WHAT MATTERS 2011

↗ Why Environmental Protection is a Global Concern ↗ Water – Ecologically Sound Handling of a Precious Resource ↗ Ambitious Environmental Policy Equals Sustainable Health Protection

Annual Report of the Federal Environment Agency

Umwelt Bundes Amt
For our Environment

JOCHEN FLASBARTH
President of the Federal Environment Agency

ENVIRONMENTAL PROTECTION IS A GLOBAL CONCERN

The Federal Environment Agency's mission is to provide science-based advice to the German Government. The Agency's core activities include early identification of problems, identifying current or foreseeable environmental impacts as well as potential environmental issues and develop solutions to face these hazards.

Environmental protection has become a global issue. It is therefore necessary to provide policy advice to the government increasingly focussed on international developments and players. Already the field of view of environmental protection has expanded beyond national borders. The fact that the pollution of the river Rhine has decreased considerably is thanks to the cooperation of neighbouring riparian countries: the International Commission for the Protection of the Rhine was founded in 1950 and it grew to a genuine cross-border environmental protection instrument after the Sandoz chemical accident in Basle in 1986. Also, protection agreements were adopted for the North Sea and Baltic Sea in the seventies: the Oslo and Paris conventions for the North Sea which were later merged into the OSPAR convention and the Helsinki convention (HELCOM) for the Baltic Sea.

Air pollution has also been increasingly looked at in view of its international implications and internationally codified by the Geneva Convention on Long-range Transboundary Air Pollution. The convention has helped to significantly reduce the burden of pollutants via the air pathway on European ecosystems over the last three decades. Of particular importance was the Montreal Protocol on Substances That Deplete the Ozone Layer. Recent research by European scientists has shown that the protocol works and that the ozone layer is gradually recovering. The risk of skin cancer and environmental damage due to aggressive UV radiation has been greatly reduced through the global protection efforts. In terms of chemical safety, the Stockholm Convention 2001 became a cornerstone for a global ban on the production and use of particularly hazardous substances. Meanwhile, in addition to the so-called "dirty dozen", the convention has been extended to a large number of other materials.

The big push for global environmental protection came in the 1992 Earth Summit in Rio de Janeiro – the UN Conference on Environment and Development. The concept of sustainability moved to the centre of both international environmental policy and development cooperation. At the same time the big three Rio Conventions were initiated: the United Nations Framework Convention on Climate Change (UNFCCC), the Convention on Biological Diversity (CBD) and the United Nations Convention to Combat Desertification (UNCCD).

International climate protection has long since moved to rank equally with the peace policy and international economic policies on the agenda of heads of states and governments. Neglected climate protection has already become a crucial issue for small island states today – and it will be the sine-qua-non of coexistence for the states in the medium to long term. Since the climate conference in Cancún, Mexico, the international community has agreed to pursue a common goal: the medium global average temperature should not rise more than two degrees in comparison to the pre-industrial level to ensure that climate change remains on a fairly manageable track. On this basis, a common understanding for a new international regulatory regime shall be established to pursue the objectives of global climate protection. The Federal Environment Agency advises the German Federal Government in the preparation and negotiations and its experts take part in developing the specialist basis for the international legislation process.

In addition to the further development of international environment law, an intensified global cooperation is also necessary at the scientific level. Data collection of air pollutants, for instance, requires international cooperation. It becomes increasingly important to share the rapidly growing knowledge about environmental relationships, problems and possible solutions. Whether it is climate research, the evaluation of chemicals or the potential for an efficient use of resources, the exchange of expertise between the science policy advisory bodies is absolutely essential in order to provide adequate recommendations. Experts of the Federal Environment Agency therefore participate in numerous committees of the European Union, the OECD and the UN as well as in international specialist organizations.

Eventually, global environmental protection means a change in management pattern – not only in our country, but world-wide. Green Economy has become the guiding principle of a new relationship between economy and environmental protection. Thus the limits of environmental impacts are not only considered as restrictions of economic activity, but also as innovation drivers and an impetus for the development of "green" future markets.

To preserve and develop wealth in many countries without endangering the balance of the global climate regime, exhausting the finite resources and overextending the use of ecosystems requires a new inventive and innovative culture. Germany is a highly respected global provider of know-how and advanced technology. In many "green" future markets Germany is a market leader, and these "green markets" continue to grow: the world market volume of 1.4 trillion euros in 2007 will increase up to 3.1 trillion euros by 2020 according to estimates. Already some 1.8 million people work in the environmental industry today. Alone the necessary measures needed to reach the German climate protection target by 2020 can create about 630,000 new jobs in Germany. If Germany continues to combine its environmental protection research and development with its international pioneering role in environmental politics, new opportunities will emerge for German companies in the export markets.

GREEN ECONOMY: INVESTING INTO TOMORROW'S INDUSTRY AND TECHNOLOGY – AND NOT INTO YESTERDAY'S

The evolution of the UN's structures for global environmental protection and international developments to enhance a Green Economy will be the focus of the next major UN summit in Rio de Janeiro in 2012. Achim Steiner, head of the United Nations Environment Programme (UNEP), talks about challenges and opportunities in global environmental protection.

Mr. Steiner, the heads of governments and states want to meet in Rio de Janeiro at another UN conference on sustainable development in 2012. What are your expectations for the "Rio+20" summit?

Achim Steiner: I know that there is a lot of scepticism about these summits. But we must not forget that Stockholm 1972, the first major UN environment conference, and the 1992 Earth Summit in Rio de Janeiro, became important milestones in international environmental policy. Therefore I have great expectations for Rio 2012. From the UNEP's view, the two topics of the upcoming conference – "Green Economy", i.e. how the world's economy can follow a sustainable path, and the UN organisations' structural reform for environmental protection and sustainable development – are key challenges for the implementation of the sustainability objective and for the United Nation's relevance and effectiveness in this field. While preparations for 2012 are underway, albeit slowly, I am sure that a lot will be happening in the coming months and the outcome will be of high political value for this summit.

It has been often stated that the United Nations Environment Programme should be upgraded. What is this supposed to look like?

Steiner: The "International Environmental Governance" topic has been with us for over four decades. On the one hand we have achieved a number of goals – from the founding of the United Nations Environment Programme, to numerous environmental conventions and agreements. But it is also clear that one of the three pillars of the sustainable development model as adopted in Rio, the international environmental policy, is still suffering from a lack of coherence and clout. It is primarily about the environment ministers' mandate and scope. International environmental politics must be strengthened in such a way that priorities, responsibilities and resolutions can be implemented more consistently and in a more direct manner. This is derived from a reform agenda, particularly the strengthening of the environment ministers' political mandate within the scope of the United Nations. This is then the source of a requirement for upgrading the UNEP since this secretariat can effectively implement the resolutions of a strengthened environment ministers' forum.

You started the Green Economy Initiative in 2008. In the longer term, is this only focused towards industrialised countries or does it also offer a perspective for developing countries?

Steiner: The core of UNEP's Green Economy Initiative is to refute the decades-old contradiction between economic development and sustainable environmental policy. At the same time, we want to use it to support all those whose requirements and initiatives for a sustainable development are being opposed by repeated macro- and micro-economic arguments that they would "endanger jobs and growth". Environmental Policy in the 21st century must also show politico-economic competence and legitimacy in order to shape strategic decisions in our society. This is precisely the synthesis that makes the Green Economy model particularly relevant to developing countries.

ACHIM STEINER
Executive Director of the United Nations Environment Programme

To what extent?

Steiner: The UNEP report "Towards a Green Economy", presented in February 2011, makes it especially clear how strongly rural regions and poorer social classes depend on the natural capital – i.e. natural resources and services dependent on them. In addition, our empirical analyses provide a model for technology and urban-related development sectors which particularly shows that the "Green Economy" can provide an opportunity for developing countries – for example through targeted expansion of renewable energy sources, thus providing power for millions of people. One thing is clear: in spite of billions in investments in Africa, energy policies of the past 50 years have not been able to eliminate the lack of energy supply across the continent. There is still over 70 percent of the population without access to electricity. But let me also emphasise that the Green Economy model primarily represents a shift in thinking. In a world that is being exposed to increasing environmental risks, there is no "return to the paradise". We face complex and, in certain aspects, epochal challenges.

Germany has a good reputation in many fields of environmental protection. Where do you see potential, what can we still do better?

Steiner: Germany has invested heavily into environmental protection over the past 30 years. Over that time, it has developed an environmental policy approach which provides a trend-setting character for many industrialised countries. An appropriate understanding in regulatory policy that actively uses the state's role in shaping sustainable economic policy would enable Germany to "bring to market" a number of efficiency measures both direct and far reaching. Renewable energy, nature conservation, recycling and energy efficiency are just some examples of the successful approaches. So I believe Germany will continue to play a prominent role both at the national and international level in the future. The prerequisite, however, is for socio-political consensus, which makes it possible to invest into tomorrow's industry and technology – and not into yesterday's.

Achim Steiner (49) has been Executive Director of the United Nations Environment Programme (UNEP) since 2006 and General Director of the United Nations Office in Nairobi (UNON) since 2009. Previously, he was General Director of the International Union for Conservation of Nature (IUCN). Steiner grew up in Brazil and studied philosophy, politics and economics in Oxford/England. After study leaves in Berlin and Cambridge near Boston he worked for various international environmental protection organisations.

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WHY ENVIRONMENTAL PROTECTION IS A GLOBAL CONCERN

Climate change, soil degradation, overfishing the oceans, rising raw material consumption or an inexorable loss of biodiversity: global problems can only be tackled through international co-operation, i.e. globally binding legislative principles, objectives and actions. The countries have become increasingly conscious of their shared responsibility for a viable world since the 1992 Earth Summit in Rio de Janeiro.

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WATER – ECOLOGICALLY SOUND HANDLING OF A PRECIOUS RESOURCE

Water is the basis of all life and an indispensable asset. We use it as drinking water and for our daily hygiene. And industry and the energy sector need water for many processes while farmers use water to irrigate their fields. However, all uses of water have an environmental footprint. Today's water conservation is primarily aimed at maintaining water as the number one food, as an economic factor for industry and a protection-worth commodity in the ecosystem.

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AMBITIOUS ENVIRONMENTAL POLICY EQUALS SUSTAINABLE HEALTH PROTECTION

Environmentally conscious health protection is a key action area in environmental policy. In Germany, legislation has led to the improvement of environmental quality and has made a great contribution to the protection of human health. Air pollution such as lead and sulphur dioxide emissions and their health effects no longer play a major role. Other risk factors are brought to the fore however – such as chemicals and products containing toxic substances or "thick air" indoors.

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WHY ENVIRONMENTAL PROTECTION IS A GLOBAL CONCERN

It is the very nature of environmental problems that they cross state borders. The origins of problems and their effects on people and the environment are frequently displaced in space and in time. We can only protect the environment effectively if we work together across borders. Obviously, the joint responsibility of all states for maintaining a viable world has increasingly moved into the general awareness since the UN Conference on Environment and Development in Rio de Janeiro in 1992. Since then numerous multilateral environmental agreements have taken effect. Yet, even today global environmental problems still threaten the natural assets of people's lives. Such examples are climate change, overexploitation of resources, the loss of biodiversity, the threat to people and the environment posed by chemicals and increasing emissions through the development of transportation.➔

The Federal Environment Agency (UBA) is committed to creating a sustainable and effective development of international, European and national environmental protection as well as to a "Green Economy" and the necessary social, economic and technological innovations. UBA's experts exploit their knowledge and the Agency's authority to create effective environmental protection and achieve sustainable development through their contribution to international working groups of the United Nations, their organisations and programmes, to the OECD's working groups and to those of the European Commission, at various events and in their communication with political decision makers.

PURSUING SUSTAINABLE DEVELOPMENT: THE 1992 EARTH SUMMIT IN RIO DE JANEIRO

The report "Our Common Future" or, as it became known, the Brundtland report has had a significant influence on the international debate on development and environmental policy since 1987 [1]. Published by the World Commission on Environment and Development, the report was the first to formulate a new model of sustainable development "which meets the needs of the present generation without compromising the ability of future generations to meet their own needs and choose their lifestyle" [2]. The report revealed how dependent we are on our environment and how global changes in the environment affect our behaviour and our actions.

At the following UN Conference on Environment and Development in Rio de Janeiro in 1992 the guidelines were set for global sustainable development. With the United Nations Framework Convention on Climate Change, the Convention on Biological Diversity and the United Nations Convention to Combat Desertification important agreements were put in place under international law. In addition, the leaders adopted Agenda 21, a global environmental and development policy for sustainable development. According to Agenda 21 it is the responsibility of the governments of individual states to plan the implementation of sustainable development in the form of strategies mainly at a national level, national environmental plans and national environmental action plans [3]. Given the multitude of conflicting interests this was a successful step toward a global environmental and development partnership. After the Rio Conference the UN Commission for Sustainable Development, CSD was established. One of the Commission's responsibilities is to check on the implementation of the resolutions of the Rio Conference at local, regional, national and international levels. In UBA in the "Agenda 21 Working Group" all divisions work together on proposals for sustainable development. The results are incorporated into scientific discussions at German, European and international levels [4].

THE BIG QUESTIONS: RIO+20

In 2002 the international community and representatives of social groups met again in Johannesburg for the World Summit on Sustainable Development. The governments agreed in Johannesburg on a plan of action which puts emphasis on poverty reduction and the protection of natural resources. In addition, the governments adopted a Declaration on which reaffirmed the global importance of sustainable development. Voluntary partnership initiatives between the active players should promote the implementation of Agenda 21 and the Johannesburg Plan of Action.

The Heads of State and Government leaders will meet again in 2012 at another UN Conference on Sustainable Development in Rio de Janeiro (Rio+20). The first big question of the conference will be how the global community can reshape the institutional framework for a sustainable development and strengthen the environmental protection at a global level. The second question is: How can the world community develop towards an environmentally sound and resource-efficient, energy-efficient Green Economy? In preparation for the conference, representatives of the civil society in Germany together with the Federal Government and UBA, are looking for solutions in "dialogue forums". Achieving the turnaround to a sustainable economy can only be managed if citizens, businesses, interest groups and scientists are involved in the development of the strategies right from the start.

ORCHESTRATING A MORE EFFICIENT GLOBAL ENVIRONMENTAL PROTECTION

Of great importance for the implementation of effective global environmental protection from UBA's point of view is a strengthening of the United Nations Environment Programme (UNEP). Founded in 1972 by the General Assembly of the United Nations, UNEP should support governments and UN-organisations in environmental protection. Since its inception, however, the demands on global environmental protection have increased significantly. New challenges such as climate protection, protection of biodiversity and the preservation of fertile soils have been added. The integration of environmental protection into other policy areas such as energy policy or maritime policy is ever more urgent.

Today there is a fragmented system of more than 40 organisations which deal solely at the United Nations' level with environmental affairs. There are also more than 500 international treaties and conventions on environmental protection. In order to demonstrate the equal status of environmental policy in relation to other policies, clearly UNEP should be upgraded to a specialised organisation of the United Nations, thus creating the basis of a global environmental regime.

The key activities of a global environmental regime are environmental monitoring, policy advice and development, coordination and appropriate regulatory measures, financing and enforcement of environment law as well as support to developing countries. However, these functions are currently not being adequately fulfilled. The international community needs more and more comparable data. The coordination of international policy and programmes must be improved. A performance review of commitments is necessary. The financing of global environmental protection is not transparent enough and not always goal oriented. The current level of support to developing countries is still insufficient. Sufficient capacity must be created so that these countries can develop economically and still respect global requirements for environmental protection. There is no alternative to cooperative multilateralism [5]. In UBA a project group deals with the requirements of a new structure of global environmental protection. Their results will contribute to the stance of the Federal Government at the international debate in Rio de Janeiro in 2012.

