

WHAT MATTERS 2010

➤ Future mobility – today's best investment ➤ Environmental protection – a barrier to investment for agriculture? ➤ Emissions trading – the engine of climate policy

Annual Report of the Federal Environment Agency

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TOWARDS AN ECOLOGICAL ECONOMIC POLICY



The international financial and economic crisis shows just how vulnerable those societies are that exclusively pursue short-term economic results for maximum return.

Even if there are isolated early signs of a slight upswing, we must draw the correct conclusions from the crisis and above all adjust how we behave in the future. We cannot return to „business as usual“. It is time to launch an ecological economic policy that encourages the sustainable use of resources, respects ecological limits and takes advantage of market opportunities for introducing new environmental technologies and energy- and raw material-efficient products and services.

Industrial nations have for far too long been dominated by a culture of wastefulness based on predatory exploitation of nature and the exclusion of the majority

of mankind. About a quarter of the world's population uses 80 % of the energy and raw materials produced. The consequences are shortages of nature's bounty and raw materials, loss of biodiversity, depletion of fossil energy resources in the face of growing energy demand, and looming climate change. Energy and resource efficiency with its far-reaching repercussions for almost any field of politics and area of life is the crucial issue which will decide what our life will look like in the 21st century and whether we will succeed in averting enormous financial losses due to climate change and environmental degradation.

Environmentally compatible mobility

Engines have become more efficient over the past ten years, but this increase in efficiency has been offset to a large extent by greater comfort and higher performance. German automakers will have to adjust their policy. Essentially, they must observe the specifications of the European Commission for reducing carbon dioxide emissions. The EU requires for new vehicles a reduction in CO₂ emissions to 130 grams per kilometre starting from 2015 – the current figure is 162 grams. Rising fuel prices are pushing a trend, although much too slowly, towards smaller and more fuel-efficient cars. High-efficiency, hybrid and electric propulsion technologies as well as consistent lightweight construction will markedly reduce energy consumption and emissions. At the same time, innovative vehicle technologies can lead to less noise and a further reduction of particulate matter, which contaminates the air we breathe. However, better technology and higher efficiency in vehicles alone is not sufficient. New concepts in transport infrastructure planning that can reduce the demand for transport and steer it towards environmental compatibility are a key component for future mobility. This is all the more necessary as traffic will continue to grow in the future – most of all road freight transport, which according to the Federal Ministry of Transport's forecasts is anticipated to grow by almost 50 percent by 2025 in comparison to 2008. The Federal Government's sustainability strategy clearly states: economic performance and transport performance must be decoupled. In order to achieve this, freight transport must be largely transferred from road to rail, for which investment is necessary to extend the railway system. We must also avert unnecessary traffic. Shorter transport routes mean clean air in the city centres, less noise and help to support biodiversity in non-fragmented habitats.

Supporting sustainable investments in agriculture

Predatory exploitation and climate change increasingly destroy fertile soils throughout the world. The international community of states faces an enormous challenge in having to produce sufficient food for an increasing number of people using the available soil area or even less without further damaging the climate, soil and water. Particularly since yield demands on the soil are rising: in addition to foodstuffs, renewable raw materials are gaining in importance. Soil protection, neglected by environmental policy in the past, must be increasingly brought into public perception. This is all the more important since land-take for towns and roads, with all its intrusion into nature and the landscape, has not decreased significantly in Germany. The agricultural sector is an important economic factor. However, it has a major effect on the ecosystem. Excessive fertilizer use by intensive agriculture causes a nitrogen surplus which damages soils and waters, and heavy tillage equipment compacts the soil. Agriculture, and

especially intensive animal farming with its emissions of the greenhouse gases methane and nitrous oxide, also contributes to global warming.

Agriculture is both a cause and a victim of climate change and faces a dual challenge. On the one hand, it must adapt its practices to local conditions to substantially reduce greenhouse gas emissions. In addition to moderate use of fertilizers or sustainable animal farming, this includes stopping the ploughing up of further grassland and re-wetting of wetlands and using them as CO₂ sinks. Simultaneously, farmers must find alternative methods of cultivation – for instance sowing time must be adapted to current temperature and rainfall patterns and more heat- and drought-resistant crops should be planted. Investment into the economic development of rural areas and environmentally conservative agricultural techniques protect natural resources and create the conditions for the production of high-quality food.

A low-carbon and resource-efficient future

The key issue is decoupling growth from energy and raw material consumption – for instance by optimizing production processes towards lower raw material consumption in order to save ores, building materials and chemical substances. Products must be designed so that they can be re-used more extensively. The less fossil sources of energy we use, the more independent from imported goods we become and the less we damage our climate.

Efficiency does not only mean saving. National economies must retool, and replace scarce, finite resources – wherever this is possible – with renewable raw materials. Clean energy technologies, which produce little or no carbon dioxide and no dangerous contaminated sites, are also in demand. The growing need for efficiency and environmental technologies creates new markets and opens economic opportunities world-wide. 1.8 million people work in the environmental sector in Germany, and 280,000 people alone are employed in the field of renewable energy. The eco-industry has long since become an important economic factor and employment engine. Environmental protection must not be neglected in times of recession. Without a progressive environmental policy, which systematically sets innovation incentives, it will not be possible to keep or improve Germany's good competitive position in the long term.

Economic development is not possible without a stable climate. The reports from the United Nations Intergovernmental Panel on Climate Change have clearly shown the dangers of global climate change. The greenhouse effect has great inertia: everything we deposit in the atmosphere today remains there for decades or even centuries, and impacts the climate. The community of nations has only a few years in which to reverse the trend in greenhouse gas emissions. This is the only

way to keep the planet from warming up by more than two degrees Celsius by the end of the century with any reasonable chance of success.

Climate protection is obviously not available free of charge. But at the same time it is the engine and generator of innovations and competitiveness in our country. And the sooner we take climate protection seriously, the less expensive the economic costs of an unrestricted climate change will be. The former chief economist of the World Bank, Sir Nicholas Stern, sent the following key message in his report to the world community: We are rich enough to finance climate protection, but too poor to just accept climate change.

Jochen Flasbarth

President of the Federal Environment Agency



Dream or conceivable future:
A mobility which is clean and
independent of fossil fuels.

FUTURE MOBILITY TODAY'S BEST IDEAS

We cannot imagine life without mobility – whether it is travelling to work, going on holiday or distributing goods and services. But the increasing amount of traffic on our daily journeys poses a serious problem both for people and the environment.



TY- NVESTMENT

We cannot imagine life without mobility – whether it is travelling to work, going on holiday or distributing goods and services. But the increasing amount of traffic on our daily journeys poses a serious problem both for people and the environment. Vehicles, whether on the road, rail, water or in the air, use energy, mostly from fossil fuels, and release carbon dioxide (CO₂) which is damaging the climate. Cars, HGVs and the like still emit too much particulate matter, nitrogen oxides and other air pollutants. A steadily increasing number of people

suffer from traffic noise. In addition, for too long we have used more land for roads, railways and airports than nature has been able to cope with. Every day more and more land is torn up and covered in tarmac. Natural areas for animals and plants are lost and humans also suffer because unaffected wild recreational areas are on the decline.

Shaping the mobility which society needs to make it as environmentally sound as possible is the main challenge of environmental and transport policy. This is all the

more essential as traffic will continue to grow in the future, especially freight transport by road, which, according to Federal Ministry of Transport forecasts, could grow by 49 percent by 2025 compared to 2008. However, “business as usual”, i.e. a mobility with excessive consumption of natural resources and (avoidable) damage to the environment and health, is not sustainable. The Federal Government recognized this and has set limits on emissions of greenhouse gases and air pollutants and on noise levels and land use. Traffic must also contribute to achieving these goals. In the future it will be necessary to re-draw many guidelines: we need mobility which helps humanity but does not harm the environment or health any more than absolutely necessary. In impending investments in the transport sector, we must thoroughly check where the funds will be going, which investment in transport infrastructure is really necessary and what the next generation of vehicles should look like. The Federal Environment Agency’s vision of ‘tomorrow’s mobility’ is explained in the following pages.

Past efforts of integrating environmental aspects into transport policy – for example via limit values for exhaust gases – are very encouraging. We all know, however, that cars and HGVs are still noisy and much less economical than is technically possible. Highly efficient hybrid and electric propulsion technologies as well as consistent lightweight construction and low-noise tyres can really help to reduce emissions. Further development requires a better strategy in which environmental protection goals form strong guidelines which prevent us from straying from the right course. In view of this, Germany needs a strategy for implementing sustainable mobility. All decisions at federal, Federal State and municipal level must be measured by this strategy. The strategy for sustainable mobility would specify the extent and means of transport that the Federal Government would like to use to guarantee tomorrow’s mobility. In addition, the strategy would also show how to take full advantage of the technological possibilities within the transport sector. It must consider the environmental goals as immovable guidelines. What should guide this strategy? First, the Government should, in all its decisions, check two questions: Does the decision generate more or less traffic? And whether or not companies and the public will use environmentally friendly means of transport?

TABLE 1: ADDITIONAL TRANSPORT POLICY MEASURES AND THEIR CO₂ SAVING POTENTIAL BY 2020 IN COMPARISON TO “BUSINESS AS USUAL”

Climate protection measures in transport	Reduction potential in 2020 compared to the current trend in million tonnes CO ₂
Introducing market-based instruments in aviation (emissions trading based on Global Warming Potential of all emissions, emission-dependent take-off and landing fees)	15.6
Reduction in personal transport (e.g. ‘The city of short distances’, integration of transport and town planning)	10.2
Using more and better biofuels	10.1 (5.1)*
Raising energy tax on fuels (by 30 €cents by 2020)	9.5
EU-wide introduction of the obligation to use low-resistance tyres	6.0
Shift from car to bicycle in city transport	5.0
Implementing fuel-efficient driving techniques (for cars, e.g. by driver training)	4.7
Prescribing fuel-efficient engine oils at EU level	4.5
Expanding and further developing goods vehicle road pricing	4.5
Reducing traffic-inducing tax preferences (e.g. commuter subsidy)	4.3
Consumer-friendly CO ₂ marking for new vehicles	4.1
Coupling company car tax to CO ₂ emissions	3.7
Promoting regional economic cycles	3.4
Introducing 120 km/h speed limit for cars on federal motorways	3.2
Introducing CO ₂ limit values for commercial motor vehicles	2.8
Introducing a ‘pure’ CO ₂ -based vehicle tax	2.8
Shift from car to bus and rail in city transport	2.6
Encouraging car sharing	2.5
Implementing support programmes for rail freight transport	2.1
Stop building traffic-generating new roads, Federal Transport Infrastructure Planning (Bundesverkehrswegeplanung – BVWP) with integrated strategic environmental assessment	1.8

*Whether climate-compatible biofuels can be produced in necessary quantities is uncertain in the view of the Federal Environment Agency. The value in brackets indicates the net value, i.e. after deduction of the additional emissions from agriculture.

Source: Federal Environment Agency 2009, summing the effects of these actions is not possible because of overlaps.



Climate friendly mobility – reducing CO₂ emissions. In order to protect the climate, the Federal Government has decided to reduce greenhouse gas emissions in Germany by 40 percent compared to 1990 by 2020 if emissions in Europe are reduced by 30 percent within the same period. According to new findings of the Federal Environment Agency, the transport sector must reduce its emissions by approximately 40 million tonnes of carbon dioxide (million tonnes CO₂) from the 2005 figures to ensure that the Federal Government can achieve their climate protection target. But, the current trend indicates that a reduction in emissions of only about eight million tonnes of CO₂ by 2020 is likely, however, 40 million tonnes, i.e. fivefold, is actually necessary and feasible. The Federal Environment Agency has developed a range of actions [1], which Germany could use to make a big step forward for climate protection in the transport sector (see Table 1).

Clean air to breathe – reducing nitrogen oxide emissions.

When engines burn fuel, whether in factories, cars or locomotives, nitrogen oxides (NO_x) are generated. These can cause respiratory illnesses in humans and acidification in soil. Germany is obligated by a European Directive (Directive 2001/81/EC to NEC – National Emission Ceilings) to release no more than 1,051 kilo tonnes of nitrogen oxide (NO_x kt) to the atmosphere by 2010. The reduction of NO_x emissions in the transport sector has been reached by a constant tightening of the Euro exhaust gas emission limits for motor vehicles. However, the limit value for nitrogen dioxide (40 µg/m³ as an annual average value), valid from 2010, is still notably exceeded in many German city centres, mainly due to traffic. Only an early implementation of Euro 5/6 for cars and Euro V/VI for commercial motor vehicles would make a reasonable decrease possible.

Limiting the stress factor “noise”. Approximately 13 million Germans are exposed to noise levels which bear health risks and disturb sleep according to Federal Environment Agency estimates. In polls, traffic noise

turned out to have the largest disturbance factor. The Federal Environment Agency and other institutions – for instance the World Health Organization (WHO) – have established target values for traffic noise abatement from research findings on noise impact. They refer to the average noise level outside flats in order to protect the external living spaces (e.g. balconies or gardens) and to maintain or improve the quality of public areas:

- A short term goal: average noise levels should be less than 65 dB(A) during the day and less than 55 dB(A) at night in order to avoid health risks.
- WHO’s goal for 2030: average noise levels should be less than 55 dB(A) during the day and less than 45 dB(A) at night in order to avoid serious annoyance.
- Existing quiet areas in agglomerations with average noise levels (L_{DEN}) below 50 dB(A) and quiet rural areas with average noise levels (L_{DEN}) below 40 dB(A) should be preserved and these levels should also be the long term target for areas with high noise levels today.

Decreasing the use of concrete and bitumen – reducing land-take.

The Federal Government’s objective is to reduce land-take for human settlement and transport to 30 hectares (ha) per day by 2020. Simultaneously, non-fragmented, low-traffic areas should be maintained to provide space for animals to move freely in and for people’s recreation. These goals are embodied in the Federal Government’s ‘National Sustainability Strategy’ and ‘Biodiversity Strategy’. Land-take for human settlement and transport still amounted to 130 hectares per day in 2000 according to the Federal Statistical Office. Transport took up approximately 23 hectares (18 percent), and it is obvious that this must be reduced. The Federal Environment Agency recommends that the growth in transport infrastructure should about six hectares per day by 2020.

I. MORE ENVIRONMENTALLY COMPATIBLE INVESTMENT IN THE TRANSPORT INFRASTRUCTURE

Germany is one of the most densely populated countries in the European Union (EU) and the number one transit country within the EU. The political reaction to the increasing need for personal and freight mobility has so far been quite one-sided, i.e. priority for the car. Meanwhile, the rail system has shrunk by 2,800 kilometres [3] since 1991. Crucial for the future development of traffic in Germany is the way the Federal Government distributes funding for new federal motorways and extensions, federal highways, railways and waterways. Many of the Federal Government's environmental goals can only be reached if traffic does not continue to increase and motorized passenger transport even decreases. The Federal Transport Infrastructure Plan plays a key role

here (see Box). This plan determines to a large extent, if and how people and goods travel from A to B in this country. This plan must become „greener“. It must guarantee at an early stage that the environmental goals do not just exist on paper.

Past Federal Transport Infrastructure Plans were concerned predominantly with adapting the transport infrastructure to the need as conveyed by the trend. If it continues in this vein, a need for new federal trunk roads and extensions would follow from the growth in road freight transport of 49 percent between 2008 and 2025 as forecast by the Federal Ministry of Transport, and this is not compatible with the environmental goals. So far, when devising the Federal Transport Infrastructure Plans, it has been assumed that economic growth and traffic growth goes hand in hand. The Federal Government's sustainability strategy, however, clearly states: economic performance and transport performance must be decoupled in the same way that worked for energy consumption. This decoupling cannot be accomplished by the Federal Transport Infrastructure Plan alone – however it could make a major contribution.

Any extension to transport routes will generate additional traffic. For instance, if someone supports the economy in less developed areas, they must anticipate higher traffic being generated as a side effect. A research report by the Federal Environment Agency shows how this effect can be tested in advance and the additional traffic generated avoided or decreased [4].

CITY, STATE, CONGESTION?



The Federal Government uses the Federal Transport Infrastructure Plan to develop its investment programme for long-distance transport routes. Based on the project proposals submitted by the Federal States, the Waterways and Shipping Administration, the Deutsche Bahn AG (the German national railway company) and associations, the Federal Government specifies the need for new construction and extension of roads, railways and waterways. Plans are derived from this requirement which are adopted by the German parliament as a law. Every five years, the Federal Ministry of Transport reviews the requirement plans, and then decides if a new Federal Transport Infrastructure Plan must be drawn up. In the current plan, approximately 150 billion euros has

been planned for the period 2001 to 2015 for the road, rail and waterways networks.

In Germany 55.5 million motor vehicles were registered in 2007. In the same year the federal trunk road network (motorways and federal highways) amounted to an overall length of 52,994 kilometres. They make up only 23 percent of the overall length of the national road system in Germany, but about 47 percent of total vehicle movements were achieved on them [5]. If all road construction projects of the 2003 Federal Transport Infrastructure Plan had been implemented, the German road system would now be about 9,600 kilometres longer [6].



MISSED CHANCE? THE 2003 FEDERAL TRANSPORT INFRASTRUCTURE PLAN UNDER THE MAGNIFYING GLASS

A stated goal of the 2003 Federal Transport Infrastructure Plan was to steer transport systems in such a way that any contribution would deliver maximum benefits for the population. In addition, eight traffic and socio-political goals were formulated, among them long-term environmentally compatible mobility and reduction of noise, pollutant and greenhouse gas emissions. These goals have however neither been specified nor quantified. The plan also fails to say whether the planned traffic projects help to achieve these environmental goals. Therefore, based on the plan, the German Parliament, as a decision maker, was not able to determine whether the desired contribution to increasing welfare and the environmental goals will be reached. Environmental protection obligations entered into at a federal level or in international agreements have not yet found sufficient consideration in the plan.

The Federal Ministry of Transport assessed the feasibility of road, rail and waterway projects before they were included in the plan. The assessment was carried out using financial and non-financial criteria. In agreement with the 1992 Federal Transport Infrastructure Plan and its forerunners, cost-benefit analysis (CBA) (monetary assessment of the effects of projects) remained the key element of the assessment for the current plan. On the other hand, ecological risks and effects on regional planning and urban development (non-monetary assessment of the effects of projects) have a lesser weight. Therefore, the Federal Environment Agency's research activities before the 2003 Transport Infrastructure Plan was drawn up focussed especially on strengthening environmental concerns within the CBA. The fact that greenhouse gases, carcinogenic substances and noise outside towns were included in the CBA is based to a large degree on the research work of the Federal Environment Agency [7–9]. That the CBA considered the induced, i.e. additionally generated traffic for the first time, was also as a result of these activities. Nevertheless, some critical aspects have remained. Thus induced traffic is not considered in its entirety, only the induced leisure and shopping traffic was included in the calculations. Also, the economic assessment significantly

overestimates the benefit from time savings due to new traffic routes. On the other hand, the cost of noise pollution was set too low. In particular, a chance was missed for nature and landscape protection. A monetisation of interferences in nature and landscape would have had an important influence on the CBA and thus on the assessment of the feasibility of the project concerned. The 2003 Federal Transport Infrastructure Plan intended to create the conditions for shifting as much road and air transport onto the railways and waterways as possible. For this reason it did not rely on a forecast of traffic development based on current trends, which foresaw a strong increase in road transport. Rather it was based on a scenario which assumed higher costs for road users and air transport – e.g. by an increase in the mineral oil tax – as well as lower user costs for rail transport ('integration scenario'). However, the cost changes assumed in the scenario did not materialize because they were not supported by concrete, transposable measures. Ultimately the Federal Transport Infrastructure Plan again included an allocation of investment in favour of road building: 77.5 billion euros was allotted to trunk roads, 63.9 billion euros to rail and 7.5 billion euros to waterways.

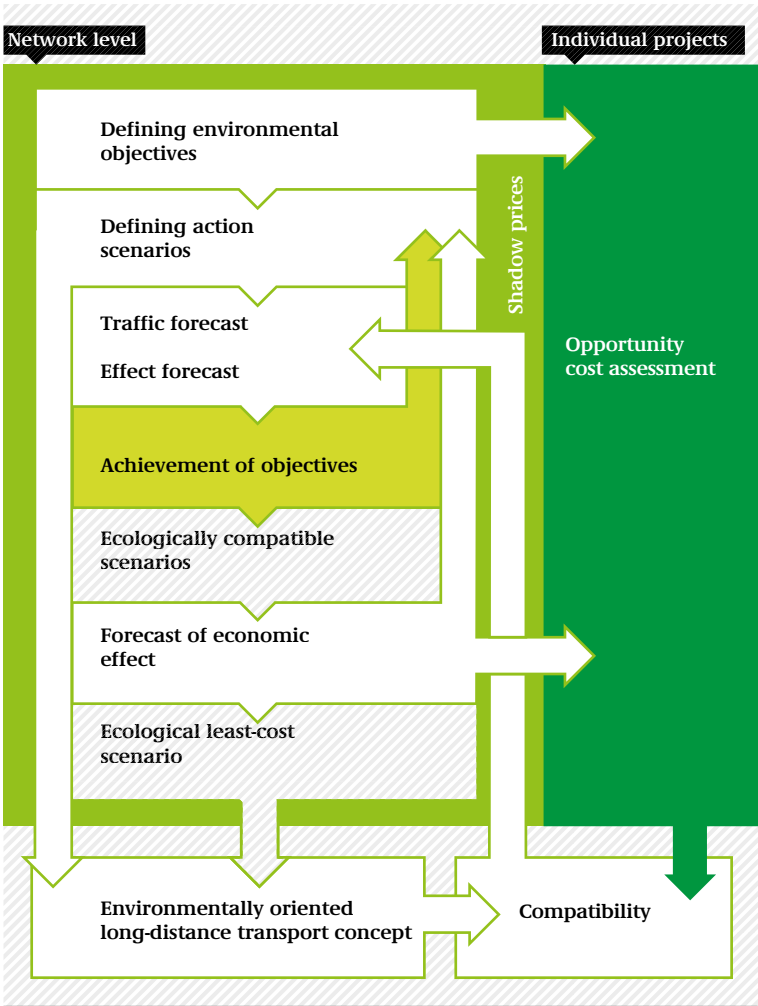
The Federal Ministry of Transport forecast a strong increase in freight transport and a minor rise in passenger transport for the period 2004 to 2025 – whereby the forecast assumes that all primary-need transport projects from the Transport Infrastructure Plan will be implemented [10]. In order to steer investment towards sustainable transport, it is necessary to evaluate all projects of the current Transport Infrastructure Plan against the criteria of the National Sustainability Strategy and other national and international environmental objectives. In future, the assessment of transport projects should be based on a traffic development scenario that meets the environmental goals.

Reappraisal needed: environmental objectives from the very beginning

The starting point for devising the Federal Transport Infrastructure Plan has up till now been the projects submitted by the Federal States, the Deutsche Bahn AG, the Waterways and Shipping Administration, and associations. A re-direction of this reporting practice is unquestionably necessary from the environmental viewpoint. Therefore the Federal Environment Agency considers that weak point analysis should be made a condition for submission of project proposals. Weak points in the transport infrastructure emerge where long-distance traffic meets network overload, traffic causes severe environmental impacts, infrastructure must be downgraded because of excessive maintenance costs, or regional planning objectives are compromised. Any new road projects submitted should conform to certain environmental criteria – for example not harming European Habitat Directive protected flora and fauna habitats. The Federal States should provide evidence of noise maps and local noise action plans which contain actions for noise reduction on busy transport routes. If noise hot-spots are identified on federal roads in towns, then, in addition to building by-passes, municipalities should consider and suggest various alternative solutions. The Federal Transport Infrastructure Planning should set out suitable specifications for implementing administrative and organizational actions for noise abatement in local through traffic (e.g. speed reduction and banning lorry driving at night) and noise remediation. The noise remediation scheme for federal trunk roads should be improved so that the remediation of federal roads within towns is also possible to a greater extent. In order for environmental objectives to be integrated in infrastructure planning from the very beginning, a new procedure is needed that starts with specifying targets at the outset of planning and abandons the analysis of individual projects. In future, infrastructure planning should consider the entire network and analyze it by taking into account all means of transport. This analysis must be based on environmental objectives. In addition, economic and social goals

can be included in the system. The environmental objectives can be achieved by a combination of instruments designed to influence traffic. They comprise organizational, economic, administrative and infrastructural components – for instance, speed limits on motorways, an increase in the HGV toll or the segregation of rail freight transport from passenger transport. A new procedure must have more room to manoeuvre which enables the analysis of various scenarios for developing long-distance traffic in Germany. The scenario that best meets all the transport-related environmental objectives and is economically efficient should then be suggested as the top environmentally responsive long-distance transport concept for implementation.

FIGURE 1: OBJECTIVE-GUIDED PROCEDURE FOR DEVISING ENVIRONMENTALLY RESPONSIVE LONG-DISTANCE TRANSPORT CONCEPTS AND DERIVATION OF COST RATES



Source: IWW et al. 1999

New obligations under the Strategic Environmental Assessment

The Federal Ministry of Transport is currently reviewing the requirement plans in order to determine if a new Federal Transport Infrastructure Plan has to be drawn up because of changes in the basic conditions. If a new plan is drawn up, Strategic Environmental Assessment (SEA), which was established by law in 2005, would be used for the first time [11].

