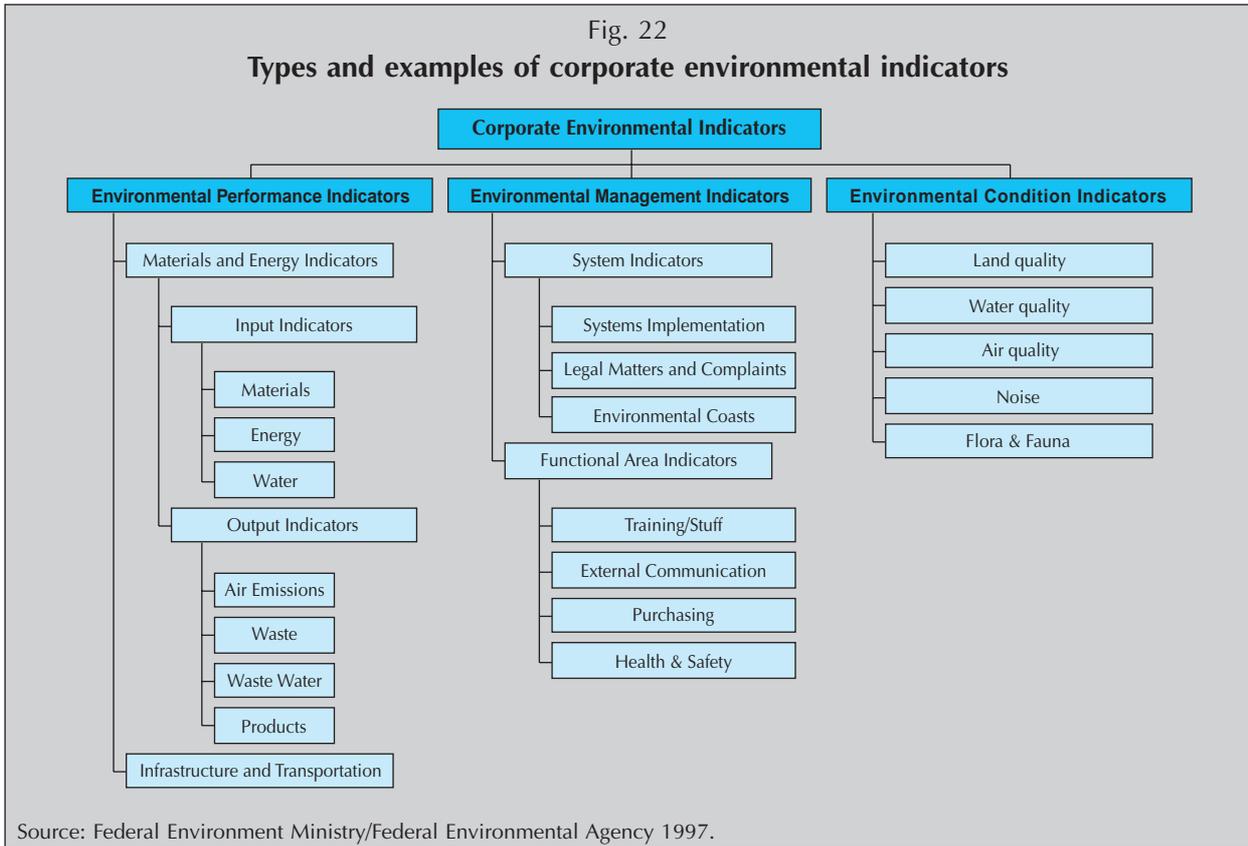
What is the position of an enterprise in the national economy? How are the environmental effects of the enterprise to be judged? Has waste accumulation per production unit decreased in the past few years? Such questions can only be answered with the aid of a multitude of figures. The abundance of data can lead to „not seeing the wood for the trees“. Environment related performance can be measured and understood through the development of corporate environmental indicators⁴⁰ (Fig. 22).

Corporate environmental indicators provide condensed information on environmentally relevant managerial situations. Environmental indicators support all environment control functions, particularly by means of

- comparative time series (trends and changes can be recognised early on)
- target-performance comparisons (distance to target can be measured),
- interfactory comparative studies (making environmental benchmarking possible).

Corporate environmental indicators can serve a variety of functions. They can:

- illustrate environmental performance in a time series analysis,
- detect opportunities for optimization,
- derive and pursue environmental goals,
- identify market opportunities and cost reduction potentials,
- evaluate environmental performance in company comparisons (ecological benchmarking),



- provide core data for environmental reports and statements,
- provide feedback to motivate staff members,
- support the implementation of the EMAS Regulation and ISO 14001.

Although neither the EMAS Regulation nor the international standard ISO 14001 require corporate environmental indicators, in practice they represent a useful aid for environmental management and environmental controlling. The International Standards Organization (ISO) is currently working on its own standard for environmental indicators (ISO 14031 „Environmental Performance Evaluation“). The adoption of ISO 14031 is to be expected at the end of 1998 at the earliest.

„Greening the Government“

Not only does environmental management play an important role in private enterprise, but it is also receiving increased attention in the public sector. Federal, Länder and local institutions affect the environment considerably, just as do business enterprises and private households. On account of its organisational size, its economic importance and its responsibility, the state

**ISO 14031
in preparation**

**Environmental relevance
of the public sector**

has particular obligations towards public welfare in taking into account the environmental relevance of its activities. In Germany, for example, there are at present around

- 43,201 schools providing general education,
- 9,245 vocational schools,
- 335 third-level institutions,
- 3,982 museums,
- 780 theatres and playhouses,
- 1,158 public facilities for the elderly,
- 163 public facilities for the disabled,
- 863 public hospitals,
- 13,032 public libraries,
- 1,260 scientific libraries.

Public facilities consume about five to six percent of the total end-use energy in Germany (costs are around five billion DM per year in local facilities alone) and around seven percent of the total drinking water in Germany (costs are around 2.7 billion DM per year). Almost 15 percent of building-construction waste can be traced back to activities in the public sector. There is in addition a substantial demand of the state. At local, Länder, and federal levels this amounted to about 150 billion DM in the old Länder in 1990. If this demand were to be selectively used for the purchase of environmental products, this would make a two-fold positive impact: as direct environmental relief and as promotion of these products.

OECD resolution

Against this background, the environment ministers of the OECD states adopted a resolution on 20 February 1996 in Paris, in which all governments are urged to test its activities from an environmental protection viewpoint and to take on a model function („greening the government“). In this connection, the German Federal Government sees the following important starting points for environmental protection:

◆ Further training and staff motivation

The prerequisite for the effective integration of environmental protection is the anchoring of responsibility for environmental protection in the organisation of a public authority. Widespread measures for environmental training and education of public employees can

contribute beyond this to an increase in problem awareness and environmental commitment.

◆ **Objective organisation**

Not just formal competencies but changes in the sense of a stronger integration of environmental protection can be created by the appointment of environmental officers or through the assignment of a co-ordination task for environmental protection to specific organisational units at all levels of public administration, from the ministries to local authorities.

◆ **Environmental purchasing⁴¹**

State institutions make a contribution to qualitative changes in the range of products through government purchasing. In 1985 it was established in the tendering law that requirements on the environmental compatibility of goods and services could also be included in public procurement procedures.

◆ **Operation and maintenance of plant and building facilities**

The many opportunities for energy and water savings and waste avoidance are of particular importance (Tab. 13).

Category	Amount in metric tons for the year 1994	Amount in metric tons for the year 1995	Costs in DM for the year 1994	Costs in DM for the year 1995	Cost changes in DM
Waste paper	248.00	481.13	36,656.43	59,676.66	+ 23,020.23
Waste glass	236.00	419.44	disposal free of charge	disposal free of charge	–
DSD waste (recyclable packaging)	108.00	576.26	disposal free of charge	disposal free of charge	–
Bio-refuse	3,927.00	3,885.05	28,757.93	41,353.90	+ 12,595.97
Residual refuse	5,080.00	4,023.82	1,300,797.80	1,045,841.45	– 254,956.40
Other waste types	1,291.91	no data	388,457.34	513,045.34	+ 124,588.00
Total costs			1,754,669.50	1,659,917.30	– 94,752.20

Source: modelled on the Deutsche Institut für Urbanistik, Berlin, 1997.

In the meantime, preliminary experience has been acquired in Germany on the application of the EMAS Regulation in public administration. It seems reasonable that the range of instruments available to the EU eco-audit should also be used by the organisational units of the administration. The Baden-Württemberg State Office for Environmental Protection [Baden-württembergische Landesanstalt für Umweltschutz (LfU)] in Karlsruhe began as early as 1992 to examine their energy, water and waste flows as well as business travel activities. An initial stock-taking was carried out for these areas as defined by the EMAS Regulation. Based on this, the LfU undertook environmental monitoring for the Karlsruhe location for the year 1994, the results of which were summarised in a preliminary report (see Appendix 16). The actual situation (structural analysis), existing material and energy flows (in-put-output analysis) and possibilities for improvement (target value synthesis) were shown. This was the first environmental report modelled on the EMAS Regulation compiled by the administration of one of the Länder.

Environmental Guidelines of the Baden-Württemberg Office for Environmental Protection (LfU)

The Baden-Württemberg Office for Environmental Protection takes on the function of an interface between science and administration. It advises the Environment Ministry and the specialised authorities in questions of technical and ecological environmental protection. Within the framework of its activities, the LfU contributes to environmental relief in many areas. On the other hand it also causes environmental pollution through its activities. As a result, the LfU also wishes to support environmental behaviour within the framework of its activities. For this reason, the following basic principles apply in the LfU:

- We are striving for a permanent reduction in environmental pollution in all areas of activity. Moreover, we will regularly monitor and assess the effects of our current activities on the environment.
- We will assess the environmental effects of each new activity and changes in any existing activity in advance, in order to avoid ecological problems effectively in future.
- We will take precautionary measures to avoid the accident-related emission of substances or energy.
- We have introduced an environmental management system and will continue to develop this further to ensure compliance with our environmental guidelines and to continuously adapt to new opportunities.
- We document the data and stocks of all in-coming and out-going materials and forms of energy, in order to ensure continuous improvement of the control of resource consumption, emissions, environmental risks and savings potential.
- We promote the responsibility and problem awareness of our staff through continuous training, discussion and information on our environmentally-compatible activities, since implementation of our environmental guidelines is only possible with the help of every single member of staff. Individual initiative and commitment receive our full support.
- Within the bounds of possibility, we promote the recognition of environmental protection aspects and the application of our basic principles of environmental protection by our suppliers and contract partners as well.

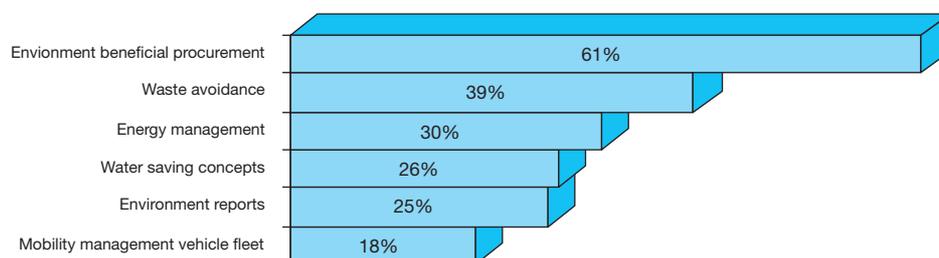
In order to support public administration in the development of environmental management systems, the German Federal Environment ministry and the Federal Environmental Agency commissioned the Deutsche Institut für Urbanistik to carry out a preliminary study on the subject of „Environmental Controlling in the Public Sector“.⁴² This study was meant, in particular, to clarify whether and how the setting up of environmental controlling systems in federal, Länder and local authorities could lead to the development of environmental improvements and simultaneous to a savings potential. For this purpose, numerous federal departments as well as ministries and subordinate authorities were surveyed. From this survey, it was apparent that a focal point for environmental protection activities in the public sector is in the area of environmental purchasing (Fig. 23). The following aspects were named as examples of constraints to a stronger environmental orientation :

- organisational constraints (lack of personnel and increased administrative expenditure, difficulties to motivate staff, incongruence between the users of buildings and their administrators, accommodation in rented property, scattered locations),
- financial and economic constraints (personnel cut-backs and office closures, new financing instruments cannot be applied because of the currently budget law, lack of budgetary responsibility, low energy costs render the amortization of environmental protection costs more difficult).

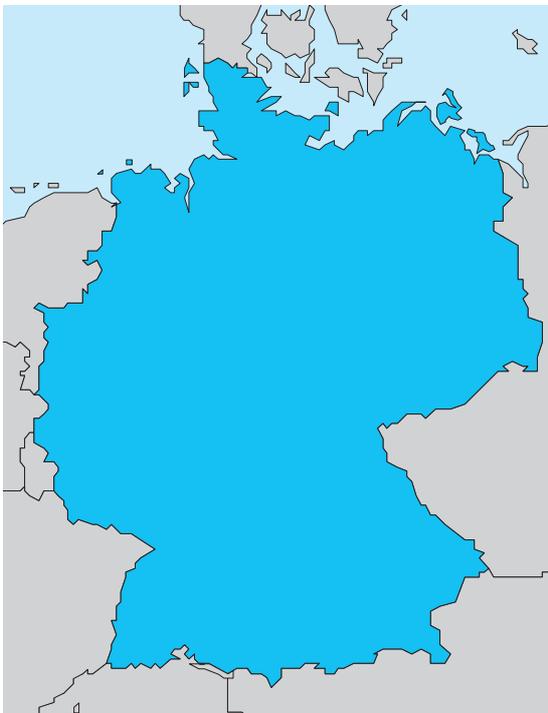
Fig. 23

The public sector and environmental protection

– Focus of environment-related activities and projects in the federal and Länder administrations: results in writing of a short survey among 175 authorities in the spring of 1997 –



Source: Deutsches Institut für Urbanistik 1997.



6

Setting Tomorrow's Course Today

- **Sustainable Development in Germany: Multi-track Progress**
- **Future Environmental Protection: Technology Preview**
- **Environmental Changes in Structure and Awareness**

Sustainability in Germany: multi-track progress

Reorientation is the precondition for future employment

What is the long term relationship between environmental protection and employment? The answer is quite simple:

- Jobs associated with the wasteful and inefficient use of resources have no long term prospects.
- In contrast, jobs which are compatible with an environmentally oriented economy can be seen as secure for the future.