TOWARDS A GREEN ECONOMY

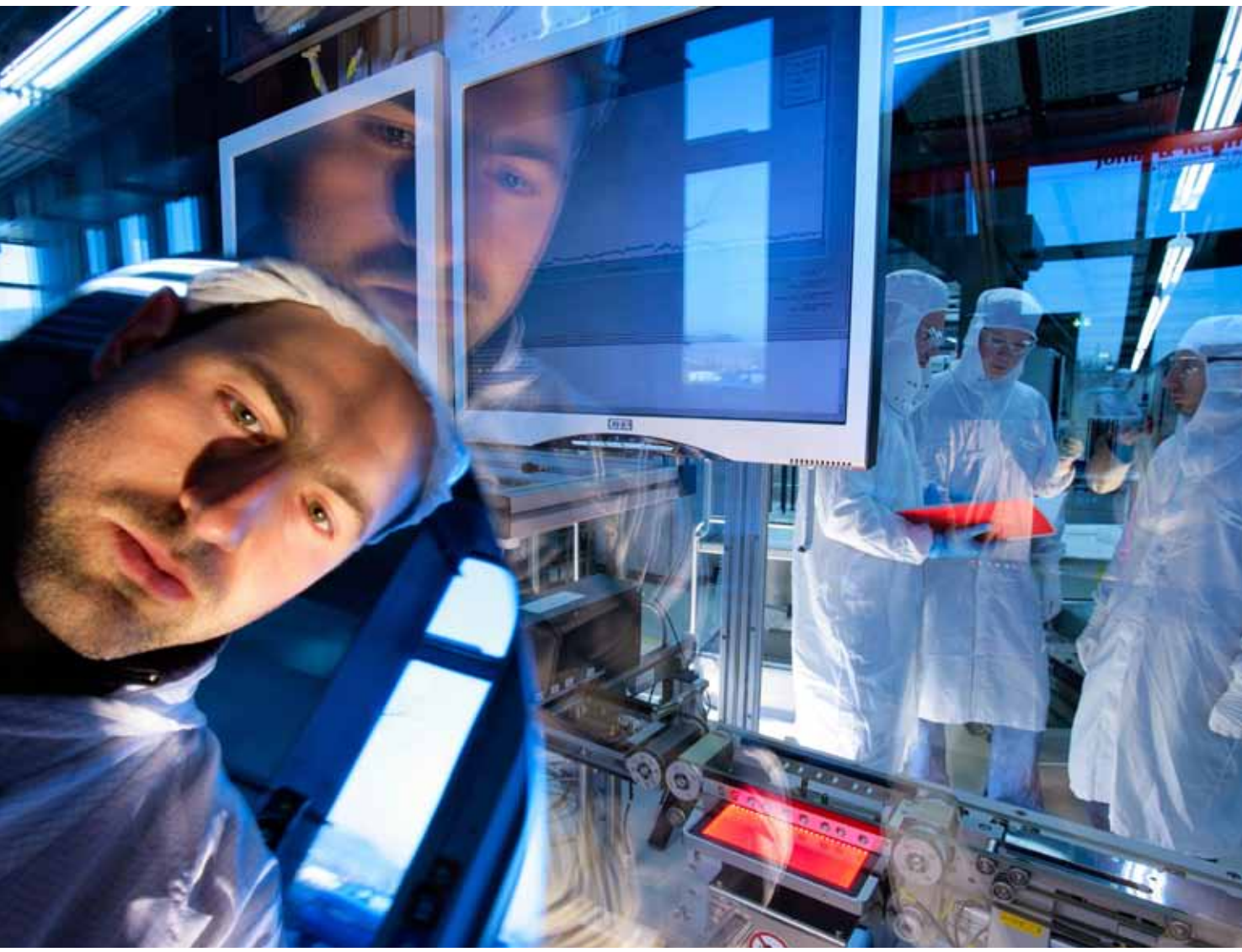
Environmental degradation and resource depletion threaten the economic development more than the recent financial crisis. Megatrends such as global population growth and economic catch-up processes of emerging countries will still increase the consumption of natural resources in the coming decades, exacerbate climate change and continue to destroy the economy's natural resource base. This is unless we implement countermeasures nationally, regionally and globally and shape our way of life and economy in an environmentally friendly, energy efficient and resource conserving way. Thus there is no alternative to moving towards a Green Economy. The topic of Green Economy will be one of the key issues at the UN conference in Rio de Janeiro.

Because of the high environmental and resource consumption, developed countries such as Germany have a particular obligation, but also great opportunities to advance the ecological modernisation of their economy. UBA has developed numerous proposals for this purpose. There is, for example, a commitment to reduce subsidies which encourage environmentally harmful consumption and production patterns in order to create incentives for an ecological conversion of the economy. According to a study by UBA, the sum of environmentally harmful subsidies in Germany amounted to about 48 billion euros in 2008 [6]. Examples include fuel tax exemption for commercial air traffic or tax privileges for company cars. Beyond reducing such subsidies the state must charge polluters the full costs of environmental pollution. This makes environmentally friendly products and production methods more attractive compared to environmentally harmful alternatives thereby increasing their market opportunities.

Globally thinking, the transition to a Green Economy can only succeed if people in industrialised, emerging and developing countries recognise that environmental protection and economic development are not contradictory, but ultimately interdependent. The example of green markets clearly shows the economic opportunities of a progressive approach to environmental protection. Experts assume that world market size of the key green markets (energy efficiency, clean energy, sustainable water management and mobility, material efficiency, waste management and recycling) will more than double, from 1.4 trillion euros in 2007 to 3.1 trillion euros in 2020. Germany today – mainly because of its ambitious environmental policy – holds high market shares on many of these markets, for example in renewable energy [7]. Meanwhile the global race for green markets is already in full swing. During the financial crisis many countries adopted economic stimulus packages with a high proportion of environmental protection measures, for example South Korea with a green share of 80 percent and China with 38 percent [8]. These programmes also aim at catching up with the competition in green markets. Germany will therefore only be able to defend its leading position on these markets if it maintains its pioneering role in environmental protection and systematically promotes environmental innovations.

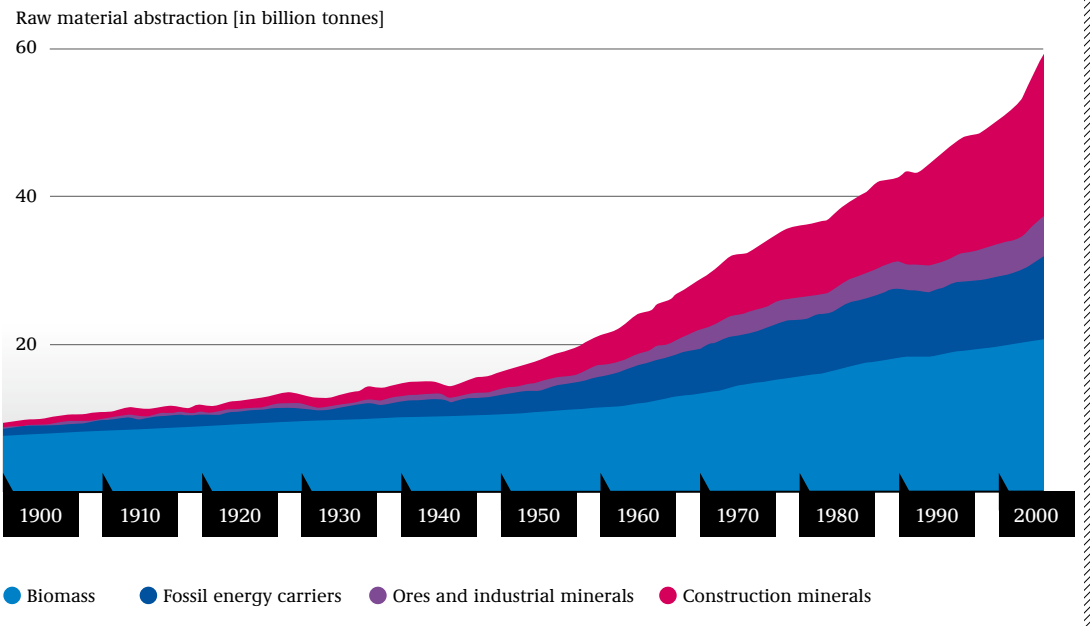
An ambitious environmental policy at the national level can promote the transition to a Green Economy in other countries through signalling effects. An excellent example of a successful policy export is the Renewable Energy Sources Act (in German: Erneuerbare-Energien-Gesetz, EEG) which has already served as a model for many countries also implementing measures to promote renewable energies. Through the transfer of green technologies, Germany acts beyond its own national borders to improve environmental protection. UBA commissioned a study investigating how the export promotion of innovative environmental technologies can be improved. In addition, UBA supports the development of sustainable consumption and production patterns at the international level. For example, it supports activities of the Federal Ministry of the Environment to promote sustainable consumption and production patterns in Africa, such as by establishing an African eco-labelling system or by developing national action programmes [9]. These activities fall within the context of the Marrakech Process advanced by UNEP and UNDESA (United Nations Department of Economic and Social Affairs), which aims to develop global action programmes for the promotion of sustainable consumption and production patterns. In its global Green Economy Initiative UNEP emphasises that investments and policy measures aimed at the ecological modernisation of the economy not only provide environmental benefits and create new jobs but also contribute to reducing poverty in developing countries.

UBA is also involved in the implementation of the EU action plan for the promotion of sustainable consumption and production adopted by the European Commission in 2008 [10]. UBA strongly supports measures of ecologic product and consumer policy, leading to a more sustainable consumption. UBA also encourages manufacturers, commerce, the public sector and consumers to use their existing freedom in decision-making to move towards sustainable consumption and production patterns (strengthening of ownership). To UBA's key fields of action belong the so-called eco-design, i.e. energy- and resources-efficient product design, knowledge transfer for sustainable lifestyles through targeted information services as well as the mobilisation of consumers by cooperative education campaigns in order to make private consumption more sustainable. In order to further develop the European knowledge base for sustainable consumption and production, UBA is active in the European Topic Centre on Sustainable Consumption and Production. The aim of this centre, contracted by the European



“The volume of world market in the key ‚green’ future markets will more than double from 1.4 trillion euros in 2007 to 3.1 trillion euros in 2020.”

GLOBAL RAW MATERIAL ABSTRACTION FROM 1900 TO 2005



Source: © Krausmann et al. (2009)

Environment Agency (EUA), is to develop and provide data and information for policy makers and the general public in Europe.

RESOURCE EFFICIENCY FOR SUSTAINABILITY

The conservation and management of resources are key priorities of Agenda 21. At the World Summit on Sustainable Development held in Johannesburg in 2002, the protection of natural resources was discussed as the basis of all economic activity and as sine qua non for sustainable development. The extent of resource use however reached a level which is not sustainable and cannot be permanently maintained. The abstraction of abiotic (fossil and mineral) and biotic (agricultural, forestry and fisheries) resources has steadily increased since the end of the Second World War and at 58 billion tonnes per year in 2005, reached three times the raw material abstraction in the early fifties (see Figure). The increasing exploitation and use of raw materials cause substantial environmental impacts over the entire value chain – from extraction through processing and use to disposal –, for example by emissions into the soil, water and air. According to the OECD's estimates, raw material consumption will rise to 80 billion tonnes per year by 2020.

Efficient use of resources is therefore an essential contribution to environmental protection. Resource policy is a cross cutting discipline whose measures must always be integrated into economic, foreign and development policy and strategies and interlocked with other relevant environmental issues and policies. Currently, UBA is working on proposals for the development of this policy field. A key issue is the combination of strategies and measures for resource conservation and climate protection. A research project starting in 2011 should develop exemplary approaches in building renovation and photovoltaic systems. The research project "Identification and control of international conflict risk in access and use of raw materials" commenced in 2010, also delivered important insights into how aspects of socially responsible and sustainable raw material extraction can be integrated in foreign trade and development policies [11].

UBA would like to contribute significantly towards a major reduction in resource consumption. That is, we would like to provide for the same wealth using considerably fewer resources. Even today it is often possible to achieve the same added value with a quarter of the resources. But against the backdrop of a globally equitable distribution of resources, a factor of 10 or more would be necessary in order to enable less developed countries to increase their prosperity. The "Material Efficiency and Resource Conservation" (MaRess) research project with UBA as project managers provided fundamental insights into the improvement of resource efficiency in Germany. The project identified the potential to increase the resource efficiency of products, technologies and strategies, developed targeted resource efficiency policies, examined their effects at managerial and operational levels and ran extensive communication and PR work to disseminate the results [12]. Based on the results of MaRess, UBA is currently investigating economic and legal models for the reduction of resource consumption as well as resource-specific measures at managerial and operational levels.

UBA introduces knowledge obtained at a national level into international activities and committees

"The earth needs one million years to produce as much fossil fuel as mankind currently uses in one year."

(for example the European Topic Centre on Sustainable Consumption and Production) and contributes actively to shaping the international resource policy. As a partner of the World Resources Forum, an independent international platform, UBA takes part in the international debate on various effects of current trends in global resource use and the development of feasible policy options for sustainable use of resources. UBA also supports the "Decoupling Working Group" of the International Resources Panel at UNEP in developing a strategy for the decoupling of economic growth and quality of life from resource use and environmental stress caused by resource over utilisation. Apart from resource efficiency it will be increasingly important in the future to recover scarce raw materials such as neodymium, indium and cobalt from old products or replace them with others if the total balance of the impact on the environment is favourable. An increasing use of renewable resources seems to be necessary. In the coming years UBA will thoroughly examine the potential of renewable resources for selected material flows for example in cascading utilisation and biorefineries.

Sustainable and efficient use of resources can only be maintained if sustainability standards are specified and made binding. To this end, UBA has developed methodical foundations for the sustainability assessment of biomass used for energy and has proposed these for the implementation of the European "Renewable Energy Directive" into German regulations in the form of two sustainability regulations on fuels made from biomass and electricity made from liquid bioenergy sources [13]. Transferability of the findings and their further development towards a sustainability certification of all biomass are analysed and processed in current projects by UBA. Over the next few years UBA will be increasingly involved in the international debate on sustainable land use and will develop proposals for globally accepted regulations and standards and their institutional implications.

PREVENT WASTES AND CONSERVE RESOURCES: OPTIMISED MATERIALS CYCLE

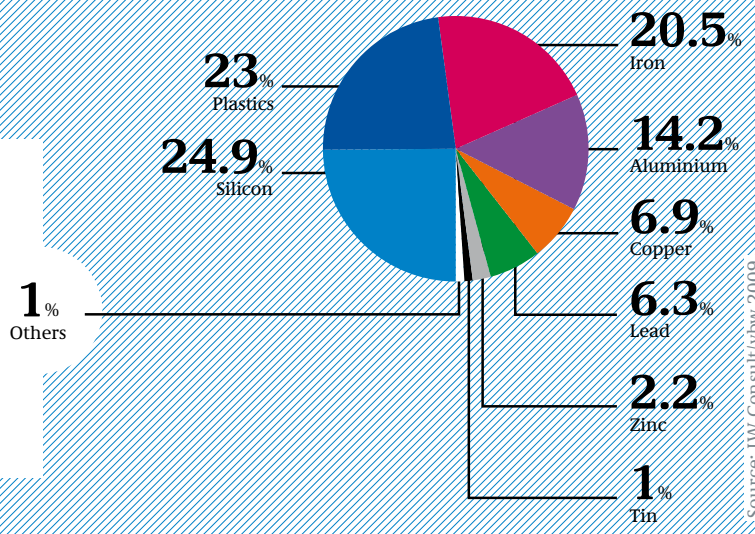
The earth needs one million years to produce as much fossil fuel as mankind currently uses in one year. The renewal rate of global fuel reserves therefore bears no relation to our constantly growing energy consumption. This raises the question: which sources can provide for our energy needs in the future – especially as the appetite of industrial nations such as China and emerging countries such as India and Brazil for raw materials is growing. Bottlenecks can be expected in the near future for important raw materials, in particular, precious metals and rare earths [14].