The reason for a SEA is to determine the effects of the Federal Transport Infrastructure Plan on the environment and represent them clearly in an environmental report. Since in an SEA – unlike the current project-related approach – effects must be documented for the total plan, it is easy to see if the plan heads in the right or wrong direction.

The introduction of obligatory assessment of alternatives within an SEA is also a step forward from the environmental protection point of view. For many years the Federal Environment Agency has called for what is now required specifically for transport planning, i.e. the development of ‘suitable alternatives with a focus on transport infrastructures’ (e.g. sub-networks to integrate new ports into the surrounding regions) and ‘alternative means of transport’ (for example rail connections instead of roads). For the first time the Strategic Environmental Assessment provides the general public with the chance of having a say in the development of transport infrastructure planning in the country. In future the Federal Ministry of Transport must publicize the draft Federal Transport Infrastructure Plan and the Environmental Report and make them available to all interested parties – including environmental associations – so they are able to comment. This consultation process would contribute to a more balanced plan. Back in 2004, the Federal Environment Agency developed proposals for integrating the Strategic Environmental Assessment into the procedure of federal transport infrastructure planning [12]. Following this, the Federal Ministry of Transport commissioned a research project to establish the actual scheme of the SEA for the next transport infrastructure planning process [13].

Sustainable freight transport

Freight transport performance in Germany has more than quadrupled since 1960, with a marked increase in growth in the 1990s (see Figure 2). In all probability this trend might continue, increasingly longer transport distances being the main cause. Thus heavy goods vehicle (HGV) distances in commercial freight transport grew by 33 percent on average (from 98 to 130 kilometres per trip) from 1997 to 2006 while the average rail transport distance rose by 34 percent from 230 to 309 kilometres within the same period. In 1960 total freight transport in Germany was distributed roughly one third each to road, rail and inland waterways. By 2005, this had changed to about 72 percent by road. Shifting freight towards an environmentally compatible means of transport should be an urgent goal of infrastructure planning. According to the ‘UBA scenario’, the increase in road freight transport from 2008 to 2025 as forecast by the Federal Ministry of Transport could be reduced from 230 to 44 billion tonne kilometres (billion tkm) (see Table 2, page 14).

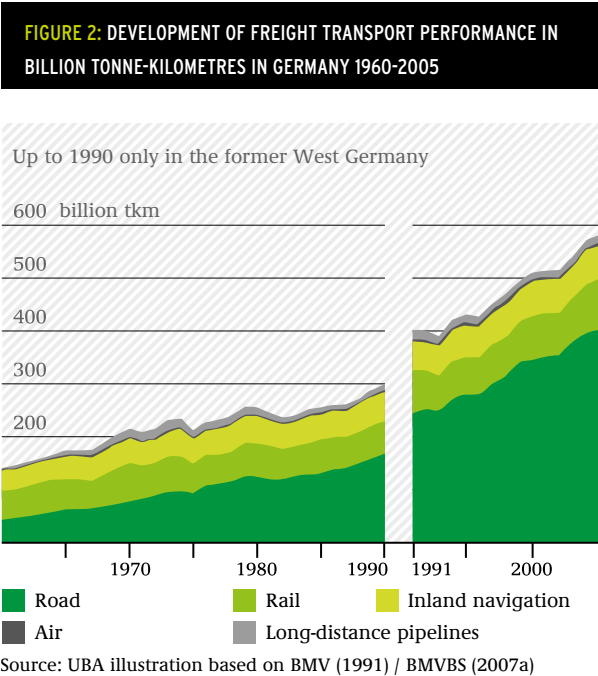


TABLE 2: COMPARISON OF FREIGHT TRANSPORT DEVELOPMENT BETWEEN THE BMVBS FORECAST AND THE UBA SCENARIO

Freight transport	Road	Rail	Inland navigation	Total
Base year 2008* in billion tkm**	474	117	64	655
BMVBS forecast 2025 in billion tkm	704	152	80	936
Increase from 2008 to 2025 (BMVBS) in billion tkm	230	35	16	282
Increase from 2008 to 2025 (BMVBS) in %	49	30	25	43
UBA scenario 2025 in billion tkm	518	213	89	819
Increase from 2008 to 2025 (UBA) in billion tkm	44	96	25	165
Increase from 2008 to 2025 (UBA) in %	9	82	39	25

* BMVBS (2009), Verkehr in Zahlen 2009/2010 **tkm: tonne-kilometres

The Federal Environment Agency investigated how freight transport could be reconciled with an environmentally compatible transport policy [14]. The study developed a ‘UBA scenario’ which, with the help of different measures, averts some of the heavily increasing freight transport and shifts another part from road to rail. Table 2 compares the freight transport performance forecast by the Federal Ministry of Transport with the ‘UBA scenario’. The Federal Ministry of Transport (BMVBS) chose 2004 as the base year for the forecast; the Federal Environment Agency converted the figures to the base year 2008.

The UBA scenario is based on the consistent use of several instruments, such as taking induced traffic into account in the promotion of economic development and in regional planning, further development of the HGV road charge and promoting inter-modal transport, i.e. transport chains with rail, sea or inland vessels constituting the key components and keeping the ‘last mile’ on the road as short as possible. In addition to these instruments, a Federal Transport Infrastructure Plan which does not increase the road system capacity plays a major role. This was the only way of avoiding the effect of extra traffic induced from expanding road capacity. As opposed to the freight transport performance of 704 billion tkm forecast by the Federal Ministry of Transport, in the ‘UBA scenario’ road freight transport increases to only 518 billion tkm by 2025. Compared to the 2008 level, this means only a nine-per-cent increase. According to the ‘UBA scenario’ rail freight transport would rise by 82 percent by 2025. Although today’s railway system can still absorb substantial quantities of rail transport at short notice by eliminating bottlenecks, such an increase would lead to capacity limits being reached on certain lines. The Federal Transport Infrastructure Plan is the most suitable instrument to prevent such a bottleneck, but it must be revised in a

way as to accommodate such an increase in rail freight transport. It must also be analysed whether new railway lines need to be built exclusively for freight transport.

Rail noise – an ecological soft spot

Railways are good for the climate – and, in addition, rail is a comparatively ‘green’ means of transport, however, rail traffic does still create noise. Freight transport at night can cause noise that presents a health risk, as shown by noise mapping under the European Union’s Directive on Environmental Noise (2002/49/EC). The most effective action to reduce noise from rail freight transport is equipping older freight waggons with quieter composite brake pads. This would enable – depending on rail condition – a noise reduction of 5 to 8 dB(A). To achieve substantial noise reduction throughout Germany an almost complete re-furbishing of the international rolling stock is necessary. According to the Deutsche Bahn AG, about 600 million euros are needed for re-fitting the German rolling stock. Regular grinding of the rails would bring another substantial noise reduction of 3 dB(A) on average. Over the medium to long term, investment in building new freight transport lines to relieve those rail lines with excessive noise is also needed.

II. IMPROVED TECHNOLOGY, HIGHER EFFICIENCY – INVESTING IN ENVIRONMENTALLY FRIENDLY VEHICLES

New concepts in transport infrastructure planning that reduce transport demand and steer it towards environmentally compatible routes is a key component of sustainable mobility. Improved technology and more efficient means of transport represent another. The transport sectors accounts for more than one quarter of energy consumed in Germany. More economical, more efficient means of transport will reduce energy consumption and emissions – both are key contributors to climate protection in traffic. Car manufacturers are required to reduce energy consumption in motor vehicles in order to help achieve the climate protection goals and to be able to succeed on the world market in a period of recession.

Vehicle emissions can be reduced considerably by high-efficiency engines and consistent lightweight construction. The necessary techniques have been developed and now await implementation. The Federal Environment Agency expects that cars in particular show very high energy saving potential: technical innovations in new vehicles are capable of reducing energy consumption by about 40 per cent by 2020 compared to today's new vehicles. Buses and HGVs offer a substantial energy saving potential of 15 percent. At the same time, innovative vehicle technologies can lead to less noise and a further reduction in levels of fine particulate matter (PM10) in the air we breathe.

THE NEW MOTOR VEHICLE TAX

Since 1 July 2009, motor vehicle tax for cars has not just been based on cylinder capacity, but also on CO₂ emissions. The lower the CO₂ emission, the lower the tax. To start with, owners of small and medium cars can benefit from this tax scheme. Petrol cars are taxed at two euros and diesel cars at 9.50 euro per 100 cubic centimetres (ccm) of cylinder capacity. The diesel car tax includes 7.50 euro for every 100 ccm or part of cylinder capacity as an energy tax compensation. CO₂ output is taxfree up to an allowance of 120 grams per kilometre for both petrol and diesel cars. Each additional gram costs a further two euros. In particular, fuel-efficient cars are favoured by this CO₂ allowance. Beginning in 2012 the allowance will be reduced to 110 grams of CO₂/km and starting from 2014, to 95 grams of CO₂/km.

The Federal Environment Agency welcomes the new motor vehicle tax scheme and, in particular, the gradual reduction of the allowances, since this encourages the development of more efficient engines. The cylinder capacity-based component of the motor vehicle tax reduces the effect of the CO₂ allowance towards fuel-efficient cars. Therefore, we suggest that this tax component should be based fully on CO₂ in order to provide greater incentive towards low-consumption cars.



Increasing the efficiency of cars

From the viewpoint of the Federal Environment Agency there are a number of measures which increase the efficiency of diesel and petrol engines and can markedly reduce friction losses in the power train from the engine via transmission to the wheels and thence to the road [15]. Even the optimization of conventional diesel and petrol engines can considerably increase their efficiency. Combining various technological options – such as a turbo charger applied to the intake air using the energy of exhaust gases and reducing cylinder capacity (supercharged petrol engine, downsizing), variable valve timing and direct injection – a reduction in fuel consumption of 25 to 30 percent can be attained. An additional hybridisation, i.e. the combination of electrical motors and internal combustion engines (see Box, page 17), enables even higher savings to be achieved, as much as 40 percent in comparison to conventional engines of the same power [16].

In addition to the above techniques, there is a wide variety of other technical options that can improve engine and power train efficiency. Low-resistance tyres and fuel-efficient engine oils, transmissions optimised for fuel efficiency, as well as gear change indicators also help (see Box). Inexpensive measures which cost a maximum of 25 euros per percent of CO₂ saved (related to the 1400 to 2000 cm³ cylinder capacity class) include cylinder capacity reduction, recycling of exhaust gases, friction minimization in the engine, improvement of engine heat management, variable valve timing, variable compression ratio and weight reduction.

A 20% increase in efficiency costs the manufacturers 280 to 330 euros on average for a petrol car. The economic benefit, expressed in simplified form as the fuel costs saved before tax over a car's service life of 12 years, is about 855 to 1850 euro depending upon engine capacity class. Higher manufacturing costs offset this advantage so that the economic balance is 280 to 330 euro smaller. This shows that CO₂ saving techniques are always worthwhile due to reasons of cost. If one takes into account the environmental and health costs averted, the net advantage increases by another 70 euros

per tonne of CO₂ saved (see also page 16). Consumers could save between 1,750 and 3,750 euros in fuel costs (including taxes) over the average service life of a car of 12 years. In view of the higher purchase price of the car and the CO₂-linked vehicle tax, which is lower with reduced CO₂ emission, the consumer can make savings of approximately 2,350 to 4,950 euros [18].

SIMPLE, EFFICIENT AND INEXPENSIVE



The following measures are further examples of where fuel savings can be made for petrol cars without considerable additional costs [17]:

Action	CO ₂ saving potential
Direct injection	↗ 5%
Optimized transmission design	↗ 4%
Low-resistance tyres	↗ 4%
Improved aerodynamics	↗ 1%

TABLE 3: MANUFACTURER’S EXTRA COSTS FOR 20 % CO₂ REDUCTION FOR A PETROL CAR

Cylinder capacity	< 1.4 L	1.4 to 2.0 L	> 2.0 L
Average CO ₂ emissions in 2006	144 g/km	177 g/km	223 g/km
Average fuel consumption	6.1 litres/100 km	7.5 litres/100 km	9.4 litres/100 km
20% CO ₂ reduction	29 g/km	35 g/km	45 g/km
20% saving in litres/100 km	1.2 litres/100 km	1.5 litres/100 km	1.9 litres/100 km
Cost per litre of fuel after tax 05/09	1.28 euros	1.28 euros	1.28 euros
Saving in litres over 12 years	1,368 litres	2,018 litres	2,925 litres
Advantage to the consumer (fuel saving)	1,751 euros	2,583 euros	3,744 euros
Manufacturer’s costs for 20% CO ₂ reduction (TNO et al., 2006)	720 euros	760 euros	910 euros
Manufacturer’s costs for 20% CO ₂ reduction according to UBA	281 euros	311 euros	329 euros

Source: Federal Environment Agency, own calculations [19]

Most of these inexpensive measures involve the engine. Considering the entire vehicle concept, vehicles with a petrol engine offer the greatest potential. Hybrid technology is currently relatively expensive, therefore it is expected that only start-stop automatic systems in new vehicles will enter the market in larger numbers over the short term. Full hybrids will be limited to the exclusive segment for a while. Image and marketing strategy will however bring hybrid technology into the general market and expand it to other classes faster than it would be reasonable to expect due to cost efficiency in terms of CO₂ reduction alone. Almost all important manufacturers intend to fully hybridize at least parts of their future new vehicle fleet. Table 3 represents manufacturer's extra costs for a 20-percent CO₂ reduction for petrol cars.



Twin movers are at work in the hybrid concept: an internal combustion engine and an electric motor. The internal combustion engine (currently a petrol engine in cars) and the electric motor are optimised to work together, which ensures as low as possible fuel consumption, low emissions and good handling characteristics. Optimal interplay between a combustion engine, electric motor and battery can only be accomplished using extensive technology and electronics. Hybrids are therefore more expensive, more complex and heavier than conventional cars based on today's technology.

In addition to cars, there is an excellent potential for hybrid engines to be used in heavy commercial vehicles. Especially urban buses and local delivery lorries in agglomerations profit from brake energy recovery since they make frequent stops and starts. The first vehicles are already being tested in demonstration projects and the first vehicle series from certain manufacturers should be available in 2010. The remaining hurdles of high costs can be lowered by market incentives for buying hybrid vehicles.

Farewell to fossil energy resources: the future is biofuels and electric vehicles

In addition to this efficiency increase in conventional vehicles which is fairly easy to introduce, an increasing number of manufacturers chose alternative fuels or alternative engine technologies. From the Federal Environment Agency's point of view there are promising developments which should be further investigated. Alternative engines – such as electric or hybrid vehicles – and alternative fuels gain importance in the future particularly due to developments in international car markets: In Asia and the USA for instance the development of alternatives to conventional engines is highly subsidised in order to drastically reduce the dependence on imported oil. Nevertheless – chiefly because of reasons of cost – efficiency increase in conventional engines will remain the key issue of energy conservation and climate protection in the transport sector over the coming years.

Second generation biofuels are currently the subject of research and development. All parts of the plant can be used in their production in contrast to first generation biofuels. According to estimations they exhibit a better CO₂ balance than first generation biofuels and could provide an effective contribution to energy supply for vehicles over the medium to long term. From today's point of view, this will result in clear climate protection advantages, especially when residual and old materials are used for production. The future of this option depends on the technical and economic feasibility of the conversion techniques employed. In addition, old and residual materials are also expected to find competing options. If biomass cultivation (for instance rape, grain, maize or sugar beet) is used for biofuel production, the atmospheric gas balance – particularly through the resulting indirect land use changes – can even have a negative result [20].

Electric vehicles can only play a bigger role in the longer term. The prospects for electric vehicles have markedly improved over the last years, due mainly to the performance of the The development of portable devices led to a substantial decrease in production costs of such accumulators over the past years. Manufacturers are currently developing all electrical components such as electric motors, control equipment and power electronics in electric vehicles for the automotive industry for use in hybrid cars. In addition, nearly all major manufacturers are working on electric vehicle concepts (such as including combustion engines as range extenders), some of which are being field tested. All in all, it appears quite realistic that electric vehicles will soon be ready for the market for some short distance application profiles in cars possibly by 2020.

On 19th August 2009 the Federal Government adopted the national development plan for electrical mobility. It states: „In order to prevail in international competition, Germany must become the leading market in electrical mobility and maintain the leading role in science and the automotive industry and its suppliers.“ The objective is to bring one million electric vehicles onto the road by 2020. The Federal Government already sponsors electrical mobility with 500 million euro from the Konjunkturpaket (Business Boosting Package) II. Eight model projects of the Federal Ministry of Transport are currently running.

SPEED LIMIT ON MOTORWAYS - INDISPENSABLE FOR CLIMATE PROTECTION



A general speed limit for cars on motorways in Germany would increase road safety and decrease noise and pollutant emission. A speed limit on German motorways would allow a greater vehicle capacity and reduce the frequency of tailbacks. This capacity increase would necessitate less motorway construction and extension. Lower design speeds allow narrower carriageways, which contribute to reducing land take. This action, which could be implemented at short notice, does not involve high costs and effectively reduces fuel consumption and carbon dioxide emission. The Federal Environment Agency's calculations indicate that a speed limit of 120 kilometres per hour would reduce the carbon dioxide emission of cars on motorways by about nine percent annually – assuming that 80 percent of the drivers adhere to it. This corresponds to a reduction of approximately three million tonnes of carbon dioxide. In addition to the direct environmental benefits, a speed limit could contribute to repositioning the vehicle fleet towards smaller, lighter and less powerful vehicles over the long term.

Silent cars for the future

Traffic is the number one source of noise in Germany. Noise is not only a nuisance, it can also lead to cardiovascular diseases. There are many possibilities of reducing traffic noise. Priority should be given to reducing noise directly at its source – for instance using quieter engines and tyres. Propulsion noise, tyre road noise and aerodynamic noise are the usual noise sources but the latter one is only noticeable at very high speeds. Tyre road noise caused by the interaction of the rolling tyre with the road surface offers the largest reduction potential. Suitable road surfaces can reduce tyre road noise and the roads can be built in such a way that they absorb part of the total vehicle noise and thus contribute to noise reduction. Porous asphalts, also called whisper asphalts, are good examples.

The vehicle tyres offer a high noise reduction potential. Current market analysis shows that car tyres are on average about 3.5 dB(A) below the legal limit today. The best tyres are even 8 dB(A) below the limit. In addition, market analysis shows no relationship between noise characteristics of a tyre and its price [21]. That is, quiet tyres do not have to be expensive and expensive tyres are not inevitably quiet. The European Commission plans to introduce obligatory marking for tyres from 2012 in order to make it possible for consumers to consider environmental aspects when choosing a tyre. The planned label should provide information about the tyre's rolling resistance, noise emission and wet braking performance. The Federal Environment Agency would expressly welcome such a marking. The intended labelling opens the possibility of increasing the market share of those tyres that most favourably meet all three parameters.

In addition, the European Commission intends to tighten the limit values for tyre noise emission from 2012 and introduce new limit values for wet braking performance and rolling resistance of tyres. Even if many tyres already meet the future limits, it is expected that the new regulation will promote extensive new developments but also result in increased costs. However, current estimates suggest that, based on conservative manufacturer's data, the costs are much lower than the economic benefit of the noise reduction achieved [22]. The additional costs per tyre are just a few euros – according to manufacturer's data.

III. LACK OF CHARGING THE ENVIRONMENTAL COSTS CREATES WRONG INCENTIVES

Passenger and freight transport not only provides mobility and a wide variety of goods on offer, but also costs the public money. The effects which impact the general public, i.e. effects not limited to people participating in transport are so-called external effects. These effects may provide benefits or cause costs to society. External effects distort the perception of the economic importance of transport. The positive economic effects of transport are frequently overemphasized. The enormous costs which the transport sector places on society are unfortunately all too often not taken into account. Transport harms the environment in many ways and involves a great deal of subsequent costs which are caused but not compensated for by people participating in motorised transport. The consequent costs of an accident not covered by insurance are part of these external costs, as well. Therefore, high environmental and health costs are not reflected in high prices and the public, not the initiator, must pay the subsequent bill. This is negative for two different reasons: First of all, transport volume increases faster than would be optimal from an overall economic point of view because the cost of transport is rather underestimated. Secondly, this tends to lead to environmentally damaging means of transport being used more extensively because higher environmental costs do not result in higher transport costs compared with more environmentally friendly means. Charging of environmental costs to the polluter would eliminate these poor incentives. Investigations by the Federal Environment Agency show that there is still room to manoeuvre [23]. HGVs starting from 3.5 tonnes cause, on average, 20.4 cents of environmental, accident and health costs per vehicle kilometre and 17 cents of infrastructure costs – in relation to the total German road system. The HGV toll is currently an average 16.3 cents per vehicle kilometre and is still far from the actual costs.

The polluter-pays-principle is not equivalent to higher taxes or fees. Administrative regulations – such as stricter emission limits – or compulsory installation of particle filters also encourage investment into more environmentally friendly techniques. In this aspect environmental protection contributes to reducing external

costs (see Box). If, as described above, investment into the right transport system is implemented, the subsequent costs for the public will decrease. This would result for example in reduced costs for treatment of illnesses due to environmental effects and in lower costs for flood and disaster control for the public budget.

KNOWING EXTERNAL COSTS - ENHANCING ENVIRONMENTAL PROTECTION



How do environmental economists calculate what the emission of a tonne of carbon dioxide or a traffic accident costs to the national economy? They determine this by an economic assessment of the damage inflicted to the environment and to our health. However, the uncertainty of such estimates is very large – not least because of very different approaches. In order to ensure transparency and a uniform appraisal procedure, the Federal Environment Agency has compiled a method convention [24], which enables a comprehensive economical evaluation of environmental damage. The cost for cars for instance is six cents per person-kilometre.

Road transport causes the highest environmental cost by far

In 2005 the external cost of transport was approximately 80 billion euro in Germany – as calculated by Infrac [25]. Road transport carries the lion's share with 96 per cent of all costs, while two thirds of the total costs are due to cars (see Figure 4). A comparison of the specific costs of the passenger transport (costs per person-kilometre) shows that above all others, cars and air transport cause the most severe damage (see Figure 3).