A new paradigm has emerged from the Conference for Environment and Development in Rio de Janeiro in June 1992. This paradigm has led to new thinking in environment and development policy: sustainable development. Although a general acceptance for this paradigm can be found in most societies the operationalisation of the concept has proven to be rather difficult.

Sustainable development – the emergence of a new paradigm

Archetypes of unsustainable and sustainable development

The concept of sustainability was already used in the last century in forestry, and meant an economic long-term use of the forest in the sense of a permanent yield of timber. In its simplest form, this concept requires that the central human and environmental developmental parameters (for example, population, use of resources, industrial production, use of technology and environmental pollution) be designed in such a way that the permanent survival of the human community is ensured. Particularly drastic examples of non-sustainable activity are:

- the deforestation of the Mediterranean forests by the Romans and the destruction of the tropical rainforests today,
- the overfishing of the world oceans using ever more refined fishing techniques, and
- the desertification of extensive areas of land in Russia that used to be covered by the Aral Sea, following the large-scale diversion of the lake's feeders for agricultural irrigation.

Examples of sustainable economic activity are more difficult to find, particularly since not all forms of economic activity should be described as sustainable when their permanence is only due to the low-level of technical intervention possible in the past. In principle, the following may be viewed as sustainable:

- the cultivation of the centuries-old rice terraces in China and Indonesia,
- various forms of agricultural forest use (agro-forestry) in Africa and Latin-America, and
- the management of Alpine pastures from the 17th century until the end of the Second World War.

Four basic requirements for sustainable development

Crucial factors for sustainable development are that the functions of the environment for humans as a source of renewable and non-renewable resources, as the absorption medium for emissions and as the very basis of life are no longer jeopardised by unsustainable patterns of production and consumption. This means not only conserving natural capital and biodiversity, but also that the stress-bearing capacity of humans themselves and of the various environmental media be taken into consideration. Four basic imperatives can be derived from the foregoing, similar to those by the „Protection of Humanity and the Environment“ Enquete Commission set up by the German Parliament:

1. Consumption of a resource may not exceed its regeneration rate or the rate at which all its functions can be substituted.
2. The release of substances into the environment may not exceed the carrying capacity or the assimilation capacity of the environmental media.
3. Anthropogenic dangers and unacceptable risks to humans or the environment must be avoided.
4. The time scale of anthropogenic interference with the environment must be in a balanced relation to the response time needed by the environment in order to stabilise itself.

Source: Federal Environmental Agency and „Protection of Humanity and the Environment“ Enquete Commission

The objective of responsible and precautionary environmental policy consists in particular in keeping the risks for humanity and the environment in the future as low as possible. If environmental policy wants to meet the demand of providing for the future, then sound concepts for long-term sustainable development must be sought. Lasting environmentally-compatible development includes, in addition to protection of the natural basis of life, a social and an economic component as well. An environmental policy oriented on the paradigm of sustainability thus has to measure its successes not only by the improvements in environmental quality (ecological component) which are achieved, but also by the efficiency of the measures applied (economic component) and their social compatibility (social component).

**Sustainability triangle
„environment-economy-
welfare“**

Interdisciplinary character of environmental policy

Operationalising the paradigm of sustainable development involves environmental protection beyond technological solutions. Environmental aspects must be integrated in other policy sectors, just as environmental policy has to pursue a form of development as economically and socially compatible as possible within an environmental framework.

Environment protection and employment: recognition and material use of synergies

Environmental policy requires no legitimation through employment or competition policy. Nonetheless it will become increasingly important in the shaping of environmental policy not to address challenges – the permanent safeguarding of our environment, reduction in unemployment, protecting Germany as a location for business and industry – in an isolated manner, but to develop strategies which use the synergistic effects between these different areas. In other words, the long-term effects on the world of work of an environmental policy guided by the paradigm of sustainability must also be borne in mind alongside the development of current environmental policy through, for example, measures for promoting the export of environmental protection goods, the promotion of renewable energies and of rational use, or the creation of incentives to improve corporate environmental policy, the latter providing growth and employment potential even in the short term.

Multi-track progress

Various approaches are necessary in order better to achieve sustainable economic activity:

□ Identifying „win-win strategies“

A first important step on the path towards sustainability is the identification of savings potential in the use of resources, and the search for opportunities to reduce environmental pollution. Stronger incentives must be set up both for businesses and consumers. By improving corporate environmental policy, businesses can tap many cost-saving potentials. Anticipatory measures and the careful handling of resources can effectively reduce commercial risks. These so-called „win-win strategies“, resulting in both economic and environmental advantages, should be vigorously put into practice. Ultimately, every individual can contribute through environmentally compatible behaviour to taking full advantage of the already existing saving potentials.

□ Promotion of green technologies

In order to achieve a sustainable economy, a significant de-coupling of economic growth and resource consumption and of economic growth and pollution, as well as a reduction in material throughput are necessary. For this, further increases in energy and material efficiency must be achieved and basic innovations brought in which open up more environmentally compatible approaches to technology and product development and use. From an environmental point of view, it is necessary to identify and promote those technologies. They will differ in terms of their market potential and capability for development. Taking into account considerations of market competition and employment policy, interest is directed to the market potential of the different new technologies in order to take full advantage of the growth and employment possibilities of the environmental protection goods market.

□ Environmental Changes in Structure and Awareness

The improvement of technology alone will not be enough in many cases to make sustainable development possible in a foreseeable period of time. This is only possible in Germany if efficiency is improved and **at the same time** both consumer behaviour and the legal and economic framework change. Along with this, regulatory law, free market and awareness raising instruments must be applied to an equal extent.

This is the conclusion arrived at by the Federal Environmental Agency arrives in its report published in June 1997 on „Sustainable Development in Germany – Progress and Prospects“. The report deals with steps and strategies aimed at sustainable development in Germany, on the basis of three scenarios („business as usual“, „technological efficiency“ and „structural transformation and awareness raising“). Four central areas were selected :

- energy use,
- mobility,
- food production,
- textiles.

Current consumer behaviour was also analysed under the aspect of its sustainability.

Technology progress alone
is not enough

Study "Sustainability in
Germany"

Success of the policy of sustainability will depend above all on whether it succeeds in finding environmental policy instruments appropriate to the respective problems and objectives. At the same time, the shaping of the legal, economic and social regulatory framework has priority over selective intervention. The result of the analysis: the whole of the available range of environmental policy tools must be applied, including

- regulatory and planning law instruments (for example, orders and prohibitions, plans and programmes),
- economic instruments (for example taxes, licences, self-imposed commitments),
- the informational tools of „environmental socialisation“ (training, information, education).

Future environmental protection: technology preview

Linking environment, employment and future technology

Environment policy has always effected the economy and the labour market. In many cases, environmental policy measures have positive employment effects: there are new technologies which promote a more efficient handling of resources, and there are increased incentives for the development of new environmentally-friendly technology. They bring about new fields of employment, changed demands on the quality of work and – if these technologies are competitive on the long term – additional jobs.

In order to be able to identify the technological possibilities which are most important for maintaining or restoring a worthwhile environment, for competition and for welfare, an increasing number of technology forecasts are being carried out. In the methodological repertoire of technology forecasting, so-called Delphi studies have been found to be particularly suited for long-term perspectives of about 30 years. These methods, originally developed in the United States, have been used at regular intervals for over 25 years for a comprehensive macroeconomic estimate and classification of science and technology.

„Delphi study“

Guideline for strategic future orientation

Delphi studies are based on expert surveys which inquire about technology-related visions of the future for the next 30 years. In two rounds of questioning, realisation periods and structural conditions for future innovations are estimated. The various rounds of a Delphi procedure lead to a feedback of the estimates of informed scientific circles to the individual assessments of the expert, so that the latter is then able to correct his or her possibly deviating assessment, or adhere to it in justified cases.

Delphi I: according to the Japanese model

In 1993 the results of a Delphi survey on the development of science and technology were published for the first time in Germany. The study was carried out by the Fraunhofer Institut für Systemtechnik und Innovationsforschung, Karlsruhe and commissioned by the then Federal Ministry for Research and Technology. The study strictly followed the Japanese model. The first German Delphi study was laid out parallel to the fifth Japanese survey. At that time, an attempt was made to confront German researchers with Japanese visions and to examine the Delphi method in regard to its usefulness. A total of 1147 individual questions were taken into account (out of an original 1150 in Japan), distributed among questions in 16 fields. Among these were many subject areas directly concerned with the environment. The complex of questions from the surveys routinely carried out in Japan was taken over almost unchanged. The fundamental tendency of the results in Japan and Germany was similar to a large extent.

Mini-Delphi: the method is further developed

For the mini-Delphi study (1995) four priority themes with two exemplary central themes each were selected:

- materials and process engineering of the future (photovoltaics, superconductivity),
- microelectronics and the information society (cognitive systems and artificial intelligence, nanotechnology and micro-system technology),
- bio-sciences and the future of medicine (cancer research and cure, brain research), and
- escape from environmental destruction (waste processing and recycling, climate research and technology).

The survey took place from 1994 to 1995 simultaneously in Germany and Japan. On the one hand, this was to make possible an extended look at selected topics, and on the other hand, to serve in the methodological preparation of a comprehensive Delphi study at international level which was already being carried out. For the central theme „waste processing and recycling“, the majority of German and Japanese specialists expect similar realisation periods. The realisation of an economic process for the

sorting and separating of recyclable materials from domestic refuse, management standards for the ecological operation and recycling of useful materials, automatically controlled (intelligent) incineration systems for domestic refuse and technologies for the utilisation of plastic waste as fuel, are expected by the end of the year 2005, for example. For the central theme „climate research and technology“, the realisation periods in Germany and Japan are similarly assessed, with the German experts slightly less optimistic. The first possible realisation derived from climate research concerns the world-wide deployment of substitute materials for CFCs and halogens (around 2005). The experts expect that the economic implications of the greenhouse effect will be able to be estimated approximately by shortly after 2005, and that the effects of ultraviolet light, which will increasingly irradiate the earth as a result of damage to the ozone layer, on genes and the body's own immune system will be explainable. However, an explanation as to how human influence of the natural carbon cycle, including the global atmosphere, the oceans and the terrestrial biosphere proceeds quantitatively is first expected in the year 2010.

Delphi II: in preparation

After positive experience with the German Delphi reports from 1993 and 1994, studies within the framework of Delphi II are presently continuing. More than 100 experts from industry, colleges and universities and many other institutions have put together more than 1000 individual topics in twelve subject areas, many of which again exhibit a direct relationship to the environment (for example, environment and nature, energy provision and depletable resources, mobility and transport, agriculture and nutrition as well as building and housing). The study is to be published in 1998.

The Delphi study from 1993 specifies a large number of technical areas directly concerned with the environment. In the following summaries, the realisation times assumed by the experts for the technology are given in parentheses.

□ Ecology and environmental protection technology

The ecology and environmental protection technology sector is one of the fields in which Germany is seen to have a leading role internationally. This is particularly the case for regional environmental questions (for example, acid rain, water quality, excessive noise, refuse), whereas the United States is seen to have a small lead in the global environmental area (depletion of the stratospheric ozone layer, pollution of the world's oceans, destruction of tropical rainforests, global warming). The market for environmental protection technology is

viewed internationally as an important growth market (see Chapter 4). It can therefore be assumed that this sector is of great importance for the Federal Republic of Germany in terms of market and employment potential as well.

Expert technology forecast

– Ecology and environmental technology –

- *World-wide annual CO₂ emissions will be reduced by up to 20 percent of current value (2003 to 2020).*
- *A technology will be generally employed for practically all motor vehicle types which limits the concentration of nitrogen oxides in the exhaust gases to 0.1 to 0.2 grams per kilometre (2000 to 2007).*
- *A technology for product planning will be in general use in which products are simply collected and sorted as resources at the end of their service life (2001 to 2010).*
- *Information on the origin, pathways and end location of chemical substances difficult to degrade in the environment will be collected so that a method can be established for forecasting the end location of these substances even before the start of production (2003 to 2013).*

□ Raw materials and water resources

New technologies from the raw material and water sectors cover a broad spectrum: starting with the use of electro-photographic recording processes right through to wastewater clarification and mining robots. The areas of maintenance of water purity, wastewater treatment and water supply are of importance from the German point of view, since the water sector is considered to be an area of German research and development.

Expert technology forecast

– Raw materials and water resources –

- *Clarification technologies for the removal of many contaminants exceeding the normal pollution level will be generally employed in wastewater processing on a world scale (2005 to 2012).*
- *Practically applied clarification technologies for the rehabilitation of rivers and lakes lead to better use of water resources and thus protect the environment (2000 to 2005).*
- *Drinking water processing technology will make such progress through new materials and biotechnological processes that clean drinking water without an aftertaste can be produced (1999 to 2005).*
- *Progress in wastewater processing technology allows extensive circulatory management of processed water in small production plants (1997 to 2003).*

□ **Energy**

Because of the direct connection between climate change and fossil energy sources, long-term predictions assume that the significance of fossil energy sources will clearly diminish in future. In the long term, both the restructuring of energy sources (for example the use of regenerative energy sources) as well as energy saving (reduction of use, more rational use, increase of conversion efficiency) will play a role.

Scientists from the Öko-Institut in Freiburg anticipate that an innovative energy policy (such as the promotion of wind energy or photo-voltaics) could have a positive effect on the employment market. An additional 200,000 jobs could result by the year 2020. According to the Öko-Institut the beneficiaries of a sustainable energy economy would include regional craft businesses and the service sector in particular.

Expert technology forecast

– Energy –

- *Air-conditioning plant without CFCs will predominate (1996 to 2000).*
- *Combined gas and steam turbine power stations using gasified coal will find practical application (1997 to 2004).*
- *The principle of combined heat use, i.e. the efficient and completely loss-free use of energy forms will dominate (2005 to 2018).*
- *New types of passive solar housing which efficiently use renewable forms of energy will become common practice (1998 to 2004.)*

□ **Production**

An essential demand on the production logistics of the future is seen to be that, on the one hand, they will have to be extended as an important instrument for the success of an enterprise, and on the other hand, their integration in the remaining business functions will become ever more important. Although additive technologies have predominated in the shaping of environmental protection technology to date, in future, by means of increasingly production-integrated environmental protection, residual material flows will already have been reduced through better processing technology, and the remaining residual material will be able to be used as far as possible in the combined production processes.