Sustainable use of resources is the key to solving this problem. Waste may thus more often be avoided and recycled. Germany has developed a modern waste management system which contributes actively to the conservation of natural resources by closing the cycle within the management system through the recovery of recyclable materials and thereby contributing to increased material efficiency. For example significant latent potential of critical raw metals (such as rare earths) reside in the world's growing mountains of electronic waste. In Germany end-of-life electrical and electronic equipment is to a very large extent re-used under the concept of the extended product responsibility. Around 600,000 to 800,000 tonnes of waste elec-

MASS MATTERS – ENVIRONMENTAL EFFECTS DUE TO RAW MATERIAL ABSTRACTION USING MOBILE PHONES AS AN EXAMPLE

All this is in a mobile telephone
(Material components of the average mobile phone)

Small electronic devices are real stocks of raw materials. In one a mobile phone there are more than 35 different materials hiding. Among them (in very small amounts) precious metals such as gold and silver or critical metals such as palladium or tantalum, but also pollutants such as mercury and arsenic.



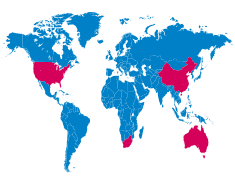
Source: IW Consult/vbw 2009

ALL THAT GLITTERS IS NOT GOLD

22.4 tonnes

of gold are needed alone for the expected 1.4 billion mobile phones to be sold in 2011.

Gold (Au)
Mining moves and processes large amounts of rock (rock to metal ratio: 750,000,000 t/t), which is associated with high energy expenditure and environmental pollution. Processing uses toxic materials such as cyanides and mercury. In small-scale mining operations these pollutants reach water, air and soil directly. But in industrial mining, where poisonous cyanide lye is kept in a closed cycle and treated in sediment basins, there is a danger of an uncontrolled release into the environment media. The failure of a dam in such a tailings facility near Baia Mare, Romania, in 2000 released about 100 tonnes of cyanide into the rivers Tisza and Danube which led to an extensive destruction of hydrobiology and fish stock in the river Tisza.
(Sources: UBA 2011; Wachter 2003)



Producer countries:
South Africa 12%
Australia 10.7%
USA 10.3%
China 9.2%

Security of supply:
Uncritical

Environmental relevance:
Very high

A mobile phone (weight 100g) contains on average

1.6 milligrams

of gold.

Source: EITO, IDATE 2011
Source: IW Consult/vbw 2009

trical and electronic equipment (WEEE) is collected annually in Germany. About seven to eight kilograms per person arise from private households alone. Through the recycling of such waste, valuable secondary raw materials can be recovered which can replace primary raw materials. Beneficiaries of closed-loop recycling and recovery of secondary raw materials are, in addition to the electronic industry, the automotive and aviation industries which use large amounts of these raw materials. The problem arises when WEEE is falsely declared as fit for purpose and exported to Africa and Asia where there is an increasing demand for this equipment. Computers, televisions, refrigerators and mobile telephones may be disposed of there cheaply but in a harmful way to health and the environment and escape proper recovery [15].

The efforts of international waste management are currently based primarily on limiting this loss of raw materials. The players strive to establish global and sustainable material management in order to utilise the unused raw material potential in waste materials while observing the requirements of health and environmental protection. In accordance with the Basel Convention [16], UBA and other institutions are, in international cooperation, developing guidelines for environmentally sound treatment and disposal of WEEE [17]. UBA thereby makes a contribution to the advancement of the idea of controlling the transboundary movements of hazardous wastes and their disposal on which the convention is based. In the seventies and eighties various "toxic waste scandals" that arose due to inappropriate storage and disposal of hazardous wastes had given impetus to such legal regulation at international level and triggered a broad debate on the topic. UBA acts as the Focal Point of the Basel Convention in Germany.

The European Waste Framework Directive also provides an important impulse for the further development of resource-saving waste management by suggesting recycling ratios for metals and plastics in addition to paper and glass [18]. It identifies waste avoidance as the ultimate goal and requires increased efforts for recycling based on the life cycle of each product. Since the EU countries have to develop their national waste prevention programmes by 2013, UBA has commissioned relevant scientists to develop the foundations for a German programme. It should be noted that some waste fractions have already achieved a very high level of utilisation in Germany. These include glass, paper, construction waste and road construction waste. There are other potentials, for example, biowastes, of which collection from households could be increased by nearly 50 percent per year [19]. UBA's international activities are directed toward a continuous increase in the utilisation standards in emerging countries and the countries of Central and Eastern Europe. A contact point in UBA is available for continuous and consistent waste technology transfer, which provides information and initiates and manages international projects. The Agency's experts are for example involved in developing waste management concepts in Russia, Romania and Armenia.

CENTRAL FIELDS OF ACTION IN INTERNATIONAL ENVIRONMENTAL PROTECTION

In the fight against climate change, the world community is facing enormous challenges: heat waves, floods, droughts, famine – the consequences of global warming will exact a high price. The reports of the United Nations Intergovernmental Panel on Climate Change (IPCC) have clearly shown us the threats posed by global climate change. At the same time we observe a global increase of manmade greenhouse gas emissions. It is even more important today to take the necessary steps in favour of climate protection as soon as possible. The earlier we act, the more time we have for the necessary technical and social adaptations to the unavoidable consequences of climate change. An ambitious climate protection pays off economically because it contributes to the modernisation of the economy, opens innovative business opportunities for the future and creates new jobs.

Now – shortly before the end of the first commitment period of the Kyoto Protocol (see box) – the international community must agree on a successor agreement for the period after 2012 so there is still a global framework for emission reductions. Germany commits itself in the negotiations to a new comprehensive climate policy with ambitious reduction targets. This framework must include the largest emitters of global greenhouse gases. It must lay the foundations for global climate friendly development paths in the coming decades so that global warming does not exceed two degrees Celsius and the worst damage can be averted. UBA strongly supports the two-degree target as an ultimate goal, knowing that this rise in temperature will already entail painful global changes in the living conditions for many people in relation to pre-industrial levels. The industrialised countries must reduce their emissions by at least 30 percent by 2020 in relation to the base year 1990 in order to make an appropriate contribution to keeping the change below the two-degree goal with a high probability. A new climate change agreement must not only commit the industrialised countries, but also utilise the potential for greenhouse gas reduction in developing countries with high emissions. In order to achieve this, their emissions must be reduced significantly up to and beyond 2020 in comparison to the business-as-usual trend.

THE KYOTO PROTOCOL: MILESTONE IN GLOBAL ENVIRONMENTAL PROTECTION

The cornerstone of global climate protection was laid by the signing of the United Nations Framework Convention on Climate Change at the UN Conference on Environment and Development in Rio de Janeiro in 1992. Associated with the Kyoto Protocol, industrial nations committed themselves to reducing their joint emissions of the most important greenhouse gases [20] between 2008 to 2012 by at least five percent below 1990 levels [21]. Germany has committed itself under the context of this convention to reducing its emissions by 21 percent compared to 1990. The Kyoto Protocol came into effect on 16 February 2005 according to international law; 192 states have now ratified it. Apart from reducing their own emissions, three flexible instruments are available to the states to achieve this objective: global trade with greenhouse gas emission allowances (Emissions Trading), implementation of joint climate protection projects in developed countries (Joint Implementation) and implementing mitigation measures in developing countries (Clean Development Mechanism).

CLIMATE CONFERENCE IN CANCÚN: DEVELOPING A GLOBAL CLIMATE ARCHITECTURE

The international community unfortunately clearly failed to agree on a climate protection resolution at the UN climate conference in Copenhagen in 2009. Instead, a group of 25 heads of state and governments, among them Germany, the United States, China, India and Brazil, developed the so-called "Copenhagen Accord" – a policy statement supported by over 130 states. The climate conference in Cancún in December 2010 succeeded in transferring and developing the Copenhagen political agreement into the UN process. For the first time the world community officially recognised the two-degree objective and agreed on a procedure to check whether the goal is adequate and the planned measures for its compliance are sufficient.

Apart from mitigation measures by industrialised and developing countries, the Cancún package also includes the establishment of a global climate fund, agreements on adaptation to the consequences of climate change, on forest protection, technology cooperation and capacity building in developing countries. In addition, fundamental agreements were made on the transparency of the mitigation measures by the states. Developed countries have pledged to mobilise 100 billion dollars annually by 2020 to address climate change in developing countries. These agreements lay the foundations for building a global climate policy architecture which must take place in the coming years: the community of states continues the formal negotiations in and beyond 2011. The next climate summit – the Conference of the Parties to the UN Climate Convention and to the Kyoto Protocol takes place in Durban, South Africa from 28 November to 9 December 2011.

UBA's experts are joining the German delegation at the UN climate negotiations and bring their expertise to issues of adaptation, reporting, flexible instruments, avoidance of deforestation and mitigation of greenhouse gas emissions. UBA has made major contributions in this role in the negotiations so far on a new climate agreement: it developed EU position papers, headed working groups and advised EU negotiators. In the coming years, the Agency will be committed in the debates to an effective, long-term and global climate protection.

To promote climate protection measures in developing, emerging and transition countries, Germany launched the International Climate Protection Initiative (in German: Internationale Klimaschutzinitiative or IKI) in 2008. Annually 120 million euros are available for this initiative from the proceeds of the sale of emission trading allowances. IKI is an innovative financing mechanism since a part of the proceeds from emission trading is reinvested into climate protection projects in developing, emerging and transition countries. It makes an outstanding contribution to the international debate on the development of the climate-related financial architecture and provides the impetus for international negotiations under the United Nations Framework Convention on Climate Change by targeted cooperation with partner countries. The initiative focuses on projects which contribute especially to the mitigation of greenhouse gas emissions, to the increase of adaptability to the consequences of climate change as well as to the preservation and sustainable use of natural carbon sinks (REDD+).

With the help of IKI, since 2008 over 200 projects have been started in more than 60 countries with a total budget of about 400 million euros. UBA supports the Federal Ministry of the Environment by providing expert opinion on the projects in the thematic field "Adaptation" and coordinates independent assessments of the IKI projects for the Ministry of the Environment. It is also UBA's responsibility to manage tendering and coordination of a systematic monitoring of IKI. This will provide forward

looking recommendations on IKI as a programme and important conclusions on the outcomes of the projects. Insights into measurability, reportability and verifiability of climate protection measures in developing, emerging and transition countries are also expected. Germany can incorporate practical experience from the implementation of IKI into the preparation of EU positions.

Climate protection is a global problem and requires an internationally functioning instrument such as emissions trading (see box). Extending the European system to the EFTA states Norway, Iceland and Liechtenstein is a first step toward global emissions trading. To make progress, Germany has been represented by the Federal Ministry of the Environment in the International Carbon Action Partnership (ICAP) since it was established in 2007. The network supports the exchange between countries and regions of Europe through North America to Asia which have already used or are planning to introduce emissions trading. The goal is a common understanding of relevant terms and key conditions of a uniform implementation of emissions trading around the world.

EMISSIONS TRADING ABOVE THE CLOUDS

The EU introduced the emissions trading scheme for businesses at the beginning of 2005. As a market-based instrument for climate protection, emissions trading ensures that CO_2 emissions are reduced where savings can be implemented most economically. However, there are still no binding international regulations for the mitigation of greenhouse gas emissions from international aviation. The reduction obligations agreed upon in the Kyoto Protocol do not include emissions caused by international aviation although air traffic accounts for about four percent of EU's greenhouse gas emissions, and is increasing rapidly. The growth rate between 1990 and 2004 amounted to about 87 percent alone.

Aviation will be included in the European Emissions Trading Scheme from 2012 onwards. All airlines and operators of so-called business jets whose flights start or end in the EU must participate. The preparations are in full swing with 4,000 aircraft operators participating from more than 150 countries. The German Emissions Trading Authority (DEHSt) at UBA is the responsible authority for about 360 operators. In the autumn of 2009 aircraft operators submitted to DEHSt monitoring plans for the calculation of CO_2 emissions from transport services for approval. The concepts served as the basis for subsequent annual reporting which started in March 2011, reporting the CO_2 emissions of the previous year. DEHSt will then for the first time issue emission allowances to aircraft operators in February 2012.

AN IMPORTANT TARGET: 100 PERCENT ELECTRICITY FROM RENEWABLE ENERGY

Global emissions must be reduced to at least half of the 1990 levels by 2050 to ensure effective climate protection. Based on the polluter pays principle, those countries with the highest emissions and greatest economic performance have to make the greatest contribution to the mitigation, which means the developed countries must reduce their emissions by 80 to 95 percent by 2050 compared to 1990. An emissions reduction on this scale is only possible by a structural change in the energy sector. This structural change must include a considerable efficiency increase in energy use and transformation as well as a substantial expansion of renewable energy generation. With the study "Energy Target 2050: 100% renewable electricity supply" UBA provided a scientific contribution to the debate on structural change in Germany. The study has shown how the electricity supply based exclusively on renewable energy, can ensure a security of supply at today's high level. The research results have also indicated that a highly developed industrialised country can be reliably supplied with electricity from renewable energy, without compromising today's consumer lifestyle and behaviour patterns.

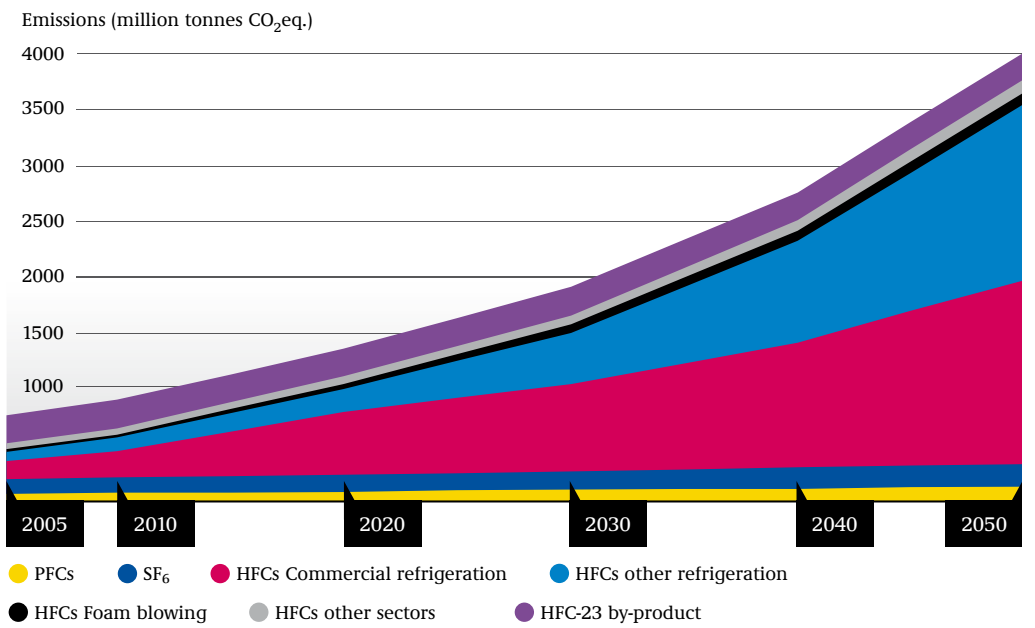
THE UBA STUDY "ENERGY TARGET 2050: 100% RENEWABLE ELECTRICITY SUPPLY"

In an analysis of global energy scenarios, UBA has shown that the potential of energy efficiency and renewable energy has been inadequately considered in the scenarios studied [22]; it is not clear how the expansion rate of renewable energy has been determined. In order to improve the representation of renewable energy in the scenarios, a regionally differentiated global inventory of all renewable energy resources will be developed in an on-going follow-up project. It is being planned to hand over the results to the recently established International Renewable Energy Agency (IRENA).