FIGURE 3: AVERAGE EXTERNAL COSTS OF PASSENGER TRANSPORT IN GERMANY 2005

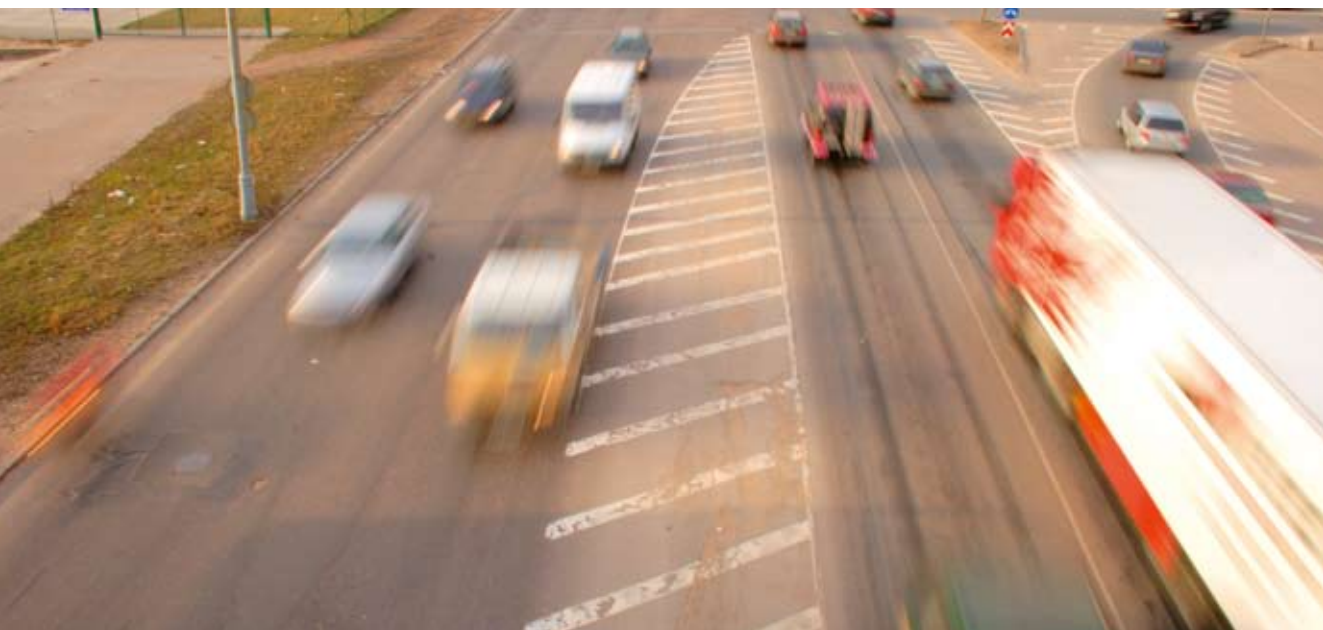
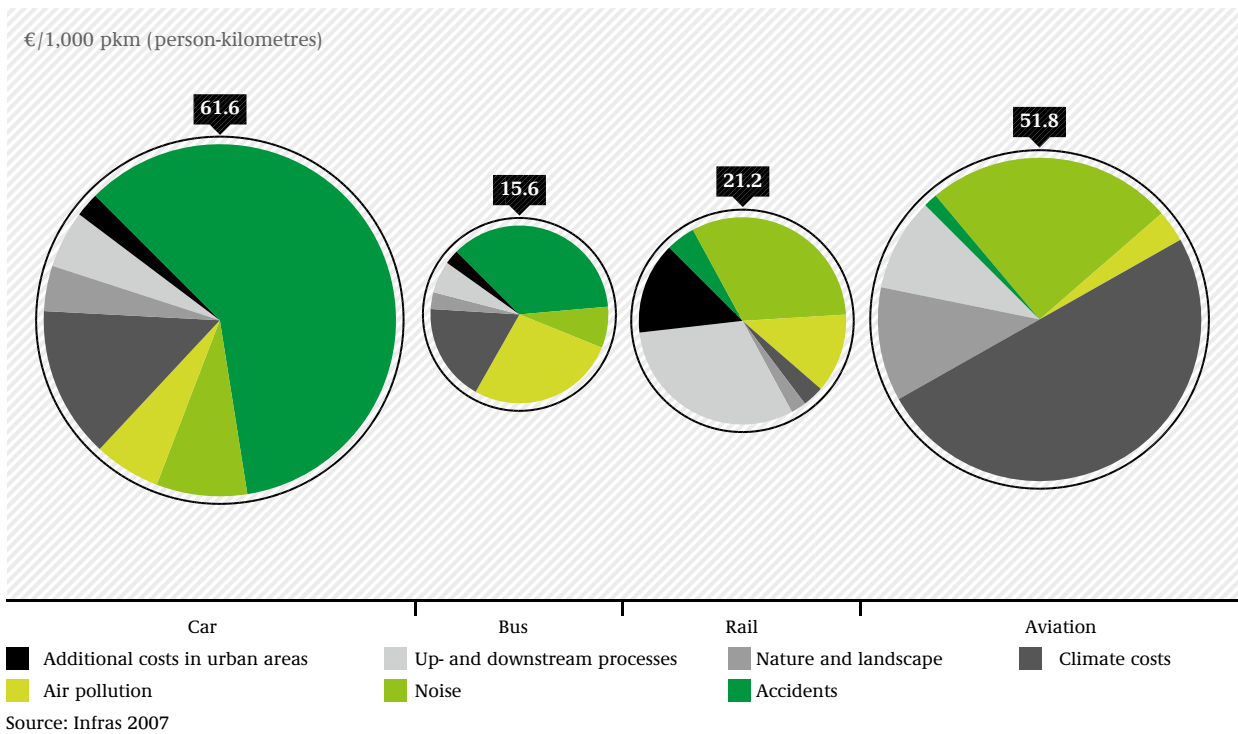
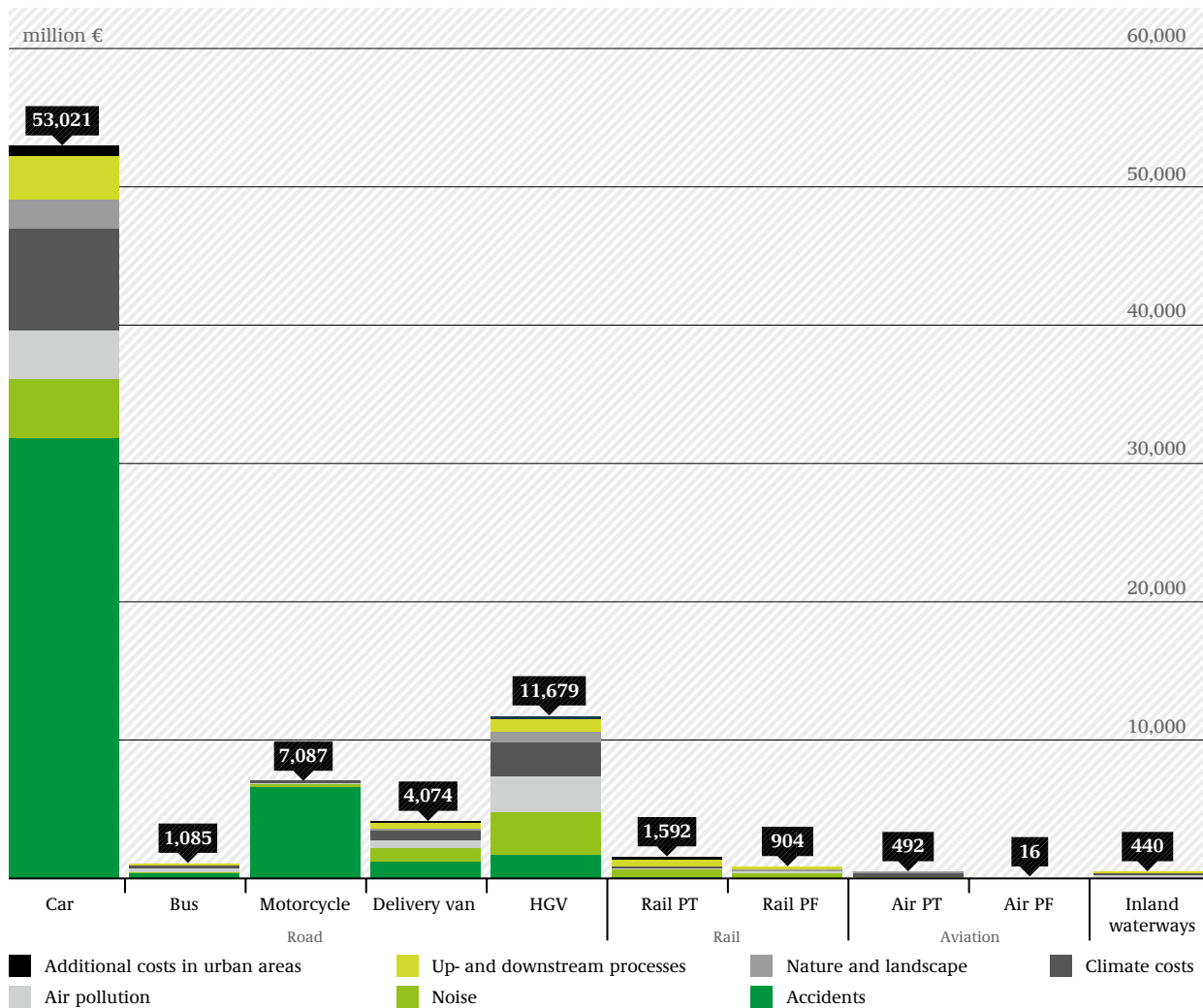


FIGURE 4: EXTERNAL COSTS OF TRAFFIC IN GERMANY IN 2005



Transport generates a high income in terms of taxes and fees. Therefore the automobile is frequently called ‘the nation’s cash cow’. A study by the Technical University of Dresden shows that this view is far from reality because the cost for society, resulting from automobile traffic, is much higher than the income raised by taxes and fees on motorists [26]. Thus the approximate 80 billion euro per year external environmental and accident costs of road transport exceeds the revenue from oil tax, HGV toll and vehicle tax of about 50 billion euro per year. Road costs of about 30 billion euro needed for maintaining the road system should also be added. The bottom line is that well over 60 billion euro of road transport costs in Germany remains unrecovered.

Internalisation of the external cost of transport

Current conditions do not yet allow us to charge the environmental costs of traffic sufficiently. However, an efficient and environmentally compatible transport policy may not be limited to making traffic more expensive. If one succeeds in reducing the environmental impacts caused by traffic, the external costs would also decrease, for which the polluters would have to be made responsible. Suitable actions and instruments could help reduce the damage to the environment. This is also a key objective of the ‘Greening Transport Package’ initiative submitted by the European Commission on 8 July 2008. A part of the package is a report from the commission on rail freight transport noise which suggests introducing route prices for rail wagons graduated according to noise emissions as an internalisation mechanism. Another part of the package is the suggested amendment of the Eurovignette Directive on which the HGV toll is based. The amendment’s goal is to specify a framework which the member states can



use to calculate and vary road tolls depending upon traffic-linked air and noise pollution and traffic volume. The Federal Environment Agency considers the proposed amendment of the directive a step in the right direction. However, the suggestion does not go far enough because it ignores subsequent accident and climate costs. The method used fails to determine the external costs of noise sufficiently which results in noticeably underestimated costs.

Without changing the Eurovignette Directive, Germany can only consider the road costs when calculating the HGV toll. But there are further possibilities for better allocation of the costs. The Federal Environment Agency therefore suggests expanding the HGV toll to all roads and all commercial motor vehicles over 3.5 t gross weight. Since the per kilometre road costs for HGVs are somewhat higher over the entire road system than on motorways, the average HGV toll would also increase. An effective combination of synergistic actions is the best solution for achieving a strong protective effect for the environment. Trades, industry, shipping companies, traffic and town planners as well as each citizen must use their creativity in order to find ways of avoiding traffic and shifting existing traffic towards a more environmentally compatible means of transport. Existing transport route capacities and vehicles must be better utilized and the internalisation of external costs can provide the right incentives for this task.

Air traffic: climate consequences and aircraft noise

With an annual growth in capacity of five percent on average, air transport is one of the fastest growing transport sectors [27]. Air traffic going out from Germany (calculation based on the quantities fuelled in Germany) emitted approximately 25 million tonnes of CO₂ in 2005. The effect on the climate corresponds to at least twice that because the emissions occur at high altitude. Unhindered growth would mean doubling these values again by 2020, which would eradicate a

large part of the effort for a 40 percent reduction in climate gas emissions by 2020 compared to 1990. Therefore the specific emission must be reduced in future to offset the effect of the increase in traffic volume, thus preventing total emissions from increasing. This not only includes climate gas emissions, but also noise and pollution from air traffic. The Federal Environment Agency suggests that air traffic based CO₂ emissions from Germany should be stabilized at the 2005 level by 2020. In addition, it must be guaranteed that the pollution emission limits are not exceeded. A pre-requisite for investing in the future of air traffic is a sustainable policy. The use of economic regulatory instruments which remove subsidies and apportion external costs to the polluters is indispensable for air traffic. Inclusion of air traffic in emissions trading has been a step to the right direction. Abolishing the energy tax exemption for kerosene and introducing value added tax for international flights would not only be ecologically beneficial, but would also serve to justify other means of transport and other branches of industry. The incentive to reduce CO₂ emission already attracts investment into low-emission technologies. Emission-based landing fees or imposing quotas may provide incentives for investment into mitigating locally emissions (noise, pollutants). Ambitious permission limits may provide additional incentives for aircraft manufacturers to invest into noise and pollutant reduction technologies. Priority must be given to noise reduction at source, but operational regulations for active noise protection are also necessary – including night-time operation. In addition, investment is also needed into ambitious noise abatement methods and soundproof buildings.



Sustainable inland waterways transport

From the environmental protection's perspective, water based transport has advantages over HGV transport, particularly because of lower specific CO₂ and noise emissions. However, inland waterways transport affects the environment both directly and indirectly and causes various ecological conflicts, which have to be considered if we want to achieve environmentally compatible movement of freight.

Direct environmental impacts resulting from boat traffic, include the emission of airborne pollutants such as particulate matter, sulphur dioxide, NO_x, carbon monoxide and the climate gas carbon dioxide. The average age of the German inland fleet is about 40 years. In order to reduce airborne pollutant discharge by canal and river boats, they must be refitted with modern exhaust gas treatment systems. The introduction of low-sulphur fuels in freight carrying boats reduces the airborne pollutant discharge. Engine overhaul and re-fitting the fleet with more efficient transmissions as well as the development and introduction of low-resistance, aerodynamic geometry (new hull forms, catamaran principle) increases energy efficiency and reduces climate gas emissions through lower fuel consumption.

The potential indirect environmental effects due to river regulation and maintenance work include losses in natural characteristics of waters (for example opportunity for migratory fish to move freely), water table reduction, habitat changes, loss of biodiversity and damage to water-meadow landscapes. Because of major harm to river and water-meadow systems caused by the construction and maintenance of navigable waterways, the development of boats better adapted to rivers is particularly important for an environmentally compatible inland fleet.

From the environmental protection's perspective, the development should not be channelled towards further river regulation but rather to adapting the boats to the specific river conditions.

Summing up: in addition to reducing pollutant and CO₂ emissions, river regulation and maintenance should be kept to a minimum and the use of waterways and rivers should be investigated using (ecological) CBA. The results should be included in the assessment of the means of transport 'inland waterways transport' under environmental aspects.

Due to the low network density (small number of waterways per area), low speed and lack of flexibility in terms of time, inland waterways transport is usually only suitable for transporting bulk freight and containers with non time-sensitive goods. The exclusive specialization of bulk shipments only makes a shift from road to inland waterways feasible in isolated cases. Besides, nearly 90 per cent of inland waterways transport is concentrated on the Rhine and the adjacent West German canal systems which limits the transfer potential geographically. For this reason, only a marginal importance is attributed to inland waterways transport as an alternative means of transport in scientific discussions. Only rivers with plenty of water or fully regulated waterways can make the inland fleet a meaningful alternative to road transport today. Inland waterways transport on rivers suffering from a water shortage (for example Elbe, Saale) – and because water levels are expected to drop in the future due to climate change – should be shifted onto the railways which are more suitable for bulk material transport. This should be considered in the amendment of the Federal Transport Infrastructure Plan.



Conclusion

Environmental protection is not a luxury item. Especially as state budgets are scarce investments should be as efficient as possible. Economic assessment of the damage to the environment makes it possible to estimate the economic advantage of using environmental activities to avoid or mitigate this damage. Today's environmental policy prevents damage to the environment tomorrow. There is no other field where this is more visible than in climate policy. The Federal Environment Agency's publications prove that it is worth protecting our climate since the costs of preventive actions are smaller than the follow-up costs of no-action at all [28 – 30].

Correctly investing is not synonymous with higher costs or fees for citizens. It is a fair cost distribution when traffic-generating and environmentally disadvantageous subsidies are dismantled and the funds are shifted to favouring more environmentally friendly means of transport.

Technical innovations and their market penetration made the largest contribution to reducing emissions over the last few years, but they cannot achieve all the desirable environmental goals in the transport sector. Half of the greenhouse gas mitigation in the transport sector must be made possible by procedural actions.

We must transfer traffic to more environmentally friendly means of transport – for instance transferring passenger transport from the car onto railways, busses and bicycles and freight transport from LHV to the railways and inland waterways – and, where it is feasible, avoid unnecessary traffic altogether. Shorter transport distance offers cleaner air in the city centres, less noise and helps to maintain biodiversity in non-fragmented habitats.

Experience shows that traffic fails to reach its environmental objectives if the goals are considered simply as flexible guidelines. Therefore, the Federal Government should unite its efforts in a strategy of sustainable mobility. This strategy should specify the extent of traffic and means of transport that the Federal Government would like to use to guarantee tomorrow's mobility. In addition, the strategy should emphasize the ways in which to take full advantage of the scientific possibilities in the transport sector.

The Federal Government can use the Federal Transport Infrastructure Plan to set the course for avoiding and transferring traffic. It should be possible to develop a methodology which considers the environmental goals as obligatory at all stages of the planning process. The Federal Environment Agency has developed proposals for this purpose. It is of crucial importance that the investment required by the growing freight transport sector can be channelled toward the extension of the railway system. Removal of existing bottlenecks must begin immediately and plans for developing the railway system by 2025 must be started today because of the long planning periods. With the Federal Environment Agency's suggestions, it is possible for the Federal Government to refrain from extending the capacity of the federal trunk road network.

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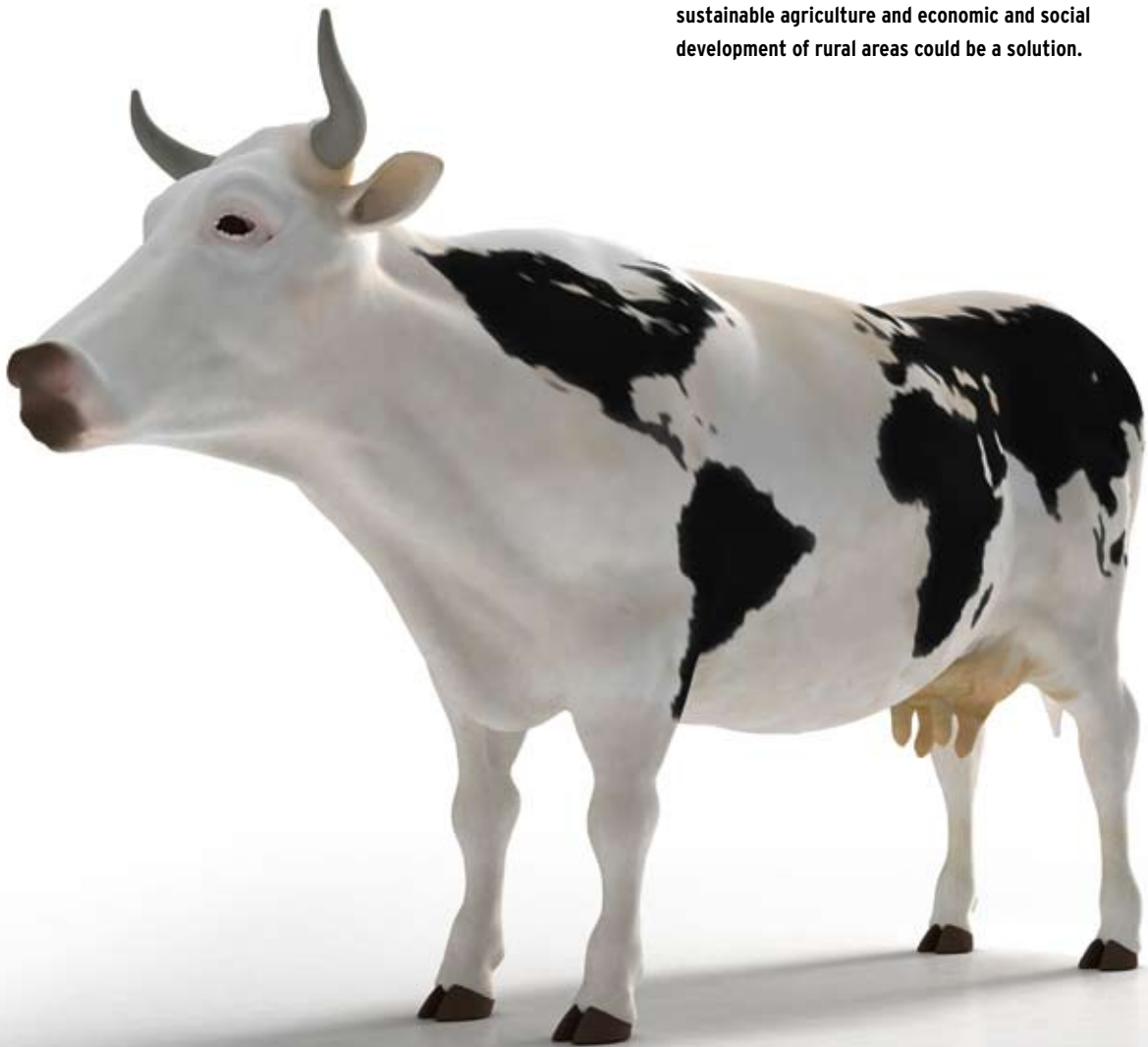
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Yet there are still critics who say that environmental protection restrains economic growth, innovation and investment – also for agriculture.

ENVIRONMENTAL PROTECTION - A BARRIER TO INVESTMENT FOR

The atmosphere is warming up and the world's population continues to grow. Investment in sustainable agriculture and economic and social development of rural areas could be a solution.



AGRICULTURE?

They say that overly restrictive government, ponderous bureaucracy, tough restrictions and lengthy approval processes – e.g. for stable construction – supposedly frighten potential investors, slow down investment, and would thereby render Germany unattractive for agriculture in the long run. As a consequence, production would be outsourced abroad resulting in less value added, less jobs and decreased tax revenue. These critics also question whether the then imported agricultural products could match local products in terms of quality and safety, but fear that in future this important question will no longer be asked.

But there was no investment slowdown in German agriculture up until the end of last year. In 2008 the partial rise of food prices and federal renewable energy subsidies, namely for renewable raw materials and the feed-in tariffs under the Renewable Energy Sources Act (Erneuerbare-Energien-Gesetz) (in the past these subsidies also included the premiums paid out for setting-aside food and fodder plant areas, to counteract surplus problems), created an overall optimistic mood, despite the impending financial crisis. The German Farmers' Association pronounced "a period of rediscovery of national significance for agriculture"[31].

The Agrarinvestitionsförderprogramm (federal programme for the promotion of agricultural investment) at present contributes 250 million euros annually and triggers private investments four times that amount. Whoever ordered agricultural machinery and equipment in 2008, faced delays in delivery: a strong demand for German agricultural technology products from foreign countries – e.g. Russia – exceeded the capacity of the industry. According to the Association of Russian Agricultural Technology Manufacturers, Russia imported machines in excess of 1.35 billion euros in the first half of 2008, 28 percent of it from Germany [32]. According to the Bundeslandwirtschaftsministerium (Federal Ministry of Food, Agriculture and Consumer Protection) Germany exported agriculture machinery worth 53 billion euros in 2008. This makes Germany the fourth largest exporter of agriculture machinery worldwide with a record growth of 15 percent compared to 2007. In agricultural and food industries, every fourth euro originated from exports.

The agrarian sector boomed worldwide, and Germany “did well” with capital goods and in the agriculture and food industries. Research and development, innovation, high-tech and quality products created and protected jobs and tax revenues up until the worldwide financial and economic crisis which is of an unforeseen magnitude and as yet uncertain duration. The German Council of Economic Experts corrected its growth prognosis of plus 0.2 to minus 6 percent within half a year (from the 2008 autumn appraisal to the 2009 spring assessment).

Can agriculture and environmental protection contribute to overcoming the crisis? Can environmental protection drive innovation and growth, protect and create jobs during economically difficult times? Or could both emerge even stronger from this crisis? There are two main arguments for such assumptions:

- The food sector was not that badly hit by the crisis. Naturally, demand decreased to a lesser degree than in other sectors of the economy. In contrast to other activities that drive demand, eating and drinking can only be cut back to a lesser extent.
- Overall conditions for future growth are still favourable: a growing world population, increasing prosperity in population-rich newly industrialized countries and the intensified search for alternatives to fossil energy resources create strong demand. The Food and Agriculture Organization of the United Nations (FAO) forecasts a worldwide rise in the demand for agricultural products (excluding biofuels) of 1.6 percent p. a. until 2015 and by 1.4 percent p. a. after that until 2030.

But experts fear that agricultural production in Australia, India and parts of Africa will decrease substantially as a result of climate change. However, the food production potential for Northern Europe, North Asia and North America is likely to rise. The arability frontier shifts northward due to global warming. But nobody knows how large and productive the newly created agricultural areas might be.

European agriculture and rural development

Increasing demand for agricultural products and geoclimatic advantages strengthen Europe’s standing in agriculture – which does make sense from a global environmental and climate protection perspective.

From a climate policy’s point of view it would make no sense to throttle production in Germany and to instead increase agricultural production in other countries where production might entail higher greenhouse gas emissions. With consumption remaining at the same level this would create an even bigger, though relocated, “ecological footprint”.

The Common Agricultural Policy (CAP) of the European Union (EU) reacted to the worldwide increase in demand of recent years. First, the European Commission stalled the set-aside programme, and then, in November 2008, the Ministers of Agriculture of the European Union agreed to abolish it altogether pursuant to the CAP health check (see BOX). Creating market equilibrium for food and feeds by means of planned production control measures – the original idea behind the set-aside programme – is no longer necessary in view of the above described developments. Export refunds, with which European Union surplus products were subsidized down to world market pricing levels and then sold there, are now obsolete and must be discontinued anyway in consideration of World Trade Organization resolutions and development policy. Subsidized agrarian exports of the European Union obstruct the development of agriculture in developing countries, since they keep prices low and cancel out incentives for local production. They are thus counterproductive to developmental policy.

In view of the pressure from the World Trade Organization and the coherence requirement anchored in the Treaty on European Union (which stipulates that measures from policy areas such as agricultural policy and development policy have to be reconciled), the fact that the European Commission has just reinstated export refunds (subsidies) for milk in order to prop up milk prices in the EU, can only be temporary until other, better mechanisms to support the dairy cattle industry can be implemented. From an environmental protection perspective, conserving high nature value grasslands in the context of rural development should be a priority. The use of grasslands is typical for traditional dairy cattle farming, it is also important for the conservation of biodiversity. The practice of state interventions in European Union domestic markets in the form of government purchases of surplus and their subsequent storage in order to limit supply and stabilize prices, has already decreased substantially. As per an agreement of the Ministers of Agriculture of the European Union of 20 November 2008, such measures are only to be used in the long run as a “safety net” in periods of crisis such as extreme price drops.