Expert technology forecast

– Production –

- *Technical developments in areas such as the absorption of carbon dioxide, artificial photosynthesis, innocuous refuse removal and anti-desertification measures show progress in the light of which environmental protection measures become widely distributed throughout the entire world (2008 to 2019).*
- *Manufacturers are legally required to collect and remove superfluous production components, as a result of which a recycling system (planning, production, collection and recycling) is spread with the help of which nearly all these materials can be re-used (1998 to 2003).*
- *High-efficiency energy conversion plants will be developed in which the energy conversion mechanisms of living organisms are used (2008 to 2020).*
- *The biological generation of hydrogen, using solar energy and by means of intact organisms or partially biological systems is applied on an industrial scale (2009 to 2019).*

□ **Urban planning, architecture and the building and construction industry**

Great importance is attached to the areas of care of resources, energy saving and recycling as well as ecological construction. Further developments could emerge with respect to newly developed recycling technologies for municipal waste or in the wider distribution of energy self-sufficient residential buildings.

Expert technology forecast

– Urban planning, architecture and the building and construction industry –

- *A planning and production technology will be used with which towns can be developed and expanded in accord with nature and the environment (2001 to 2009).*
- *Municipal waste is reduced by half through newly developed recycling technologies (1996 to 2000).*
- *Energy self-sufficient buildings and residential buildings become wide-spread through progress in effective energy utilisation (such as long-lasting heat storage from natural sources of energy) (2003 to 2010).*
- *Both barely soluble materials and pollutants are eliminated in a very effective manner through the development of more compact wastewater processing systems on a biological basis (1997 to 2005).*

□ **Mobility and traffic**

In the opinion of German technology experts, the subjects of environmental protection and traffic guidance systems are highly important for the areas of mobility and road traffic in future. „Maintaining mobility and at the same time perceptibly reducing the undesirable consequences of traffic“ is the guiding principle for optimising German traffic at the Federal Ministry of Education, Science, Research and Technology. The Ministry programme promotes innovations in traffic in the priority areas of environmental compatibility, security and new forms of mobility with the aim of a lasting maintenance of mobility, shrinking the volume of traffic and reducing the undesirable consequences of traffic.

Expert technology forecast

– Mobility and traffic –

- Extremely economical motor vehicles with 30 percent lower fuel consumption at a comparable size are widely distributed (2000 to 2008).
- During rush-hour traffic a very rapid conveyance sequence of trains – every few minutes in large cities – is practised, with a monitoring system recording the distance between trains and relative speeds, and improved facilities for boarding and disembarking (1998 to 2004).
- Excessive commercial vehicle noise has been reduced so far by improved engines, transmissions, silencers and tyres that it corresponds to that of private cars (2000 to 2008).
- A technology which reduces the nitrogen oxide emission of goods vehicles down to the values of petrol-driven private cars (below 0.25 grams per kilometre) is applied in practice (2001 to 2005).

Structural and awareness changes

The improvement of technical efficiency and use of already existing savings potential in the utilisation of natural resources are important steps on the way to sustainable development. However, a technological „leap of efficiency“ and the targeted promotion of environmentally compatible new technologies alone will not, in all probability, be sufficient in important sectors to guarantee the transition to sustainability in industrialised countries. Chapter 4 of Agenda 21 on „Changing Consumption Patterns“, it says: „While consumption is excessive in certain parts of the

**Change in values:
a bridge to the future
of employment**

world, the basic needs of a large section of humanity are not satisfied.... All countries should therefore strive for a sustainable consumption pattern; the industrial countries should take the lead in this. A change in values is a necessary prerequisite for this“.

A policy of sustainability develops a pressure to conform which has to be influenced by changes in the legal, economic and social framework. In this regard, the so-called soft instruments such as environmental education, public information (for example on environmentally beneficial products or pioneer work in environmental protection), or the promotion of environmental ethics also acquire a relative importance which is not to be ignored.

A change in the economic framework is of particular importance in connection with the future of employment. For markets are somewhat 'blind' when it comes to ecology: whereas the supply of goods is matched to demand through the instrument of pricing, this is not the case with environmental assets, since these are usually common property and therefore can be used for free. Since there is no price indicating the scarcity of these assets to consumers, they tend to be used in a wasteful manner that surpasses sustainability limits. Government therefore has to ensure that environmental assets become more expensive so that prices comply more than hitherto with the ‚environmental truth‘. In this connection, reforming the public finance system plays a key role.

**Prices must tell the
„ecological truth“**

Environmental reform of public finance

The central objective of a green budget reform is to establish economic incentives in order to induce sustainable patterns of consumption and production. A distinction must be made here between the following strategic approaches:

- aligning subsidisation policies to the goal of sustainable development (abolishing subsidies that result in environmental degradation, refocusing and redesigning subsidies to comply with environmental requirements),
- basing charges and contributions on environmental factors,

- redesigning existing taxes and special levies, and
- increasing existing charges and introducing new charges on activities that damage the environment.

The latter two approaches have recently been the subject of intense and controversial debate over the issue of a green tax reform. Employment policy aspects also play an important role.

The following statements contain the basic philosophy of a green tax reform. Its essence consist in taxing the results of production activities – in other words the value added – less and instead using the consumption of natural resources to a greater degree as the basis of assessment. A greening of the tax system is connected with the expectation that natural resources will be used more sparingly because of their relatively higher price, in other words conserved, whereas higher net returns for the production factors employment and capital remain by given charges because of tax relief. This, in turn, should extend the scope of profitable investment opportunities and jobs.

„That we frequently continue to treat the production factor environment, which is becoming increasingly scarce, as a free asset, but at the same time enormously raise the cost and increase the difficulty of employing people desperately seeking work, through a variety of charges, seems to me difficult to understand.“

Federal President Roman Herzog in a lecture to the Umweltakademie of the German Federal Foundation for the Environment on 19 July 1995 in Berlin.

„Today, we have sub-optimally combined a development model of employment and nature, two of our main resources in the community. The model is characterised by insufficient use of working resources and an excessive use of natural resources, and leads to a worsening of the quality of life. The community must study the ways in which sustainable economic growth can be promoted which leads to increased labour intensity and at the same time contributes to lower consumption of energy and natural resources.“

From the white paper „Growth, Competitiveness, Employment. Challenge of the Present and Paths into the 21st Century“ of the Commission of the European Community.

In the past two decades, many countries have attempted to reduce environmental pollution and resource consumption through the introduction of environmental charges. In particular, it was possible to realise a series of environment-related charges in recent times with good success in the countries of northern Europe (Tab. 14). However, the fact that such individual national solutions do not accord easily with EU legislation sometimes stands in their way. In order to provide clarification in this regard, the European Commission published „Guidelines for the efficient use of environmental charges in the single market“ in January 1997.

The greening of the tax system at the same time offers the opportunity to satisfy the mounting need for reform in our tax and charges system. An increase in environmental charges, for example, can create the financial room to relieve the social security system from the financing of payments outside of insurance, thus sinking ancillary wage costs.

Within the framework of a business survey, the Institut für Mittelstandsforschung in Bonn noted that the main obstacles to new recruitment in German firms were ancillary wage costs and current dismissal protection regulations (see Appendix 17). If ancillary wage costs were lowered and dismissal protection eased, around 400,000 further jobs could be created, according to estimates.⁴³

**Revenue neutral
regrouping**

Table 14 Environment-related charges within the European Union as of March 1997																
	A	B	D	DK	E	F	FIN	GB	GR	I	IRL	L	NL	P	S	
Motor Fuels																
– Leaded/Unleaded (Differential)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
– Petrol (Quality differential)							•								•	
– Diesel (Quality differential)				•			•								•	
– Carbon/Energy taxation				•			•						•		•	
– Sulphur tax				•											•	
– Other excise taxes (other than VAT)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
Other Energy Products																
– Other excise taxes	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
– Carbon/Energy taxation	•	•		•			•						•		•	
– Sulphur tax		•		•			•								•	
– No _x charge						•									•	
Vehicle Related Taxation																
– Sales/Excise/Regist. tax diff. (cars)	•	•		•			•		•	•	•		•	•	•	
– Road/Registration tax diff. (cars)	•	•	•	•	•				•	•	•		•		•	
Agricultural Inputs																
– Fertilisers															•	
– Pesticides				•			•								•	
Other goods																
– Batteries		•		•										•	•	
– Plastic Carrier Bags				•												
– Paper Bags				•												
– Disposable containers		•		•		•								•		
– Tires				•		•										
– CFCs and/or halons				•												
– Disposable cameras		•														
– Lubricating Oil Charge				•		•										
– Oil Pollution Charge						•								•		
– Solvents				•												
– Disposable tableware				•												
Air Transport																
– Noise charges		•	•			•							•		•	
– Other taxes				•										•	•	
Water Charges and Taxes																
– Water charges		•	•	•		•	•	•					•	•		
– Sewage charges		•	•	•	•		•	•					•	•	•	
– Water effluent charges		•	•	•		•							•	•		
– Fertiliser pollution													•			
Waste treatment and disposal																
– Municipal waste			•	•	•	•	•						•	•	•	
– Waste disposal charge	•	•	•	•	•	•	•	•		•	•		•	•		
– Hazardous waste charge	•	•	•			•	•							•		
– Depositing in dumps						•		•					•	•		

Note: The form (for example assessment basis) and extent of environment-related charges differ from country to country.
Source: OECD 1997.

It would also be possible, however, to integrate the reforms imminent in the taxation of business enterprises or in the field of income tax in a greening of the tax system. Seen in this way, it could produce tax and finance policy dividends as well as ecological and employment dividends. Some Scandinavian countries such as Denmark, Norway and Sweden, and Great Britain and the Netherlands as well, have already taken steps in this direction.

Denmark

A central part of the Danish tax reform of 1993 consisted of a redistribution of the tax load from employment to resource consumption and activities which pollute the environment. The reforms served to reduce the borderline income tax rates by about eight to ten percent from 1994 to 1998, and to introduce additional environmental charges with a yield of twelve billion Danish crowns. An increase in petrol and energy taxes was responsible for the larger part of the increased tax revenues; around a third was from an increase in refuse charges and a new water charge. Denmark had already introduced a carbon dioxide tax in 1992, which was considerably increased in 1996. The returns from the increase in carbon dioxide tax flowed back into industry in the form of a lowering of employer contributions to social security, and in the form of assistance for energy saving measures. The Danish government has already signalled that it would like to investigate the possibilities of a further shifting of the tax load.

As regards the employment dividend of a greening of the tax system, it must be repeatedly emphasised that this is by no means automatic, but assumes a well thought-out shaping of the reform and a suitable response by those involved. Provided that the following preconditions are met, a greening of the tax system can indeed contribute to a strengthening of Germany as a location for business and industry and lead to more employment:

1 It is imperative, when basing fiscal revenue more on environmental protection, that the state does not emerge as the sole winner in the long run. On the contrary – if initiatives geared to sustainable development are to be given sufficient space to develop, total levies must be permanently reduced in the medium term. Here lies the core of social acceptability – together with continuing privatisation in competition, and deregulation – since in this way adaptability and readiness are promoted. Sustainable engagement in economic activity with additional ecologically-motivated measures requires general deregulation in other areas, in order not to tie down market potential.

A Solution is not in the hands of a „radical change“

Mid-term objective: levy relief

Calculability

2 The demand for constancy in economic policy is also valid for a green tax reform. The sought after changes in the taxation framework should be as transparent and predictable as possible so that enough time for adaptation with as little friction as possible remains. In concrete terms this means environmental taxes should be introduced in stages along predefined paths, and embedded in the clearest possible environmental policy objectives.

Economic compatibility

3 Fiscal charges which jeopardise the international competitiveness of German business must be avoided. This in no way, however, means freeing the business sector from environmental charges from the outset, especially since businesses will in fact be relieved by lower charges in other areas in the course of a greening of the tax system. The concern is rather with the search for the maximum limits for businesses most effected by environmental taxation, which will certainly involve controversial discussions, and the consequences to be drawn for the effective structuring of environmental taxes. A glance at other European countries such as Denmark, Sweden or the Netherlands shows that there exist a whole series of possibilities for structuring environmental taxation in a business-friendly manner.

Acceptance

4 If a green tax reform is to develop positive employment effects, then private households will have to recognise and accept the income losses forced on them by higher prices for environment and energy intensive goods. If price level increases are made the object of compensation demands in wage negotiations, then a rise in labour costs will be added to an environment and energy-related rise – with losses in monetary stability and ultimately in employment as well. On the other hand, if monetary policy does get embroiled in the mistake of reacting to charge-related price rises in environmental and energy-intensive goods with a restrictive monetary policy, then the scarcity of environmental goods will be expressed through higher prices, not a depreciation in the value of money.

In the past few years, the employment effects of a greening of the tax system has been analysed in numerous studies (see Appendix 18). Almost all results show the employment effects of a green tax reform to be positive

overall, or at least neutral, with most studies assuming that social security contributions and thus ancillary wage costs will be brought down with the revenue from environmental taxation.