CLIMATE PROTECTION AND CFC PHASE-OUT

That targeted emission reduction measures may have complex consequences has been demonstrated by chlorofluorocarbons (CFCs) which are regulated by the Montreal Protocol on Substances That Deplete the Ozone Layer [23]: the Protocol stipulates an international phase-out of substances that deplete the ozone layer and also affect the climate. Therefore substitute substances and alternative processes were required. The chemical industry has responded and developed and publicised fluorinated greenhouse gases (F gases), however, these have a substantial global warming potential. Although little is known, many products and goods contain these climate-damaging F gases, today. For example, air conditioning systems of cars contain large amounts of F gases as refrigerants. Although F gases, similar to CO_2 and other greenhouse gases, are covered by the Kyoto Protocol, their production and use is not regulated. Unlike the Montreal Protocol, which regulates the production and consumption of CFCs, the Kyoto Protocol aims to reduce emissions – not just F gases. The method of reduction and which greenhouse gases are selected to achieve the emission reduction targets will be individually decided by the contracting parties.

GLOBAL FORECASTS OF FLUORINATED GREENHOUSE GAS EMISSIONS IN THE MAIN FIELDS OF APPLICATION IN MILLION TONNES CO_2 EQUIVALENT ("BUSINESS-AS-USUAL SCENARIO")



Source: UBA, Climate Change 17/2009 [24]

The global share of fluorinated greenhouse gases in the total emissions of greenhouse gases is now nearly two percent. Forecasts commissioned by UBA (see Figure) show that this share will increase threefold by 2050 in a business-as-usual scenario [24]. Other forecasts, developed in cooperation with F gas manufacturers, suggest even higher proportions [25]. However, this increase can be avoided: instead of using fluorinated greenhouse gases as alternatives to ozone-depleting substances, manufacturers can access solutions without halogenated substances. For example CO_2, an environmentally friendly refrigerant, is available for air conditioning systems in cars. CO_2 and hydrocarbons as climate friendly alternatives have also been successfully used in the cooling systems of supermarkets [26].

INTERNATIONAL ACTIVITIES IN THE FIELD OF AIR POLLUTION CONTROL

International agreements for air pollution control have existed for three decades. They aim to reduce the transboundary transport of air pollutants as much as possible. Such agreements are essential, since local air pollution control measures can only be efficient if the long-range transport of air pollutants is minimised. An important prerequisite for international agreements is a common understanding of causes, effects and prevention costs. UBA contributes to creating the scientific foundations for updating the Protocols, chiefly in the working groups of the Geneva Convention on Long-range Transboundary Air Pollution. An up-to-date key issue of ours is the assessment of the effects of particulate matter and reactive nitrogen based on the latest findings in order to consider them appropriately in the imminent amendment of the Gothenburg Protocol.

Our monitoring stations at Forellenbach in the Bavarian Forest and Neuglobsow in Brandenburg provide valuable data on the effects of air pollutants on ecosystems. UBA's air monitoring network measures large-scale complex air quality parameters at seven permanent stations and numerous temporary measuring points. As a result Europe's unique dataset on the composition of particulate matter is now available. UBA's experts not only assess air quality, but also aim to understand the physicochemical transport processes in the atmosphere. Moreover, we observe the spatial distribution of greenhouse gas concentrations at our monitoring stations situated outside large-scale developments. We are not constrained to well-known greenhouse gases, but try to identify such substances which exhibit high greenhouse gas potential and whose global emissions increase for example due to new products. The monitoring station on the Zugspitze mountain in particular supplies valuable information to the Global Atmosphere Watch (GAW) network, which is used by numerous experts in assessing climate change.

MAINTAIN BIODIVERSITY BY INTERNATIONAL ENVIRONMENTAL PROTECTION

In response to the rapid loss of biodiversity the international community adopted the Convention on Biological Diversity (CBD) at the 1992 Rio Conference, which Germany ratified in 1993. The objectives of the convention can only be achieved if the environmental protection measures succeed both at national and international levels in reducing the threat to biodiversity posed by climate change, habitat destruction and the input of nutrients and pollutants [27].

In developing and implementing international and European regulations, UBA is committed to establishing biodiversity as an independent protected commodity and to implementing assessment methods which take into account biodiversity to the necessary extent. A major innovation from UBA's point of view is the inclusion of biodiversity conservation as a separate objective in the risk regulation of pesticides within the new EU plant protection package. In order to protect terrestrial ecosystems from eutrophication and acidification we commit ourselves to an updating of the multi-component protocol of the Geneva Convention on Long-Range Transboundary Air Pollution [28].

With the support of UBA advanced scientific approaches make it possible to enshrine the protection of biodiversity as an important factor in the development of international air pollution control strategies. UBA has encouraged the implementation of biodiversity into firm environmental protection measures in numerous cases of water, sea and soil protection and chemicals regulation, one example being the Baltic Sea Action Plan. The status of aquatic ecosystems will improve in future thanks to the European Water Framework Directive and the Marine Strategy Framework Directive, whose implementation is supported by UBA by the development of assessment procedures and effective measures (see page 34 ff). In the area of soil biodiversity the results of our research projects contribute to developing international protection strategies.

“Globally, about 880 million people have no access to a safe drinking water supply.”

WHO COLLABORATING CENTRE FOR RESEARCH ON DRINKING WATER HYGIENE

Globally, about 880 million people have no access to a safe drinking water supply. An important responsibility of the World Health Organization (WHO) is to prevent diseases which result from drinking unsafe water. Since 1995 the “WHO Collaborating Centre for Research on Drinking Water Hygiene” situated in Bad Elster supports WHO in the implementation of its programmes. It contributes to the continuous development of the WHO Guidelines for Drinking Water Quality, being the key international point of reference in drinking-water hygiene. UBA’s close co-operation on the guidelines enables German experience and positions to be represented in the development of international standards. This is important because the principles of the WHO guidelines are the scientific foundation of the EC Drinking Water Directive and thus of German drinking-water legislation.

Another activity of the Collaborating Centre is to advise water and health authorities in less developed countries which still suffer from drinking-water related diseases. The aim is to improve the livelihood and services of general interest for people in these countries. The main focus is on using the available resources to develop locally adapted solutions in supply and surveillance of drinking water through training of and advice to local specialists. The associated knowledge transfer of regulations and concepts developed in Germany represents an important contribution to international health protection in the drinking-water sector. For 2011, projects are planned in the Democratic People‘s Republic of Korea and in Iran.

PROTECTION OF THE MARINE ENVIRONMENT OF THE BALTIC SEA AND THE NORTH-EAST ATLANTIC

The Baltic Sea Action Plan of the Helsinki Commission (HELCOM) serves as a regional approach to the implementation of the European Marine Strategy Framework Directive. Its goal is ambitious because the Baltic Sea has to achieve a good ecological status by 2021. At a special meeting of the Helsinki Commission in 2010, the environment ministers of the Baltic Sea States reaffirmed and extended the Baltic Sea Action Plan which had been adopted in Cracow in 2007. With its contribution to the content of the Baltic Sea Action Plan and to the ministerial declaration, UBA provided major support to the Federal Ministry of the Environment.

The four key themes – eutrophication (over-fertilisation and its consequences), hazardous substances, biodiversity and maritime activities (shipping and oil production) – which describe the main problem areas affecting the Baltic Sea, propose tangible actions to improve the environmental status of the Baltic Sea. They include the improvement of the cleaning performance of wastewater treatment plants and the introduction of phosphate-free detergents in other Baltic Sea States (as in Germany). The examination of the environmental status of the Baltic Sea is carried out using the ecosystem approach (see page 40). The objectives of marine protection should be given due consideration in all relevant policy areas. A pilot project initiated and managed by the Contracting States and to which UBA made a major contribution, for the first time provided a holistic assessment of the status of the Baltic Sea. The project results identify the formative stresses such as fishing and eutrophication and analyse the costs of protecting the Baltic Sea as well as the resulting benefits (ecosystem services such as fishery yields). They provide an important foundation for the subsequent work of the HELCOM states to achieve a good environmental status of the Baltic Sea.

UBA's experts take part as leaders or delegation members in relevant HELCOM working groups. These working groups deal with monitoring and assessment (MONAS) and the development of measures to reduce land-based discharges into the Baltic Sea (LAND). UBA is also committed to the protection of the marine environment of the North-East Atlantic including the North Sea within the Commission for the Protection and Conservation of the North-East Atlantic (OSPAR). UBA's experts participated in compiling the OSPAR Quality Status Report 2010 for the North-East Atlantic [29]. They support OSPAR working groups, in particular those dealing with the key topics of eutrophication, oil and gas production, monitoring and assessment and hazardous substances.

The "Bergen Statement" was adopted by the ministers of the OSPAR Contracting Parties in 2010. Therein they have re-affirmed their vision of a clean, sustainably used North-East Atlantic as well as the application of the ecosystem approach for the assessment and regulation of human activities which affect the marine environment. They intend to pursue the continuous protection against pollution (eutrophication, hazardous substances, radioactive substances, pollution from offshore oil and gas production), a rapid evaluation of the reports about the Deepwater Horizon oil platform with the view of deriving possible OSPAR measures as well as significant reduction of waste in the sea. They have affirmed their determination to stop the decline of species and habitats and in this context they have extended the OSPAR network of marine protected areas by establishing several reserves on the high sea (this was the first time globally that a network of protected areas has been established outside of any national jurisdiction) as well as measures for the protection of selected species and habitats.

COHIBA – REDUCTION OF HAZARDOUS SUBSTANCES IN THE BALTIC SEA

22 partners from all countries bordering the Baltic Sea support the Baltic Sea Action Plan within the COHIBA (Control of Hazardous Substances in the Baltic Sea Region) project. Jointly they want to create conditions by 2012 to reduce or prevent the discharge of hazardous substances into the sea. The key objectives are to identify the main sources of eleven particularly hazardous substances and/or groups of substances and develop a control system and, in addition, analyse the discharge pathways and determine the amount of the discharge of these substances into the Baltic Sea. Finally, cost-effective measures have to be devised to reduce the discharge of these materials into the Baltic Sea – a key area managed by UBA. UBA intends to involve Russia as the only non-EU member via Advisory Assistance into the current project work in the future [30].

PROTECTION OF THE ANTARCTIC

Since 1961 the Antarctic including its surrounding waters south of 60 degrees Southern latitude is subject to a special conservation regime under the Antarctic Treaty which provides for peaceful uses only and grants a special status to scientific research. Since the Protocol of Environmental Protection to the Antarctic Treaty of October 1991 and the Act Implementing the Protocol of Environmental Protection to the Antarctic Treaty of September 1994 came into force in 1998, the protection of the Antarctic environment has been of high priority. Whether scientific research, tourism and journalistic activities or any kind of logistics – all activities must be environmentally compatible and are subjected to authorisation. In Germany, UBA is the competent authority and it participates, at an international level, in the Antarctic Treaty Consultative Meetings and in its Committee for Environmental Protection to actively contribute to the development of environmental protection in the Antarctic.

UBA supports the designation of Antarctic Specially Protected Areas and Antarctic Specially Managed Areas. The Fildes peninsula with its comparatively large biodiversity is one such area being used intensively by scientific and logistic activities and, increasingly, by rising tourism. Waste dumping sites, serious damage to sensitive vegetation and landscape destruction are the result. Since 2006, Germany has pursued the proposal to designate this region – an area with five stations owned by different nations and four huts – as an Antarctic Specially Managed Area in the future.

One of the major problems in the Antarctic is a sharp rise in tourism over recent decades. In the 2009/2010 season alone, 21,600 tourists visited the Antarctic or its offshore islands. Most Antarctic tourists come from the United States, followed by Germany and Great Britain. Cruise tourism to endangered and frequently-visited regions is regulated by "Visitor Site Guidelines" adopted by the Antarctic Treaty Consultative Parties. Individual tourism, however, which affects new and so far pristine areas on the continent in the form of individually organised journeys such as skiing, mountaineering, climbing and mountain biking, gives cause for concern. UBA has summarised the essential rules of behaviour in "Visitor Guidelines for the Antarctic" and intends to develop a national strategy for sustainable tourism.

Underwater noise has increased substantially throughout the last decades in the world's oceans. Whales and seals are in particular subject to risks from underwater noise. This is still a controversial issue of debate among the different players. High sound levels can result in injury or significant biological disturbances at distances of several miles from the acoustic source. In a research project commissioned by UBA and performed by the Alfred Wegener Institute (AWI) and the University of Veterinary Medicine Hannover Foundation (the former

Research and Technology Centre, FTZ, Büsum) data on the occurrence, distribution and abundance of whales in the Antarctic are collected in order to improve our state of knowledge for assessment purposes. UBA advocates the development of technical measures for noise reduction and alternative technologies – including scientific surveys with so-called airguns. Thus shipping and marine research should become less harmful to the environment and contribute to maintaining the functioning of the Antarctic ecosystems.

CHALLENGES FOR A SAFE INTERNATIONAL CHEMICAL MANAGEMENT

Each year the world produces about 500 million tonnes of chemicals, traded and used in diverse processes and products – used for example to manufacture plastics, pesticides or pharmaceuticals. Projections anticipate a growing use of chemicals. Chemicals make our life easier, but they can threaten or damage people's health and the environment. In particular chemicals which are difficult to degrade (Persistent Organic Pollutants, POPs) and accumulate in the human body and in animals and spread through the air, water or food chain, represent a global problem. POPs can be found practically everywhere in the world, even in the Arctic. We must establish international safety standards, so that the sustainable use of chemicals is possible in all countries.

UBA provides specialist advice to the Federal Ministry of the Environment, other public authorities, industry and professional associations in order to identify the best options for safe handling of chemicals and to manage the regulation of substances causing concern. We cooperate at an international level to assess the effects of chemicals, for example of POPs which are particularly dangerous to the environment; POPs include industrial chemicals and pesticides as well as unintentionally formed substances such as dioxins, which can develop as by-products of combustion processes or in the chlorine industry. Furthermore, we assess technical measures for the substitution or emission reduction of chemicals. These efforts involve not only the ecological, but also the socio-economic consequences. In 2002 the international community formulated the so-called "2020 Objective" at the World Summit on Sustainable Development in Johannesburg. It means that we must minimise the negative effects of chemicals on human health and the environment as far as possible by 2020. International conventions on chemicals management therefore require industrial nations and emerging and developing countries to ensure these goals are realised. Thus according to the Rotterdam Convention, dangerous chemicals may only be exported accompanied with information about their effects (Prior Informed Consent Procedure, PIC). The Stockholm Convention regulates POPs so they do not get into the environment. The Strategic Approach on International Chemicals Management (SAICM) provides the integral framework which links chemicals management with other development issues.

HUMAN BIOMONITORING – AN INSTRUMENT OF HEALTH-RELATED PROTECTION OF THE ENVIRONMENT

Human Biomonitoring (HBM) examines human body fluids and human tissue in order to determine the exposure to pollutants. As an information and control instrument of environmental politics, it supplies scientifically substantiated data on whether and to what extent substances are taken up by the human body, whether there are population groups with particularly high exposure and whether chemical legislation has resulted in any reduction of exposure. UBA possesses extensive experience from many years of large-scale HBM programmes. HBM studies performed in other European countries however, are often based on different research questions and procedures so that the data obtained are not always comparable.