MAKING EUROPEAN UNION AGRICULTURAL POLICY MORE EFFICIENT



In 2003 the EU Ministers of Agriculture agreed to a fundamental reform of the Common Agricultural Policy (CAP) for the years 2005 to 2013 (Agenda 2007). Making CAP simpler and more efficient was to increase acceptance among citizens and farmers since a large part of the annual European Union budget goes to agriculture. In 2008 this amounted to 52 billion euro (43.6 percent). Agriculture and Rural Development Commissioner Fischer Boel initiated a mid-term review (health check) for the Agenda 2007. The check-up is focussed on three areas: How can the system of direct payments be made more transparent and efficient? How can market intervention mechanisms be employed sensibly? And how can the European Union best meet the new challenges brought about by climate change?

Political decisions resulting from the 'health check' include regulations for energy crops, the omission of set-aside programmes, the step-by-step abolition of milk production quotas and partially diverting direct subsidies to rural development (second pillar of CAP). To date, the European Commission reduced all direct

payments above the exemption amount of 5,000 euros by 5 percent annually, and transferred the achieved budget savings into the budget for rural development (compulsory modulation). This rate will be gradually raised to 10 percent by 2012. For payments of direct subsidies over 300,000 euros there is an additional annual deduction of 4 percent (progressive modulation). For the environment the increased modulation means that in future, higher amounts for agrarian environmental measures could be available in Brussels. However, they must be co-financed nationally which means that complementary funds must also be increased in the member states.

More information:

www.ec.europa.eu/agriculture/healthcheck/index_en.htm



There remains added hope that the CAP ‘health check’ resolution for the modulation increase in support of rural development will draw further investment, especially in economically weaker regions, particularly since it is not exclusively focused on investment in agriculture and its competitiveness. Further areas of emphasis per Regulation [33] are:

- improving the environment and the countryside (particularly with so-called agri- environmental programmes),
- increasing quality of life in rural areas and the diversification of rural economy (trade, tourism, manufacturing) as well as
- support for the LEADER projects by local action alliances that operate according to the “bottom-up” principle (see BOX, p.31).

To achieve this, the four axes of the EAFRD Regulation must have minimum quotas attached in order to prevent excessive amounts being assigned to axis 1 (competitiveness) and thereby disproportionately subsidizing the admittedly distressed dairy industry over the short term. Second pillar measures are subject to a co-financing provision, i.e. European Union funds are only released if the member states contribute their part (differentiated by old and new members). This places demands not only on the European Union, but also, in Germany, on the Federal Government and the Federal States. The Federal States in particular have significant discretion in deciding on the distribution of funds for the four development axes which they use in very different ways.

It appears that the European Union wants to better support rural development financially in keeping with its increased political significance. Several decisions made in the context of the CAP health check, the 10 percent modulation increase, the additional deduction of 4 percent on direct payments over 300,000 euros, and the transfer of the thus liberated funds to the second pillar of CAP strengthen it, as do the efforts of more effectively integrating it with other policy areas such as structural policy. Though this is no longer part of agricultural policy, but is rather implemented by the Directorate-General for Regional Policy using instruments such as the European Regional Development Fund (ERDF) and the European Social Fund (ESF). For the next reform of the Common Agricultural Policy, for the time period after 2013, it appears that the “quid pro quo” principle will likely be more prevalent. This would mean that public assistance will only be granted as payment for services, ecological or otherwise, for which there is direct demand in society. The importance of today’s direct payments, which are coupled to the adherence to already existing legal obligations via Cross Compliance, would continue to decrease.

Are agricultural investments on the right track?

Agriculture already invests more actively and intends to continue to do so in the future. But are these investments on the right track? Do they lead to a sustainable rural development that is economically, ecologically and socially balanced, pursuant to the “Agenda 21” decided at the world summit in Rio de Janeiro in 1992? Are they in accordance with the amended Article 20a of the German Constitution wherein the state guarantees not only the protection of the environment, but also that of animals? Or are they just a flash in the pan at the expense of natural resources for which we will have to pay later, but all the more dearly? In the following paragraphs we will present some important indicators that show the state of development of the agri-environmental situation.

Since 1991 the European Union has supported rural areas within the LEADER programme. LEADER stands for “Liaison entre actions de développement de l’économie rurale” (Links between actions to develop rural economy). It deals with projects from all areas relevant to the development of rural areas such as economics, social, tourism, culture, environment and agriculture. Regions which have formed “Local Action Groups” (LAG) are eligible for participation for the purpose of finding solutions to their developmental problems.

More information:

www.netzwerk-laendlicher-raum.de/regionen/leader-regionen/

Establishing prospects for rural development

According to the European Commission the review of the Common Agricultural Policy in 2008 (the so-called “health check”) is supposed to “modernize, simplify and streamline it and remove restrictions....” Relevant in terms of environmental protection is, among other things, the intent to add emphasis to climate change, renewable energy, water management (above all water scarcity) and biodiversity. Beginning on 1 January 2010, member states are supposed to add “types of operations in accordance with their needs” to their rural development programmes to address these new challenges. For this, the European Commission offers an indicative list of types of operations (in Annex II of the new EAFRD Regulation), from which the member states can select when compiling their national strategies. The European Union wants to produce the necessary funds with increased modulation and by transferring the generated cash into rural development. The crucial instrument for the implementation is the aforementioned EAFRD Regulation, particularly the goals of improving the competitiveness of agriculture and forestry and improving the environment and the countryside.

Germany implements the environmentally relevant resolutions via “The Joint Task for Improvement of Agricultural Structures and Coastal Protection” (GAK). But, as mentioned before, European Union funding for rural development measures is only available through national co-financing (co-financing provision, 50 percent in the old Federal States, and 25 percent in the new Federal States). The Federal Government as well as the Federal States are under an obligation. For “the new challenges” such as “Natura 2000”, the EC Water Framework Directive, climate change, and renewable energy, the EU share of financing is relatively high at 75 percent (in “convergence regions” with lower gross domestic product even 90 percent), which facilitates co-financing of the programmes and investments.



What are the environmental problems?

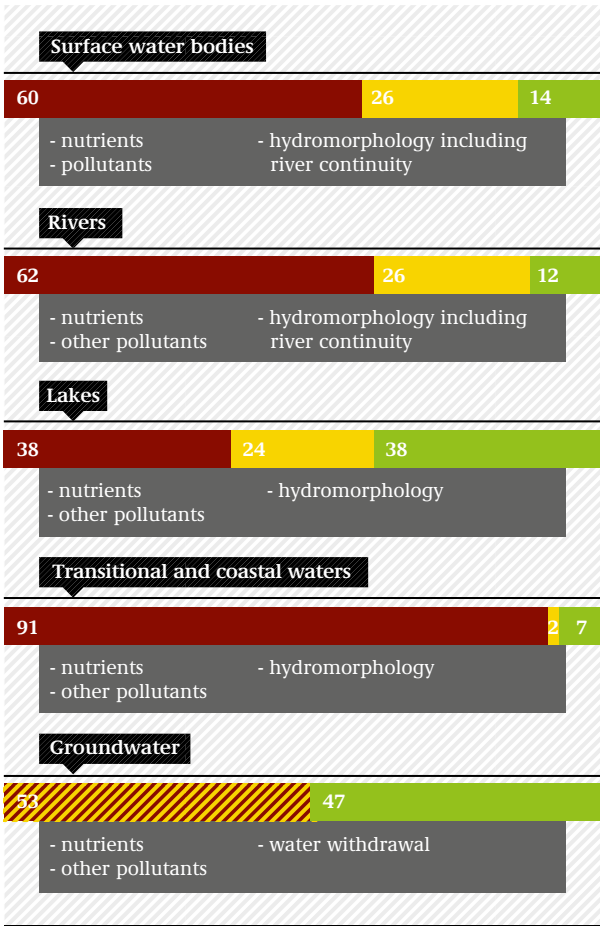
Germany’s report according to Article 5 of the EC Water Framework Directive of 22 March 2005 to the European Commission (see also page 35), points out that: for 60 to 85 percent of the surface water bodies and 53 percent of the groundwater bodies further action is necessary in order to achieve the required goal of “good status” by 2015 (Figure 5). The most important causes for missing the goals are, among other things, eutrophication and contamination. In lakes, coastal waters and groundwater they are the principal reasons for missing the goals.

A casual look at this topic is at first encouraging. In recent years there has been at least a temporal link between investments in agriculture and a decrease of environmental impact in rural regions [34]. The contaminant load of surface waters in Germany has improved noticeably in recent decades. A comparison of the biological water quality maps from 1975 to 2000 indicates that since the 1970s, improved and intensified waste water purification measures created a noticeable improvement of biological water quality. The proportion of mapped watercourses with quality class II and better classification increased from 47 percent in 1995 to 65 percent in 2000. However, the main contributing factors were new construction and improvement of municipal waste water treatment plants as well as the use of phosphate-free laundry detergents. Though farmers have been more careful and efficient with fertilizers than in the 1980s, they can and must continue to significantly reduce their balance surpluses.

Today agriculture’s share of nutrient inputs into surface waters stands at two thirds for nitrogen and half for phos-

phorus (see Figure 6). These inputs are a significant reason for the eutrophication (overfertilization) of lakes and dammed watercourses with excessive algae growth and oxygen deficiency. In the sea “algal blooms” may occur and also “black spots” in mudflats due to oxygen deficiency. Eutrophication is therefore not only a problem for the environment – it is also an economic problem. Because it indirectly endangers jobs and income since it renders affected regions unattractive for tourism and fishery.

FIGURE 5: RESULTS OF THE 2004 RIVER BASIN DISTRICT ANALYSIS AND MAJOR PRESSURES ON SURFACE WATERS AND GROUNDWATER IN GERMANY



Goal attainment in % (percentage of water bodies):

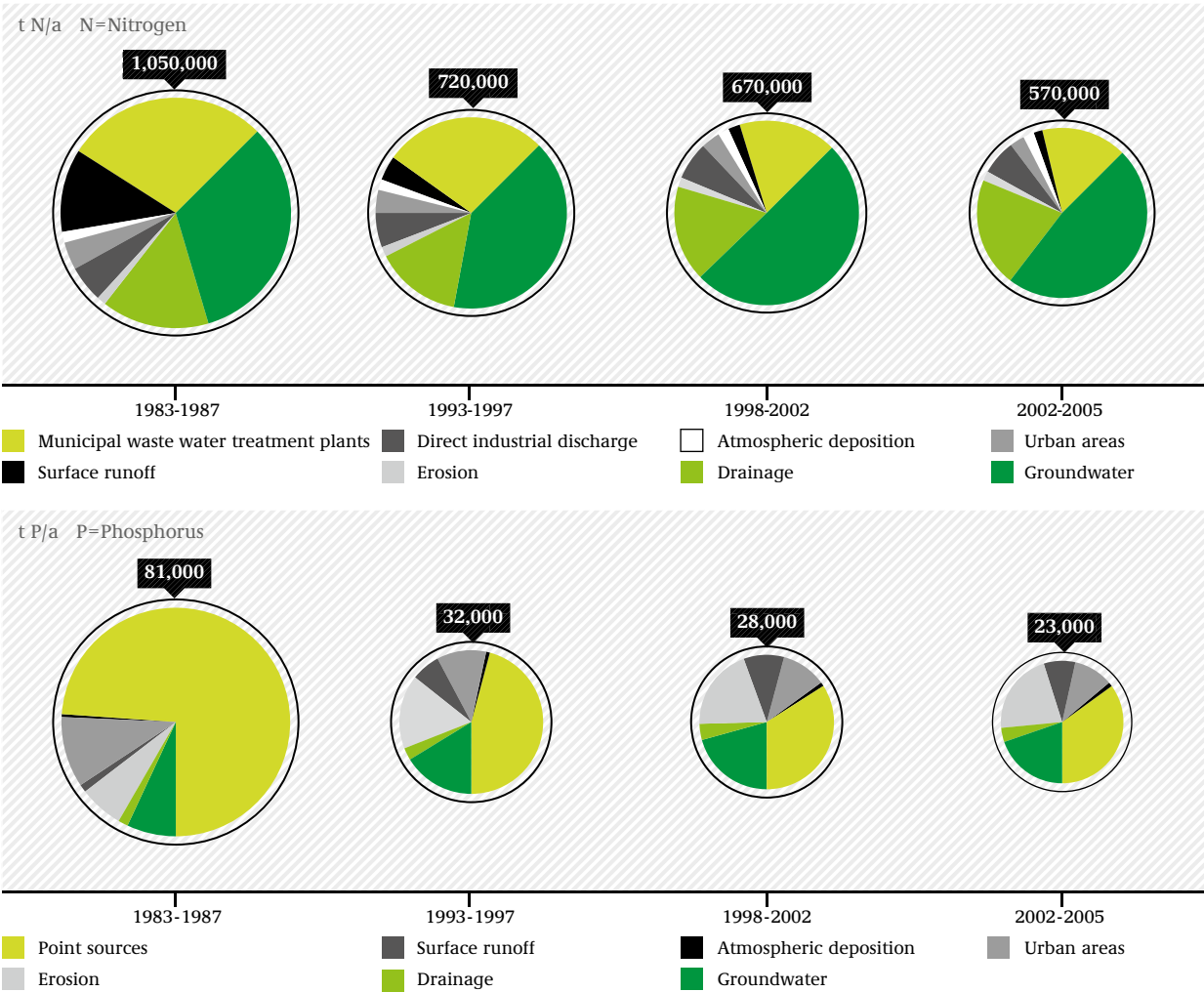
- Unlikely
- Uncertain
- Probable
- Most important reasons for not reaching goal

Source: Federal Environment Agency

The cause of eutrophication is nutrient inputs from the area, meaning diffuse sources of nutrients. They are highest wherever excessive livestock densities are kept on output-prone land such as with sandy soils. With phosphate these problems exist in the far north-west with its boggy soils, with nitrogen all over the northwest (sandy soils) and in some areas of the Alpine foothills (high run-off). Pesticides are major pollutants for waters – particularly for small water bodies and groundwater. The reasons for exceeding environmental quality standards for pesticides are usually inappropriate application, farmyard runoff and accidents. Emissions from agriculture are also a problem for air pollution control and climate protection. The cause is predominantly animal husbandry and associated processes, like the storage of organic fertilizer (liquid manure, dung, muck) and its distribution on fields or grassland. The most important effects of the emission of nitrogen compounds into the atmosphere are: increased greenhouse gas concentrations, the formation of particulates from precursor substances, acidification and eutrophication of nutrient-poor soils and ecosystems. This results in the endangerment of flora and fauna and further forest damage. Methane emissions constitute a relevant portion of gases that affect the climate. They make up 4.4 percent of total greenhouse gas emissions

– approximately 50 percent comes from cattle farming alone. Using internationally accepted reporting standards it turns out that German agriculture contributes 5.4 percent to national greenhouse gas emissions. However, this does not include processes that are not considered agricultural in nature, such as inorganic fertilizer synthesis and humus extraction from drained bogs (if these were included, the total would come to approximately 13 percent of national greenhouse gas emissions). In the past 20 years livestock-related emissions of ammonia and ammonium into the air have been declining [35]. It nevertheless seems questionable whether Germany can meet its internationally agreed obligations for reducing ammonia emissions (see page 38).

FIGURE 6: NITROGEN AND PHOSPHORUS CONTAMINATION IN SURFACE WATER BODIES IN GERMANY

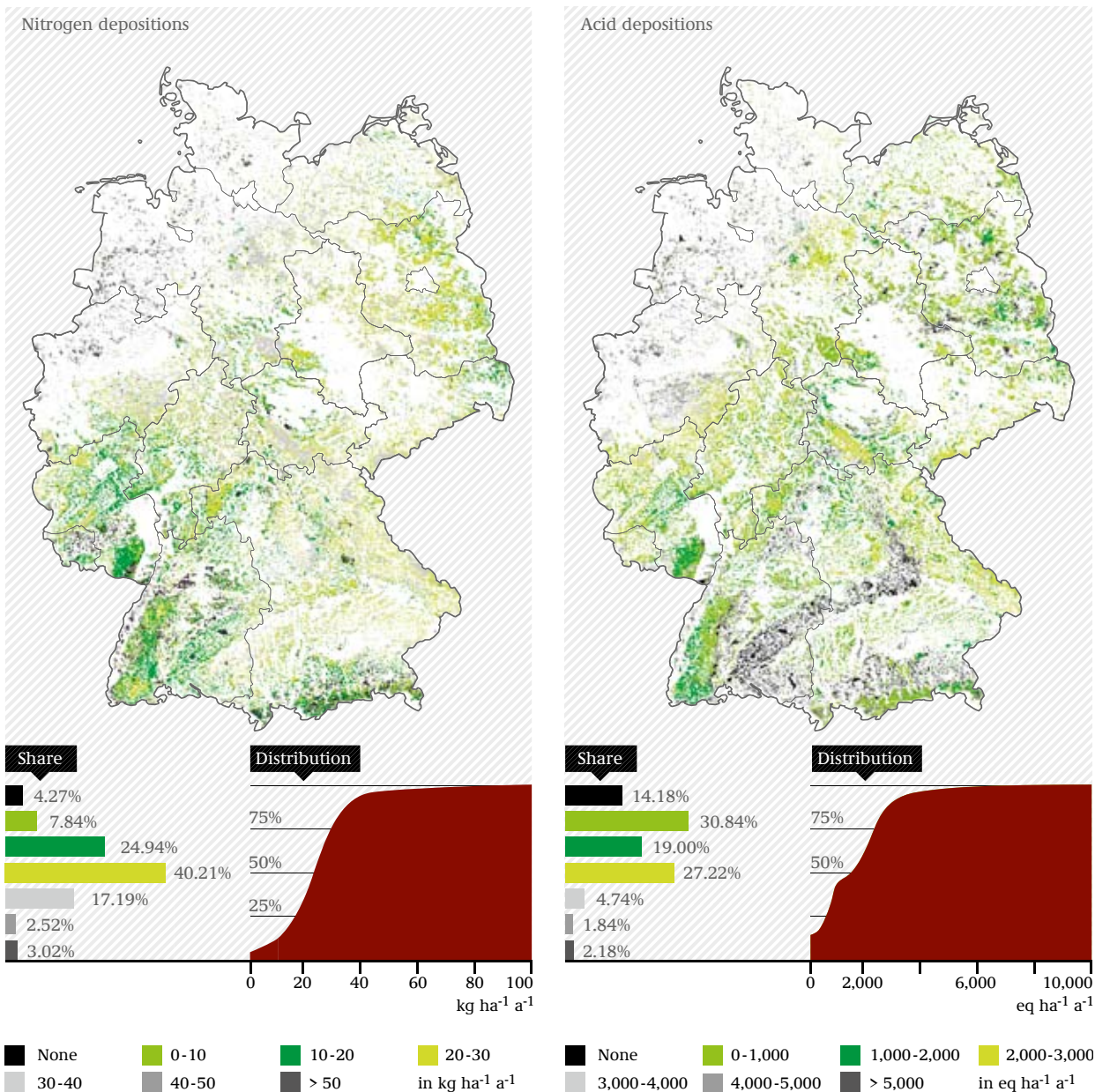


Source: Federal Environment Agency 2009



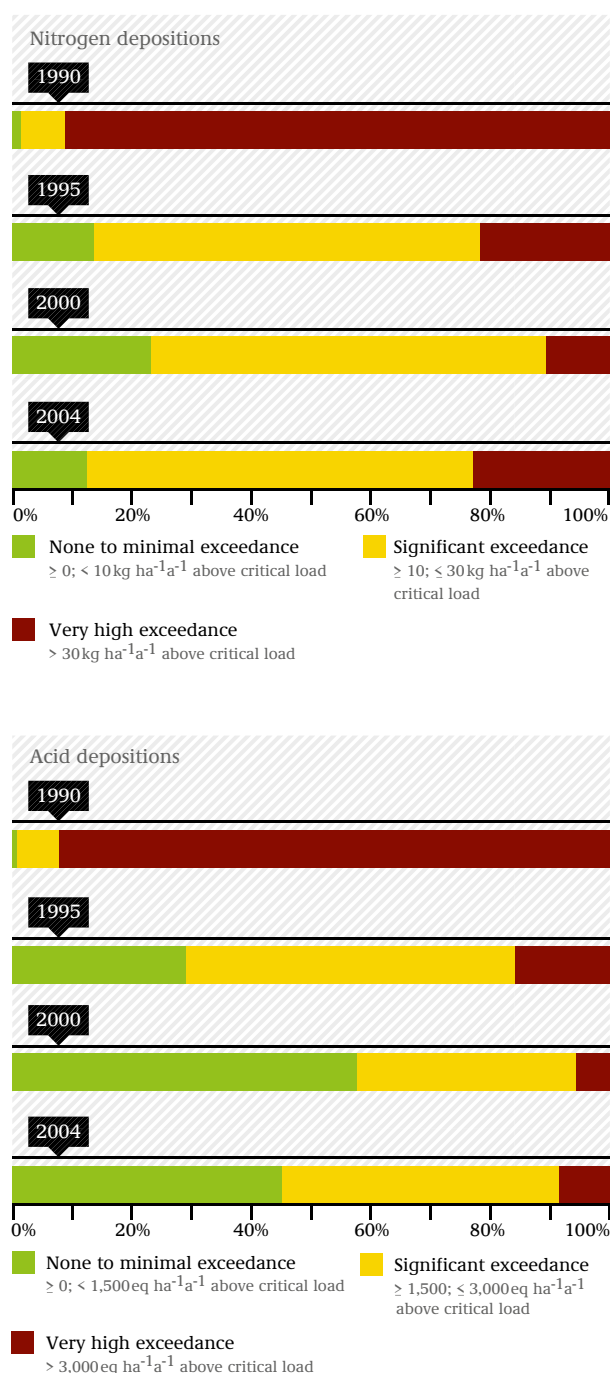
The National Strategy for Biodiversity also complains that nitrogen levels in land-based eco-systems have not decreased to the extent necessary. Because of emissions of ammonium compounds with their acidifying and eutrophying effects, more than half of the higher plants in Germany are endangered. To assess the danger to sensitive eco-systems through eutrophication and acidification, “critical loads” for the deposition of compounds of this type have been established. Currently, critical loads for acidification and eutrophying nitrogen are exceeded on, respectively, 85 percent and 95 percent of ecologically sensitive areas (Figure 7). The contamination intensity has been stagnating at the same high level since 1995 (Figure 8).

FIGURE 7: EXCEEDANCE OF CRITICAL LOADS FOR EUTROPHYING NITROGEN AND ACID DEPOSITIONS IN 2004



Sources: BGR Hannover, DWD Offenbach, Federal Environment Agency Berlin, ÖKO-DATA Strausberg

FIGURE 8: LEVELS OF EXCEEDANCE OF CRITICAL LOADS FOR EUTROPHYING NITROGEN AND ACID DEPOSITIONS



Sources: ÖKO-DATA, Nationale Umsetzung UNECE Luftreinhaltekonvention (Wirkungen), UBA texts 39/2008

Rural biodiversity continues to decline, despite the agri-environment programmes of the European Union, which have been in existence for approximately 20 years. In May 2008, the 9th meeting of the Conference of the Parties to the Convention on Biological Diversity in Bonn concluded that the diversity of species and the integrity of ecosystems worldwide are in great danger. The goal of the biodiversity strategy of the Federal Government is to noticeably increase the biodiversity in agrarian ecosystems by 2020, and to increase the amount of semi natural landscape elements in agricultural areas to 5 percent by 2010. It is questionable whether this goal can be attained.

Not only the limitation of species and varieties grown, and the reduction of crop rotation, but also the intensification of agriculture and the use of all available areas,

particularly by termination of set-aside (loss of valuable ecological compensation areas), standardize and deplete agrarian ecosystems. If we want to stop further losses of species and biotopes, agriculture has to play a key role.

What does environmental protection require from agriculture?

Agriculture crucially affects ecosystems. Climate change, the fight against decrease of biodiversity, the use of renewable energy, and good water management are the new challenges for farmers and agricultural policy. A sustainable, long-term environmentally friendly agriculture must make a larger contribution to protecting natural resources, and ensure the basic conditions for the production of high quality foods. The goal of agri-environmental policy is to reduce negative environmental impact from agriculture and to implement a kind of land use that contributes to achieving relevant environmental quality objectives and preserves all future potential. The effective reduction of nitrogen loading of ecosystems and the atmosphere is part of this. The nitrogen reduction strategy of the Federal Environment Agency shows high emission reduction potential and cost efficiency for regulatory and support instruments (for example the Fertilisation Ordinance and the EAFRD Regulation) as well as for economic instruments (e.g. a charge on excess nitrogen) [36].

Ecologically intact waters in Europe

The EC Water Framework Directive is the first standardized European law for the protection of all water bodies. Its goal is to achieve good qualitative status for all ground and surface waters by 2015. That means: Complying with environmental quality standards for pollutants, for example those which stem from the use of pesticides in agriculture, and the quality standards for nutrients which do not significantly affect typical biotic communities in nature. Furthermore morphological water structure is to offer sufficient habitats for plants and animals in nature. The effects of pollutants and nutrients as well as modifications to hydromorphology are, among others, the results of agricultural activity.