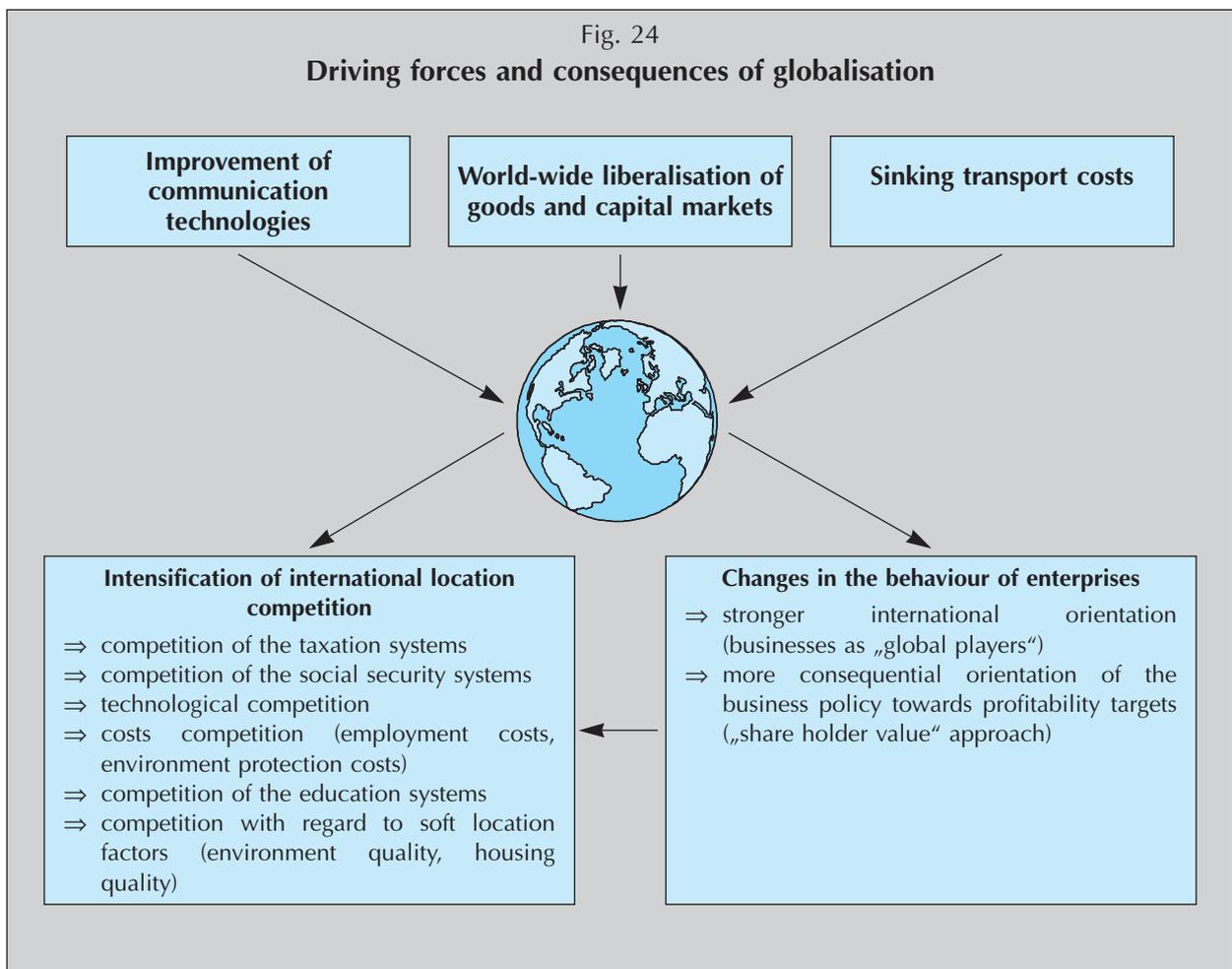
Globalisation: the future perspective

Growing international integration in the business sector is often termed globalisation. This is expressed above all in the following developments:

- a strong increase in international trade in goods and services,
- a rapid increase in foreign direct investment, and
- the increasing international integration of the financial markets.

The forces driving globalisation as well as the economic consequences are very complex. For example, both changes in policy framework and technological developments are among the forces driving globalisation (Fig. 24).

**Globalisation:
the new slogan**



A glance at the statistics shows, however, that the term globalisation is misleading in certain respects. Increasing economic integration is not spread relatively evenly around the globe (as the term suggests), but is taking place – at least so far – mainly between the industrial countries. It is most clearly marked within the so-called „Europe-United States-Japan“ triad. In addition, regional integration, i.e. the economic exchange between neighbouring countries, has grown considerably in the last few years, this process being strengthened by the conclusion of a large number of regional free trade agreements. A trend to regionalisation is embedded within the trend towards globalisation, as the structure of German investments abroad also shows (Fig. 25).



Environment effects of Globalisation

The change in perspective towards the global problems of the 21st century moves the question of the acceleration of environmental pollution and excessive demands on the natural basis of human life ever more into the foreground of discussion. The environmental effects associated with globalisation may not necessarily be negative, however, but rather ambivalent and only initially estimable at the moment (Tab. 15). A balancing up of positive and negative effects is, for this reason, neither possible nor useful at present.

Table 15 Arguments on the environmental effects of globalisation	
possible negative environment effects	possible positive environment effects
<ul style="list-style-type: none"> • lowering of social and environmental standards as an effect of growing competitive pressure • increasing relocation to countries with low environmental standards • strengthening of international economic growth • increase in international transport • accelerated development of previously sparsely settled regions 	<ul style="list-style-type: none"> • tendency to even out environmental standards • more effective use of resources • strengthening of product competitiveness • removal of environmentally harmful subsidies

Globalisation sceptics fear that governments will come round to lowering environmental standards as a result of the intensification of international locational competition, in order to reduce environmental protection costs and prevent businesses moving to countries with lower environmental standards. Such a race for lower environmental standards („race to the bottom“) is unlikely for a variety of reasons:

- The quality aspect of goods and services plays an exceptional role, particularly in the face of intensifying competition. Since the environmental importance of production processes and products in particular have been transformed internationally into an important quality feature (integrated environmental protection), an international alignment or even an increase in environmental standards is more to be reckoned with in view of growing product competition.
- An alignment of environmental law is gradually taking place within the European Union. This is a levelling factor which should not be disregarded, at least with regard to location competition within the European Union. Since no pronounced difference exists between the member states of the European Union and the other industrialised nations with regard to businesses' environmental protection costs, differences in these costs play no appreciable role in competition between the industrial nations. This aspect is of great significance, since the international investment and trade flows making up the core area of globalisation are still concentrated primarily in the so-called „Europe-United States-Japan“ triad.

Dropping of ecological standards ...

... or the tendency of environment standards to conform on high level?

Shifting location to countries with lower environment standards?

- The political and economic importance of Europe in the globalisation process must also be taken into account. The member states of the European Union have a real chance to help shape the process of international agreements against global environment destruction, and in this way to work towards high environmental standards.
- The argument that enterprises would change location if a considerable difference were to exist between environmental protection costs at home and abroad cannot be verified empirically (see Chapter 3). As far as this is concerned, lowering existing environmental standards would be the wrong way to pursue a policy of location retention.

Against this background, the core problem with regard to globalisation is rather that the necessary raising of environmental standards will not be carried out because governments fear a reduction in international competitiveness should they proceed on their own, as the discussions on the introduction of carbon dioxide/energy taxes have shown.

Environmentally destructive global economy growth ...

The argument that globalisation leads to an expansion of production and thus to a further increase in environmental pollution cannot be affirmed without restrictions. On the one hand, growth is often accompanied by the use of modern, less emission-intensive technologies. On the other hand, environmental awareness, as well as the ability to bear the cost of environmental protection, tends to increase with increasing incomes. In addition, globalisation favours the transfer of modern, more environmentally compatible technologies, particularly through improvements in communication technologies and the international liberalisation of markets. It is not possible to generally determine whether on balance additional growth from globalisation leads to more or less environmental pollution.

The example of Germany shows that growth and increasing environmental pollution do not have to go hand-in-hand. Although gross domestic product in Germany rose by 75 percent from 1970 to 1994 (at the 1991 prices), sulphur dioxide output was reduced at the same time by 76 percent (see Chapter 2). This development was above all credited to the expansion of waste gas desulphurisation in the power station sector, as well as the substitution of emission-intensive fuels. Although a de-coupling process in terms of the development of gross domestic product can also be seen with

carbon dioxide and nitrogen oxide emissions, pollutant emission in absolute units is only slightly reduced (Fig. 6), and a steady increase in sealed surfaces as a whole can even be seen in land use.

Based on the previous behaviour patterns of growth processes as well as scientific forecasts on the development of environmental pollution, a considerable international increase in environmental pollution is very probably to be reckoned with in some sectors as a result of forcing the growth process, unless drastic changes in the political and economic framework take place. The increase in global temperatures from carbon dioxide emissions, traffic-related environmental pollution, land use and the loss of biodiversity could be mentioned in this connection.

In some respects, globalisation may lead directly to growing environmental pollution. This is true above all for the traffic sector, since the intensification of the international exchange of goods is inevitably associated with an increase in traffic flows. According to the OECD, international freight transport will increase by 71 percent from 1992 to 2004 (this corresponds to 20 trillion kilometres/tonne). Approximately 4.5 percent of this is due to the liberalisation of world trade agreed upon in 1994 in the framework of the so-called Uruguay round, the rest to global economic growth. Moreover, it is to be feared that the new locations developed in the wake of globalisation, and above all the construction and development of transport infrastructure associated with this development, could contribute to an aggravation of the carbon dioxide and nitrogen oxide problems.

It is therefore important to obviate the negative consequences of globalisation by setting up an environmental framework – above all internationally. This means strengthening international co-operation in the area of environmental protection and the integration of environmental protection in activities aimed at the liberalisation of international economic relations (for example, OECD multilateral investment agreement).

It is, however, also to be expected that the driving forces of the market alone will make a positive contribution to environmental protection. After all, international competition creates powerful incentives for reducing costs in order to survive on the world market. In this connection, the increased

**... or more effective
utilisation of resources?**

Cutting back environmentally harmful subsidies

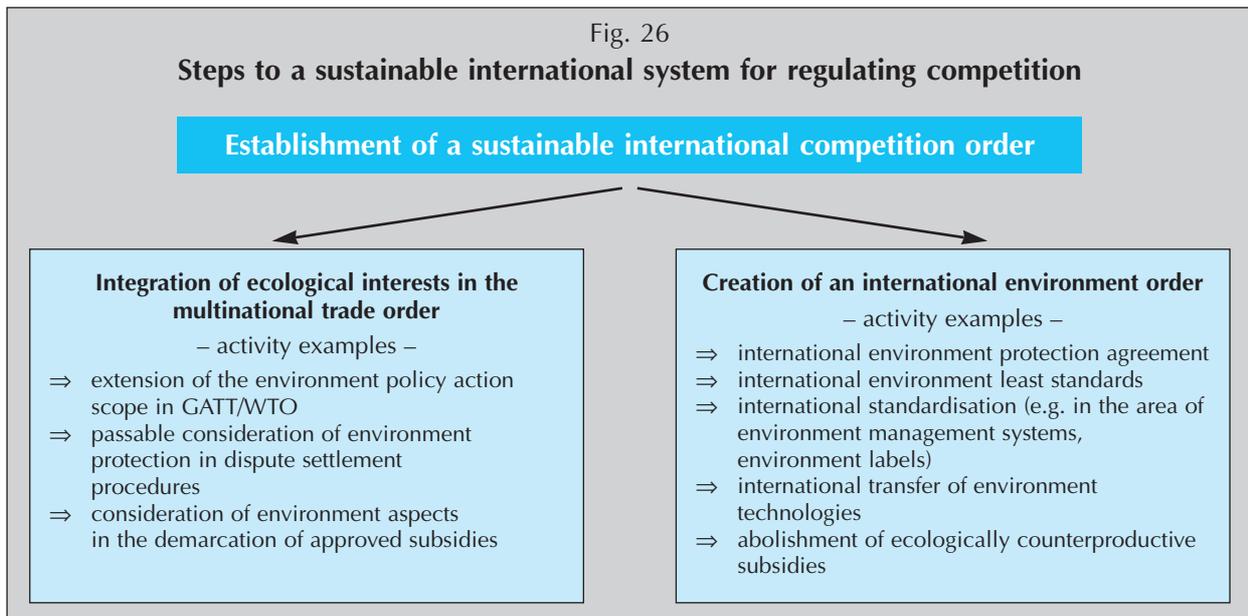
use of integrated environmental protection technologies directly suggests itself. Integrated environmental protection in fact offers the opportunity of avoiding additional costs in production and products, and of contributing to the lowering of costs, particularly since integrated environmental protection technologies are commonly associated with reductions in energy, water or material consumption (see Chapter 2).

An essential driving force in globalisation is the liberalisation of world markets. With the opening up of national markets and their integration in the international market, pressure is growing for the abolition of subsidies. Since a large number of subsidies, particularly in the energy, transport and agricultural sectors, promote environmentally harmful activities, an indirect contribution can be made in this way towards relieving the environment. Many central and eastern European countries have, for example, already cut back their energy subsidies, since these promoted a wasteful approach to energy.

Market globalisation – globalisation of environmental and employment policy strategies

Both environmental and employment effects are associated with increasing market globalisation. In the worst case, both environmental and employment objectives can be circumvented, if for example more environmentally-compatible production processes at home are counteracted by switching to foreign products or relocating production facilities abroad. For this reason, the negative consequences of globalisation for environmental protection and employment must be met with more vigorous globalisation of environmental and employment policy strategies.

This means that the new dimensioning of the globalisation of the world economy has to be countered with a new dimension of international co-operation. For this, international agreements will be needed to lay the foundations for a sustainable international system for regulating competition (Fig. 26).



Important in this regard:



The increased globalisation of sociopolitical strategies does not mean a standstill for national policy. Now as before, national problems must be overcome first. Modernisation of the economy, the state and society is the decisive step. In the course of changes in awareness and structure, the creation of secure new jobs must receive priority.

Consistent environmental protection is a key instrument for this.