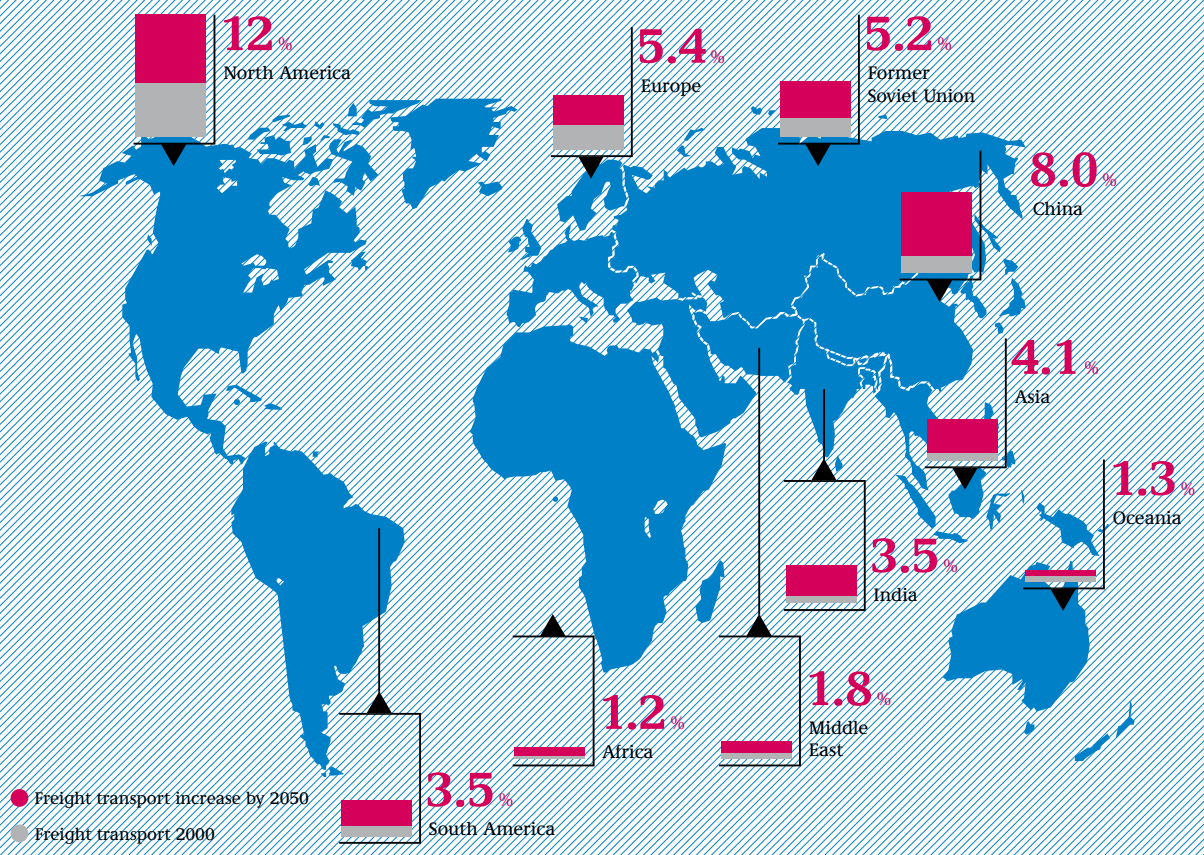
The European environmental and public health politics therefore funds the COPHES project [31] within the Seventh Framework Programme for Research and Technological Development (FP7) of the European Union. 35 research teams from 24 countries are working together until 2012 to harmonise HBM studies in Europe and develop standardised procedures. These are being tested by means of a pilot study within the project DEMOCOPHES. For this purpose, in each of 16 countries 120 children between 6 and 11 years and their mothers are examined for selected environmental pollutants or their metabolites: phthalates, cadmium and cotinine in urine and mercury in their hair. UBA conducts the German part of the pilot study from which the research teams derive recommendations for a future representative HBM study, which if possible, should measure various pollutants in all European countries. The aim of this HBM study will be to provide policy recommendations to reduce exposure of people in Europe to pollutants.

UBA is involved in European and international specialist committees to develop ambitious standards and regulatory instruments. Two of the most important instruments are the European Community Regulation on chemicals and their safe use, REACH (Registration, Evaluation, Authorisation and Restriction of Chemical substances), and now the world-wide applicable Globally Harmonised System (GHS) on classification and labelling of chemicals. The responsibilities of the EU states toward REACH and the European ordinance to GHS are managed by the European Chemicals Agency (ECHA) in Helsinki – an important cooperative partner for UBA. Other important European standards, in whose development and implementation UBA participates, concern the regulations on chemicals in products (for example the RoHS Directive on the restriction of the use of certain hazardous substances in electrical and electronic equipment) and the development of technically advanced requirements for industrial facilities. UBA provides information about how regulations for better chemical safety are applied in industrialised countries. Emerging and developing countries form the main target group for information provision because chemical production and processing is increasingly shifted from OECD states to non-OECD states.

DEVELOPMENT OF TRANSPORTATION – ENVIRONMENTALLY FRIENDLY IN THE LONG-TERM

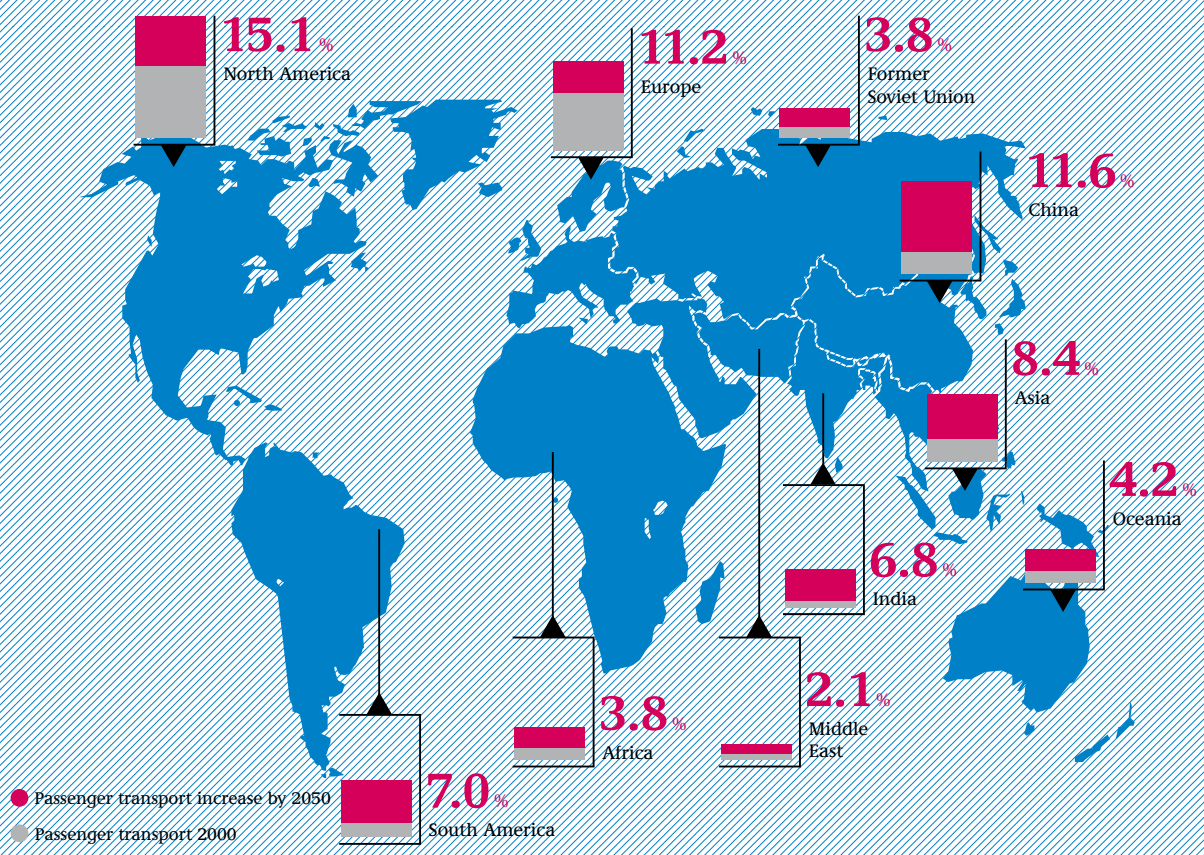
Sustainable mobility has been more or less a national issue so far. The promotion of sustainable mobility at European and global levels is however essential for development of a long-term environmentally friendly transport system. It is estimated that greenhouse gas emissions from traffic will rise in the period between 2000 and 2050 by about 130 percent. The levels of air pollutants and noise are regionally very high not just in developing and emerging countries, but also in Europe. The worldwide development of transportation gives cause for concern. Motorised traffic grows steadily at the global scale. Projected passenger transport will nearly double and freight traffic is predicted to increase by 140 percent by 2050.

DEVELOPMENT OF FREIGHT TRANSPORT BETWEEN 2000 AND 2050 (IN TRILLION TONNE-KILOMETRES)



Source: progtrans 2010 [32]

DEVELOPMENT OF PASSENGER TRANSPORT BETWEEN 2000 AND 2050 (IN TRILLION PERSON-KILOMETRES)



Source: progtrans 2010 [32]

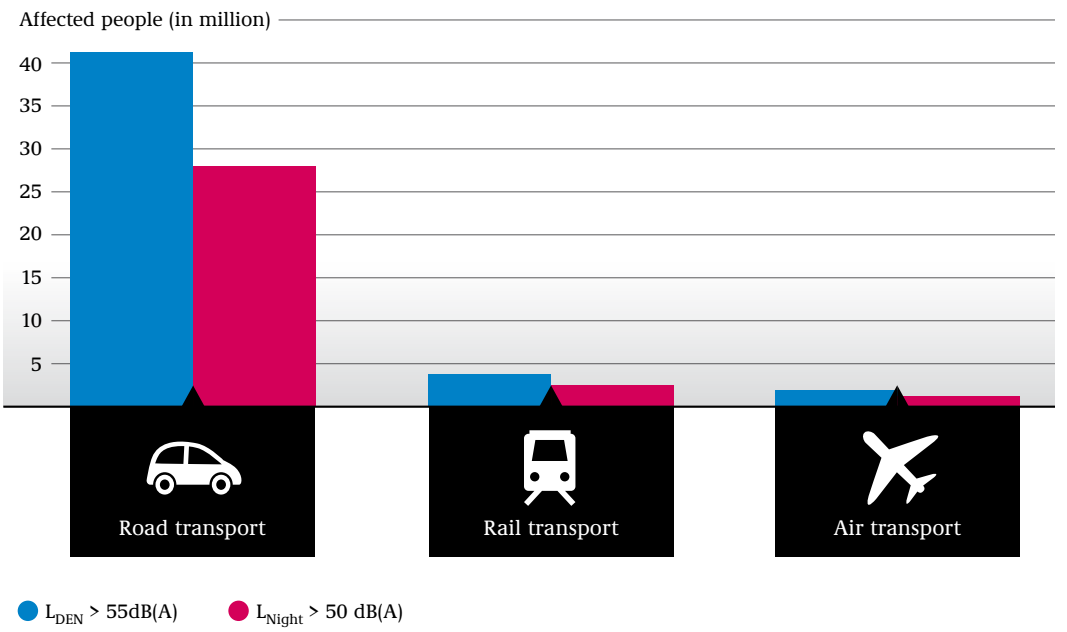
In 2010 the Commission for Sustainable Development (CSD) assessed the global progress in the implementation of sustainable development targets within the transportation sector: transport is still a far cry from being sustainable, while at the same time many developing countries are completely lacking efficient transport systems. These are however a prerequisite for economic growth and prosperity. The Federal Ministry of the Environment coordinates the CSD process for transport within the EU in which UBA's national expertise is also incorporated. An important commitment of the EU is to help emerging and developing countries to build their own skills for sustainable transport development and to promote knowledge and technology transfer. The Ministry of the Environment therefore supports the dialogue in the "Sustainable Low Carbon Transport" partnership. Headed by the giz (Deutsche Gesellschaft für Internationale Zusammenarbeit) and on behalf of UBA, it is where the criteria for a uniform assessment of the sustainability of transport systems are being developed.

SILENT, SUSTAINABLE, MOBILE – EUROPE IN ACTION

Many people in Europe are exposed to high noise levels which affect their health and reduce their quality of life. Road traffic is the main source of noise, followed by rail and air transport. An analysis by UBA showed that in major metropolitan areas in Europe, substantial parts of the population are exposed to high noise pollution (see Figure).

The European Environmental Noise Directive (2002/49/EC) came into force in 2002 with the aim of improving the noise situation. It stipulates that the member states prepare noise maps for heavily used major roads, major railways and major airports and large urban agglomerations. Noise pollution in all European urban agglomerations and on all major traffic routes will be recorded by 2012. For comparability of results within the EU, two uniform indicators are being used: the day-evening-night noise index L_{DEN} as a basis for assessing annoyance and night noise index L_{Night} as a measure of sleep disturbance. Noise maps will serve as a basis for noise action plans whose implementation should reduce or eliminate environmental noise and prevent a noise increase in quiet areas. They were developed jointly with the public and provide for measures such as routing concepts for HGVs, noise-reducing road surfaces, increased reliance on regional public transport and on revised speed limits. UBA particularly supports coordination with local air pollution control plans and other spatial plans. The implementation of the Environmental Noise Directive requires a continuous noise reduction process in Europe which should lead to a decrease in noise pollution despite increasing traffic in the medium to long term, making an important contribution to sustainable mobility.

NOISE-AFFECTED POPULATION IN EUROPEAN METROPOLITAN AREAS IN 2007



Source: UBA illustration, Data: EEA publication 2010 [33]

ENVIRONMENTAL PROTECTION IN EUROPE AND NEIGHBOURING COUNTRIES: PURSUING JOINT OBJECTIVES

Pursuing environmental themes and objectives at the European level – this is the goal of the EPA network (Network of the Heads of Environment Protection Agencies). This informal association of heads of the national environmental protection authorities and similar institutions in Europe was established in 2003 where UBA is also a member. The biannual network meetings have developed into an important platform for the exchange of ideas and experience on relevant topics of European environmental policy for the members and participating representatives of the EU Commission.

The network organises its work in thematic interest groups. Since 2004 UBA has held the lead of the group "Sustainable use of natural resources", which has already distinguished itself by issuing statements in the European Commission to promote a sustainable and efficient use of resources. UBA will provide major contributions to the relevant debates in the future as well – for instance on the development of sustainable consumption, production and resource management. UBA will also be a key player in the new interest groups and deliver its position on forwarding a "green" economic policy and issues of noise pollution. The "Europe Vision 2050" project was another UBA initiative. Its goal, in collaboration with other environmental protection authorities in Europe and within a participatory scenario process, is to develop a common vision for a sustainable Europe.

The 6th Environmental Action Programme (EAP) sets the framework for the European Union's environmental policy up to mid-2012. It is obvious that the priority action fields of the programme – climate change, wildlife and biodiversity, environment and health and the management of natural resources and waste – despite the progress achieved, will remain key items on the agenda of the EU's environment policy beyond 2012. A new, 7th EAP should therefore provide the basis for a common, medium-term guidance for the member states so that we can establish a targeted and successful environmental policy both at an EU and global level. Therefore UBA and other members of the Network of the Heads of Environment Protection Agencies have petitioned in letters to the EU Commission for a new, 7th EAP. UBA will continue to advocate for an ambitious and proactive EU environmental policy and will submit proposals for shaping its content.