Germany and the other member states of the European Union took the steps necessary for implementing the Water Framework Directive (see Table 4, page 36). In order to remedy the water quality deficits observed by the assessment the relevant authorities are presently compiling appropriate programmes of measures. Their goal is to achieve good water quality by 2015, unless justified extensions of this deadline are granted. This is also the time by which further measures for the reduction of environmental impact from agriculture need to take effect.

Many measures of nutrient management, crop rotation management and careful cultivation are equally efficient for agriculture and the environment, if they keep nutrients effectively on the fields to boost yield instead of letting them wash away into waters. Riparian zones also create natural spaces around water and contribute to shaping them into landscape elements worth experiencing. They can play an important role

in cross-linking biotopes since they interconnect areas so forming green corridors. The significance of riparian zones increases in the context of the cessation of set-aside. The pressure to reduce erosion promotes the spread of innovative techniques such as seeding mulch, direct seed or strip tillage (strip processing), improves best practice and the application of progressive agricultural techniques. Such techniques are generally more economical for farmers (particularly since they are subsidized) than ‘the adequate contribution to the recovery of the costs of water services (including environmental

and resources costs)’ as required by Article 9 of the WFD. This would only be financial compensation for damage caused. But environmental protection must primarily be concerned with preventing damage because preventive environmental protection is always better and more economical than remediation.

TABLE 4: SCHEDULE OF THE WATER FRAMEWORK DIRECTIVE

Action	Reference	Deadline
Phase I: Analysis of characteristics of waters, review of human impact, report	Article 5	2004
Phase II: Establishment of monitoring networks and monitoring of waters	Article 8	2007
Phase III: Establishment of management plans and programmes of measures	Article 11 and 13	2009
Phase IV: Implementation of the programmes of measures and renewed monitoring	Article 11	2012
Achieving the environmental objectives	Article 4	2015



Protection and sustainable utilization of the seas

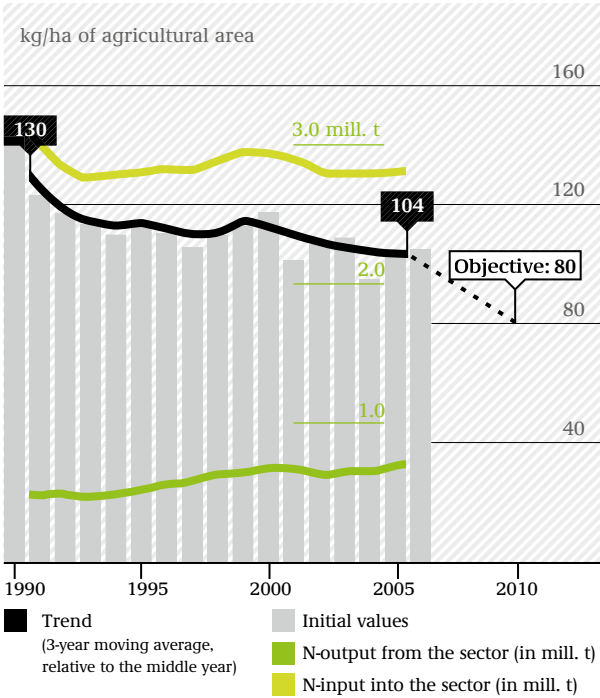
In the autumn of 2005, the European Commission submitted a comprehensive thematic strategy for the protection and conservation of the marine environment. This marine strategy represents an important first step for the development of a new protection concept: an integrative approach. This means a single ‘synopsis’ of the effects from all the contributing sectors – such as agriculture, fishery, traffic and industry. Consideration of marine protection issues in respect to all relevant forms of utilization is meant to help achieve noticeable improvements in the quality of the environment. Another activity of the European Commission for the European seas was the presentation of the maritime policy green paper. It expands on a new political approach

for the integration of economic growth, social prosperity (Lisbon strategy) and ambitious marine protection. It is about enabling dynamic and sustainable economic use of the seas, focussing the integrative approach on regulating the shipping, industry, commerce, tourism, energy, fishery and marine research sectors towards ambitious marine protection for the 21st century. After a one-year public consultation procedure, the European Commission presented a reworked version as the 'blue book'.

In July 2008 the Marine Strategy Framework Directive – 'the environmental pillar' of marine policy – was enacted. With the help of an ecosystemic protection concept the overriding objective is to achieve 'good environmental status of the marine environment' by 2020. The directive requires the member states to develop national action plans for their marine environments in active co-operation with neighbouring states, in order to achieve the objective of good environmental status of the marine environment with suitable programmes of measures within the specified timeframe.

The 'Baltic Sea Action Plan' [37] of the Helsinki Commission (HELCOM), adopted at the ministerial conference in Cracow in 2007, is seen as a pilot project for the implementation of the Marine Strategy Framework Directive. Scientifically based, specific emission reduction obligations for the discharge of nitrogen and phosphorus were established for each member state. The objective is to again transform the Baltic Sea to a good ecological status (with a visibility depth of 3 to 5 metres) in order to create the foundations for a sustainable fishery as well as for Baltic Sea tourism. Because of its good performance in advance, Germany's emission reduction obligations are very low compared to other states. Accordingly, Germany has to reduce its annual phosphate inputs (related to phosphorus) by 240 tonnes and its nitrogen inputs by 5,620 tonnes by 2016, which is 1.6 percent of the total emission reduction for phosphate and 4.2 percent for nitrogen. The largest share of emission reduction obligations is required from Poland. Higher efficiency through a more targeted use of resources and modern equipment for precision agriculture using satellite-based navigation systems should at least help to further reduce environmentally relevant losses of nitrogen and phosphorus compounds and be both economically and ecologically advantageous. Unfortunately this development has stagnated in respect to important agri-environmental indicators. For example, after a strong decrease at the end of the 1980s up to the middle of the 1990s, the nitrogen balance surplus for Germany has not shown any further tangible decrease in the last ten years. As Figure 9 indicates, the average surplus is at around 100 kilograms of nitrogen per hectare (kg of N/ha).

FIGURE 9: EXCESS NITROGEN IN GERMANY*



* Data for 1990 uncertain, values for individual years may change slightly after the planned methodological harmonization has been completed

Source: Federal Environment Agency/University of Gießen; Federal Ministry for Nutrition/Julius Kühn Institute Braunschweig, 2008

From an environmental protection perspective, the implementation of the Fertilizer Ordinance in 1996 does not meet expectations. The nitrogen balance surplus of the past ten years has been around 100 kilograms per hectare every year, without a recognizable trend of reduction. Whether the amendment to the Fertilizer Ordinance, which was adopted in 2007 and is stricter with regard to some aspects, will bring substantial improvement cannot yet be assessed. A consistent implementation of the measures mentioned is a prerequisite for meeting the Federal Government's sustainability objective of reducing the nitrogen surplus to 80 kilograms per hectare by 2010. For many years now, the Federal Environment Agency has demanded a reduction in the nitrogen surplus to 50 kilograms per hectare. It would be the only way to reduce the eutrophication of waters and to achieve the environmental objective of 'good ecological status'.



Clean air for Europe – the air pollution control strategy of the European Union

The European Union Thematic Strategy on Air Pollution (Clean air for Europe – CAFE) is the common heading for a number of regulations which also make demands on agriculture. Thus the NEC (National Emission Ceilings) Directive specifies national upper limits for the annual emissions of certain air pollutants for each individual European Union member state. Relevant for agriculture in Germany is the maximum ammonia amount of 550 kilotonnes (kt) per year, which is to be achieved by 2010 [38]. The same objective was also agreed upon in the so-called multi-pollutant multi-effect protocol (Gothenburg 1999) under the UN Convention on Long Range Transboundary Air Pollution (UN-LRTAP). The context for this is the objective to halve the area on which ‘the critical deposition rates’ (Critical Loads) are exceeded for nitrogen compounds.

Ammonia emissions originate mostly from agriculture, so this is where the strongest emission reduction measures

are needed. Not least because of this, the European Commission plans to update the NEC Directive in the context of the ‘Thematic Strategy on Air Pollution’ and to probably establish lower national emission ceilings for ammonia. A draft which will consolidate the decisions taken in December 2008 into a comprehensive ‘climate and energy package’ will presumably be presented by the next commission which is to be appointed this year.

The Federal Ministry of Agriculture and the Federal Environment Agency published an ammonia emission inventory for German agriculture in 2002. The annual ammonia emissions, predominantly originating from livestock, were at 651 kilotonnes (kt) in the reference year of 1991 and decreased to 619 kt in 2005. However, experts doubt whether Germany can meet its obligations from the European NEC Directive to reduce ammonia emissions to 550 kt by 2010. Preliminary emission forecasts for 2010 and 2020 indicate that ammonia emissions in 2010 will probably be between 604 and 609 kt [39]. Therefore Germany will most likely not achieve the target without additional measures.

At the centre of the current technical discussion are the emission factors, i.e. the quantity of ammonia released annually as a function of animal species, season, husbandry type and reduction technology applied [40]. Differentiating emission factors in this manner creates a basis for illustrating emission reduction activities for technical and management staff and thus offsetting them against emission reduction obligations. Specifically, this means that emission reductions can be offset not only by decreasing the number of animals, but also by means of technical and organizational improvement.



This is to create incentives for farmers to fully exhaust emission reduction potentials in these areas and to employ modern, low-emission and animal-friendly husbandry practices, since that will enable them to keep more animals on the whole without the risk that Germany may not meet its ammonia emissions reduction obligations. The Ministry of Agriculture supports the necessary investments with the Agrarförderprogramm (Agrarian Support Programme). In conjunction with the Federal Environment Agency, it supported the publication of a ‘Nationaler Bewertungsrahmen Tierhaltungsverfahren’ (National Assessment Framework for Animal Husbandry Practices) to provide guidance to and as a source of information for competent bodies.

Waste gas treatment systems for intensive livestock farms are currently not state of the art and are therefore not mandatory. One reason for that is the relatively high cost, so that their appropriateness seems questionable. Additionally, waste gas treatment systems can only be used in closed stables with forced ventilation and centralised capture of waste gas flows. For purposes of animal-friendly husbandry, the trend is in the opposite direction: towards ambient air stables with natural ventilation, often with provisions for moving about freely.

Waste gas treatment systems can be used as an additional measure in situations where a license according to federal immission control law would otherwise not be granted because of pre-existing pollution. For purposes of providing orientation and creating security for investors, the German Agricultural Society (DLG) has created the Signum test. The society certifies tested systems

(generally, a measurement programme with continuous two-month measurement periods under typical summer and winter conditions is conducted) which feature ammonia and total dust removal efficiencies of at least 70 percent. Furthermore the odour concentration in the cleaned gas should not exceed a value of 300 olfactory units/m³. Typical process-related odours (stable smells) must not be perceptible in treated gas.

Soil conservation in Europe - a multicoloured patchwork full of holes

At a European Union level there are so far no legal regulations or financial instruments for the direct protection of soil. The Soil Framework Directive proposed by the European Commission on 22 September 2006 is to create a harmonized basis for soil protection, both in terms of precautionary measures and the remediation of existing damage. Most relevant for agriculture are measures that prevent erosion, humus loss, compression and acidification. For this, the member states are supposed to indicate ‘priority zones’ which require special protection in the danger areas mentioned above. The draft directive provides for the European Union members to conduct risk analyses, determine acceptable upper limits and create action plans for protecting against these risks. Common criteria shall be the basis for a uniform approach towards controlling erosion, humus loss, the encroachment of deserts upon southern Europe and for adaptation to expected climate change.

Concerns that the designation of ‘priority zones’ will lead to restrictions on farming and have the effect of decreasing the market value of the properties could be mitigated by providing financial compensation for such cases in which the obligations exceed the level of ‘best agricultural practice’. Like other agri-environmental measures, such compensation would have to be financed via the ‘second pillar’ of the Common Agricultural Policy, specifically its second axis ‘environmental and landscape improvement’.

Currently, only nine of the 27 member states in the European Union have legislation and other regulations for protecting soil. Soil conservation in Europe is thus a multicoloured patchwork with a lot of holes. Following harmonisation of water legislation (the EC Water Framework Directive) and air (EU strategy on air pollution) a similar harmonization of equal status is urgently required for soil protection. The responsibility for soil conservation must carry the same weight as

the responsibility for air and water pollution control. However, at the detail level, sufficient flexibility is to be granted considering the regional and national variability of soils. Brussels should therefore concentrate on focussing its competencies on solutions for transnational soil conservation issues. Especially the encroachment of the deserts upon southern Europe, accelerated by climate change, requires actions which go beyond the capabilities of individual countries. Whether and when an agreement is to be expected, is at present not yet foreseeable.

Sewage sludge, compost, and fertilizers are good for the soil, but they also contain hazardous substances which can accumulate and limit the degree to which soil is suitable for food production. Phosphate fertilizer can for example contain cadmium and uranium in environmentally relevant concentrations. The Düngemittelverordnung (Fertilizer Ordinance) which was revised in December 2008, specifies a limit value of 50 milligrams per kilogram of phosphate for cadmium in phosphate fertilizer. This concentration will most likely also become the EU-wide limit value. If the limit value is exceeded, the fertilizer may not be placed on the market. There is a labelling obligation for products with concentrations below the threshold but over 20 milligrams of cadmium per kilogram of phosphate (as phosphorus pentoxide P_2O_5), which is to steer farmers towards using less polluting fertilizers.

Fertilizers with less than 20 milligrams cadmium per kilogram phosphate will not create unwanted long-term accumulation of cadmium in the soil. Low-cadmium apatite meets this requirement though phosphates originating from sedimentary rocks do not. Cadmium would have to be removed from these mineral fertilizers. An economically feasible process for this is however not yet on the horizon. Existing processes would lead to a substantial increase in the price of phosphate fertilizers. More stringent limit values can therefore only be realized after solutions have been found through further research and development.



The climate change challenge

Agriculture both causes and suffers from climate change. On the one hand it contributes to global warming by emitting greenhouse gases such as methane and nitrous oxide. On the other hand it is strongly affected by increased weather anomalies like heat waves, storms, hail and flooding. Agriculture must therefore react to climate change in two ways: both by lowering its greenhouse gas emissions as well as adapting to the unavoidable extent of climate change that can no longer be averted by consistent preventive measures.

What is the level of greenhouse gas emissions from agriculture? In the classification of the Intergovernmental Panel on Climate Change (IPCC) and its common reporting formats for the Kyoto Protocol, the national greenhouse gas inventory for Germany in the agricultural section only shows methane emissions from livestock (digestive processes of ruminants and organic fertilizer management) and from the processing of organic fertilizer (liquid manure, manure) as well nitrous oxide emissions (N₂O) from agricultural soil [41]. Converted into CO₂ equivalents, this adds up to 52 million tonnes per year or a 5.4 percent share of total greenhouse gas emissions in Germany. If further agriculturally relevant items are added from other chapters of the national inventory report – for example agricultural machinery diesel consumption under ‘Transport’, or the production of mineral nitrogen fertilizers found under ‘Chemical Industry’ – then the share of agriculture emissions increase to 13 percent [42] (see Table 5).

TABLE 5: ANNUAL GREENHOUSE GAS EMISSIONS FROM GERMAN AGRICULTURE (in mill. t CO ₂ equivalents; Döhler, Dämmgen et al. 2008)	
Farming and fertilization	84.2
Enteric fermentation	18.3
N fertilizer production	14.1
Organic fertilizer from animals	8.1
Fuels etc.	6.8
Soil liming	1.7
Total	133.2 (13%)

When taking the value added chains of foods and renewable raw materials into account, agriculture accounts for about 20 percent or 200 million tonnes of CO₂ equivalents (see Table 6) [43]. In the interest of transparency we would like to point out that forestry as well as land use changes are not part of agriculture in the IPCC common reporting format – those are found in the chapter on Land use, land use change and forestry. Additionally, short term CO₂ cycles are not included, namely CO₂ fixation by crops during photosynthesis, since these amounts are largely released again when feed or food is consumed.

TABLE 6: GREENHOUSE GAS EMISSIONS IN GERMAN AGRIBUSINESS AND FOOD PRODUCTION (in mill. t CO ₂ equivalents)				
	CO ₂	CH ₄	N ₂ O	Total
Intermediate consumption				45.3
Fertilizer	8.4		7.9	16.3
Feed				13
Agriculture				111.6
Enteric fermentation		18.3		18.3
Organic fertilizer		5.0	3.0	8,0
Agricultural soils	-0.6	37.8		37.2
Land use change: cropland	25.0			25.0
Land use change: grassland	16.6			16.6
Food and drink industry				10.7
Trade				35.0
Households				75.0
Forests				- 78.7

Source: BMELV; Report to AChK and AMK, September 2008

Unfortunately there are no systematic and technically reliable investigations into the quantity of greenhouse gas emissions from agriculture that could be reduced, by what means and at what cost could this be done in Germany. Therefore a prioritization of possible measures that could achieve the lowest possible emission reduction costs per tonne of greenhouse gas avoided is presently not possible. The current scientific basis is not yet capable of doing this. Furthermore, such costs vary strongly as a function of the individual conditions of the holdings. Therefore, the danger of misguided policy management should not be neglected.

In agriculture and related areas like forestry, many measures are largely undisputed because they are advantageous in several respects – these are measures for improved nitrogen efficiency through optimal organic fertilizer management, targeted feed utilization, humus conservation and care, grassland protection, re-wetting of marshland and semi-natural forestation. Measures for improving the thermal insulation of buildings also make sense in agriculture, as is the ‘cascading use’ of plant based biomass and liquid manure (first in a biogas plant, then on the field), and efficient use of machinery [44].

Germany's strategy for adapting to climate change

Agriculture is however, not only an emitter of greenhouse gases – it is to a large extent also a victim of climate change and is therefore confronted with substantial challenges for adaptation. On 17 December 2008, the Federal Cabinet adopted the German Strategy for Adaptation to Climate Change. The strategy submitted by the Federal Ministry of the Environment aims to prevent possible risks for the environment, economic damage and negative social consequences. The Federal Environment Agency participated in the creation of this strategy. The challenges presented by climate change for agriculture in Germany vary regionally. For example, parts of southwestern Germany have to prepare for more heat, parts of eastern Germany for (still more) drought [45]. Increasing water shortage might develop to a degree that it limits yields, wherein a drought in spring might be more disastrous than heat in the summer. It is difficult to predict the effects of increasingly extreme weather conditions (heavy precipitation, hail, storms). Meanwhile experts are already discussing whether multi-peril crop insurance – as the insurance industry offers it to farmers – should be supported by the state, or whether these risks should be borne individually in the context of normal entrepreneurial risk. Climate change also provides an opportunity for German agriculture. The German Adaptation Strategy points out that regions which are currently too cool or too wet for agricultural use (like low mountain ranges or parts of Northern Germany) could profit from a gradual rise in temperature and a longer growing season by cultivating crops that used to be limited to warmer climate areas (like maize, certain types and varieties of fruit, wine, and also winter grains and rapeseed).

By supporting ongoing and additional Federal and State measures and programmes, the overall strategy emphasizes putting agriculture in a position to better adapt to upcoming changes in climate. This involves numerous additional investments in agricultural techniques and organizational structures – for example, measures for improving water retention in the agricultural landscape, for upgrading irrigation infrastructure (where the precipitation balance permits), for improving soil fertility and soil structure, for management adjustments in animal

husbandry as well as innovations in crop breeding.

Through cooperation with stakeholders and in coordination with the Federal States, the Federal Government wants to develop a firm 'action plan for adaptation' by 2011. A definitive instrument for the implementation of the climate change adaptation measures in the 'agricultural and rural development' sector will be the 'Gemeinschaftsaufgabe Verbesserung der Agrarstruktur und des Küstenschutzes' (Joint Task for the Improvement of Agricultural Structures and Coastal Protection).

Environmentally friendly use of pesticides

The body of laws regulating crop protection in the European Union has been amended in recent years. The objective was clearly specified: The risks inherent in the use of pesticides for the environment, operators and consumers need to be significantly reduced. At the start of 2009, the European Union Council and the European Parliament agreed on plant protection legislation. It covers a new regulation on placing pesticides on the market in the European Union as well as a directive on the sustainable use of pesticides (framework directive). The new regulations for bringing pesticides to market include substantial changes to the approval processes which equally benefit the environment, consumers and agriculture. Occupational safety of operators is improved by the prohibition of substances that are carcinogenic, mutagenic or teratogenic. From a consumer protection point of view, the coordination between producers, marketers and consumers is also simpler now as the contamination of foods with particularly critical substances is already reduced during cultivation. Active substances in pesticides that are toxic and accumulate in the environment and the bodies of animals and humans (so-called PBT substances) will not be approved in future. Other substances with similar environmentally harmful characteristics are to be replaced by less critical ones in the medium term (substitution requirement). The search for less environmentally harmful alternatives promotes investment in research and development. In the medium term we expect that because of the substitution requirement fewer environmentally harmful pesticides will be developed and made available to farmers which in the long run will improve the sustainability of agriculture and its credibility with the public. For example farmers use copper compounds both in conventional and organic cultivation for fungus control. Currently there is no alternative to copper compounds for organic farming. Even though there are alternatives, their utilization in conventional agriculture is far more extensive. Copper is a heavy metal, it accumulates in the soil and damages soil organisms and soil fertility. The precautionary values for soil are often exceeded especially in the cultivation of the permanent crops fruit, grapes and hops. Therefore to substitute copper compounds with more biocompatible alternatives is urgently required in the medium term. Abandoning the utilization of copper compounds should be attempted without impairing the spread of organic farming. For this, further research and development is necessary. It is not only the exceptionally harmful substances that are to disappear from the market. The new European



Union legislation also aims to noticeably reduce the overall volume of pesticides employed. The directive obligates the member states to provide concrete help to farmers in their decision making processes: is the application of a pesticide really necessary or are there innocuous alternatives such as the use of biological control agents or the cultivation of varieties that are more resistant to diseases? In order to assist in making these types of ‘integrated pest control’ decisions, additional funds must be provided for the research and development of suitable methods. The fact that farmers can improve their market position with the use of pesticide alternatives was proven by the example of Spanish fruit and vegetable producers: with the consistent application of various biological control agents, they have noticeably reduced pesticide use over the past years and thereby have also reduced the contamination of crops with residues – a clear market advantage in times of increased health consciousness among consumers. However, going forward, the application of pesticides cannot be completely avoided in conventional agriculture. Therefore the framework directive also prescribes preventive measures designed to avoid the contamination of water and soil with pesticide residues. Among other measures, protective zones beside rivers and lakes are to be created in which farmers must not apply pesticides. The Federal Environment Agency supports combining this obligation with simplified application provisions for pesticides: georeferencing is to help identify areas of water country-wide which are particularly at risk for inadvertent contamination from pesticide use as a consequence of spray drift. If farmers protect these waters against pesticide inputs through border strips or screening hedges, then restrictions applied to them in the pesticide approval process can be slackened without jeopardizing aquatic life.

A problem: The use of pesticides is increasing. The EU-wide abolition of set-aside, the increased demand for food and the increased cultivation of non-food crops lead to an intensification of agricultural production which results in the increased application of pesticides and the loss of ecologically valuable compensation

areas. Thus it is that the chemical industry companies that are members of the *Industrieverband Agrar* (a chemical industry association), which service 95 percent of the German market for pesticides, registered a sales volume increase of almost 9 percent over the previous year for 2007. This has negative ecological consequences. For example the increasing competition for land creates a situation in which the negative effects of pesticides on food sources for animal wildlife in the agrarian landscape can no longer be sufficiently compensated.

TABLE 7: WHAT REMAINS TO BE DONE?

Category	Federal Environment Agency requirements
Agri-environmental policy	Conservation of biodiverse grassland in the context of rural development
	Optimal organic fertilizer management
	Support for re-wetting marshlands
	Achieve the reduction target of 80 kg N per hectare, per annum for total nitrogen surplus by 2010.
	Followed by an assessment and updating of this target.
	Revision and further development of 'best available techniques' for large scale animal husbandry operations or low-dust biomass combustion plants
Water	Achieving good ecological status of waters according to EC Water Framework Directive by 2015, and for marine waters according to the Marine Strategy Framework Directive by 2020
	Implementation of erosion protection for land and 10 m border strips beside all waters, in order to provide sufficient habitat for plants and animals of natural landscapes, and to reduce substance discharges from agriculture
	Investigate the possibility of adapted use of vegetation as biomass
Fertilizer Ordinance	Reduce limit value from 50 to 20 milligrams of cadmium per kilogram of phosphate in phosphate fertilizer
	Establish a limit value for uranium in phosphate fertilizer
Pesticide use (EU-Regulation and Framework Directive)	Substitution of particularly hazardous substances with more environmentally compatible alternatives
	Creation of compensation areas in order to increase biological diversity in agricultural landscapes, and for the sustainable use of pesticides
	Expansion of, and binding standards for, integrated plant protection
	Reduction of pesticide inputs into waters using targeted measures of the National Action Plan (e.g. by establishing buffer zones)
	Quantitative reduction of pesticide use through improved consulting and operator education
Air pollution control strategy	Maximum ammonia volume of 550 kilotonnes per year by 2010
	Emission reductions not only by decreasing livestock numbers, but also by applying modern, low emission and ethical animal husbandry practices
	Odour concentration in treated gas must not exceed a level of 300 olfactory units/m ³
	Typical process related odours (stable smell) must not be perceptible in treated air
Soil protection	Minimizing erosion, humus loss and compression
Climate change	Reduction of greenhouse gas emissions
	Anticipate and avoid environmental risk, economic harm and negative social consequences in the context of the national adaptation strategy
	Investment in measures for improving water retention in the agricultural landscape, for improving irrigation infrastructure, soil fertility and soil structure, and for adjustments in the management of animal husbandry as well as innovations in crop breeding
	'Cascading use' of plant biomass and liquid manure - first for energy recovery, then materially

Environmental protection: economically viable for agriculture?