Appendix

- **Tables and figures**
- **Cross references**

Tables and figures

Appendix 1 Issues of Agenda 21

I. Social and economic dimensions

- International co-operation to accelerate sustainable development in developing countries and related domestic policies
- Combating poverty
- Changing consumption patterns
- Demographic dynamics and sustainability
- Protecting and promoting human health
- Promoting sustainable human settlement development
- Integrating environment and development in decision making

II. Conservation and management of resources for development

- Protection of the atmosphere
- Integrated approach to the planning and management of land resources
- Combating deforestation
- Managing fragile ecosystems: Combating desertification and drought
- Managing fragile ecosystems: Sustainable mountain development
- Promoting sustainable agriculture and rural development
- Conservation of biological diversity
- Environmentally sound management of biotechnology
- Protection of the oceans, seas and coastal areas and their habitat resources
- Protection of fresh water resources
- Environmentally sound management of toxic chemicals
- Environmentally sound management of hazardous wastes
- Environmentally sound management of solid wastes
- Safe and environmentally sound management of radioactive wastes

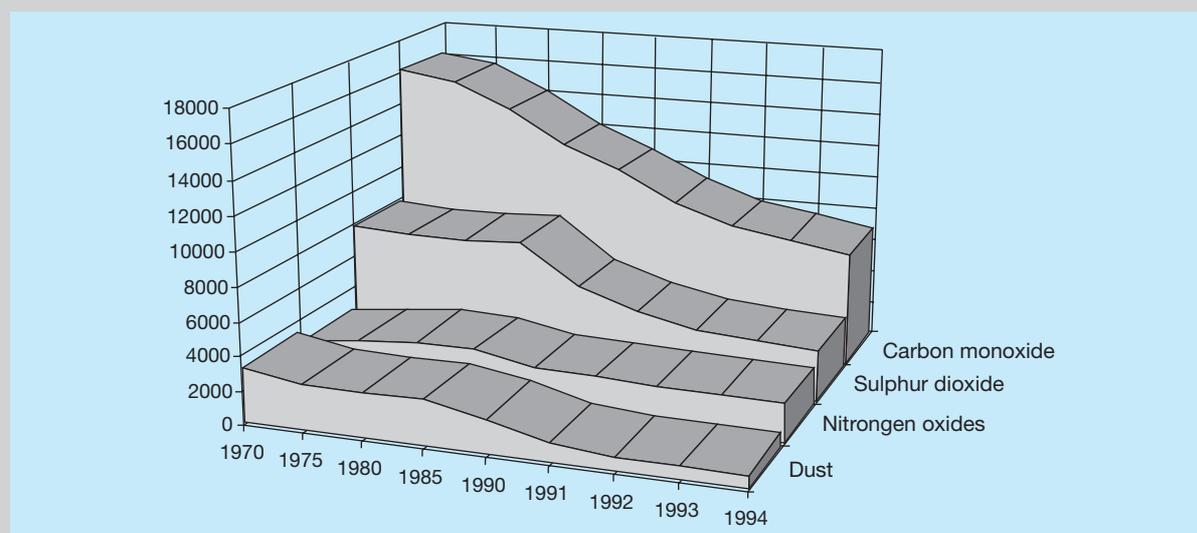
III. Strengthening the role of major groups

- Global action for women towards sustainable and equitable development
- Children and youth in sustainable development
- Recognizing and strengthening the role of indigenous people and their communities
- Strengthening the role of non-governmental organisations
- Local authorities' initiatives in support of Agenda 21
- Strengthening the role of workers and their trades unions
- Strengthening the role of business and industry
- Scientific and technological community
- Strengthening the role of farmers

IV. Means of implementation

- Financial resources and mechanisms
- Transfer of environmentally sound technology, cooperation and capacity building
- Science for sustainable development
- Promoting education, public awareness and training
- National mechanisms and international co-operation for capacity building in developing countries
- International institutional arrangements
- International legal instruments and mechanisms
- Information for decision making

Appendix 2
Trends in air pollution in Germany
 – in 1000 metric tons from 1970 to 1994 –



Source: Federal Environmental Agency 1997.

Appendix 3
Contaminated sites in Germany

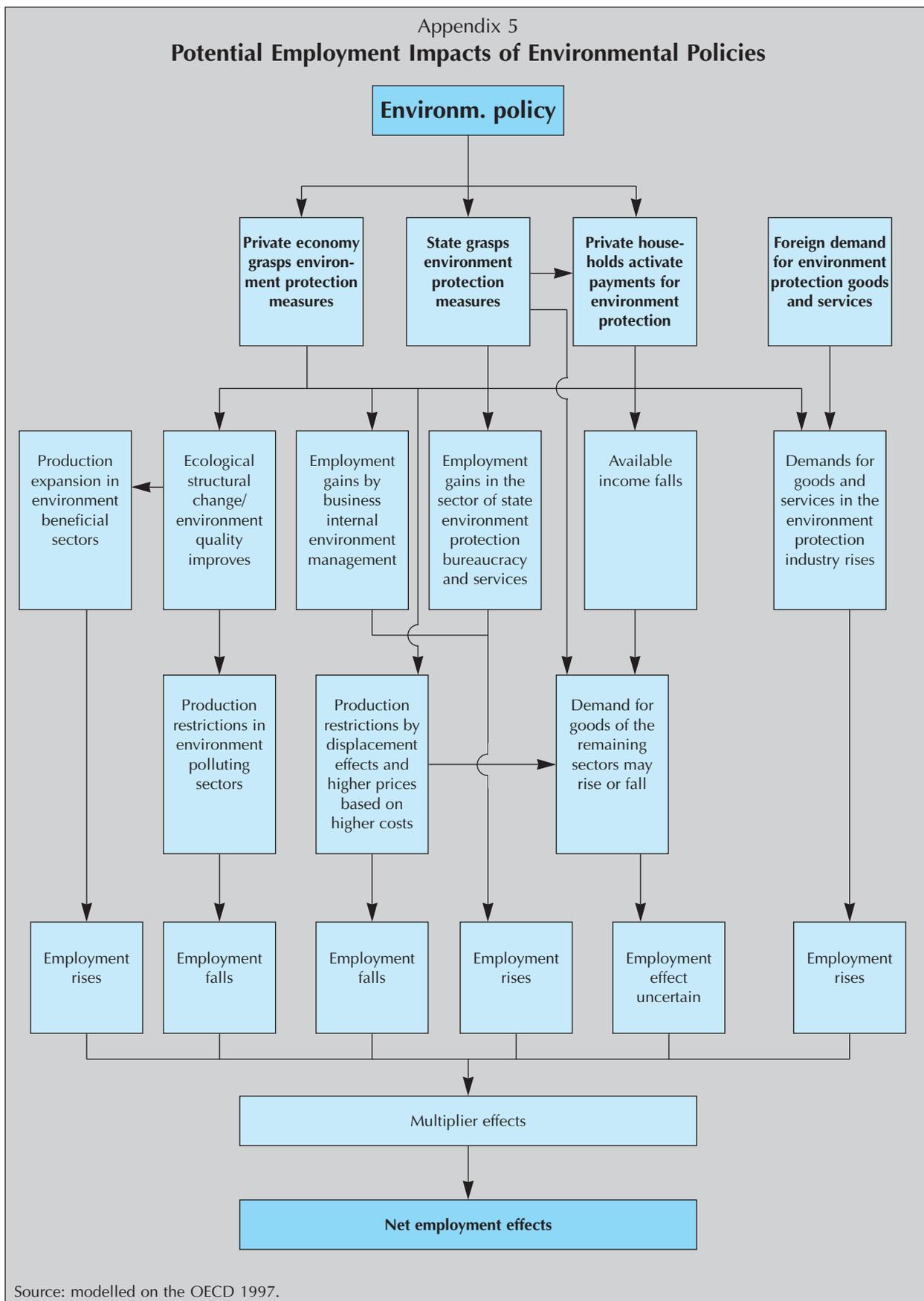
– number of recorded and estimated possible contaminated sites (as of December 1994 to December 1995) –

Land	Number of recorded sites	Number of estimated sites
Baden-Württemberg	5,002	31,000
Bavaria	11,478	no data
Berlin	5,490	6,000
Brandenburg	14,196	18,500
Bremen	3,100	no data
Hamburg	760	2,500
Hesse	2,711	13,400
Mecklenburg-West Pomerania	10,422	14,000
Lower Saxony	8,160	no data
North-Rhine Westphalia	21,292	no data
Rhine Palatinate	10,578	no data
Saarland	4,233	4,800
Saxony	27,180	no data
Saxony-Anhalt	17,339	21,000
Schleswig-Holstein	9,169	no data
Thuringia	18,867	25,000
Germany as a whole	169,977	over 240,000

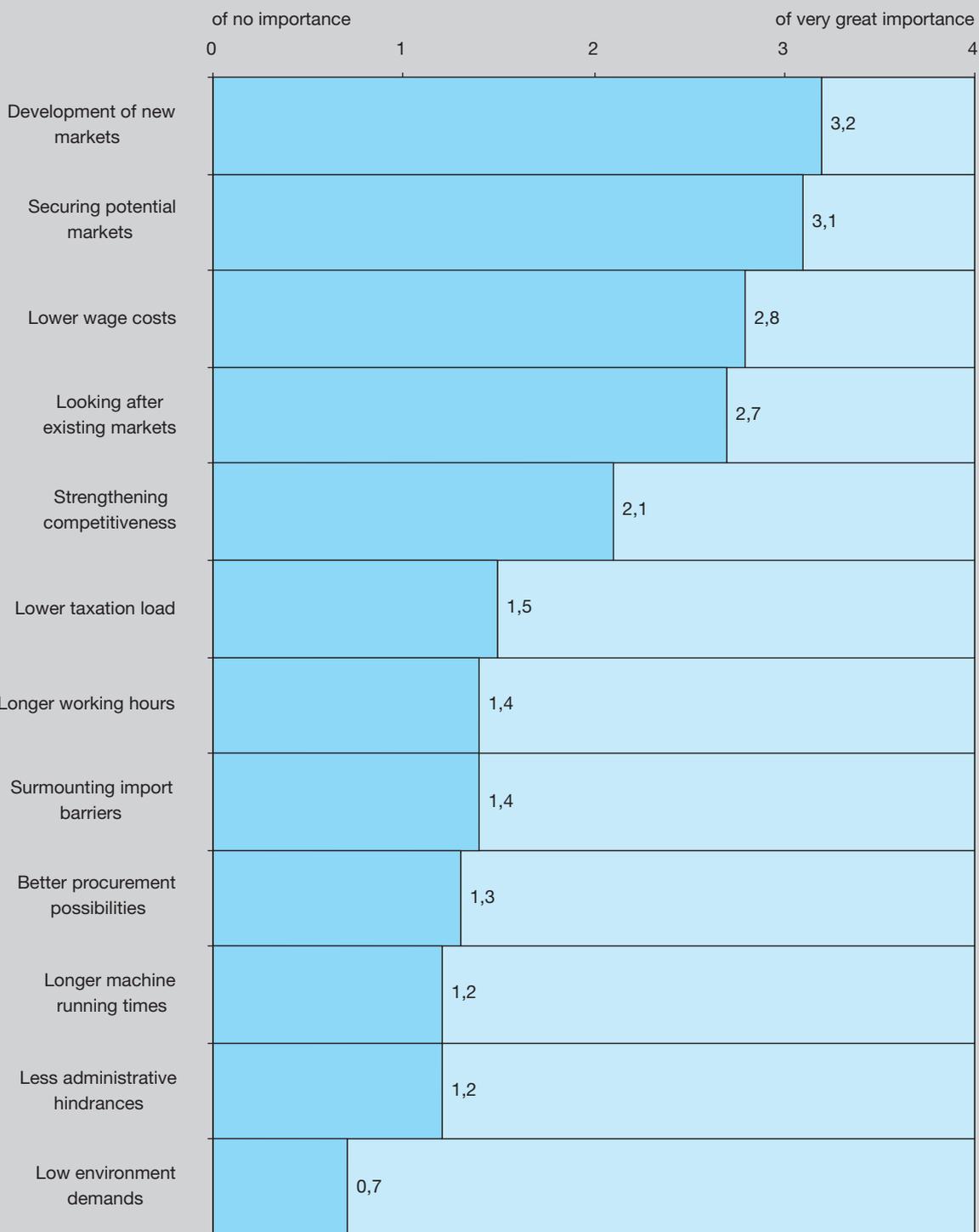
Source: Federal Environmental Agency 1997.

Appendix 4					
Passenger and freight transport					
	1991	1992	1993	1994	1995
Passenger transport in billion passenger kilometres (pkm)	911.3	930.2	940.3	924.9	939.3
• individual motor car traffic	753.7	772.3	780.1	761.8	773.8
• public road transport	82.6	80.4	79.6	78.3	76.9
• rail	57.0	57.2	58.7	61.2	63.2
• air traffic	18.0	20.3	21.9	23.6	25.4
Freight transport in billion tonnes kilometres (tkm)	355.1	359.3	350.9	369.6	378.8
• road	202.7	219.0	211.6	219.5	229.1
• rail	80.7	67.3	65.2	71.0	69.1
• inland shipping	56.0	57.2	57.6	61.8	64.0
• pipelines	15.3	15.4	16.0	16.8	16.1
Amount of cars (in millions)	36.7	37.9	38.9	39.8	40.4
• low-emission cars (in millions)	..	17.8	25.3	28.0	30.5
Amount of heavy goods vehicles (in millions)	1.76	1.96	2.14	2.23	2.25
Car traffic (in billion kilometres)	496.4	510.0	517.8	505.7	514.4
Heavy goods vehicle traffic (in billion kilometres)	51.7	55.1	56.0	60.4	62.9
Fuel consumption (in billion litres)	62.9	64.6	65.3	64.9	66.2
• passenger traffic	47.5	48.2	48.7	47.0	47.5
• goods traffic	15.5	16.3	16.6	17.9	18.7
Average fuel consumption of cars (litres/100 km)	9.2	9.1	9.1	9.0	8.9

Source: Federal Ministry of Transport 1996.



Appendix 6
Central and Eastern European locations: German business investment motives
 – Survey of 470 German businesses in spring 1996 –



Source: Institut der Deutschen Wirtschaft 1996.

Appendix 7

International Transfer Centre for Environmental Technology (ITUT)

The **International Transfer Centre for Environmental Technology** in Leipzig is intended to strengthen technological, scientific and political co-operation in environmental protection between Germany and its partners. For this purpose, two complementary institutions exist under the coverage of ITUT. **ITUT-GmbH** makes the connection between the supply and the demand sources and tenders the accomplishments of the German environmental protection enterprises on international markets. **ITUT-Verein** functions as an information and communications centre for environmental protection know-how. In addition, ITUT supports the environment area managers appointed by the foreign chambers of commerce in nine regions of the world.

ITUT-Verein

- Information on partner countries: analysis and assessment of the environmental policy framework and problem situations as well as environmental technology needs in the partner countries;
- Information service on environmental law and enforcement in Germany and the European Union;
- Provision of research contacts for the development of solutions adapted to specific problems in the partner countries;
- Transfer of knowledge, preparation of scientific and technological co-operation;
- Conferences: organisation of conferences and meetings in Germany and the partner countries;
- Advanced training in German businesses and institutions for interested parties from the partner countries.

ITUT-GmbH

- Provision of business contacts: provision of government contacts, provision of co-operation partners on location, organisation of bid presentations, participation at national and international trade fairs, organisation of visits by German and foreign business representatives;
- Information: information hotline on specific market opportunities and invitations to tender, exhibition and trade fair exchange, information on the needs for adapted technology, information on promotion programmes and funding instruments;
- Organisation of project alliances, provision of partners for project alliances;
- Supplier catalogues with the corresponding services and products for the information of potential foreign customers;
- Network to chambers of commerce abroad, to the environment area managers, embassies and development co-operation institutions in the partner countries.

For ITUT address see Appendix 10.