Involving the public and better integration of environmental bodies into other policy areas are core concerns of the European environmental policy. An environmentally conscious public and civil societal environment interest groups still fail to exercise a critical observer role in many of Germany's neighbouring countries in the east and southeast. Though the states which joined the EU in 2004 and 2007 have, to a large extent, implemented the EU environmental legislation into national law, there is still a substantial demand for advice in the very expensive modernisation of environmental infrastructure such as water mains and sewers. Experience gained in the reconstruction of the environmental infrastructure in the new German Federal States (former German Democratic Republic) during the 1990s and Germany's global pioneering role in the development of environmental technology, qualify Germany and UBA in an adviser role. UBA also looks beyond Europe for the exchange and cooperation with national and private policy advisory institutions. Thus a closer cooperation with the American Environmental Protection Agency (US EPA) was agreed upon in the areas of chemicals management. With the World Resources Institutes in Washington and the Indian TERI Institute the foundation of an enhanced cooperation in the fields of climate and resource conservation has been laid.

KNOWLEDGE TRANSFER FOR ENVIRONMENTAL PROTECTION

Within the Advisory Assistance Programme the Federal Ministry of the Environment provides financial support for cooperation with the countries in Central and South-East Europe and the successor countries of the former Soviet Union. In bi- or multilateral projects German experts advise their colleagues in the partner countries on solutions to their environmental problems. Experience and knowledge exchange based on concrete examples are the core elements of this cooperation; the establishment of specialist expertise in the partner countries is an important outcome of the projects.

UBA provides specialist and administrative management for the projects and contributes to developing the environmental solutions in partner countries. A project in the Narew region in North-East Poland for example focuses on the resource saving production of biomass for energy production. In the economically underdeveloped region near the European Union's external border, Camelina sativa (false flax) is cultivated in mixed cultivations and cameline oil is produced. This oil is used as tractor fuel or as cooking oil in the region and will be marketed in the future. The by-products from cultivation and pressing are used as fodder. The cultivation of mixed crops is possible with little use of fertilisers and pesticides and enhances agro-biodiversity. With the support of the German partner Euronatur, farmers in the project region have developed the necessary infrastructure and the necessary technical, agricultural, legal and practical knowledge for the cultivation and use of vegetable oils. Over the long term a regional competence centre for applied

environmental technology will be developed in the Narew area to provide knowledge and experience transfer among different users in Poland.

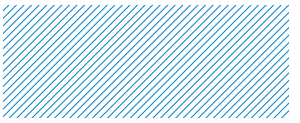
UBA's specialist expertise is also incorporated in projects to implement international agreements: an advisory assistance project of the United Nations Economic Commission for Europe (UNECE) should promote the implementation of the Convention on the Transboundary Effects of Industrial Accidents and thus transboundary risk management. The aim of the project is to develop an effective and practical testing of risk prevention systems for incident-relevant facilities to safeguard the Danube Delta. One of the key measures of the project is to develop safety guidelines for oil terminals. Three terminals are directly above the Danube Delta, one each in Romania, the Republic of Moldavia and Ukraine. Further training of Ukrainian, Romanian and Moldavian specialists within this project will contribute to achieving the goals of environmental co-operation agreed at government level. The project will be a flagship project for the implementation of the EU's strategy for the Danube Region.

The EU offers a variety of instruments for collaborating on solving problems: these are long-term administrative partnerships, known as "Twinning", and short-term actions for Technical Assistance and Information Exchange (TAIEX). The European commission aspires, with both cooperation instruments, to support the establishment and development of institutional structures in countries which joined the EU, want to join or, as European neighbours, are interested in a closer cooperation with the EU. UBA uses these tools for knowledge transfer; 91 of UBA's employees have so far passed on their experiences in environmental administration in 12 Central and Eastern European countries, Turkey and Egypt.

REGIONAL COOPERATION FOR SUSTAINABLE PRODUCTION

Small and medium-sized enterprises (SMEs) account for roughly half of the total industrial pollution in the EU [34]. Because they are not sufficiently informed about the avoidable environmental impacts of their activities, many business owners see no reason to change their actions so they can be more sustainable in terms of environmental protection and economic efficiency. The INTERREG projects SPIN [35] in the Baltic Sea region and Act Clean [36] in Central Europe have therefore adopted a common environmental goal to support these companies in the introduction of innovative environmental technologies [37].

A key part of these projects is a freely accessible project database with examples of innovative environmental technology where entrepreneurs will find examples of how they can make production processes more sustainable. The database is linked closely with UBA's Internet portal "Cleaner Production Germany", which presents the state of the art and is used for the transfer of German environmental technology. Conversely the project partners of each individual project bring innovations from the EU states involved so enabling the reciprocal transfer of environmental technology. Through the Integration of the identified techniques and procedures into their production processes, SMEs can be more material and energy efficient, thus reducing their costs and relieving the environment. The action catalogue "Transnational Agenda" highlights pathways towards sustainable development of the economy to policy makers in the participating countries.



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[19] A study commissioned by UBA has found that the amount of biowaste currently collected from households could be increased by about 2 million tonnes to more than 6 million tonnes (cf. UBA-Texts 43/2010, Witzenhausen Institute).

[20] The Kyoto Protocol specifies the gases: carbon dioxide (CO_2), methane (CH_4), dinitrogen oxide (N_2O), partially halogenated fluorohydrocarbons (H-HFC), perfluorinated hydrocarbons (PFC) and sulfur hexaflourid (SF_6).

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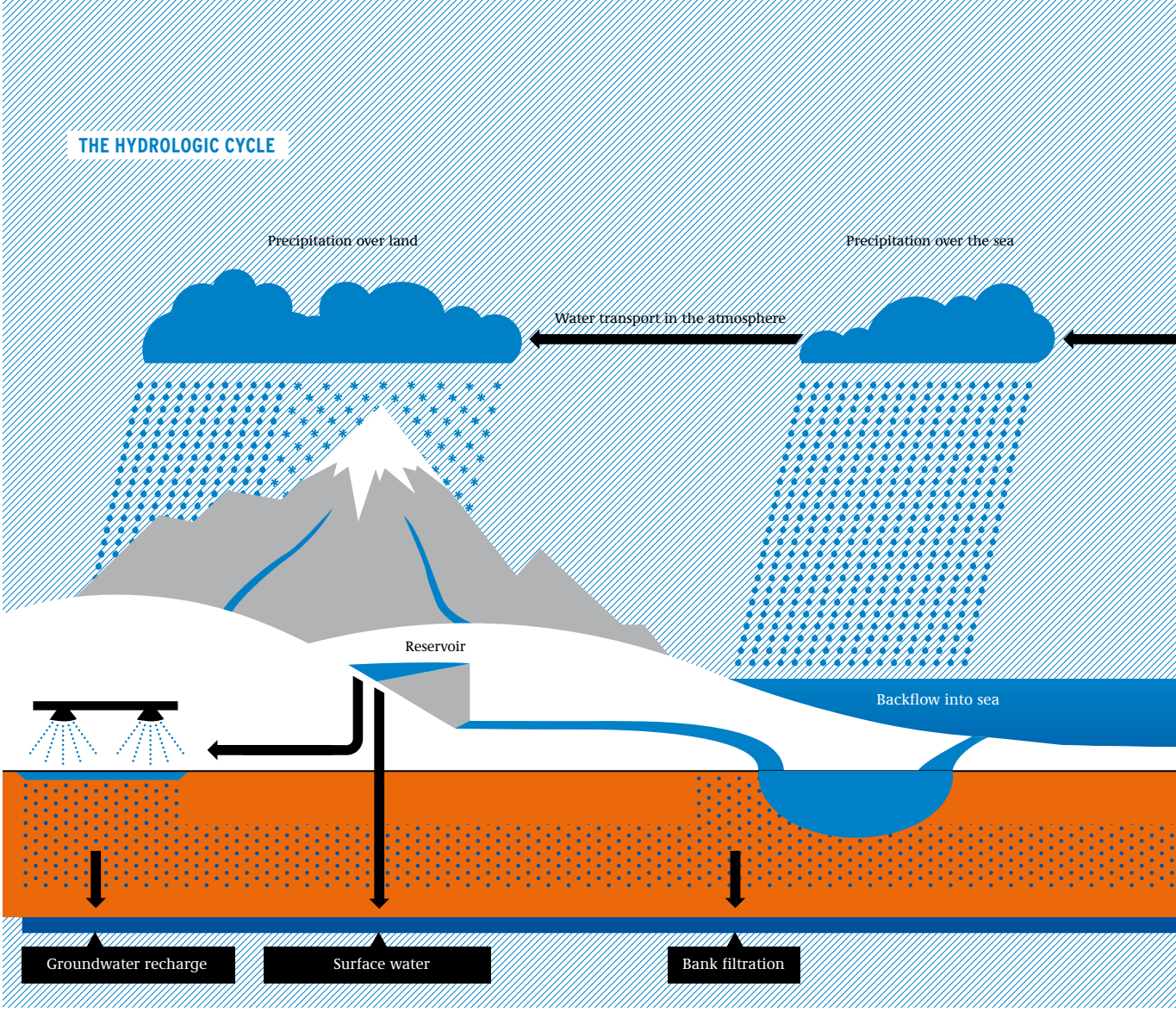
[37] The European Territorial Cooperation (ETC, formerly: INTERREG) is an independent objective of the European structural policy. Its implementation is carried out by transnational projects within different programme spaces of the EU (e.g. the Baltic Sea Region and Central Europe). Project management agencies are chiefly research institutes, universities and authorities in the respective countries of the programme space.

WATER

ECOLOGICALLY SOUND HANDLING OF A PRECIOUS RESOURCE

Water is the basis of all life, and an indispensable resource. We use it for nutrition and our daily hygiene. Industry and the energy sector need water for many production processes, agriculture irrigates the fields with it. But: all water uses leave ecological traces. Substance discharges, water extraction and the impact of construction change the quantitative and qualitative condition of water, so affecting its status. With its diverse range of flora and fauna, water is and remains a part of the ecosystem worthy of protection. Waters are a recreational resource and the basis of our very existence and commercial activity. To preserve and connect all this is the task of modern water protection. Current European legislation like the EC Water Framework Directive (WFD) and the Marine Strategy Framework Directive (MSFD) take this approach. It is their goal to improve the ecological condition of waters without excluding their economic or touristic use. ➔



The concepts for protecting the aquatic environment must be continually improved and advanced in step with new developments such as the consequences of climate change or the oil spill disaster in the Gulf of Mexico last year. In addition, public discussion about the price of drinking water in Germany affects the interests of water conservation. The Federal Environment Agency (UBA) sees itself as responsible for developing positions on these topics: We develop protection concepts, derive goals for them, formulate the technical requirements for legislation, and advise policy makers and the public. Our experts participate in national and European working groups, evaluate and publish data, make recommendations on how to deal with water responsibly, and take a stand on important water protection issues. Main topics of our work for 2011 are the effects of climate change, the implementation of the Marine Strategy Framework Directive and the Water Framework Directive in Germany.

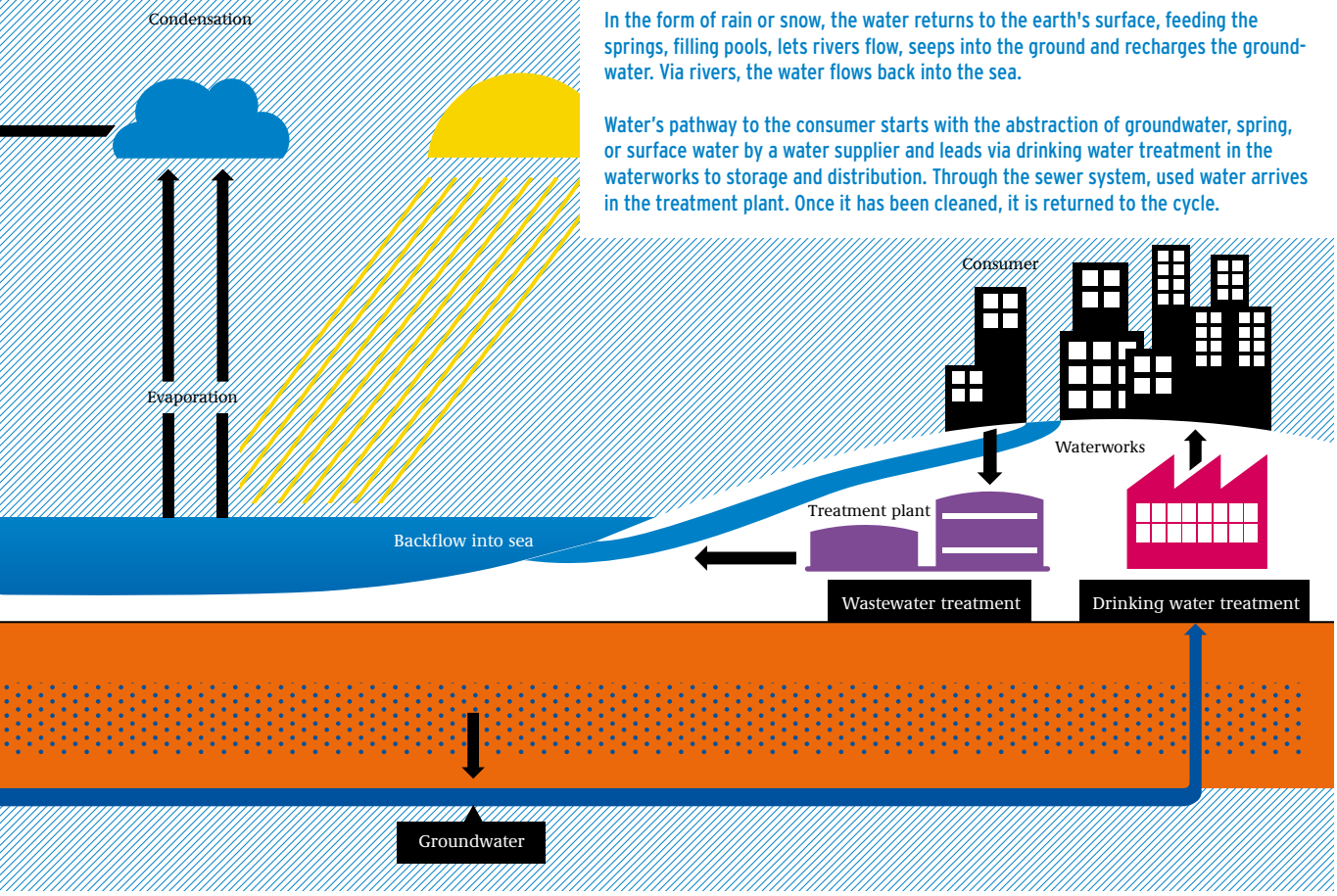
A PARADIGM SHIFT IN WATER PROTECTION – THE EU WATER FRAMEWORK DIRECTIVE

Over the past ten years we have undergone a systemic transformation in the management of waters towards an action plan driven pursuit of water protection objectives: until then the focus was on chemical contamination of waters, now all of the effects of human usage on the ecology of waters are considered in water management. This means that the changes of water run-off and the structure of waters (the technical term is: “hydromorphological degradations”) are considered in management measures.

Always in Motion – the Hydrologic Cycle
The water on earth moves in large cycles. The radiant heat of the sun has water constantly evaporating into the atmosphere – from land surfaces, and especially from the largest water surface: the sea. At height where it is colder, the water vapour condenses into water droplets, from which clouds develop.

In the form of rain or snow, the water returns to the earth's surface, feeding the springs, filling pools, lets rivers flow, seeps into the ground and recharges the groundwater. Via rivers, the water flows back into the sea.

Water's pathway to the consumer starts with the abstraction of groundwater, spring, or surface water by a water supplier and leads via drinking water treatment in the waterworks to storage and distribution. Through the sewer system, used water arrives in the treatment plant. Once it has been cleaned, it is returned to the cycle.