Environmental protection is not a barrier to investment – this is also true for agriculture. Germany is an international leader in exports of high-quality food and agricultural technology – this creates future opportunities. World population growth, increasing prosperity in newly industrialized countries and climate induced production cutbacks by important producer countries will presumably strengthen this position. Tough standards for protecting human health and the environment do not obstruct this development, but support it. State-of-the-art technology and a high level of product safety are both foundations for our leading position as one of the strongest export economies, and also advanced environmental protection. Relenting would threaten our success. Further development opportunities for German agriculture arise from current and foreseeable international obligations in environmental protection. The ‘quid pro quo’ principle for support and performance ensures acceptance of public funding for agriculture.

Agro-environmental policy must supplement an increasingly environmentally conscious economic policy effectively, not least because it results in numerous stimuli for innovation and employment. Examples of this include ‘best available techniques’ for high volume animal husbandry or the development of biomass combustion plants with low emissions of fine particulate matter. It is about maximizing the opportunities for rural development, not least in order to create an equivalent quality of life outside the urban environments in Germany as is required in the constitution. If soil protection in Europe, which is still the basis for all agricultural production, cannot be improved and if the EU does not effectively counteract the encroachment of deserts, erosion, compaction, acidification, salinization and landslides, then technical innovation would also soon reach its limits. Anticipatory protection of environmental media and advances in technical efficiency need to be merged to form a meaningful whole. As an export driven nation, Germany should continue to assert its leading role in Europe and beyond.

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EMISSIONS TRA THE ENGINE OF

Floods, droughts, hurricanes, fires, streams of refugees, and the threat of climate wars: the world faces enormous challenges in dealing with such consequences of climate change.



DING – CLIMATE POLICY



**Improving the balance of
economics and ecology:
emissions trading helps**

The experts of the Intergovernmental Panel on Climate Change (IPCC) agree: greenhouse gas emissions caused by humans – first and foremost carbon dioxide (CO₂) – are primarily responsible for climate change [46]. And there is not much time left for action: the world has only until the end of the next decade to effect a change in the trend of these emissions in order to achieve a long-term sustainable stable level of greenhouse gases in the atmosphere. That is the only chance for preventing global warming by more than two degrees Celsius with sufficient probability – the temperature level at which it is currently assumed that climate change will remain manageable.

Climate change may also cost us dearly. In his 2006 report to the British government, the former World Bank chief economist Sir Nicholas Stern urgently warned against the economic consequences of climate change [47]. His long-term analysis to 2050 and beyond shows that the subsequent costs of delayed or no climate protection is many-fold higher than the costs of climate protection [48]. Stern puts the cost of unmitigated climate change at 5 to 20 percent of global GDP. Compared to that, the cost of climate protection is moderate. Stern estimates

that fast and decisive climate protection would cost the worldwide community of states about 1 percent of global GDP – an estimate that the 2009 McKinsey study Pathways to a low carbon economy, deems far too high [49]. This shows that from an economic perspective, climate protection is a worthwhile investment. Only doing nothing will be expensive.

The climate protection investments of today are tomorrow's cost savings

In the coming decades substantial efforts will be needed to allow mankind to continue taking advantage of the seemingly free benefits of a stable climate. According to the World Energy Outlook 2008 of the International Energy Agency (IEA), 9.3 trillion dollars of additional worldwide investment will be necessary from 2010 to 2030 in order to reach the 2 degree goal. This corresponds to 0.55 percent of cumulative worldwide GDP from 2010 to 2030 [50]. Raising such an immense amount of investment requires national policies, which then makes climate protection investment more profitable for the individual enterprise.

The present worldwide trends in energy supply and resource consumption are clearly not sustainable. According to the IEA oil is the most important energy source for the world, but this fossil energy source is finite, just as is natural gas. Coal is available in sufficient quantity, but in conventional combustion processes, without the carbon capture and storage technology that will only be implemented in the coming decade, it produces a lot of carbon dioxide which is harmful to the climate. Without innovation and entrepreneurial action the urgently needed reconstruction of the energy systems and the change in resource utilization cannot be achieved to the necessary extent.

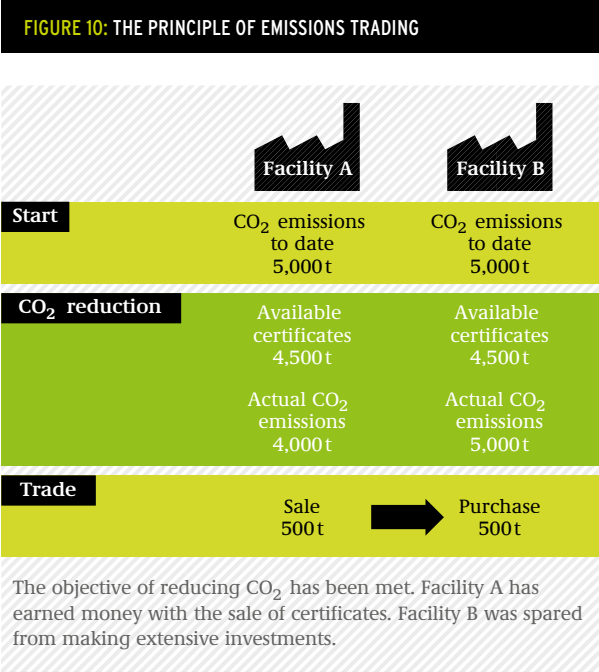
The European Union (EU) promotes these changes. To a large extent it meets its emission reduction obligations specified in the Kyoto Protocol with the help of a trading system for CO₂ emissions at the plant level: emissions trading. The European Emissions Trading Scheme started on 1 January 2005 and covers the emission-intensive sectors of energy and industry which cause about 40 percent of the European CO₂ emissions. Only a limited amount of annually permitted CO₂ emissions is available to these sectors in the form of certificates or so-called emission allowances (European Union Allowances). Each of these emission allowances corresponds to one tonne of CO₂. In Germany emissions trading covers more than half of CO₂ emissions – and therefore is of central importance to climate protection.

How does emissions trading work?

Companies obtain their emission allowances from the German Emissions Trading Authority (DEHSt) at the Federal Environment Agency. During the introduction of emissions trading, most of the certificates for CO₂ emissions were issued free of charge to companies. This was particularly crucial during the first trading period: to achieve equality in order to avoid investment barriers

and to promote the acceptance of the instrument in general. Without cost-free distribution, the risk of so-called Carbon leakage, shifting production abroad into countries that do not participate in emissions trading, exists in some industries (see also page 55).

Each year, companies have to surrender as many emission allowances as they have actually emitted in tonnes CO₂. If a company emits more CO₂ than it owns emission allowances, it must acquire additional certificates from a stock market, a broker or from another company. Operators of plants which discharge less CO₂ than they estimated, for example because of improved plant efficiency, can sell their surplus emission allowances. In other words: emitting CO₂ to the atmosphere and affecting the climate is no longer free. The situation was different before emissions trading, companies hardly had any incentives for reducing their CO₂ emissions. If, how, when and to what extent a company technically reduces its CO₂ emissions or buys certificates depends on individual economic considerations. If the cost of reducing emissions from the operation is lower than the price of CO₂ on the market, companies will prefer reduction measures. Thus emissions trading directs emission reduction measures to where they can best be implemented and so limits the cost of emission reduction to the level of the certificate price. At the same time it creates economic incentives for developing and using innovative and cost-effective climate protection techniques. As a so-called Cap and Trade System, emissions trading creates a lot of flexibility for companies. Companies can trade. At the same time emissions trading sets a limit to reduce CO₂ emissions to the atmosphere: the emission allowances available on the market are limited (cap). No more CO₂ can be emitted than emission allowances are available in the emissions budget.



Source: DEHSt (German Emissions Trading Authority)

Currently, the German Parliament specifies the extent as to the contribution emissions trading must make to climate protection. It decides on the size of the national emissions trading budget in accordance with the volume of permissible greenhouse gas emissions allocated to Germany by the Kyoto Protocol. In essence, this is how much CO₂ may be emitted by the participating companies per trading period. Parliament also decides how the available budget is going to be reduced from one trading period to the next. For the first trading period from 2005 to 2007, companies obtained 499 million emission allowances per year. After 2008 for the second trading period, companies will receive only 452 million emission allowances per year.

Starting with the third trading period in 2013 there will be no more national, but rather one general European Union budget. This was proposed by the European Commission and decided upon in December 2008 by the European Council and the European Parliament. The companies required to participate in emissions trading will have to face a further decrease of available emission allowances – because the emissions reduction plan, as set out in the European Union climate package, stipulates that the emissions trading sector in Europe must reduce its emissions by 21 percent by 2020 compared to the first trading year of 2005.

For the first emissions trading period, the quantitative contribution of emissions trading to climate protection was still extremely small. EU-wide, and therefore also in Germany, too many emission allowances had been issued so that only the beginnings of a solvent market developed. This was in part due to the low quality of data on the actual CO₂ emissions from companies for the time period before emissions trading was started. But the member states were also to blame for their reticence. Many hesitated to use this new instrument immediately and decisively. Accordingly, many of the national budgets turned out to be very generous. Despite initial difficulties, a significant qualitative effect is now connected to emissions trading: since its introduction, climate protection is an important topic in board rooms. The energy industry and the energy-intensive industry now base their investment decisions on the connected CO₂ emission costs. Furthermore, the data on facilities which are required to participate in emissions trading has never before been as complete as it is today.

Stricter criteria in the second trading period

The EU does not stop at the emission reduction goals of the 1997 Kyoto Protocol. At that time the member states had agreed to an 8 percent reduction in greenhouse gases for the period 2008 to 2012 compared to 1990. Germany even committed to a reduction of 21 percent. More ambitious climate protection continues beyond 2012: it is the goal of the EU to reduce greenhouse gas emission by at least 20 percent by 2020 compared to 1990 – and by 30 percent if it comes to an ambitious international Kyoto Protocol follow-up treaty starting in 2013. Emissions trading is a significant, if not the central policy instrument of the EU, for achieving these goals.

Meanwhile, ambitious targets require an effective and resolute implementation. The EU commission takes this into account. For the second trading period it applied a more rigorous standard to the examination of allocation plans (National Allocation Plans) for the emission allowances of the respective member states. This primarily concerned the examination of the national emissions caps, which are markedly lower than in the first trading period. Additionally, the allocation rules for free certificates among the member states were better harmonized, the process simplified and made more transparent.

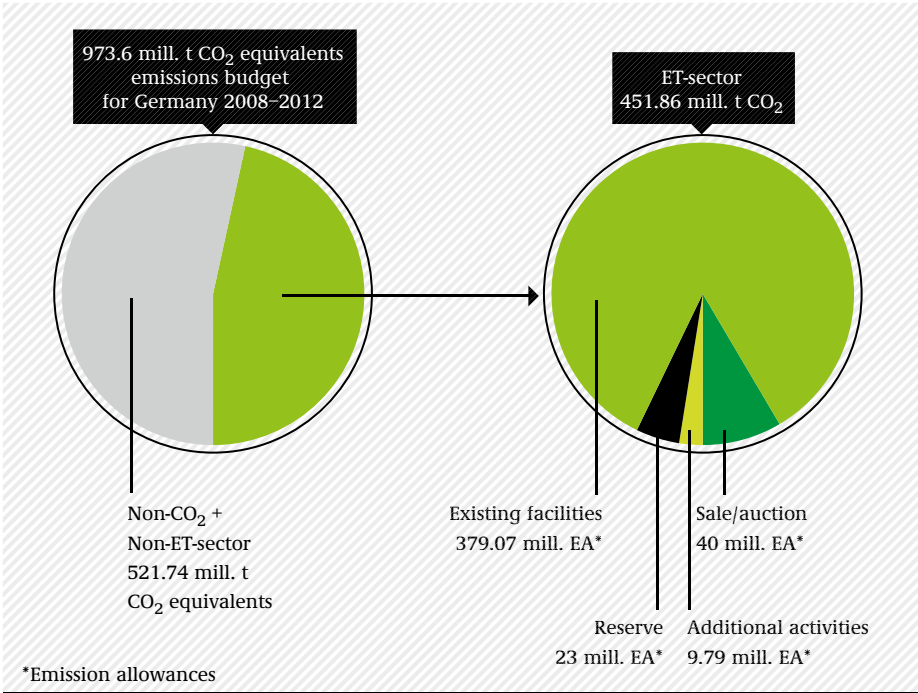
In Germany the now reduced national budget of 452 million emission allowances, and the rules for how emission allowances are to be distributed among operators participating in emissions trading, are governed by the

Zuteilungsgesetz 2012 (Allocation Law 2012), based on the Nationaler Allokationsplan (National Allocation Plan) for the second trading period from 2008 to 2012. Starting from 2008, altogether 40 million emission allowances per year are no longer issued free of charge. Part of the budget is intended as a national reserve and for additional facilities required to participate in emissions trading. The total budget of free allowances to be divided among the facilities that have participated in emissions trading so far amounts to approximately 379 million emission allowances per year.

The pressure is on - industry needs to act

Other than in the first trading period, which started in 2008, different rules apply to the allocation of free emission allowances to the energy industry and to the emission-intensive industry. Based on its past (historical) CO₂ emissions, the industrial sector is subject to a moderate deduction of 1.25 percent, small emitters are completely exempt. The energy industry however receives noticeably less free emission allowances and must therefore bear most of the emission reduction costs in the second trading period. This is how the legislature reacts to the so-called windfall profits from the first trading period, i.e. the ‘jump-on-the-bandwagon’ effects in the energy industry which result from issuing free emission allowances and simultaneously taking into account their value in electricity tariffs. Because of the real costs of emission allowances, especially for the energy industry, technical improvements towards more efficient combu-

FIGURE 11: DISTRIBUTION OF EMISSION BUDGETS 2008-2012



Source: DEHSt (German Emissions Trading Authority)

stion processes and better low-emission fuels become attractive. For the energy-intensive industry, a buyer's market develops for surplus emission allowances because of the reductions of their own CO₂ emissions.

Compared to the first trading period, the advancement of the allocation rules for energy and industrial facilities has made the system more transparent and distributes the burden more fairly, even when calculating the level of free allowances in individual cases often became much more complex than in the allocation procedure of the first trading period. While previously there were blanket deduction factors for certain facility groups, the second trading period made allocation deductions for the energy industry (power stations) based on the efficiency standard of the facility.

Ambitious benchmarking system implemented

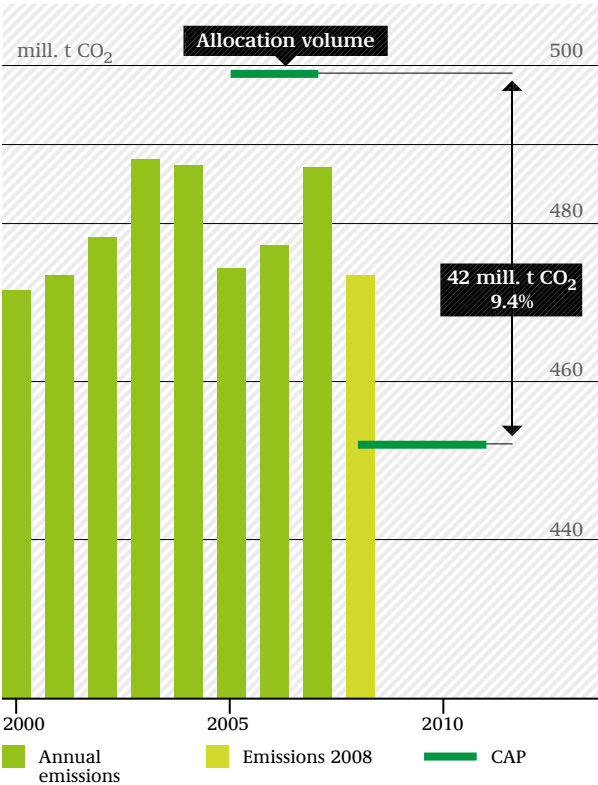
For energy producing facilities, so-called benchmarking is the new method of allocation. The amount of free emission allowances a facility receives is calculated on the basis of the emissions for individual products such as power and heat. For energy producing facilities that went into operation before December 31st 2002, the reference quantity is the historical production volume, otherwise a default value for the capacity utilization of the facilities (full use hours per year) is used.

Based on their emissions from 2000 to 2005, industrial facilities receive an allocation reduced by 1.25 percent if they were in operation by December 31st 2002. Younger

facilities also receive their allocation based on product specific benchmarks. The determination of allocation volume on the basis of historical emissions (grandfathering), which was prevalent in the first trading period, takes place to a much smaller extent in the second trading period. Since benchmarks in all sectors and industries are determined by looking at best available technology, the free allocations computed from this are only equivalent to actual CO₂ emissions for the most modern and efficient facilities.

Energy or general industrial facilities that started operating prior to December 31st 2002 and emit no more than 25,000 tonnes of carbon dioxide annually uniformly receive a grandfathering allocation based on their historical emissions. They thus remain participants in emissions trading with all reporting obligations and are required to surrender emission allowances annually at the level of their actual emissions. For them it is also worthwhile reducing their CO₂ emissions. They can sell their unused emission allowances from the free allocation on the market and make money while protecting the climate.

FIGURE 12: ALLOCATION QUANTITIES IN EMISSIONS TRADING
2008-2012 SUBSTANTIALLY LOWER THAN BEFORE



Source: DEHSt (German Emissions Trading Authority)

FIGURE 13: ALLOCATION RULES OVERVIEW
(BENCHMARKING AND GRANDFATHERING)

	Energy producing facilities, activities I to V > 25,000 t/year	All facilities, all activities
Benchmarking	Commissioned < 2003	Commissioned post 2003
Grandfathering	Industrial facilities (activities VI and up, Appendix 1, TEHG) and energy producing facilities <= 25,000 t/year	

Source: DEHSt (German Emissions Trading Authority)

For the first time several facility types of the emission-intensive industry are required to participate in emissions trading in the second trading period due to the introduction of the harmonization of application areas within the European Union. As such, petrocrackers (facilities for the production of propylene and ethylene), integrated iron and steel works including subsequent treatment units, soot production facilities, facilities for the production of mineral fibres, and flares (facilities for burning gas in sea-/land transfer stations) are now all subject to the Treibhausgas-Emissionshandelsgesetz (Greenhouse Gas Emissions Trading Law).

Starting to sell

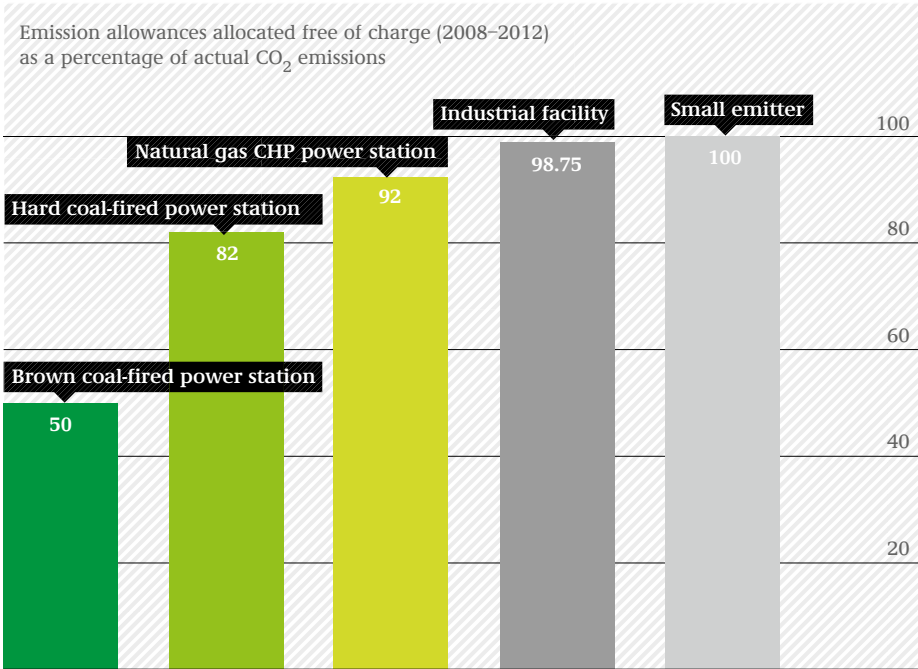
Emissions trading, as a functioning free market climate protection instrument, makes it obvious that emission allowances for carbon dioxide are factors of production like personnel and raw materials. Consequently, and as emissions trading is further developed, emission allowances shall no longer be issued free of charge. In the second trading period, several European Union member states have decided to adopt this course of action. Germany sells approximately 8.8 percent of all emission allowances, putting it into the lead in the European Union. Altogether about 3.7 percent of the total European Union budget for the second trading period are auctioned or sold. Annually 40 million emission allowances are sold at market price in Germany, and starting from 2010 will also be auctioned – likewise parts of the budget from the national reserve which serve to finance the general system costs of emissions trading. The largest portion of these emission allowances, some 38 million per year, is created via a decrease in allowances for electricity production in existing energy producing facilities, i.e. through a cutback on free allocations to these existing facilities.

In the 2008 allocation, the cutback amounted to about 15 percent. The Federal Government used approximately half of the income from 2008 for national and international climate protection measures of the Federal Ministry for the Environment. Despite implementing the sale of emission allowances, existing facilities still obtain the majority of necessary emission allowances in the second trading period free of charge. In order to treat all participants equally, and in order to avoid investment barriers, new and therefore usually more efficient facilities also get the required emission allowances free of charge on the basis of ambitious benchmarks. The national reserve amounts to 23 million emission allowances per year – a significant increase from the first trading period during which it stood at 9 million for three years. Out of this reserve, new facilities receive their certificates – or companies which obtained additional certificates through legal challenge. A small part of the reserve is sold during the trading period in order to finance the administrative costs of emissions trading. It is common for the reserve to receive emission allowances if allocations are revoked or reduced for legal reasons. According to law, the Federal Government can sell surplus certificates on the market towards the end of the trading period.

Options and choices within the project mechanisms of the Kyoto Protocol

When the national emissions trading budget for the second trading period was determined, it had already become apparent that the actual CO₂ emissions in Germany would be higher than the upper limit specified in the budget [51]. In 2008 the actual CO₂ emissions of the companies required to participate in emissions trading amounted to approximately 473 million tonnes compared to a budget of approximately 452 million tonnes. In order to create more economic flexibility, German

FIGURE 14: SUBJECT TO CUTBACKS



Source: DEHSt (German Emissions Trading Authority)



companies that are subject to emissions trading can also fulfil their obligation to surrender emission allowances by using credits deriving from the Kyoto Protocol project mechanisms Joint Implementation (JI) and Clean Development Mechanism (CDM) in the second trading period. German companies can surrender these emission credits up to 22 percent of their individual allocation quantity (all German companies in total: 90 million emission credits per year).

The objective of the project mechanisms is to accomplish emission reductions where they are most economical and simultaneously promote sustainable development in transforming and developing countries using modern environmental technologies, increasing energy efficiency, or using renewable energies. The project mechanisms also activate the market's search for reduction potential in emission sectors and such states which are not, or are not yet subject to the emission limits of the Kyoto Protocol and emissions trading. Specifically, this means: everyone who invests in foreign climate protection projects and obtains approval from the Climate Secretariat of the United Nations can convert the thus reduced greenhouse gas emissions into certificates and use or sell them. Excluded from this are certificates from nuclear projects as well as EU-system certificates from agricultural and forestry carbon sink projects and from projects which lack the participation of an investor state (unilateral projects). In principle, CDM projects take place in developing countries, and JI projects in countries which have their own stabilization or mitigation obligations, i.e. developed countries.

Since the registration of the first project with the Climate Secretariat in March 2005, CDM has experienced strong growth: at the beginning of 2009, more than 1,200 projects with an emission reduction volume of more than 1.5 billion tonnes of carbon dioxide equivalents were registered up until the end of the first commitment period of the Kyoto Protocol (2012). Climate protection thereby also became an investment criterion in developing countries and mobilized substantial funds from developed countries. The previously approved and continuously updated methodologies for project types show that an abundance of possibilities exists for better climate protection [52]. Among the projects with German participation, those in the categories of biomass, water power and energy efficiency including fuel switching, are most prominent. Projects for utilizing wind power, the mitigation of nitrous oxide emissions and biogas projects follow. The application volume for solar energy and geothermal projects was lower. As the designated national authority, DEHSt (German Emissions Trading Authority) examines and approves the submitted project requests.