Appendix 8

Environmental Biotechnology Network
Biological methods and procedures in environmental technology

The objective of the „Environmental Biotechnology Network“ is to widen the spectrum of application of biological methods and operations in environmental technology. This is guaranteed by, among other things, independent user consultation, as well as the initiation and support of development projects. The Federal Ministry of Education, Science, Research and Technology is promoting the development of this network.

Working priorities of the network are the following environmentally-related areas:

- soil and groundwater rehabilitation
- wastewater treatment
- exhaust air scrubbing
- waste and residue treatment
- production integrated environmental protection

Services available from the „Environmental Biotechnology Network“ include:

- provision of information
- organisation and conducting of specialised seminars
- consultation on the application possibilities of biological methods and processes
- scientific, personnel and technological support (pilot plant) particularly of small and medium-sized enterprises in the implementation of R+D projects
- support in patenting and marketing innovative methods and processes
- consultation for business start-ups

Contacts for interested parties from research, industry and public authorities are currently available in Bochum (Ruhr-Universität), Frankfurt (Dechema e.V.), Hamburg (TU-Hamburg-Harburg) und Leipzig (UFZ Leipzig-Halle GmbH).

Appendix 9

Important Federal environmental protection promotion programmes at a glance

- **Investment programme for the reduction of environmental pollution:** Since 1979, the Federal Environmental Agency has been promoting model programmes for the reduction of environmental pollution which demonstrate how advanced processes can be used on an industrial scale. Originally conceived purely as a programme for the rehabilitation of contaminated sites and air quality control, it has been successively extended to other environmental areas since 1994. The aid is granted either as an interest subsidy or as an investment subsidy. Preference is given to projects from small and medium-sized businesses. A total of 540 projects with grant aid of 1.62 billion DM were approved by the end of 1995. For 1996, a total of 56.6 million DM was made available. The share of integrated technology had risen to around half of all grant-aided projects by 1993.
- **Environmental programme of the Deutsche Bundesstiftung Umwelt (DBU):** At present, projects are promoted within the framework of nine sectors in the areas of environmental technology, environmental research/environmental provision and environmental education. Only non-repayable grants earmarked for a specific purpose are awarded. Between 1991 and 1996, around 2000 innovative environmental protection projects were grant-aided with a total volume of more than one thousand million DM. The DBU awards the most highly endowed environmental prize in Europe, worth one million DM.
- **ERP Environment and Energy Conservation Programme:** Loans can be granted from ERP (European Recovery Programme) special funds, in the areas of water treatment, waste management, air quality control (including measures for the reduction of excessive noise, odour or vibration) as well as energy conservation, efficient use of energy and the use of renewable forms of energy. Aid is in the form of loans with favourable interest rates. The loan terms for the new Länder are somewhat more favourable than those for the old Länder. Small and medium-sized businesses are given preference. Environmentally-related investments made on the basis of an environmental audit can receive priority funding from the ERP Environment and Energy Conservation Programme. The credit volume for ERP environment promotion has been clearly increased every year since 1991. In 1995 it amounted to 4.5 billion DM. In 1996 credit commitments were reduced to 3.4 billion DM, however. In the meantime about 40 percent of ERP funding flows into integrated environmental protection.
- **Environmental programme of the Deutsche Ausgleichsbank (DtA):** Investments in accordance with the objectives of the ERP Environment and Energy Conservation Programme, or which are recognised as model projects worthy of promotion by the Federal Environment Ministry, are funded. Projects for the implementation of integrated environmental protection receive priority funding. The loan as a rule amounts to a maximum of 75 percent of the investment total. Small and

medium-sized businesses and self-employed individuals with a (consolidated) annual turnover of up to 500 million DM are entitled to apply. Private households are entitled to apply within the framework of the 50,000- solar-roof initiative. In 1996, loans amounting to 1.4 billion DM were granted. For the 50,000 roof solar initiative the credit commitments amounted to 22 million DM.

- **Environmental surety programme:** The Federal Environment Ministry and the Deutsche Ausgleichsbank (DtA) promote investments by small and medium-sized businesses for the manufacture of environmentally-beneficial products and production plant by assuming liability for reduced interest rate loans from the DtA environmental programme. Indemnity is 80 percent of the loan amount. The loan can be for up to 100 percent of fundable costs, maximum one million DM. In future, a surety fund of 100 million DM for a total credit volume of 125 million DM – eight times the funding so far – will be available for innovations in environmental protection.
- **Environmental programme of the Kreditanstalt für Wiederaufbau:** Investments by businesses and self-employed individuals for the elimination or avoidance of air pollution, odour emission, excess noise and vibration, as well as improvement of wastewater clarification, waste disposal and waste treatment are supported. Loans with favourable interest rates are granted, as a rule up to ten million DM. Up to two thirds of the investment can be funded, up to three quarters for applicants with less than 100 million DM annual turnover. The loans granted amounted to 0.7 billion DM in 1995.

Appendix 10

Institutions offering help for international business transactions in the environmental technology sector

- **The International Transfer Centre for Environmental Technology (ITUT)** in Leipzig

Contact: ITUT Verein zur Förderung des internationalen Transfers von Umweltschutztechnologie e.V. or ITUT Internationales Transferzentrum für Umwelttechnik GmbH.

The address of both institutions is: Businesspark Leipzig, Maximilianallee 4, D-04129 Leipzig, Germany.

- The German **Chambers of Foreign Trade** of the German Association of Chambers of Commerce see themselves as instruments of German foreign trade promotion in the sense of economic self-administration. Chambers of Commerce exist today in over 70 countries with which Germany maintains trade relations. In a series of countries, in which, for a variety of reasons, the founding of a Chamber of Commerce is not possible or not yet possible, a „German Trade and Industry Delegate Office“ or a „German Trade and Industry Representative Agency“ are to be found. The Chambers of Commerce are busy in ten fields of activity (among others, providing of business contacts and business information, organising of events, congresses and symposia).

A detailed description of the activities as well as a complete list of the addresses of all Chambers of Foreign Trade is to be found on the Internet: <http://www.ihk.de:80/ahk/ahkhome.htm>

Contact: either through the Chambers of Foreign Trade themselves or the foreign trade department of the local domestic Chamber of Commerce.

- **IHK Gesellschaft zur Förderung der Außenwirtschaft und der Unternehmensführung mbH** with registered offices in Bonn and Berlin organises co-operation between export-oriented enterprises and the so-called **Chamber of Commerce business pools** with their specific regional orientation. A Chamber of Commerce business pool is established by several companies with a common interest preparing to enter the target market via a common foreign office. Looking after matters on location is an experienced and knowledgeable market specialist, supported by the Chambers of Commerce Abroad and German trade and industry delegates. Competition between pool members is excluded through suitable choice. The business pools are thus not specifically oriented towards the environmental protection technology sector, but offer general assistance on specific foreign markets. Chamber of Commerce business pools exist at the moment for Ukraine, the Moscow region/Russia, Israel, Shanghai/China, Malaysia, the Philippines, Japan (especially for environmental protection and geo-technology) and São Paulo/Brazil. In preparation are business pools for the United States, South Africa, Vietnam and Minsk/Belorus. In addition, special environmentally-oriented pools working together with the environment area managers are in the planning phase. Beyond this, Chamber of Commerce business pools exist at the moment in 13 further locations. These are looked after by the local Chambers of Commerce: along with the business pools, the IHK-Gesellschaft zur Förderung der Außenwirtschaft und der Unternehmensführung mbH organises entrepreneur, business contacts and co-operation projects (such as joint trade fair participation) in many countries.

Contact: IHK-Gesellschaft zur Förderung der Außenwirtschaft und der Unternehmensführung mbH, Adenauerallee 148, D-53113 Bonn, Germany. Tel.: +49(0)228-104-263, Fax: +49(0)228-104-238 or (for the Moscow, Ukraine, Minsk business pools): IHK-Gesellschaft zur Förderung der Außenwirtschaft und der Unternehmensführung mbH, Schönholzer Straße 10-11, D-13187 Berlin, Germany. Tel.: +49(0)30-48806-451, Fax: +49(0)30-48806-333.

- The **environment area managers** are a joint project of the ITUT and the IHK-Gesellschaft zur Förderung der Außenwirtschaft und der Unternehmensführung mbH (funded by the Federal Ministry of the Economy). They offer special advice and support at ten German Chamber of Foreign Trade locations for enterprises exporting or willing to export in the environmental protection sector. Their services extend from consultation on specific requirements to successful project preparation, demand and market analysis of the respective target regions, the provision of possible German or foreign partner businesses, and information on and the cultivation of contacts with decision makers in the envisaged market, through to the organisation of on-going exchanges of experience and information. Environment area managers have offices so far in Kuala-Lumpur, Bangkok, Warsaw, Prague, Budapest, Shanghai, Bombay, Jakarta, São Paulo and Mexico City, and are to be reached there through the respective German Chambers of Foreign Trade.

Contact: through ITUT or IHK Gesellschaft zur Förderung der Außenwirtschaft und der Unternehmensführung mbH, Schedestraße 11, D-53113 Bonn, Germany. Tel.: +49(0)228-104-260/261, Fax: +49(0)228-104-264, email: umeister@bonn.diht.ihk.de or erunkel@bonn.diht.ihk.de.

- The **German Foreign Trade Information Office (bfai)** in Cologne

Contact: Bundesstelle für Außenhandelsinformation, Postfach 100 522, D-50445 Köln, Germany. Tel.: +49(0)221-2057-0, Fax: +49(0)221-2057-212, on the Internet: <http://www.bfai.com/> or: Bundesstelle für Außenhandelsinformation, Außenstelle Berlin, Postfach 650 268, D-13302 Berlin, Germany.

Note:

In the summer of 1997 the Federal Environment Ministry and the Federal Environmental Agency began a project which included the compilation of a „**Guide to grant-aid in environmental protection technology**“. It is hoped that the guide will appear at the end of 1998.

Contact: Umweltbundesamt, FG I 3.2, Postfach 33 00 22, D-14191 Berlin, Germany Fax: +49(0)30-8903-2285.

Appendix 11

Western Europe: the environmental protection market

– forecasts/trends/expectations –

- Various expectations exist in regard to the extent of annual growth of the environmental protection market up to the year 2000: the average is around 5.5 percent, with a range between 3.8 percent (OECD) and 11.6 percent (Environmental Technologies Development Corp.).
- A range of between 29 percent (International Transfer Centre for Environmental Technology 1996) and 32 percent (Helmut Kaiser Unternehmensberatung 1996) has been indicated for the Western European share of the world environmental protection market. It is generally assumed that the Western European environmental protection market will remain stable over the next few years.
- Relatively large growth opportunities are expected in the wastewater technology segment. Frost & Sullivan anticipate an annual growth of 5.7 percent. Good chances are chiefly seen for physicochemical water-treatment plant and sewage sludge treatment systems. Additional demand impulses are expected on the basis of the implementation of the EU guideline on the treatment of municipal wastewater, and the proposal for a guideline on water quality for swimming.
- The market for refuse incineration plant is also seen as a dynamic international segment. Helmut Kaiser Unternehmensberatung forecasts an overall demand in the year 2000 of 2.6 billion DM for Western Europe, 3.2 billion DM in 2005 and 3.6 billion in 2010, compared to 2.3 billion in 1995. This corresponds to an average annual growth rate of 2.9 percent from 1995 to 2000, of 4.1 percent from 2000 to 2005, and of 2.5 percent from 2005 to 2010. According to this forecast, Western Europe will remain the largest single market in the foreseeable future, although growth rates will be at the lower end of the scale internationally. The main reason for this is that a pronounced drop in the volume of waste is to be expected starting in the year 2000 in Western Europe as a whole and even earlier in some individual countries.
- In Western Europe, an interesting market in technologies for the use of renewable forms of energy exists primarily in plant for wind energy utilisation, smaller hydroelectric plant and, to a lesser extent, for large-scale hydroelectric plant (Büro für Technologiefolgenabschätzung beim Deutschen Bundestag 1996).

Further assistance

- The „Umweltreport“ series from the German Foreign Trade Information Office offers a review of the status and tendencies of environmental policy in a number of European countries.

- German Water e.V. promotes the use of German environmental technology in the water management sector internationally. The association was founded in 1995 and consists of water and wastewater technology enterprises, engineering firms, water federations, academic institutes, building firms and banks. The focus of their activity is informational and communicative, in order to make the acquisition of international water management projects possible for its members through access to political decision makers. The association also sees itself as a framework within which members can and should form consortia for the implementation of concrete projects.

Contact: German Water e.V., c/o Gesellschaft für Wirtschaftsförderung NRW mbH, Postfach 20 03 09, D-40101 Düsseldorf, Germany. Tel.: +49(0)211-130 00 48, Fax: +49(0)211-130 00 82.

Appendix 12

United States, Canada, Mexico: the environmental protection market

– forecasts/trends/expectations –

- Varying forecasts exist for the annual growth rate of the environmental protection market in the United States, with an average of about 5 percent. More cautiously, the OECD predicts only 3.8 percent per year.
- The OECD anticipates that the share of the United States/Canada region in the world environmental protection market will remain largely constant at around 40 percent over the next few years.
- In the market for waste incineration plant, Helmut Kaiser Unternehmensberatung assumes the following values: 1995 around 0.8 billion DM, 2000 around 1.0 billion DM, 2005 around 1.1 billion DM and 2010 around 1.2 billion DM. This corresponds to average annual growth rates of 2.8 percent, 3.1 percent and 2.3 percent for the three five-year periods. In line with the forecasts, this region will remain behind the international trend, as indeed will Western Europe. The reason for this is mainly that the tendency to return to dumping instead of the thermal utilisation of waste is again on the increase in the United States, because resistance in the population towards the building of new waste incineration facilities is very great and the availability of landfill sites in the United States presents no serious problems.
- An interesting market for technologies utilising renewable energies exists in North America, chiefly for plant for the use of solar and wind energy, geothermal energy, and smaller hydroelectric plants, as well as facilities for obtaining energy from „modern biomass“, and also, to a lesser extent, for large industrial-scale hydroelectric power stations (Büro für Technologiefolgenabschätzung beim Deutschen Bundestag 1996).