The realignment began in 2000 with the European Union Water Framework Directive (WFD) [1]. The Directive introduces a new evaluation standard for rivers, lakes and coastal waters: Apart from the requirement to achieve "good chemical status" which is assessed on the basis of EU-wide environmental quality standards, it also provides for "good ecological status", which is a measure based on the presence of natural biotic communities. For groundwater, also in accordance with EU-wide environmental quality standards, "good chemical status" is to be achieved, as well as "good quantitative status", where water abstraction may not exceed recharge from inflow and precipitation. For surface waters, "good status" is therefore a function of good chemical status and good ecological status – while for groundwater it is good chemical status as well as good quantitative status. UBA recognises that such ambitious objectives can only be reached over the long term. The deadlines for implementing the Water Framework Directive extend over many stages up to 2027 (see illustration page 35 et seq.).

TIMELINE FOR THE IMPLEMENTATION OF THE WATER FRAMEWORK DIRECTIVE

DECEMBER **2000**
Effective date of the Water Framework Directive

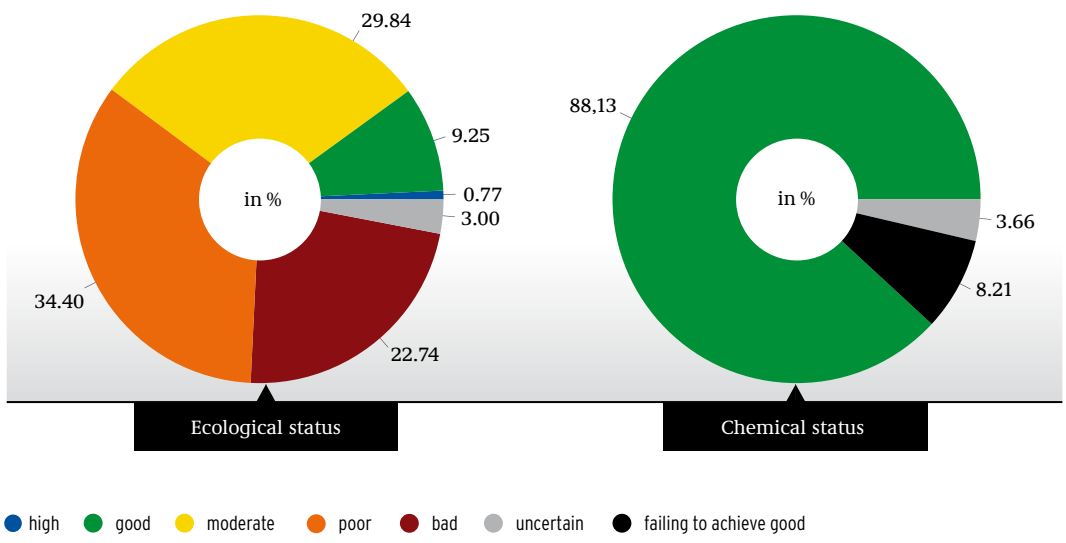
DECEMBER **2003**
Legal transposition

DECEMBER **2004**
Characterisation results

Characterisation

Development of monitoring programmes

STATUS OF WATERS IN GERMANY IN 2009: RIVERS, LAKES AND COASTAL WATER BODIES



Source: BMU/UBA (2010): Water Framework Directive – The way towards healthy waters

MANAGEMENT PLANS AND PROGRAMMES OF MEASURES

In order to assess waters, accurately capture pressures and then apply measures, the Water Framework Directive subdivides waters into so-called "water bodies", differentiating between groundwater and surface water bodies. Groundwater bodies encompass an enclosed volume of water, in surface waters a body is defined by sections of uniform quality and typology. The results of water monitoring show that for 90 percent of water bodies in rivers, 60 percent of lake water bodies, almost all water bodies of transitional and coastal waters, and for almost 40 percent of groundwater bodies, action is required in order to achieve "good status" (see diagram).

In order to improve the status of waters, the Federal States developed programmes of measures. In addition to a lot of other information, for example descriptions of pressure levels and usage situation, or a review of the desired environmental objectives, these programmes of measures also are included in the river basin management plans across state borders. Management within river basins not only requires coordination among the Federal States, it also necessitates cooperation with neighbouring states for transboundary river basins. Working in alignment with the conditions in river catchment areas is also new for German water protection.

UBA has evaluated the management plans for the different river basins and published the results [2]. Most measures relate to the improvement of the waters' morphology. The measures concern the profile design of waters, the characteristics of the riverbed material and the continuity for fish (permeability of weirs) as well as a reduction in nutrient and pollutant loads in the water. Hydromorphological changes and contaminant loads represent the main causes of failure to meet the objectives of the Water Framework Directive. According to the principles of the directive, the polluters also need to contribute to the necessary improvement measures. The problem however, is that a polluter is not easily identified since contamination is often a result of the actions of multiple users. For example large hydro-electric power plants are often located in weirs, which were established for the use of rivers as Federal waterways for shipping.

TIMELINE FOR THE IMPLEMENTATION OF THE WATER FRAMEWORK DIRECTIVE

DECEMBER **2006**

Monitoring programmes ready for implementation

DECEMBER **2009**

Establishment of river basin management plans and programmes of measures, 1st management cycle starts

DECEMBER **2012**

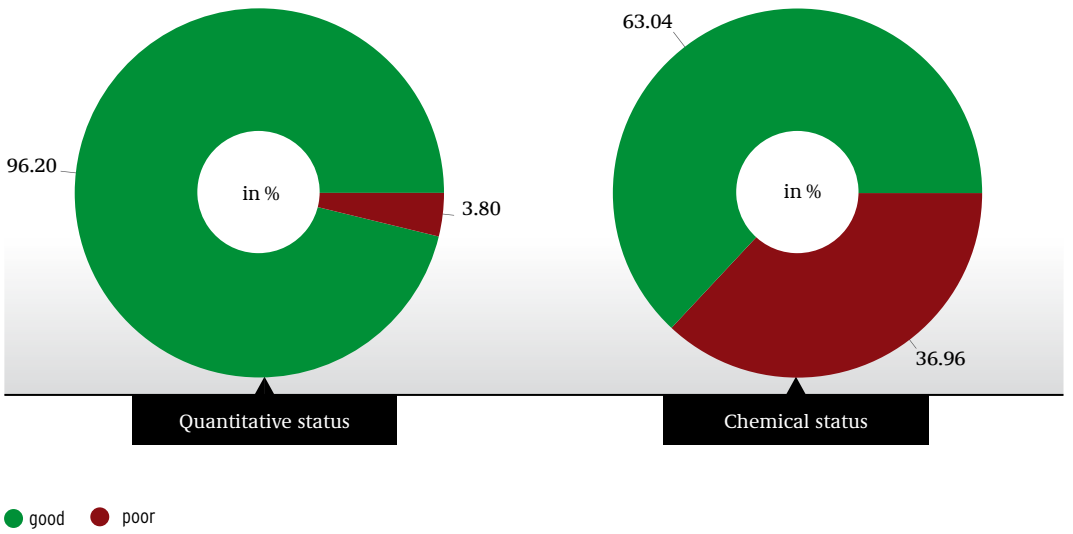
Implementation of the relevant measures

Develop management plans and programmes of measures

Implementation of programmes of measures

Period during which WFD objectives are to be met

STATUS OF WATERS IN GERMANY IN 2009: GROUNDWATER BODIES



Source: BMU/UBA (2010): Water Framework Directive – The way towards healthy waters

THE NEED FOR ACTION IN WATER MORPHOLOGY AND RIVER CONTINUITY

The "good ecological status" of a water body can be based on whether its structure allows population, for example by fish, to an extent that conforms to the type-specific diversity of species. Criteria for this include the permeability of so-called transverse structures (e.g. weirs), or the condition of embankments. In Germany, river continuity is interrupted or disturbed at every other river kilometre by a total of 200,000 transverse structures. Currently, the hydromorphological status of only eight percent of the flowing water segments can therefore be rated "good" or "better" [2]. To bring about an improvement in the river basins, further coordinated action for dismantling or modifying transverse structures, or for building fish passes are necessary. UBA is developing a methodology for monitoring the performance of such hydromorphological measures.

The new Water Resources Act (WHG) transposes the European Water Framework Directive into national law [3] and thereby also creates the preconditions for improving the morphology of waters (not just the material properties). Among other things it stipulates that measures for the protection of fish populations must be taken in the construction and operation of the more than 7,500 hydroelectric power plants in Germany. The cumulative damage effects of the use of hydroelectric power are thereby considered for the first time.

UBA is developing a methodology for deriving protection goals which can be used to determine for each individual hydroelectric power plant, the proportion of fish which has to be able to pass the installation without harm. The Federal Waterways and Shipping Administration is responsible for ensuring continuity in Federal Waterways. UBA contributes to the development of technical approaches to achieve the goal of full river continuity of federal waterways.

DECEMBER **2015**
Meeting environmental objectives, 2nd management cycle starts

DECEMBER **2021**
3rd management cycle starts

DECEMBER **2027**
Final deadline for meeting objectives

Source: BMU/UBA (2010): Water Framework Directive – The way towards healthy waters

EUTROPHICATION

Eutrophic is the Greek word for "well nourished". Eutrophication is triggered by human activity, which leads to an accumulation of nutrients such as phosphorus and nitrogen in the aquatic environment. Algae and cyanobacteria ("Phytoplankton") floating in the water can grow excessively and deprive plant species, many small organisms and other animals of their basis of life – either because substantial accumulations of phytoplankton block the sunlight to aquatic plants or because the biological decomposition of the plant mass substantially lowers oxygen levels in the water. In extreme cases eutrophication can create anoxic lifeless zones at depth in shallow seas and lakes.

THE BIGGEST CHALLENGE: AGRICULTURE

Like soil, water is an indispensable resource for agriculture. But, Germany's intensive agriculture severely damages waters, the remediation or reduction of which will take many years. Extensive farmland consolidation, straightening and dredging of waters as well as regular "maintenance of waterbodies" damage most of the rivers and streams permanently [4]. The excessive use of fertilizers and pesticides causes severe nutrient and pollutant contamination in many waters. Excessive levels of nutrients such as phosphorus and nitrogen (especially nitrate) encourage algae growth in rivers, lakes and seas, and thereby promote eutrophication (see box) in waters [5]. Furthermore, once nitrate level thresholds in groundwater have been exceeded, it requires substantial technical and financial effort to be processed into drinking water.

Water quality monitoring shows that agriculture is currently the main cause of water pollution. The implementation of the Water Framework Directive represents a major challenge in this area. Therefore, the management plans for all river basins include programmes of measures for the reduction of agricultural pollution. These can range from requirements for land management to providing consulting and information services. Many of the proposed measures go beyond the legal requirements for "a good agricultural practice". A critical success factor is that these supplemental measures, which are necessary in order to achieve the objectives of the Directive, are not specified as mandatory, but are rather based on voluntary compliance.

UBA recommends establishing compliance with the necessary environmental requirements as obligatory standards in agricultural law. Of particular importance in this context is an environmentally appropriate alignment of the European Union's Common Agricultural Policy (CAP). UBA is going to develop recommendations in time for the CAP reform in 2013. The "Agriculture Commission at the Federal Environment Agency" (Kommission Landwirtschaft am Umweltbundesamt or KLU) was established in the summer of 2010 to provide support at a technical level. It includes renowned experts in science and administration from the agricultural and environmental sectors who co-operate and advise UBA in matters of agricultural policy.

IMPROVED WATER QUALITY THANKS TO ENVIRONMENTAL QUALITY STANDARDS FOR HAZARDOUS SUBSTANCES

The Water Framework Directive uses environmental quality standards for evaluating the contaminant load in ground and surface waters. Environmental quality standards for 33 substances were specified which define "good chemical status" for surface waters in a daughter Directive [6] to the Water Framework Directive at the end of 2008. The system by which the substances were chosen is based on preliminary work done by UBA and takes into consideration toxicity for humans and ecological effects. UBA participates in an EU working group which is currently checking further substances for their EU-wide relevance.

In addition to the mandatory EU-wide list of substances for determining "good chemical status", substances which individual countries classify as relevant are also regulated at a national level for the purpose of evaluating ecological conditions. Only if no national standard is exceeded, can a waterbody qualify for the "ecologically good" class. Since 2003, Germany has set standards for 150 substances which, based on a model regulation in which UBA was significantly involved, are subject to regulations of the 16 Federal States. In the future a Federal Regulation will introduce these standards uniformly and supplement them by about 20 substances recognised as relevant. Among them will be several active pharmaceutical ingredients, which so far have not been regulated. They were included because in some waters they occurred in such ecologically critical concentrations that they were assumed to impact aquatic organisms.

Up to now, German law has not included environmental quality standards or thresholds for the assessment of groundwater quality. So far, only generally worded objectives like: "Groundwater is to have as natural a condition as possible", or: "Groundwater may not be adversely affected" exist. For issuing permits and authorisations for the use of groundwater, the EC Groundwater Directive now specifies the requirements of the Water Framework Directive [7].

The Groundwater Directive establishes mandatory EU-wide environmental quality standards: for nitrate, 50 milligrams per liter (mg/l), for pesticides and biocides as well as for their relevant metabolites, decomposition and reaction products 0.1 micrograms per liter (µg/l).

In addition, the directive identifies eight substances and substance groups for which each member state has to define its own thresholds. Germany uniformly regulates these substances nationwide. In cooperation with the Federal States, UBA has derived the following groundwater thresholds: arsenic 10 µg/l, cadmium 0.5 µg/l, lead 10 µg/l, mercury 0.2 µg/l, ammonium 0.5 mg/l, chloride 250 mg/l, sulfate 240 mg/l and for the sum of trichloroethylene and tetrachloroethene 10 µg/l.

"Like soil, water is an indispensable resource for agriculture. But: Germany's intensive agriculture also creates serious damage to waters."

DEADLINE EXTENSION INSTEAD OF LESS STRINGENT ENVIRONMENTAL OBJECTIVES

The Water Framework Directive aims to achieve good status for all surface and coastal waters as well as for groundwater in Europe by 2015. Apart from chemical substances discharged into waters, the ecological status of surface waters is of particular importance. Straightening of rivers, building flood barriers and other interventions in the hydromorphological status should be rebuilt if necessary for achieving "good ecological status" where they do not present significant restrictions to current use.

However welcome this course of action may be from an environmental perspective, it is also very ambitious and challenging for society – especially given the associated timeline. Besides coming up against natural and technical limits, the objective of achieving a "good status" also will reach economic boundaries. Therefore, under certain circumstances, the Water Framework Directive permits a departure from the objectives of "good status" for individual water bodies. This means that the deadline for achieving good status can be extended by two six years periods, and less stringent environmental objectives may be defined for a water body. One condition, among others, is that no further deterioration of the status of the waterbody occurs. Maintaining the status quo is therefore the minimum requirement. UBA has always advocated that, if necessary, exceptions are granted by extending

the deadline, not by setting less stringent environmental objectives. By granting more time for the measures, available financial resources can be deployed in stages, and used more efficiently. This perspective now prevails in Germany and many other European Union member states.

The management plans and programmes of measures show that Germany will have to resort to time extensions in several cases. By 2015 the Federal States want to achieve good status for an additional eight percent of the surface water bodies as well as for two percent of the groundwater bodies. The deadline has been extended for most of the other water bodies however - approximately 80 percent of the surface water bodies and 36 percent of the groundwater bodies. The expectations are that in the next two planning cycles (up to 2022 and 2027), good status can be achieved by employing additional measures.

The success of the initial planning phase of the Water Framework Directive is therefore less measured according to the number of water bodies changed to "good status", but more in terms of the fact that the foundations for the implementation of the next planning phases were developed. The cost and endeavour required for this were substantial. Since both planning and implementation of the measures by the Federal States take place at the river basin level, UBA made it its business to work towards a nationwide coherence of implementation – from data acquisition to measure selection.