The Federal Environment Agency is an active participant in the further development of the approval criteria for climate protection projects. Clearly, the projects must make a demonstrable additional contribution to climate protection. But they must also be deemed agreeable in other environmental and developmental policy aspects. For example, these criteria are reflected

in the approval criteria of the World Commission on Dams for large dam projects with an output of more than 20 megawatts. In this area the Federal Ministry of Environment and the DEHSt drive a process which is to ensure that high standards are adhered to in large water power projects and the administrative practices of the European approval agencies are standardized [53]. In the context of the negotiations over a follow-up treaty for Kyoto, the Federal Government is committed to improving the environmental integrity of the Clean Development Mechanism and to create regulations with which this mechanism makes its own contribution to sustainable development in the economically more efficient developing countries, above and beyond mere compensation.

Including the project mechanisms into emissions trading must not distort the responsibilities: The industrialized countries are chiefly responsible for the high levels of historical and current greenhouse gas emissions and must therefore advance emission reduction on the strength of their own efforts. The European Council decided that a maximum of half the emission reductions targeted up to 2020 compared to 2005 may be accomplished with climate protection projects abroad. As a result, the demand for emission credits from these projects on the basis of the reduction goal of 20 percent by 2020, as decided unilaterally by the EU, will start to decrease after the third trading period. If the international negotiations for an ambitious Kyoto follow-up treaty are successful, the European Union has already announced that it will raise its own reduction commitment to 30 percent. This will again increase the flexibility for CDM and JI as well. Beyond that, the European Union seeks to induce newly industrialized countries to make their own reduction contributions. Because of this, the ratio of project-linked mechanisms to new sector-linked mechanisms is to be defined again in the negotiation process. Since they are also entitled to further economic development this means that in most cases only a decrease in comparison to projected emissions growth will occur without any absolute reductions. This could for instance be achieved by means of reducing the emission intensity in suitable sectors, such as electricity generation or steelmaking. But for them to do this, the developing countries demand financial support from the industrialized countries.

Carbon leakage - a challenge for emissions trading?

The term carbon leakage describes the problem of emissions trading in Europe causing manufacturing companies to shift part of their production and the associated CO₂ emissions into existing or new plants abroad – particularly into regions with less stringent climate protection requirements than the European countries. Even though this shift would result in a decrease in emissions harmful to the climate in Europe, so would industrial production, turnover and employment drop, and without a reduction of greenhouse gas emissions worldwide. The contribution of European emission reductions to global climate protection therefore depends

on whether worldwide emissions really decrease or whether they actually increase elsewhere because of geographical shifts in production. A production shift is feared for sectors which are emission-intensive and are subject to strong international competition. But how high really is the risk of carbon leakage? Studies on behalf of the Federal Environment Agency show that the carbon leakage problem is much smaller than expected by the general public discourse (see Box). Scenarios suggesting that the introduction of auctioning would lead to a blanket deindustrialization of Europe have not been substantiated by actual events.

EMISSIONS TRADING AND THE COMPETITIVE LANDSCAPE IN INDUSTRY



EU emissions trading has only a limited impact on the international competitive ability of German industry. When free allocation of emission allowances stops after 2013, it will be only a limited few industries that will shift their production abroad. This is the result of a study by the Öko-Institut (Institute for Applied Ecology), the Fraunhofer ISI Institute for Systems and Innovation Research and the DIW German Institute for Economic Research Berlin conducted on behalf of the Federal Environment Agency. This is the first time that an empirical basis for the controversially led discussion on carbon leakage exists in Germany.

According to the study, only the companies which are simultaneously subject to very high costs due to emissions trading, and face very strong international competitive pressures, are in danger. Most affected in Germany are the pig iron and steel industries, the

fertilizer industry, parts of the chemical industry, the manufacturers of paper, cardboard and paperboard, as well as the aluminium industry. Altogether, significantly less than 1 percent of German GDP is in danger of being transferred abroad. Experts discussed the study's results and methodology in September 2008 in Berlin at an international workshop and compared them with similar studies from Great Britain and the Netherlands. The results of the workshop were collected in a publication entitled „Carbon Leakage – The Relocation of Production and Emissions as a Challenge for Emissions Trading?“. The complete study „Impacts of the European Union Emissions Trading Scheme on industrial competitiveness in Germany“ is available for download on the internet.

More information:
www.dehst.de

In order to limit the risk of carbon leakage, a common solution for all participants must be found – ideally an ambitious, worldwide climate agreement. In the UN climate negotiations, the Federal Government campaigns for a Kyoto follow-up treaty that induces newly industrialized countries to set emission goals for their most important sectors which are below „business as usual“. Until this happens, the European Union could employ unilateral instruments that conform to its international commitments as a temporary solution. For the 3rd commitment period from 2013 onwards, the European Union chose such a unilateral approach: a continued free allocation of emission allowances to companies for which carbon leakage could be particularly relevant. In principle, free allocation should only take place on a basis of ambitious benchmarks, i.e. the lowest possible CO₂ emissions per unit of output. The Federal Environment Agency advocates defining these benchmarks independently of fuel type and the technology of the facilities. Otherwise efficiency optimisation would take place only within individual technologies and not drive the use of the best available technology forward. The level of these benchmarks should be determined in consideration of most efficient techniques, substitutes and alternative methods of production instead of simply using average emission rates. The Federal Environment Agency supports the European Commission in its efforts to develop benchmarks which distort the pricing signal for a tonne of carbon dioxide as little as possible. Such distortions develop for example, if benchmarks within an industry are highly differentiated. Because they are more efficient than industry-wide compensation measures, the Federal Environment Agency favours an approach which limits the circle of eligible companies to those who are

actually endangered. This means that on a case-by-case basis, the operators of the facility must prove that they are actually affected by carbon leakage. Other compensation measures which were also being discussed are problematic in the eyes of the Federal Environment Agency: although they are in theory effective and efficient means against Carbon Leakage, border adjustment measures such as penalty duties and export subsidies in practice present insurmountable methodical, international legal and political problems. This includes the high cost of enforcement and the strain such measures would probably put on international trade and the international climate negotiations themselves. In a survey the Federal Environment Agency analyzed the implementation options, the WTO admissibility and the practical problems of a border tax adjustment for those extra costs which may come from the application of national and European climate protection mechanisms [54]. The authors concluded that the implementation of a border tax adjustment system is possible in respect to WTO law. Nevertheless practical problems exist in determining the amount of the tax adjustment. A further alternative measure would be targeted subsidies from the proceeds of auctions. In principle, subsidies should be granted only for investments and not subsidize ongoing production in order to minimize the incentive distorting effects in regard to better emission reduction. Subsidies would be easily implemented, can be conditional and subject to restrictions. Subsidies could be conditional, so that operators must first prove that their enterprise is endangered by carbon leakage and afterwards demonstrate that native production and employment did not decrease which is similar to German hardship case allocation rules for free emission allowances in the first two trading periods. Because of general EU subsidy law issues alone, subsidies are surely not the ultimate solution in the fight against carbon leakage.



An EU solution: free emission certificates for industry until 2027

In its resolutions for the European climate package in December of 2008, the European Council made a political decision in order to address the dangers of carbon leakage in emissions trading starting from 2013: the industries participating in emissions trading can count on free allocations of emission allowances for longer than initially planned. Although auctioning for industry will be implemented from 2013 for 20 percent of allowances, the complete cessation of free allocation will not take place until after 2027 and not as initially planned in 2020. Industries which can prove that they are directly affected by carbon leakage continue to obtain their emission allowances completely free of charge. Eligibility criteria are the share of additional emissions trading contingent costs in each euro of gross value added (at least five percent) and the trade intensity of the industry outside the EU (over ten percent). A carbon leakage risk is also present if only one of the two criteria is more than 30 percent. In September 2009 the EU commission published a list specifying the industries concerned. This list can be supplemented annually as changes are made.

There are also provisions for sectors only indirectly subject to risks due to carbon leakage because of increased procurement costs for electricity for example. If they can demonstrate that the electricity price increase was caused by emissions trading, financial adjustments can be made for these sectors. The level of the possible financial compensation will be based on a product-specific electricity benchmark and the CO₂ emissions from the EU energy mix – i.e. the average from the percentage breakdown of energy sources from which the electricity was generated. A fundamental revision of the exemption rules is to take place in the light of the new international climate protection agreements.

Emissions trading with the USA, Canada and Australia - what is the appropriate framework for the system?

Carbon dioxide emissions trading in the European Union became a model for active climate protection in other regions. Numerous studies and initiatives have the goal of introducing similar cap-and-trade systems outside of Europe. Individual countries (for instance Australia, New Zealand) are already very close to an implementation or have already introduced an emissions trading system on a voluntary basis. Therefore, linking European Union emissions trading with other planned or existing emissions trading systems in different parts of the world is on the agenda – an option with numerous advantages for international climate protection. By extending the range of applications for emissions trading and linking the systems, more liquidity is created in the market and the heterogeneity of the participants increased which results in more growth potential for cost-effective emission reduction. Linking the emissions trading systems can gradually lead to a global carbon market with a uniform price for CO₂ emissions and thus eliminate distortions to international competition.

Avoiding the costs of climate change is only one aspect of linking emissions trading systems. Connecting the emissions trading systems will have a positive effect on international climate policy, since for example, countries with cost effective methods for avoiding emissions could profit from being connected to the international carbon market.

INTERNATIONAL PARTNERSHIP FOR EMISSIONS TRADING



In October 2007 fifteen states and regions which had already implemented emissions trading systems or were planning on doing so, established the International Carbon Action Partnership (ICAP). This partnership intends to harmonize and connect the existing systems to create a worldwide carbon market. ICAP is currently organized as a network of experts from different regions and countries, such as the European Union, the USA, Canada, Australia, New Zealand and Japan – it has 31 member states at present. Germany played a significant role in establishing ICAP and since 2008 provides the project manager who is based in the Federal Ministry for the Environment in Berlin. As a platform for knowledge transfer ICAP can play an important role in the implementation of emissions trading systems in other states and regions, particularly in newly industrialized countries such as China, South Korea or Mexico, and also promote the harmonization and integration of these systems.

In connecting different emissions trading systems it must above all be guaranteed that a linkage does not jeopardize the ecological integrity of the European Union emissions trade. The Federal Environment Agency therefore deems it absolutely vital that after integration, a clearly defined and absolute upper limit for emissions is applied to the entire emissions trading system. Not all of the models that are currently discussed internationally provide for this.

“Safety valves” which, above a certain certificate price allow operators to pay “penalty taxes” instead of surrendering their emission allowances, are incompatible with the European system. In such a case, adherence to upper limits for emissions could no longer be guaranteed for the whole system. Already there are examples for planned emissions trading systems which contain such a safety valve. Permitting the “borrowing” of certificates from future trading periods could have similarly negative effects in respect to the ecological integrity of the emissions trade. The hope underlying this concept is the assumption that the necessary emission reductions can be carried out at a later time for less money – this however is most doubtful.

The method of receiving credit from CO₂ reduction projects outside of the emissions trading systems can also be problematic should lax requirements exist for such climate protection projects. For the project mechanisms of the Kyoto Protocol detailed regulations are in place to ensure the ecological integrity of JI and CDM projects. Some of the emissions trade initiatives outside Europe are planning markedly less stringent standards for national climate protection projects („offset projects“). In addition, no competitive distortions among

connected systems must be allowed to develop due to differing enforcement standards. One tonne of CO₂ emissions must be covered by one emission allowance throughout the entire system. Therefore the Federal Ministry for the Environment and the Federal Environment Agency advocate regulations governing monitoring and quality control of emission reports which are comparable to those of the European Union.

Extending the scope of emissions trading - integration of new industries and gases

The European Union continues to heavily back emissions trading as a targeted and efficient climate protection instrument. Currently emissions trading already covers 40 percent of the European and even 50 percent of the German CO₂ emissions. In the course of further European development, additional emissions-intensive industries in Germany will participate in emissions trading from 2013. The number of facilities and their associated emission budgets will be determined by the Federal Environment Agency up to spring 2010. The process of extending emissions trading to involve other types of facilities features another important step forward – the inclusion of additional greenhouse gases besides CO₂. In future, the emissions of nitrous oxide (N₂O), which is generated in the production of nitric acid, adipic acid, glyoxylic acid and glyoxal as well as the emissions of perfluorinated hydrocarbons (PFC) from the production of primary aluminium, will be subject to emissions trading.

TABLE 8: ADDITIONAL INDUSTRIES OR SECTORS, WHICH WILL PARTICIPATE IN EMISSIONS TRADING FOR STATIONARY FACILITIES STARTING FROM 2013, AND THE GREENHOUSE GASES INCLUDED

1. Combustion plants (> 20 MW*; e.g. direct heated dryers, process-integrated burners and furnaces of all industries which are not explicitly mentioned in Appendix I of the Emissions Trading Directive)	CO ₂
2. Production and processing of ferrous metals (> 20 MW* including rolling mills, forging works, foundries etc.)	CO ₂
3. Production of primary aluminum	CO ₂ and PFC
4. Production of secondary aluminium > 20 MW*	CO ₂
5. Production and processing of non-ferrous metals (> 20 MW*)	CO ₂
6. Production of soda and sodium bicarbonate	CO ₂
7. Production of gypsum, production of plasterboard and other gypsum products (> 20 MW*)	CO ₂
8. Production of organic basic chemicals (> 100 t/day)	CO ₂
9. Hydrogen and synthesis gas production (> 25 t/day)	CO ₂
10. Ammonia production	CO ₂
11. Nitric acid production	CO ₂ and N ₂ O
12. Adipic acid, glyoxylic acid, glyoxal production	CO ₂ and N ₂ O
13. Production of ceramic products by firing (an exclusive threshold of > 75 t/day is new)	CO ₂
14. Separation, transport and geological storage of greenhouse gases (Carbon Capture and Storage, CCS)	CO ₂

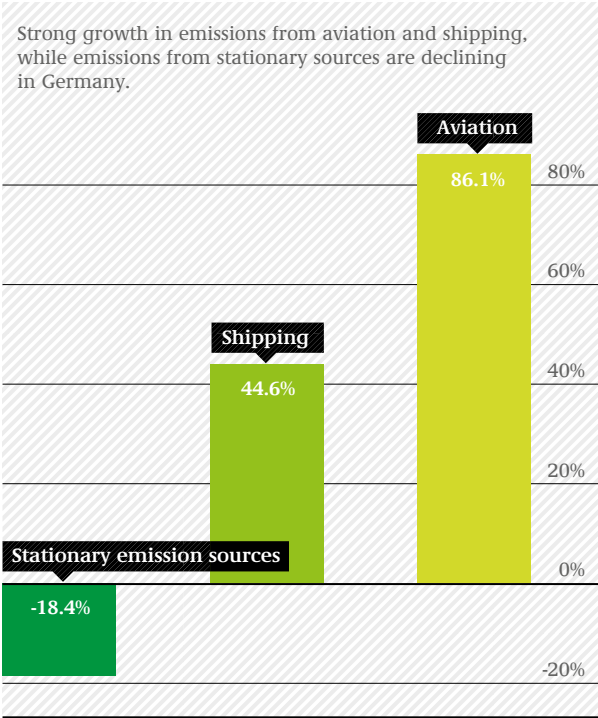
* The threshold refers to the total output of all units in a facility in which fuel is burned. Exception: units with an output < 3 MW and those which exclusively burn biomass are not considered in determining the emissions trading obligation.

Emissions trading for aviation: starting in 2012

Aviation is an industry that shows strong growth, its emissions increasing correspondingly. Though planes currently contribute only two or three percent to world-wide carbon dioxide emissions, the sum total is already equivalent to the CO₂ emissions of a large industrial nation. Furthermore, CO₂ is not the only substance harmful to the climate that is emitted from the engines at altitudes between 9 and 13 kilometres: the global warming effect is amplified by nitrogen oxides, particulates and steam. According to cautious estimates, the total climate impact of aviation is approximately two to three times larger than the effects of its CO₂ emissions alone.

In the summer of 2008 the European Union agreed to the implementation of emissions trading for aviation. Starting from 2012, all flights using planes with a Maximum Takeoff Weight of over 5.7 tonnes, using instrument flight rules, and which start or land in the European Union will be subject to it. In addition to several classes of flight types such as customs, military, rescue and training flights, small airlines with a small number of flights (on average two flights per day) or with annual emissions below 10,000 tonnes of CO₂ are exempt. The 2012 emissions budget is at first reduced to 97 percent of the average emissions from 2004 to 2006, and is then curtailed at 95 percent starting from 2013. Of the total budget, 15 percent is intended for auction, the remainder allocated free of charge – on the basis of a Europe-wide benchmark which is calculated based on the tonne-kilometre performance (the weight of all passengers and freight, multiplied by the respective distance) from 2010. Reporting their tonne-kilometre performance is a prerequisite for airlines in order to receive their free emission allowances. Emissions trading in aviation exhibits further unique characteristics compared to that of stationary installations. Because emissions from international aviation are currently not subject to the international climate regime of the Kyoto Protocol, a complete integration of aviation emissions trading and emissions trading for

FIGURE 15: EMISSIONS TRENDS OF AVIATION AND SHIPPING
1990-2004



Source: dpa, own calculations

new stationary installations is not yet possible. For that reason aviation has its own type of certificate. Operators participating in stationary emissions trading may still only use their own types of emission allowances (EU allowances) and certificates from project-based mechanisms to meet their submission obligations. Aircraft operators may however use all types of emission allowances – those from aviation and those from stationary emissions trading. There will be a special reserve of 3 percent for new and fast growing airlines which is to be issued free of charge in a special allocation procedure in 2016. If a non-EU country passes resolutions on measures to reduce the climate impact of aviation which also concern flights into the European Union, then the European Commission will investigate options for integration together with this country – if applicable, with an exemption for the flights of this country from the obligation to participate in emissions trading. Though emissions trading in aviation only begins officially in 2012, the participating airlines were faced with new tasks already in 2009. All airlines which start or land in the European Union had to submit so-called monitoring concepts to the relevant national authority for approval – these are the basis for the tonne-kilometre performance and CO₂ emissions reporting that begins in 2010. The German Emissions Trading Authority was mandated by the Federal Government with the preparations for the implementation of aviation in emissions trading in Germany. It began laying the foundations for making a smooth implementation possible in 2008: preparing the technical, methodological and information technology implementation requirements for monitoring guidelines, communicating the requirements to European and non-European aircraft operators and expert bodies, providing technical support to policy



makers creating the national legal foundations as well as intensive co-operation at a European level with the relevant national authorities and the European Union Commission in order to harmonize the requirements for monitoring.

As before, with the introduction of emissions trading for stationary facilities, political compromises were made in the creation of the framework for the inclusion of aviation in emissions trading. It is particularly unfortunate that the severe climate impact of greenhouse gas emission at high altitudes was not acknowledged by applying a multiplier of 2 to the CO₂ emissions. It is all that much more important now that the European Commission submits its declared measures for the reduction of nitrogen oxide emissions from aviation. Of greater importance however, is that the powerful and growing aviation sector becomes part of emissions trading at all and that the emissions from this sector will be mitigated for the first time. Powerful innovation and investment incentives for emission reductions are thus created. The next step must be to win over more states to participate in emissions trading – also in aviation – in order to create a worldwide emissions trading system.

Integration of international shipping

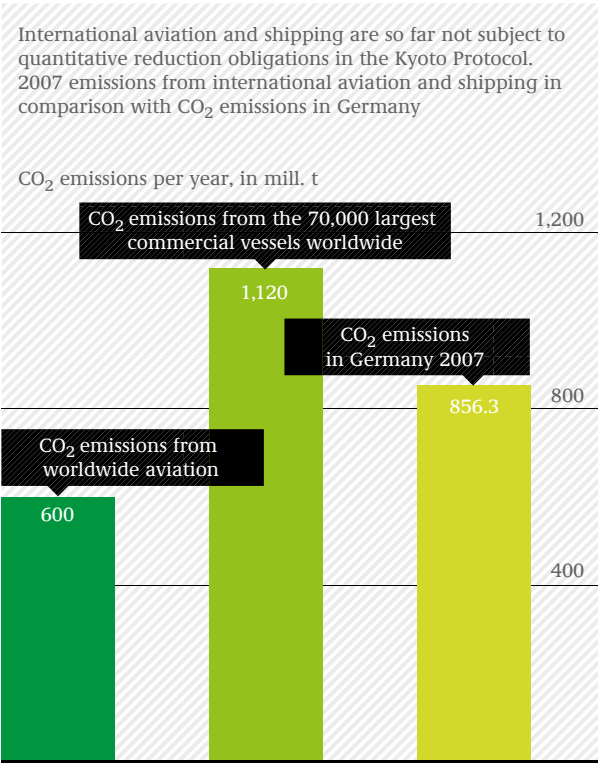
For many years the greenhouse gas emissions from international shipping were considered low. Meanwhile, various research results indicate that CO₂ emissions from worldwide shipping have been grossly underestimated so far. A study by numerous experts conducted on behalf of the International Maritime Organization (IMO), a subsidiary organization of the United Nations, came to the preliminary conclusion that the shipping sector emitted about 1,019 million tonnes of CO₂ in 2007. This means that the emissions from the shipping sector are significantly higher than those from world-wide aviation and also higher than Germany's total CO₂ emissions (see Figure 16).

The Kyoto Protocol does not contain binding reduction obligations for CO₂ emissions from international shipping. Article 2.2 of the Kyoto Protocol instructs the UN special organizations (International Maritime Organization – IMO) to compile measures for the mitigation or limitation of greenhouse gas emissions from international shipping. But despite many years of negotiation there is no agreement on substantive climate protection measures for the shipping sector in the committees of the IMO. In the past two years however, the IMO intensified its efforts for passing a binding scheme. So far merely a formula for an energy-efficiency design-index was developed which is still being debated. It is totally unclear how this formula is to be used and economic instruments were only cursorily discussed. The passage of an effectively binding scheme for existing ships is currently not on the horizon. Based on a study commissioned by the Federal Environment Agency, Germany, together with Norway and France, submitted a proposal for an emissions trading system for international shipping at the meeting of the environmental committee of the IMO in July 2009. At present the only suggested

alternative to emissions trading is the idea of a levy on so-called bunker fuels.

Because no resolutions for measures were forthcoming, the European Union again announced that, with continued stagnation at IMO level, it would evaluate and implement its own climate protection instruments for

FIGURE 16: CO₂ EMISSIONS FROM INTERNATIONAL AVIATION AND SHIPPING IN COMPARISON WITH CO₂ EMISSIONS IN GERMANY



Sources: UBA, IMO 2008

sea transport. The commission will begin discussing possible measures, among them the integration of the shipping sector into European Union emissions trading. Similar to the inclusion of aviation in emissions trading starting from 2012, this could be a first step on the way to a worldwide solution.

The Federal Environment Agency assigned the research project to the Öko-Institut (Institute for Applied Ecology) “Erweiterung des EU-Emissionshandels durch Einbeziehung des Schiffsverkehrs” (The extension of European Union emissions trading by including the shipping sector). It is to further develop the economic and legal concepts for the inclusion of the shipping sector in the European emissions trading system and to gauge and evaluate the economic consequences for Germany and Europe.

Outlook

With the implementation and extension of emissions trading up to 2020, the EU has created the engine for effective climate protection. EU emissions trading made an impact right from the start. The first trading period from 2005 to 2007 was essentially a test phase. It revealed some initial flaws and weaknesses of the instrument in its design at that time so that policy could be adjusted accordingly. With what has been learned so far, the collected data, the institutions created and the legal decisions, emissions trading is on course. Emissions trading has a very good chance of developing into an instrument of economic efficiency and integrity for climate protection policy worldwide. Emissions trading in Europe already captures over 40 percent of CO₂ emissions and reduces them continuously – in 2008 by more than 3 percent compared to 2007. That

alone is a good model for other countries, namely the USA, but also for newly industrialized countries.

Therefore, internationalization, the integration with systems on other continents, will be among the big challenges for the coming years. Further essential tasks will arise by extending European emissions trading to new industries and the other greenhouse gases specified in the Kyoto Protocol. Not least the integration of aviation, and later on other means of transport, will shape the development of the existing system for the years to come.

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THE FEDERAL ENVIRONMENT AGENCY



BRIDGING SCIENCE AND POLITICS – DEPARTMENTAL RESEARCH IN THE FEDERAL ENVIRONMENT AGENCY

Identifying tomorrow's problems today. The Federal Environment Agency considers itself as an early warning system which detects future potential dangers to people and their environment at an early stage and puts forward practical proposals for avoiding harm to the environment. The Federal Environment Agency, at the interface between science and politics, identifies and assesses facts about the state of the environment, puts forward proposals to facilitate improvements and monitors their effectiveness. Thus for example the Agency performs continuous monitoring of air quality using its air monitoring system in order to check the success of a whole range of actions. Another example: the investigation of specimens deposited in the Environmental Specimen Bank years ago provides information about

when dangerous substances entered the environment and about their spread over the years.

These are only two examples of our scientific work which is principally aimed at providing advice to the Federal Ministry of the Environment and other Ministries. Research in the Federal Environment Agency is based not only on the Agency's own research: we grant research contracts to universities and other scientific institutes in Germany and abroad, and we also acquire research funds from third parties in order to close gaps in our knowledge about the state of the environment. This multifaceted departmental research is aimed at fulfilling the Agency's services towards the Federal Government.