Appendix 13

**Central and eastern Europe (including Russia):
the environmental protection market**

– forecasts/trends/expectations –

- ECOTEC Research and Consulting Ltd. assumes an annual growth of around 7.5 percent by the year 2000 for development of the overall market for environmental protection goods in Eastern Europe.
- The OECD expects the share of the environmental protection market will have found its level at three to four percent in 2010.
- Helmut Kaiser Unternehmensberatung concedes a higher relative importance to this sub-market: growth from 1995 to 2000 from 34 billion DM to 47 billion DM is forecast in the demand for environmental protection goods (including construction work). This corresponds to an annual growth of 6.7 percent (international market share around five percent).
- Among all the regional markets for waste incineration plant, the central and eastern European region should develop the greatest dynamics in the medium term: for the period between 2005 and 2010 a growth in demand of around 80 percent is expected. However, the high problem concentration and the low starting point (in 1995 only about half a billion DM was realised) must also be taken into account, so that in spite of brisk growth, market volumes in absolute terms should still be below those of western Europe and Asia (except Japan) in 2010. For the year 2000, a demand for waste incineration plant of around 0.7 billion DM is forecast, increasing to 1.2 billion DM in 2005 and to around 2.1 billion DM in 2010.

Further assistance

- The Transferzentrum für angepaßte Technologien GmbH, TAT, (Transfer Centre for Adapted Technologies, TAT) offers support for small and medium-sized businesses in developing the environmental markets in central and eastern Europe, and regularly organises workshops („Environmental Markets“).

*Contact: TAT Transferzentrum für angepaßte Technologien GmbH, Hovesaatstraße 6, D-48432 Rheine, Germany. Tel: +49(0)5971-990-0, Fax: +49(0)5971-990-150,
in Internet: <http://members.aol.com/tatgermany>*

- An extensive summary of information on Internet sources on economic development in the states of central and eastern Europe is provided by the Deutsches Institut für Wirtschaftsforschung (Berlin) at:

<http://www.diw-berlin.de/Koop/deutsch/transec.htm>.

Appendix 14

Asia: the environmental market

– forecasts/trends/expectations –

- Expectations on the future development of the environmental protection market also vary for Asia (not including Japan). Average annual growth rates of around 10 percent have been forecast in several studies. The OECD is also more cautious here, assuming an annual growth of five to seven percent.
- According to an estimate by Helmut Kaiser Unternehmensberatung the total expenditure for environmental protection goods in Asia (not including Japan) will rise from 36 billion DM to 56 billion DM between 1995 and 2000 (this is equivalent to an annual growth of 9.2 percent), and in addition, in Japan alone, from 100 billion DM to 132 billion DM.
- The Japanese share of the world environmental protection market was around four percent in 1992 according to OECD data. For the year 2010 around 14 percent is expected.
- In the wastewater/sludge market segment Frost and Sullivan reckon with an annual growth rate of around eleven percent in south-east Asia by 2005.
- The forecast demand for waste incineration plant shows high growth rates. Here, particularly for the countries of east and south-east Asia (not including Japan) growth rates of around 50 percent are given for the three five-year periods between 1995 and 2010. In absolute terms, Helmut Kaiser Unternehmensberatung expects turnover of around 1.5 billion DM annually in the year 2000 on this sub-market, around 2.2 billion DM in 2005 and around 3.6 billion DM in 2010, compared to around 1.0 billion DM in 1995. The figures are lower for Japan. With an initial turnover of 561 million DM in 1995, a market volume of 683 million DM is expected for the year 2000, 830 million DM for 2005, and 1060 million DM for 2010.
- Around 70 percent of the total Asian gross national product is produced in Japan. Good prospects for the future exist in the environmental protection sector since pressure for action is increasing and the Japanese government has explicitly recommended co-operation with foreign enterprises supplying high performance environmental protection technology. According to official data, based on a broad definition of the environmental protection market, the overall volume of the Japanese environmental protection market amounted to around 244 billion DM in 1994. Forecasts predict around 372 billion DM for the year 2000, and around 560 billion DM for 2010 (German Chamber of Commerce Japan, 1994). A large part of the market falls to the waste disposal and recycling sectors: in 1994, around 71 percent of total demand was allocated to this sub-market, for the year 2000 69 percent is expected, and in 2010 65 percent is still expected. Here, an important growth impulse should arise from the tightening of limits for dioxin emissions from waste incineration plants. In 1997 the recommended maximum permissible value of 0.5 nanograms per cubic metre is to be made law. In addition, a programme for the „transformation of Japan into a recycling society“ has been in force since 1996.
- A market for technologies utilising renewable forms of energy exists in Asia, chiefly for solar energy facilities and industrial-scale hydroelectric power stations. Clear demand impulses for geothermal plant, technologies for the utilisation of modern biomass and marine energy production are

expected, especially in the China/Pacific region, and to a lesser extent for wind energy installations as well (Büro für Technologiefolgenabschätzung beim Deutschen Bundestag 1996).

Further assistance

- The Pro Asia e.V. business association was founded in August 1991 by 12 environmental protection technology enterprises.

Contact: Pro Asia e.V., Essener Straße 5, D-46047 Oberhausen, Germany. Tel.: +49(0)208-260 03, Fax: +49(0)208-260 51.

- The Japan – Environment and Genetic Technology business pool is a joint undertaking founded by the Düsseldorf Chamber of Commerce, IHK Gesellschaft zur Förderung der Außenwirtschaft and ECOS GmbH in Osnabrück. Its objective is to smooth the first steps into the Japanese market for small and medium-sized businesses from the environmental protection technology sector. For this purpose there is an office in Tokyo which functions as a focal point and as a representative office for German business pools firms, which bear the costs of the office (businesses from North-Rhine-Westphalia can apply Ministry of the Economy for funding).

Contact: IHK Düsseldorf, Ernst-Schneider-Platz 1, D-40212 Düsseldorf; Germany. Tel.: +49(0)211-3557-220 or -217.

Appendix 15			
Employment effects of energy efficiency measures			
– Results of empirical studies –			
Study	Country	Period	Employment (gainfully employed/year)
ISI (1983)	Germany	1981 to 1995	+ 70,000 to 90,000
Prognos (1987)	Germany	1985 to 2020	+ 95,000 to 131,000
ISI (1992)	Germany	1987 to 2005	+ 240,000 to 440,000
DIW (1993)	Germany	1991 to 2000	+ 83,000
ISI/DIW (1994)	Germany	1987 to 2020	+ 60,000 to 90,000
Greenpeace/DIW (1994)	Germany	1992 to 2010	+ 121,000
Hohmeyer (1985)	a) Denmark, Germany, France, United Kingdom b) EU 12	1980 to 2000	a) + 100,000 b) + 600,000
Krier/Goodman (1992)	United Kingdom	1992	+ 75,000
Centre for Energy Conservation and Environmental Technology (1994)	Netherlands	1988 to 2005	+ 71,000

Appendix 16

Environmental report of the of the Landesanstalt für Umweltschutz (LfU) Baden-Württemberg

– summary and outlook –

„In the present first environmental report, numerous suggestions for improvement and measures for the environmental compatibility of LfU activities are made. The standardisation and completion of the data situation in almost all positions of the standard form of accounting is urgent. The environmental balance of the LfU in Karlsruhe shows very clearly that a need for action exists in all sectors. Sometimes these are only small measures which would lead to a reduction in environmental pollution but which demand considerable organisational effort, for example in the case of office supplies. For example, the office supplies generally used in the LfU must be constantly checked for their environmental relevance, and if necessary, more environmentally compatible products must be brought in.

Many of the suggested measures can only be put into effect in an unsatisfactory manner or not at all, mainly in the areas for which property owners, not tenants, are responsible. It is also unsatisfactory that the data situation cannot be improved in this regard. In the energy sector (heating, power) and water/wastewater, simple measures could achieve savings of around 20 percent. With property management costs for energy and water/wastewater of 726,610 DM (1994) for the LfU in Karlsruhe this would amount to 145,000 DM per annum.

Measures which already take effect in the ordering phase are best suited for minimising environmental pollution. For this reason, the ordering standards for purchasing, and improvement of the data situation in the management of facilities, equipment, utility and consumer goods will be tackled next.

The implementation of the waste management plan is an important first step, from both an environmental and an economic viewpoint. It is precisely here that many effects on the environment can be avoided or at least reduced by appropriate measures.

The commitment of staff is necessary to cope with the varied periodical tasks in corporate environmental protection. Above all, the organisation, internal services, housekeeping, information and communications departments, the laboratory departments, measurement networks, and specialist services of the special departments are called to act in the fulfilling of these objectives. Additional tasks or those shaped by other criteria in the planning, implementation and documentation of corporate environmental protection will also confront staff in these departments.

Public administration can just as well as the private sector commit itself to environmental protection. The LfU has decided to demonstrate this. In its first environmental report, the need for action is to be shown, weak points analysed and measures for improvement suggested. The extrapolation and refinement of environmental reports is viewed as an essential objective. Informing and motivating staff on environmentally compatible ways of behaviour are important priorities in the further development of environmental management in the LfU.“

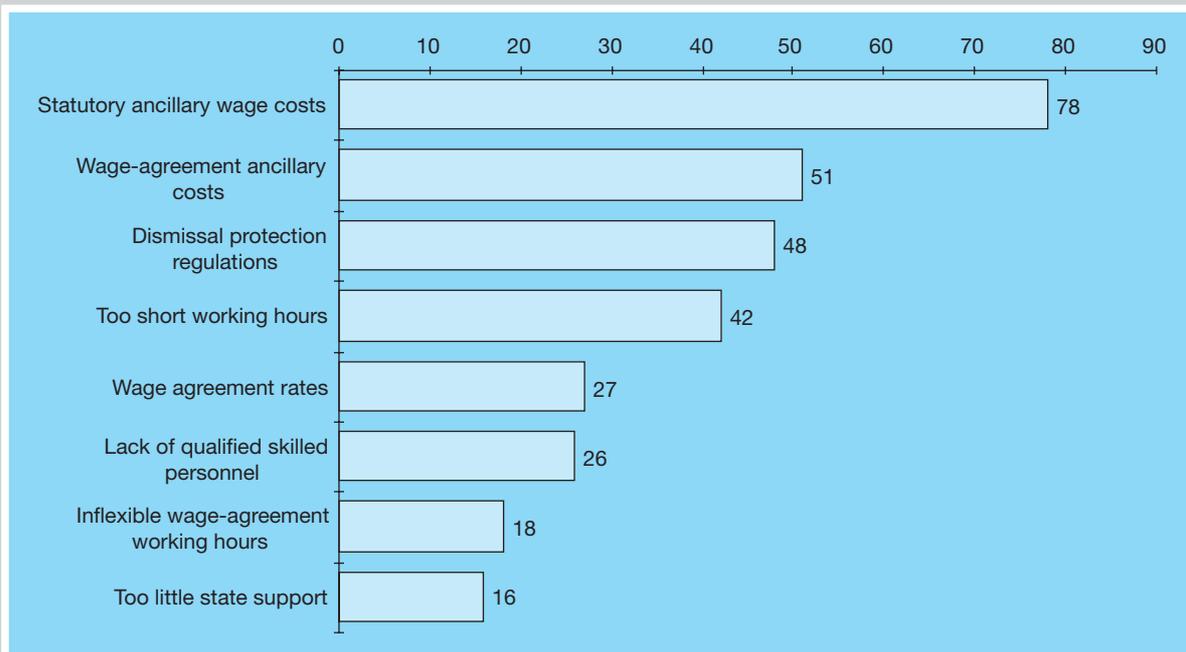
Source: First environmental report of the LfU, Karlsruhe, December 1996.

Appendix 17

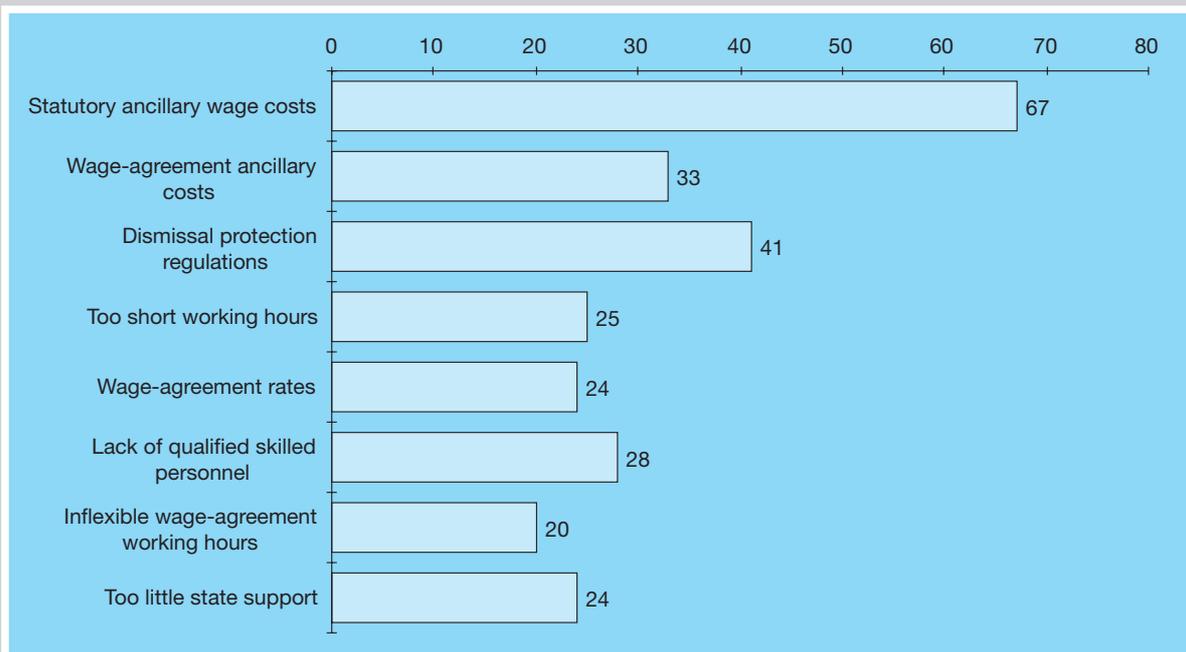
Main obstacles to new job recruitment

Representative survey of 1,082 German companies in October 1995

Percentage of businesses in the manufacturing sector which see these as a barrier to recruitment (multiple naming)



Percentage of businesses in the services sector which see these as a barrier to recruitment (multiple naming)



Source: Institut für Mittelstandsforschung and Institut der Deutschen Wirtschaft 1997.

Appendix 18					
Employment effects of carbon dioxide/energy taxes					
I. European Union					
Study	Tax	Area studied	Use of tax revenues	Changes in employment	
				absolute	in percent
EU-Commission (1997)	Stepwise increase of the minimum tax rate for petroleum products; extension of coal and electricity taxation	EU	Lowering social security contributions	+ 100,000 to 150,000	
EU-Commission (1996)	CO ₂ /energy tax	EU-12	Lowering social security contributions	+ 800,000	
Op de Breke (1993)	CO ₂ /energy tax	EU-12	a) Lowering social security contributions b) Lowering income tax c) Lowering VAT d) Lowering social security contributions from low income groups		a) + 1% b) + 0.7% c) 0 % d) +3%
Bureau du Plan (1993)	CO ₂ /energy tax	EU-6	Lowering employer social security contributions		+ 0.64 %
DRI (1993)	CO ₂ /energy tax	EU-11	Lowering social security contributions (30%)		0 %
EU-Commission (1992)	CO ₂ /energy tax	EU-12	a) Lowering social security contributions b) Lowering VAT		a) 0 % b) + 0.1 %
II. Germany					
Study	Tax	Area studied	Use of tax revenues	Changes in employment	
				absolute	in percent
Meyer (1997)	CO ₂ tax	Germany	Lowering social security contributions	+ 1,500,000	
IFO-Institut (1997)	Energy tax	Old Länder	Lowering social security contributions	+ 405,000	
Deutsches Institut für Wirtschaftsforschung (1997)	Energy tax, waste charge, road user fees, increase in petroleum tax and wastewater charge	Old Länder	Lowering social security contributions, abolition of commercial earnings and capital tax, lowering of reduced VAT rate	+ 140,000 to + 260,000	
Institut für Arbeitsmarkt- und Berufsforschung (1997)	Raising the petroleum tax by 20 Pfennig/Litre	Old Länder	Lowering unemployment insurance contributions by 1 %	+ 50,000	
Deutsches Institut für Wirtschaftsforschung (1994)	Energy tax	Old Länder	Lowering employer social security contributions Environmental bonus	+ 330,000 to + 800,00	
Energiewirtschaftliches Institut an der Universität Köln (1994)	CO ₂ /energy tax	Old Länder	Allocation neutral return of levy revenues		0
ISI/DIW (1994)	CO ₂ /energy tax	Old Länder	Lowering of indirect taxes	+ 60,000 to + 80,000	+ 0.2 % to + 0,3 %
Bakker/Bleyenbergh (1992)		Old Länder	Lowering social security contributions		+ 1.5%

III. Other countries					
Study	Tax	Area studied	Use of tax revenues	Changes in employment	
				absolute	in percent
WIFO (1995)	Energy tax	Austria	Lowering social security contributions and technology funding (thermal power coupling, thermal insulation etc.)		+ 0.4%
Cambridge (1994)	a) CO ₂ /energy tax b) Raising fuel taxes by 5% per year (or 10% per year)	United Kingdom	a) Promotion of energy conservation measures, lowering social security contributions b) Lowering social security contributions	+ 491,000 + 191,000 (or + 492,000)	
Cambridge (1992)	CO ₂ /energy tax	United Kingdom	Lowering VAT	+ 78,800	
Bréchet (1992)	CO ₂ /energy tax	France	a) Lowering social security contributions b) Lowering VAT and social security contributions		+ 0.4% + 0.4%
Standaert (1992)	Energy tax	a) Germany b) France c) Italy d) United Kingdom	Lowering social security contributions		a) + 0.7% b) + 0.3% c) + 0.7% d) + 0.1%
ESRI (1991)	Energy tax	Ireland	Lowering social security contributions		+ 0.7%

Cross references

- 1 Bundesumweltministerium (Ed.): Konferenz der Vereinten Nationen für Umwelt und Entwicklung im Juni 1992 in Rio de Janeiro – Dokumente – Agenda 21. Bonn 1992.
- 2 Bundesumweltministerium: Schritte zu einer nachhaltigen Entwicklung: Umweltziele und Handlungsschwerpunkte in Deutschland. Bonn 1996.
- 3 General term for volatile organic chemicals. VOC emissions occur when using lacquers and varnishes, for example.
- 4 In the case of pollutant input from diffuse sources, a variety of sources are responsible for environmental pollution. An example of this is the input of agricultural control chemicals by agriculture, or the emission of diesel exhaust particles by vehicles.
- 5 It should be mentioned that there are now studies and forecasts from the automobile industry and petroleum sectors (cf. Analyse und Prognose GmbH, Shell, Esso) which see a trend change in carbon dioxide emissions and point out that a clear fall by 2005 is to be anticipated. In order to issue generally acceptable statements, the Federal Environment Ministry has formed a working group for emission forecasts in road traffic, to which, alongside representatives of the Länder, the Federation of the Automobile Industry (VDA), the Petroleum Enterprises Federation (MWW), the General German Automobile Club (ADAC), the Traffic Association of Germany (VCD), and the German Nature Protection Ring (DNR) belong. The objective of this working group is to reach agreement among all participants on the basis and methods for calculating traffic emissions up to the year 2020.
- 6 In order to determine the quantified objectives, cf. Federal Environmental Agency. Sustainable Development in Germany – Progress and Prospects. Berlin 1997, p. 90–92.
- 7 The basic materials and intermediate production goods industries, the capital goods and consumer goods industries and the food, beverage and tobacco industries are all part of the manufacturing sector.
- 8 Cf. Gesellschaft für Marketing-, Kommunikations- und Sozialforschung mbH (Authors: Preisendörfer, P./ Wächter-Scholz, F.): Umweltbewußtsein und Umweltverhalten. Sozialwissenschaftlicher Ergebnisbericht zur Umfrage „Umweltbewußtsein in Deutschland 1996“. Berlin 1997.
- 9 This also applies to „follow-up“ technologies satisfying the precaution requirement.
- 10 Handbuch Umweltkostenrechnung. Editor: Bundesumweltministerium und Umweltbundesamt. Vahlen Verlag München 1996. 254 pages, hardback, 36 DM, ISBN 3-8006-2110-X, published in December 1996.
- 11 Cf. Materialien aus der Arbeitsmarkt- und Berufsforschung No. 1/1991 (Qualifizieren mit Profil. Berufsanforderungen im Urteil betrieblicher Experten) and No. 2.1-2.12/1994 (Anerkannte Ausbildungsberufe im Urteil der Betriebe), IAB Institut für Arbeitsmarkt- und Berufsforschung der Bundesanstalt für Arbeit, Nürnberg.

- 12 OECD: Communiqué zum Treffen des OECD-Ministerrates am 21. bis 22. Mai 1996, Document SG/COM/NEWS (96) 53, Paris 1996.
- 13 Adams, J.: Environmental Policy and Competitiveness in a Globalised Economy: Conceptual Issues and a Review of the Empirical Evidence. In: OECD Proceedings, Globalisation and Environment. Preliminary Perspectives, OECD, Paris 1997.
- 14 OECD: Environmental Policies and Industrial Competitiveness, Paris 1993.
- 15 Cf. Bundesumweltministerium (Ed.): Aktualisierte Berechnung der umweltschutzinduzierten Beschäftigung in Deutschland (Authors: Benzler, G./Blazejczak, J./Dressel, K./Edler, D./Halstrick-Schwenk, M./Horbach, J./Komar, W./Löbke, K./Sprenger, R.-U.). Published as part of the „Umweltpolitik“ series by the Federal Environment Ministry, Bonn 1996. The approx. 50 page brochure can be obtained free of charge from the Federal Environment Ministry.
- 16 Cf. Umweltbundesamt (Ed.): Arbeitsbeschaffungsmaßnahmen im Umweltbereich. BERICHT 3/89 des Umweltbundesamtes, Berlin 1989.
- 17 Cf. Umweltbundesamt (Ed.): Beschäftigungswirkungen des Umweltschutzes – Abschätzung und Prognose bis 2000. Einzelanalysen. TEXTE 42/93 des Umweltbundesamtes, Berlin 1993.
- 18 Cf. Blazejczak, J./Edler, D: Tendenzen der umweltschutzinduzierten Beschäftigung in Deutschland. Wochenbericht 9/97 des Deutschen Instituts für Wirtschaftsforschung, Berlin 1997, 64th year, p. 157–162.
- 19 In the statistics of the manufacturing sector, environmental protection investments, which are partly tangible assets, are indicated separately. In the broadest sense of the word, they can be viewed as a starting point for the use of integrated environmental technology. In 1994, their share of the overall environmental protection investments of the manufacturing sector (old Länder) was around 18 percent.
- 20 Cf. Coenen, R./Klein-Vielhauer, S./Meyer, R.: Umwelttechnik und wirtschaftliche Entwicklung. Arbeitsbericht Nr. 35 des Büro für Technikfolgenabschätzung beim Deutschen Bundestag. Bonn 1995.
- 21 The manufacturing sector includes the sectors of mining and the excavation of stone and soil materials, the processing industry, power and water supply as well as the building-construction industry.
- 22 Cf. Zur technologischen Leistungsfähigkeit Deutschlands; Report to the BMBF from December 1995, drawn up by NIW (overall control), DIW, ISI and ZEW; and: Zur technologischen Leistungsfähigkeit Deutschlands; revised and expanded 1996; summary final report to the BMBF, published by NIW (overall control), DIW, ISI and ZEW.
- 23 Cf. Bundesumweltministerium/ITUT e.V. (Ed.): Maßnahmen zur Stärkung des Exports der Umweltindustrie (Umwelttechnik, Umweltdienstleistungen und umweltfreundliche Produkte). Compiled on behalf of the Federal Environmental Agency by Schitag Ernst & Young, Bonn 1996.

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- 24 Cf. Sprenger, R.-U./Franke, A./Wackerbauer, J./Wiesner, G.: Verbesserung der Chancen ostdeutscher Unternehmen auf dem Umweltschutzmarkt, IFO Institut für Wirtschaftsforschung, München, July 1997; published in the „TEXTE“ series No. 65/97 of the Federal Environmental Agency.
- 25 Cf. Sprenger, R.-U./Franke, A./Wackerbauer, J./Wiesner, G.: Verbesserung ..., see above
- 26 Equally favourable prospects are provided by the sector of efficient and well-considered energy use. According to ISI calculations, as early as the eighties the production and export of industrial products for the efficient use of energy increased in Germany much more strongly than industrial production as a whole.
- 27 Cf. Bundesumweltministerium: Tagungsband des Fachgesprächs „Beitrag der Biotechnologie zu einer nachhaltigen, umweltgerechten Entwicklung“, Reihe Umweltpolitik, Bonn 1996.
- 28 The promotion of efficient energy use and renewable forms of energy predominantly takes place via the ERP environment and energy conservation programme and the DtA environment programme
- 29 A Petajoule = 10^{15} , this corresponds approximately to the annual energy consumption of a city as large as Munich.
- 30 Cf. DIW/ISI: Gesamtwirtschaftliche Auswirkungen von Emissionsminderungsstrategien. Bericht für die Enquete-Kommission „Schutz der Erdatmosphäre“ des Deutschen Bundestages, Teilstudie C2, Berlin, Karlsruhe 1994.
- 31 According to calculations of the Deutsche Institut für Wirtschaftsforschung, about 75,000 individuals could be additionally employed by 2005 through residential thermal insulation measures. This calculation already takes into account employment losses in the energy industry. Study on behalf of World Wide Fund for Nature.
- 32 Cf. ifo/RWI: Gesamtwirtschaftliche Beurteilung von CO₂-Minderungsstrategien. Untersuchungen des Rheinisch-Westfälischen Instituts für Wirtschaftsforschung, Heft 19, Essen 1996.
- 33 See Research Centre Jülich on the costs of CO₂ reduction measures: policy scenarios on climate protection, draft final report, Karlsruhe 1997. This study, drawn up on behalf of the Federal Environment Ministry and the Federal Environmental Agency, shows that CO₂ reduction measures in the building stock are an important component within the framework of a cost-optimised climate protection strategy.
- 34 Cf. Fischer, A./Kallen, C.: Klimaschutz in Kommunen – Leitfaden zur Erarbeitung und Umsetzung kommunaler Klimakonzepte. Deutsches Institut für Urbanistik, Berlin 1997.
- 35 Cf. Enquete-Kommission „Schutz der Erdatmosphäre“: Mehr Zukunft für die Erde. Nachhaltige Energiepolitik für dauerhaften Klimaschutz. Bonn 1995.

- 36 In the transition from a straightforward supplier business to a services business, it is not the sale of as much energy as possible which is the object, but rather the maintaining of a service in readiness (e.g. warm living quarters). It is in the interests of a service business to develop economic savings potential which will not be exhausted by the consumers.
- 37 Cf. Energieeinsparung und erneuerbare Energien, BMWI documentation No. 361, 1994.
- 38 The World Energy Council – WEC, first founded in 1924 as a world power supply conference, and later named world energy conference – is the oldest and largest private initiative in the energy supply sector. The WEC – with headquarters registered in London – is supported in its work by national committees in 91 states currently (including Germany).
- 39 Bundesumweltministerium/Umweltbundesamt (Ed.): Handbuch Umweltcontrolling. Published by Vahlen Verlag München 1995 (663 pages, hardback, 54 DM, ISBN 3-8006-1929-6).
- 40 In order to support companies in the development of corporate environmental indicators, the Federal Environment Ministry and the Federal Environmental Agency published „A Guide to Corporate Environmental Indicators“. The 50 page brochure can be ordered free of charge from the central inquiry service of the Federal Environmental Agency.
- 41 The Federal Environmental Agency published a handbook on environmentally beneficial procurement, which is now in its third edition: Umweltfreundliche Beschaffung, Umweltbundesamt (publisher), Wiesbaden, Berlin, Bauverlag 1993.
- 42 Cf. Kallen, C./Libbe, J./Becker, D./Zschocke, C./Trenz, S./Dehmel, U.: Umweltcontrolling im Bereich der öffentlichen Hand – Analyse und Erarbeitung eines Leitfadens zur Nutzung des Potentials für Umweltschutzmaßnahmen (Vorstudie). Deutsches Institut für Urbanistik, Berlin, Juli 1997; to be published as part of the „TEXTE“ series of the Federal Environmental Agency.
- 43 The Institut für Arbeitsmarkt- und Berufsforschung (IAB) of the Bundesanstalt für Arbeit also concludes that a lowering of social security contributions would lead to considerable positive employment effects. (Cf. IAB Workshop Report, No, 7/May 13th 1997: Wege zu mehr Beschäftigung – Die Senkung der Sozialversicherungsbeiträge, Nürnberg 1997.)