Output of departmental research

Departmental research fulfils certain criteria as laid out in the 'Concept of a modern departmental research of the Federal Government' of December 2007 as follows:

- it is problem-orientated and focuses on practical use;
- it is interdisciplinary because of being problem-orientated;
- it integrates users and beneficiaries of the knowledge in a transdisciplinary way
- it generates knowledge transfer and provides help in implementing the scientific system to the user system (for example enforcement of environmental laws) and vice versa;
- it combines scientific competence available at short notice with the ability to work on long-term issues continuously and research-based.

Commissioned by the Federal Government, the German Council of Science and Humanities is currently assessing the Federal Government's departmental research. In its recommendations about the role and future development of federal institutes entrusted with research and development tasks (2007) the Council assessed departmental research with the quality mark 'good to very good' [55]. At the same time it encourages further efforts toward maintaining and continuously improving the quality of departmental research.

The Federal Environment Agency is ready to meet this challenge. In order to unite its efforts in this field and implement the recommendations of the German Council of Science and Humanities, the Agency established the Central Control office in May 2008 under the vice-president's responsibility. Its task is to support management in developing a systematic and efficient research planning which focuses on the Agency's key topics and services. The objective is to make the Federal Environment Agency capable of fulfilling its role as a departmental research consultant even better.

The Federal Environment Agency considers its research activities as a necessary prerequisite for giving policy advice, which is one of the Agency's key services. In addition, the Act on the establishment of the Federal Environment Agency mandates the Agency to provide the public with information on issues of environmental protection and environmental-related health protection.

Theory and practice - closely bonded within the Federal Environment Agency

Those who need to perform quick and precise research for environmental policy, need specific knowledge which can only be acquired over many years. Therefore it is important that the Federal Environment Agency employs scientific personnel on a long-term basis. One of the most advantageous features of the Agency's research capability is that the scientific staff have a close connection to law enforcement and regulation – for instance in the field of pesticides. Enforcement services and provision of policy advice are two sides of the same coin. The enforcement of environmental law is entirely based on the scientific competence of the Agency's experts. Only those who know about the latest results

in science can reliably decide whether a pesticide may be used on our fields and thus might get into our food. Our enforcement tasks generate impetus for new research topics – for example if it turns out that an approved active substance has undesired side effects. In the Federal Environment Agency, theory and practice are in intimate contact.

Research needs an exchange of ideas and dialogue

The best knowledge arises from an open exchange of ideas with others. We have an interdisciplinary work environment and maintain a critical dialogue both within and outside the Agency. It is a good practice to first present and discuss research results in workshops with all those concerned.

Dialogue also develops through the participation of the Agency's scientists in national and international working groups – for instance at EU or OECD level – or from other technical, organisational and methodological insights. Not least is the fact that individual knowledge and experience of the Agency's colleagues does play a major role in knowledge generation and application. The Federal Environment Agency takes research to be a wide-ranging concept which also includes combining scientific findings in a synoptic way and integrating scientific results of third parties into one's own work.

Research needs exchange. The Federal Environment Agency will continue to provide facts and recommendations of proven quality. We are planning to establish and implement the concept of modern departmental research together with our partner authorities. In addition, the Federal Environment Agency will extend its international research activities, for example by enhancing cooperation with other European environmental protection authorities. All this is aimed at improving our early warning system and enabling politicians to start actions at an early stage to avert stress to the environment in future.

The Environmental Research Plan (Umweltforschungsplan, UFOPLAN) of the Federal Ministry for the Environment is the Federal Environment Agency’s key instrument to instigate external research projects. Based on the Agency’s recommendations, the Federal Ministry for the Environment combines the research projects it considers necessary to meet its specific needs for advice into annual environmental research plans. The Federal Environment Agency usually grants projects in accordance with current award guidelines and manages the projects in technical and administrative respects. In 2009, 86 research and development projects on environmentally related topics were started [56]. Table 10 provides an overview about the wide spectrum of key topics of the 2009 UFOPLAN.

Contact:
Vera Rabelt, “Central Control”

SOURCES:
55 The recommendations of the German Council of Science and Humanities as well as further information is available on the internet at: www.wissenschaftsrat.de
56 More information about the 2009 UFOPLAN can be found at: www.umweltbundesamt.de/service/ufoplan.htm
www.bmu.de

TABLE 10: KEY TOPICS OF THE 2009 UFOPLAN

1	Ecological industrial policy/resource efficiency
1.1	Further development of the national 'Environment - Innovation - Employment' initiative (including instruments, industrial policy implications and overall economic effects of innovative environmental policy; European environmental technology promotion programmes; sustainability management in enterprises; national dialogue processes and communication platforms)
1.2	Product-linked ecological innovation policy
1.3	Best available techniques at installations - improving German technology standards
1.4	Resource efficiency in production and consumption
1.5	Resource efficiency in waste management and development of product responsibility
1.6	Integrated water management, enhancing efficiency in water supply and waste water disposal
2	National and international climate protection
2.1	Integrated overall concept for climate and energy policy (including emission reduction programmes)
2.2	International carbon market, implementation and development of the European emissions trading system and the flexible mechanisms (including legal issues of environment, energy and climate protection)
2.3	(Further) development of the post-2012 climate regime
2.4	Contribution of waste management and soil protection to climate protection (national/international)
3	Adaptation to the effects of climate change
3.1	Devising and enforcing a national strategy for adaptation to the consequences of climate change
3.2	Adaptation to the effects of climate change at international level
4	Energy efficiency
4.1	Energy efficiency - key to an integrated climate and energy concept
5	Expansion of renewable energy - biomass use and production, CO ₂ efficiency, land use efficiency
6	Sustainable mobility and pollution control
6.1	Climate protection in the transport sector
6.2	Improvement of greenhouse gas mitigation and energy efficiency in engines and fuels
6.3	Improvement of noise reduction in the transport sector, in facilities, equipment and machines
6.4	Air quality, air pollution control
7	Environment and health, chemicals safety
7.1	Environment and health
7.2	REACH, chemicals safety (including pesticides and biocides)
7.3	Nanotechnology
8	Basic and cross-cutting topics without direct relation to key topics
8.1	Basic issues of environmental law (including Environmental Code, environmental assessment, impact assessment, bureaucracy reduction and better lawmaking)
8.2	Polls on basic environmental policy issues and on specific topics
8.3	National and European reporting commitments about packaging and Electrical and Electronic Equipment Act (ElektroG)
8.4	Sustainability policy
8.5	Protection of the marine environment
8.6	Miscellaneous





OUR CREDO: A FEDERAL ENVIRONMENT FOR PEOPLE AND THE ENVIRONMENT

Who we are

The Federal Environment Agency is the scientific environmental authority within the remit of the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU), and it deals with a wide and varied range of topics. We are committed to protecting the environment and human beings from harmful environmental effects. We represent all necessary fields and qualifications. The value of our analyses and recommendations for political decisions, and the fact that we are independent of any individual interests, make us a unique environmental institution in Germany.

What we want

Our objectives are:

- to protect and maintain the natural bases of life – for present and future generations,
- to promote sustainable development,
- to make environmental protection a matter of routine in everyone's thoughts and behaviour.

What we provide

- We identify, describe and assess the state of the environment in order to detect adverse impacts on human beings and the environment as early and as comprehensively as is possible
- We develop specialist solutions as our departmental tasks and recommend effective actions to the BMU and other Federal Ministries.
- We also provide advice to other state, municipal and private sector institutions.
- We provide understandable information to the public on the causes of, and practical solutions for, environmental problems.
- We participate in international committees and conferences and promote international environmental protection.
- We make our knowledge and our experience available both at a national and international level.
- Our services are provided in a timely and cost-conscious way.

How we work

- The Federal Environment Agency – meaning each and every member of its staff:
- We are responsible and dedicated and rely on flexible and cooperative working methods.
- We respect the views of others and appreciate their achievements.
- Our management in particular are responsible for creating a good interpersonal working environment where creativity and specialist knowledge combine to produce positive results.
- We make our decisions transparent; we are self-critical and open to criticism from outside.
- We rely on our own capabilities and observe the rules of good scientific practice in order to provide services that are sound, traceable, effective and practicable.
- We gain our knowledge from our own research, from research contracts, through practical trials and from the assessment of the work of others.
- The Agency's conclusions are the result of an opinion forming process which takes all relevant aspects into consideration.

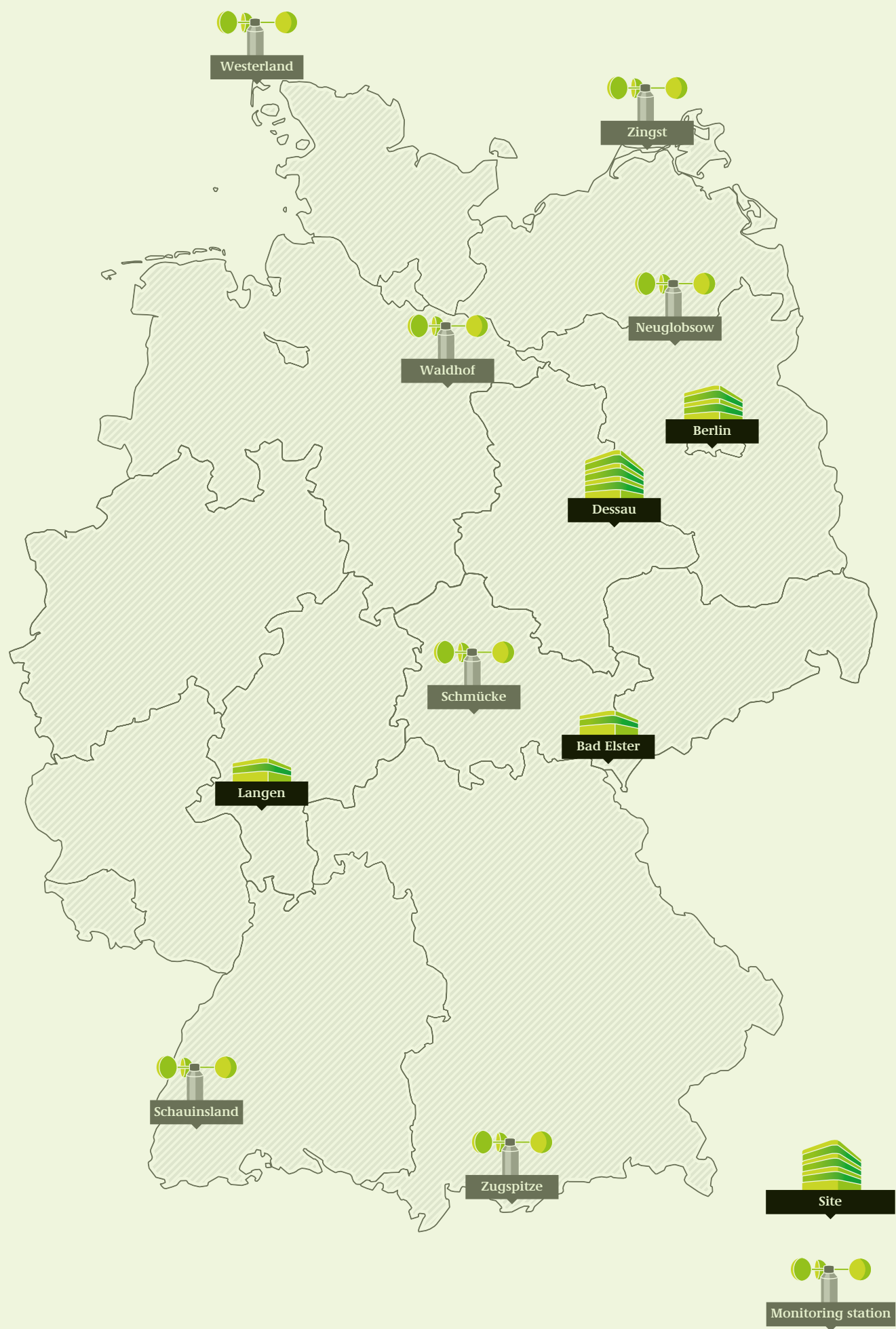




ORGANISATION DATA & FACTS

The Federal Environment Agency is Germany's central environmental protection authority. It was established in Berlin in 1974 and has had its headquarters in the Bauhaus city of Dessau since May 2005. Apart from its Central Administration Division, UBA has five divisions with 14 departments and employs more than 1400 employees at 13 sites – three of them in Berlin and seven monitoring stations of UBA's own air monitoring network. Almost 800 employees work in Dessau-Roßlau (see Figure 17, page 72). In addition to 'pure scientific work', the enforcement of environmental law – for example the Chemicals Act or the Plant Protection Act – and providing information to the general public about environmental protection issues are key areas of our daily work. The Federal Environment Agency is a partner and contact point in Germany to a number of international institutions, for instance the World Health Organization (WHO) and the European Environment Agency.

FIGURE 17: SITES OF THE FEDERAL ENVIRONMENT AGENCY







DIVISION I ENVIRONMENTAL PLANNING AND SUSTAINABILITY STRATEGIES

Sustainability strategies and instruments, climate protection and energy, transport and noise, international environmental protection – Division I deals with a wide variety of issues. The focus is increasingly on strategies for sustainable development, aimed at significantly reducing the conversion of raw materials and energy into polluting substances and reducing land take for settlements and roads in the future. Climate protection is one of the largest challenges the international community of states is currently facing. It will only be manageable if industrialised countries like Germany move their energy supply towards renewable energy and greater energy efficiency is achieved. Another major challenge of environmental and transport policy is to shape the mobility required by society to be as environmentally compatible as possible.

Division I develops strategies for achieving the quality objectives for the environment as proposed by the Federal Environment Agency and required politically. Based on effect analyses, the Agency also formulates recommendations for the improvement of environmental and climate protection policy instruments at national and international level. Effective environmental protection requires reliable data. The Division updates the public, policymakers and decision makers in science and industry regularly about the state of the environment in Germany and about trends and causes of change to the environment both in terms of improvements and harm.

More information:

www.umweltbundesamt.de



DIVISION II ENVIRONMENTAL HEALTH AND PROTECTION OF ECOSYSTEMS

The Agency's mission statement – 'for people and the environment' – applies to Division II in particular. The specialists within the four departments are directly concerned with protecting water, soil, air and ecosystems and deal with issues of environmental health. For this purpose the Federal Environment Agency pursues its own data acquisition (Environmental Specimen Bank, Air Monitoring Network) or uses data generated by the Federal States and performs its own studies. Based on scientific findings, the specialists develop quality objectives for the protection of the environment and human health, assess the risks which environmental pollutants pose to adults and children and develop action programmes.

The Division is also concerned with establishing hazard and exposure trends which is a prerequisite for priori-

tising protective environmental policy measures. The public are becoming increasingly aware of the health issues in environmental protection. The Federal Environment Agency works on reconciling environmental and health protection requirements. The experts of Division II publish clearly worded information papers for the general public about 'environment and health' and provide advice to municipalities and the Federal States on issues of environmental health.

More information:

www.umweltbundesamt.de



DIVISION III

SUSTAINABLE PRODUCTION AND PRODUCTS, WASTE MANAGEMENT

Technology, production and consumption represent key areas in environmental and health protection. The two departments of the Division explore different ways of devising production processes and technologies in such a way that impacts on the environment and human health are minimised. These techniques are expected to increase the competitiveness of German enterprises and create jobs. Additionally, environment and health-compatible products must fulfil requirements which increase their acceptance among the population and enhance their sales.

The services of Division III comprise various approaches – for example the ‘Blue Angel’ eco-label, environmentally friendly procurement and the solution of certain environmental problems in various branches of industry. One overarching approach is sustainable consumption. Division III seeks to improve the safety of installations

at national, European and international level, introduce the model of sustainable production into various areas of production and enhance sustainability in waste and waste water management.

More information:

www.umweltbundesamt.de



DIVISION IV CHEMICAL AND BIOLOGICAL SAFETY

Chemicals are an all-pervasive part of our everyday life. The two departments of Division IV concentrate on chemical substances and their effects on, and risks to, ecosystems and human health. The Division plays an important role in the enforcement of national and European environmental law, e.g. in the field of industrial chemicals, pesticides, health pests, biocides, drugs and washing and cleansing agents. Our specialists investigate the effects chemical substances have on the environment, the expected environmental concentrations and whether these present a risk. If this is the case, conditions of use, use restrictions or bans are recommended for risk reduction.

The Agency's specialists develop the scientific base from which we can learn more about chemicals and can establish safer and better assessments in the future about the risks posed by these substances. The Division's own

laboratories and the artificial stream and pond system (FSA) in Berlin serve this purpose. The Division also evaluates the efficacy of pesticides intended for application against disease vectors. The Hazardous Substances Rapid Information Service, which helps fire brigades and police in accidents involving chemicals, is part of the GSBL hazardous substances data pool and provides the public with data on more than 140,000 substances and products. Chemicals management is today a European sphere of activity. The work of the Division is therefore focused mainly towards the European Union and increasingly towards international and global issues.

More information:

www.umweltbundesamt.de



DIVISION E

EMISSIONS TRADING – GERMAN EMISSIONS TRADING AUTHORITY (DEHSt)

The European Union introduced emissions trading at the beginning of 2005. As a market-based instrument for climate protection, emissions trading ensures that carbon dioxide emissions are reduced where savings can be made in the most economical way. The objective of the German Emissions Trading Authority (DEHSt), established at the Federal Environment Agency in 2004, is to guide emissions trading towards ecological and economic success. This can be achieved by maintaining the ecological integrity of this instrument, neutrality of competition and low transaction costs.

In addition to central management functions for emissions trading in Germany, DEHSt offers a reliable service to businesses participating in the European emissions trading system and to experts and authorities. It checks the requests from plant operators for allocation of emission allowances and issues these on an annual basis.

The specialists also check the annual reports on the actual emissions of the facilities. The DEHSt operates the national emissions trading registry and is responsible for national and international reporting. DEHSt as the competent national authority checks and authorises climate protection projects according to the flexible mechanisms of the Kyoto Protocol (Joint Implementation and Clean Development Mechanism).

More information:

www.dehst.de



CENTRAL DEPARTMENT – ADMINISTRATION AND SERVICE

The central department is working to provide all Agency staff with a functioning, pleasant environment in which to perform their specialist work. It provides its services in classical fields of administration: human resources, financial management and accounting, optimization and organization of internal processes, procurement, administration of the Agency's four large sites and the air monitoring network, research and third-party project administration, IT and communications technology, legal advice and a specialist environmental library.

The central department considers itself responsible for the Federal Environment Agency's necessary modernization with the aim of keeping the Agency fit for purpose in the field of research and enforcement of environmental law. Thus for example budgeting of material and human resources within the responsibility of

the Agency's specialist units has been introduced with central department support to promote the effective and cost-efficient use of personnel and funds. In its own activities the central department takes into account environmental and health aspects, for instance in procurement and building activities, and thus promotes the Agency's aim of setting an example in terms of environmental protection.

More information:

www.umweltbundesamt.de

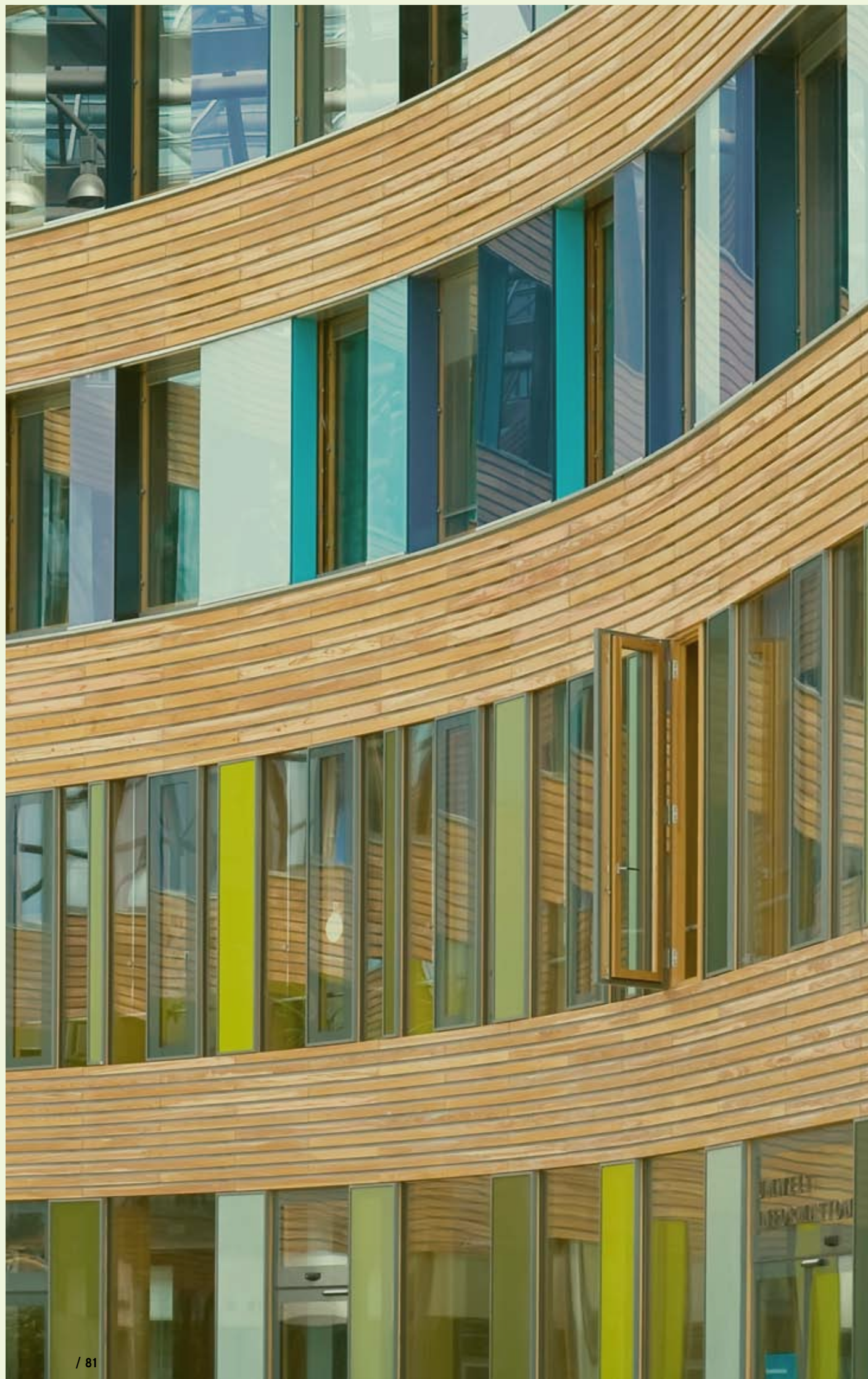
TABLE 11: EMPLOYMENT

Year	Total	Civil servants	Employees	Workers*
2009	1,146	447	699	-
2008	1,151	448	703	-
2007	1,141	442	699	-
2006	1,127	410	648	69
2005	1,136	410	654	72
2004	1,025	369	583	73
2003	1,000	393	534	73
2002	1,010	390	543	77
2001	1,001	387	538	76

*Because of the change of the employment management system from BAT/MTArb to TVöD in 2007, previously separately recorded 'worker' jobs have been integrated under the heading of 'employees' from that time.

TABLE 12: BUDGET OF THE FEDERAL ENVIRONMENT AGENCY

	Goal 2008 in 1,000 Euro	Goal 2009 in 1,000 Euro
I. Budget of the Federal Environment Agency		
I.1 Total expenditure	98,183	102,960
To		
- Personnel	62,035	69,754
- Investment	7,098	5,878
- Allocations and grants (without Invest.)	14	20
- Administration	29,036	27,308
To		
Scientific publications and documentation	355	359
Environmental information and documentation system (UMPLIS)	2,695	2,704
Information technology	5,238	4,820
I.2 Services provided to federal authorities and third parties		
- Federal authorities (actual expenditure)	321	-
- EU, others (actual expenditure)	1,161	-
II. Managed funds transferred from other Chapters for distribution		
e. g. for		
- Investments towards pollution abatement	19	48
- Allocation of funds for research projects (UFOPLAN)	17,100	18,441
- Environmental Specimen Bank	4,331	4,331
- Grants to associations, federations, etc.		
• support for institutes	3,481	1,279
• support for projects	3,341	3,208
- Educational measures	1,205	1,035
- Advisory assistance for environmental protection in countries of Central and Eastern Europe and the Newly Independent States (NIS)	1,844	1,025
- International cooperation	533	273
Sum total of funds transferred from other chapters of the Environment Ministry's budget	31,854	29,640



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EDITORIAL INFORMATION

Publisher:

Federal Environment Agency
Wörlitzer Platz 1, 06844 Dessau-Roßlau
Phone: 0340 / 2103-0
Email: info@umweltbundesamt.de
Internet: www.umweltbundesamt.de

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Fotini Mavromati

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Layout:

Studio GOOD, Berlin
www.studio-good.de

English by:

Nigel Pye, NP Services
Email: npservices4u@gmail.com

Photographs:

Cover: Silvia Sinha
U2: Silvia Sinha
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