For this purpose UBA publishes nationwide aggregated data and information about different aspects of the implementation according to the WFD timetable and also points out the shortcomings. Important questions in this context are: How can the commitment to create the most cost effective combination of measures be implemented at the planning stage? How can agriculture, as one the main causes of groundwater contamination, be held more accountable? How can the designation of heavily modified waters be standardised? What other environmental quality standards for pollutants have to be established nationwide? How can aspects of marine protection and flood protection be included in the planning of measures?

BETTER PROTECTION OF THE MARINE ENVIRONMENT – THE EC MARINE STRATEGY FRAMEWORK DIRECTIVE

Approximately 70 percent of the earth's surface is covered with water. Oceans and seas are an important habitat for plants and animals and a vital source of food, energy and raw materials. Marine ecosystems play a key role in climate change and weather dynamics. However, the fishing industry, oil and gas production, pollutant inputs from industry and agriculture, coastal urban development and tourism increasingly put pressure on the seas. Progressive loss of biological diversity, the degree of pollution with hazardous substances and the consequences of climate change are some of the most clearly visible warning signals.

In the autumn of 2005 the European Commission presented a "Thematic Strategy for the Protection and Conservation of the Marine Environment". It combines different areas like the Common Fisheries Policies (CFP) and the protection of biodiversity and marine ecosystems. Important objectives include the integrated detection and evaluation of all effects, and a balanced relationship between conservation and usage. On the basis of the precautionary principle and the ecosystem approach, it is about integrated management of human activities (especially fisheries, agriculture, shipping, energy generation and chemicals) with the aim of managing them so that the health of the complex and dynamic marine ecosystems is not impaired.

The EC Marine Strategy Framework Directive (MSFD), which came into force in July 2008, forms "the environmental pillar" for this strategy, with the goal of achieving or maintaining "good environmental status" for all European seas by 2020 [8]. The criteria for "good environmental status" are qualitatively defined in the Directive on the basis of 11 descriptors (see box on page 42). At a European level, the operationalisation via quantitative determination presently takes place in the working group "Good Environmental status" which is jointly chaired by the EU Commission and Germany, repre-

TIMELINE FOR THE IMPLEMENTATION OF THE MARINE STRATEGY FRAMEWORK DIRECTIVE

JULY 2008
Directive enters into force

2010
Implementation into national law

JULY 2012
Initial assessment
Description of good environmental status & definition of environmental objectives and indicators
Start of monitoring programmes

2015
Development of programmes of measures

sented by UBA. The implementation timeline starts with the entry into force of the Directive in 2008, via the achievement of the "good environmental status" objective in 2020 pending the review of the Directive in 2023 (see figure). Another cycle will be necessary if the "good environmental status" goal is missed in some parts of the marine environment.

The Marine Strategy Framework Directive continues the realignment of water management that began with the Water Framework Directive. UBA believes the Directive presents an excellent opportunity to achieve ambitious and harmonised pan-European marine protection. The problem is that the Directive is rather lacking in specific technical requirements: the Member States have to develop and specify the requirements either by themselves or in co-operation with the other Member States.

Germany is implementing the Marine Strategy Framework Directive by an amendment to the Federal Water Act. Matters regulated by the new law include:

- → Initial assessment of the environmental status,
- → Criteria for describing "good environmental status",
- → Establishment of environmental objectives,
- → Creation and implementation of monitoring programmes,
- → Establishment of programmes of measures.

The requirements of the Directive are thereby implemented consistently together with the existing regulations for the implementation of the Water Framework Directive.

The initial evaluation required by the Marine Strategy Framework Directive has to be completed by 15 July 2012. For Germany's North and Baltic Seas, this evaluation is currently being prepared by the Federal government and coastal states with the participation of UBA. This initial survey involves an analysis of the most important characteristics (e.g. dominant habitat types of the seabed or description of biological communities) of North and Baltic Seas and to assess the current environmental status, taking into account the effects of human uses and pressures (like pollutants, eutrophication, waste and noise). Beyond that, an economic and social analysis of both, the use of those waters and the anticipated costs of degradation is necessary.

2016
Implementation of programmes of measures

2018
Assessment of environmental status (updated every 6 years)

2020
Good status achieved?

2023
Review of the Directive (Article 23)

CRITERIA FOR GOOD ENVIRONMENTAL STATUS OF EUROPEAN SEAS

The goal of the Marine Strategy Framework Directive is to achieve "good environmental status" for seas in the European Union region [8]. The definition of this status is determined on the basis of eleven so-called "qualitative descriptors" [9]. These are:

D1: Biological diversity is maintained. The quality and occurrence of habitats and the distribution and abundance of species are in line with prevailing physiographic, geographic and climatic conditions.

D2: Non-indigenous species introduced by human activities are at levels that do not adversely alter the ecosystems.

D3: Populations of all commercially exploited fish and shellfish are within safe biological limits, exhibiting a population age and size distribution that is indicative of a healthy stock.

D4: All elements of the marine food webs, to the extent that they are known, occur at normal abundance and diversity and levels capable of ensuring the long-term abundance of the species and the retention of their full reproductive capacity.

D5: Human-induced eutrophication is minimised, especially adverse effects thereof, such as losses in biodiversity, ecosystem degradation, harmful algae blooms and oxygen deficiency in bottom waters.

D6: Sea-floor integrity is at a level that ensures that the structure and functions of the ecosystems are safeguarded and benthic ecosystems, in particular, are not adversely affected.

D7: Permanent alteration of hydrographical conditions does not adversely affect marine ecosystems.

D8: Concentrations of contaminants are at levels not giving rise to pollution effects.

D9: Contaminants in fish and other seafood for human consumption do not exceed levels established by Community legislation or other relevant standards.

D10: Properties and quantities of marine waste do not cause harm to the coastal and marine environment.

D11: Introduction of energy, including underwater noise, is at levels that do not adversely affect the marine environment.

FISHERIES POLICY MUST BE INCLUDED

Fisheries policy greatly influences the volume, size and age distributions of many animal and plant species in the sea. The Marine Strategy Framework Directive uses the condition of commercially exploited fish populations as a criterion for the evaluation of the status of the sea. In order to achieve a sustainable use of the seas, i.e. an ecologically compatible exploitation of the populations, the certification of fish and shellfish can be a powerful economic instrument. Leading in this area is the "Marine Stewardship Council" (MSC). This independent organisation issues its ecolabel to fisheries working sustainably. So far 94 fisheries world-wide have passed the certification process, among them, for example, the German North Sea crab fishery. Presently, 12 percent of fish products produced world-wide come from catches of these fisheries. UBA supports the MSC programme financially. This facilitates better public relations and communications efforts directed at the stakeholders in the fisheries sector, food producers and food retail. Simultaneously creating awareness among the general public has the goal of putting more sustainably produced fish on the shelves in markets. UBA thereby promotes the continual improvement of the MSC standards.

MSC: THE ECOLABEL FOR FISHERIES WORKING SUSTAINABLY

WASTE AND NOISE IN THE SEAS

Fisheries not only affect the fish stock of the seas. Apart from shipping, it is the main source introducing waste to the sea. About 20,000 tonnes of waste are released into the North Sea annually – an amount equivalent to the annual domestic waste produced by a small German town of 50,000 inhabitants. About 600,000 cubic metres has already settled on the floor of the North Sea [10]. The majority of it is plastics, the miracle product of the modern age. Plastics are particularly problematic as it takes up to 450 years for them to biodegrade: Marine life gets tangled up in nets made of plastic or mistake plastic parts for food – clogging their digestive tracts or starving the animals [11]. Beyond that, toxic substances are introduced into the food chain and can damage the genotype as well as the hormonal balance of marine creatures. Apart from ecological problems, plastic waste also creates aesthetic and socio-economic problems. In East Holstein alone, 1.2 million euros must be spent annually in order to keep the beaches clean [12].

UBA demands and promotes the development of adequate data collection and evaluation procedures, e.g. in order to determine the share of micro-plastics and to exactly quantify both, the waste volume on beaches and the death of animals traceable to plastics. Our goal is: Stop littering of the seas and introduce mandatory disposal ashore. To accomplish this, effective measures must be agreed upon in future. UBA supports a project of the Nature and Biodiversity Conservation Union (NABU), designed to better inform and offer practical solutions for the general public, policy makers and affected user groups [13].

For the first time, the Marine Strategy Framework Directive also considers the negative biological effects of underwater noise – because the consequences of underwater noise for marine organisms can range from behavioural disturbances to death [14]. However, at this point there are no comprehensive data about the extent of human-induced noise pollution in the North and Baltic Seas. UBA has already mapped noise ashore and now also plans appropriate investigations for the seas. Important fundamentals have already been developed in this respect [15]. Among other things it was assessed which animals are potentially affected by underwater noise in German marine areas, which noise sources should be looked at, and which existing monitoring stations could be integrated into a future monitoring network. Mammals are particularly noise-sensitive. In German marine areas, porpoises are particularly affected, they are disturbed by pile driving during the construction of offshore wind turbines.

"In East Holstein alone, 1.2 million euros must be spent annually in order to keep beaches clean."

PREVENTING OIL POLLUTION – CONSEQUENCES FROM THE OIL DISASTER IN THE GULF OF MEXICO?

Descriptor D8 of the Marine Strategy Framework Directive demands: "Concentrations of contaminants are at levels not giving rise to pollution effects". This requirement seems absurd as regards oil pollution. After an explosion at the end of April 2010 the British Petroleum (BP) oil platform Deepwater Horizon sank into the Gulf of Mexico. According to American authorities' estimates, approximately 780 million litres of oil have flowed uncontrolled into the sea since then, destroying or damaging large areas of flora and fauna. The consequences for different coastal and marine ecosystems in the Gulf of Mexico are serious and remain unforeseeable up until the present for certain habitats like the deep sea.

There are currently around 700 oil and gas production installations in the North-East Atlantic, some of which are over 20 years old [16]. In view of the events in the Gulf of Mexico, the regulations, safety, technical and liability standards for these European installations need to be thoroughly examined. UBA demands that offshore oil and gas production meet the following criteria:

- → Creation of high safety standards world-wide as a component of certified safety management systems as well as their monitoring by supervisory authorities,
- → Establishment of emergency management,
- → Creation of an infrastructure to combat leaked oil and other harmful substances,
- → Creation of a fund to cover the financial consequences of incidents,
- → Establishment of appropriate liability limits,
- → Guarantee of a fast incident information flow.

As harmful as accidents like the one in the Gulf of Mexico are, they are not the main path by which oil is introduced to the sea. Estimates show that only a little more than one tenth of the oil introduced into the seas comes from accidents involving platforms and tankers. The by far larger share is put in by shipping (legal and illegal dumping), municipal sewage, the daily operation of oil platforms, and from natural sources in the sea. As part of the implementation of the MSFD it is crucial to also reduce these sources using suitable measures.

CAREFUL USE OF WIND POWER

The Federal Government of Germany wants to increase the share of renewable energies in power generation to at least 30 percent by 2020. For this, the use of wind power in the North and Baltic Seas is also to be expanded. Numerous offshore wind farms are being planned, each consisting of several wind turbines. As of July 2010, 23 offshore wind farms had been approved in the German Exclusive Economic Zone (EEZ) of the North Sea and three more in the Baltic Sea. Altogether, the wind farms include 1,808 individual wind turbines. In order to learn about the effects of wind farms, so far only projects with a maximum of 80 wind turbines have been approved. They form the basis for deciding on further expansion. Their construction and operation are closely monitored under ecological aspects. UBA is involved in the licensing of offshore wind energy plants (technical and organisational measures for reducing environmental effects of offshore wind energy plants related to their construction, operation and dismantling), and promotes an environmentally compatible expansion of offshore wind power. This includes the development of technical solutions for avoiding bird strike, for example by optimising traffic safety lighting. During the construction phase it is above all the noise which drives sea mammals from their usual biotopes. UBA therefore develops "ecological guard rails" for the evaluation of wind energy plants in the areas of hazard protection and precautionary environmental protection.

"Already today, water management must be planned in a way that makes it possible to react to gradual changes as well as to extreme events such as droughts or floods."

WATER MANAGEMENT IN TIMES OF CLIMATE CHANGE

The amount of usable water resources is mainly determined by three factors: the climatic conditions of a region, the level of water abstraction and local water management. Germany is located in the so-called humid climate zone, meaning that in a one-year time period there is more precipitation than can evaporate. With an available water volume of 188 billion cubic metres, Germany is a water-rich country. The country's water reserves are sufficient to cover all usage needs. By employing water-saving technology, industry, the energy industry, agriculture and private households today use less than 20 percent of the water available [17]. Despite the altogether favourable conditions, there are areas with only small amounts of usable ground- and surface water, since water reserves, precipitation and water requirements are unevenly distributed. By using effective production and distribution systems, and by adapting usage, spatial and temporary shortages can be alleviated in Germany today. But how will that situation change with climate change? Not only globally but also in Germany temperatures are rising because of climate change and precipitation patterns are changing. Germany will presumably see more rain and less snow in winter, and less rain in summer. The already drier eastern regions of Germany will, for instance, be more strongly affected. These changes also impact waters and the hydrologic balance of a region. However, climate change is already taking place today. The consequences for the hydrologic balance are continuously monitored, and scientists are examining the long-term effects.

Despite the consequences described above, it is to be assumed that the overall water budget will not be fundamentally changed by climate change. That means: there will be enough water in Germany in the future [18]. Nevertheless, there will be regional and seasonal effects – especially during more frequent and prolonged regional drought phases, which will affect water use to varying degrees. To that effect, groundwater recharge is crucial for potable water supply, since more than 70 percent of Germany's drinking water is obtained from groundwater. Since the groundwater supply is fed year-round from precipitation, and so far abstraction quantities have been smaller than groundwater recharge, there will presumably be no fundamental problems with the drinking water supply in Germany even under changed climate conditions.

Nevertheless, measures which support groundwater recharge and thereby stabilise the hydrologic balance make sense in areas which lack water. Measures might include the reduction of soil sealing and decentralised seepage of rain water. Agriculture is affected differently – not only are local groundwater supplies crucial, but also seasonal precipitation. If precipitation shifts into the winter term and should there be no rain during the vegetation season, yields and harvest quality suffer as a result.

FINDING SUITABLE MEASURES FOR THE FUTURE TODAY

The challenge therefore is to now prepare and take suitable measures for handling the consequences of climate change, despite the current scientific uncertainties with regard to the extent, the timing and the concrete local effects of climate change. Adaptive measures are particularly called for in the areas of water and soil in order to maintain their different usages. It is important that the measures be designed to remain flexible and effective over a broad range of climate changes. An example: Flood events can increase because of climate change; this should be alleviated by creating additional flood plains. In some areas higher dykes may become necessary. Therefore, some regions in Germany are already building new dykes with broader bases, so that – should it become necessary in the future – the height of the dykes can be increased more easily and cost-effectively.

What this example shows: adaptive water management and water protection measures must be designed looking ahead long-term, since water management investments and decisions often establish the conditions for decades to come. Water management today must be set up to react both to gradual changes and to extreme events such as droughts, heavy precipitation and floods. Problems from immediate extreme situations, like floods and low water levels, have always had to be dealt with in recent history.

FLOOD RISK MANAGEMENT IN EUROPE

Floods have natural causes and are a part of nature. The biotic communities in rivers and marsh lands are adapted to changing water levels. Problems have developed and are developing only as a result of major human interference with the course of rivers. This was done for the purpose of creating space for developing settlements, to improve navigability, enable more intensive agriculture, for hydroelectric power use and, paradoxically, for flood protection. These interferences led to the loss of natural flood plains and marsh lands and, as a consequence, to fundamental changes in the drainage behaviour of waters. As a result of shortening and straightening river courses, flood waves today flow off at higher velocity and volume. The probability and intensity of flood events may increase due to climate change. Human settlement, industrial settlement and other human activities along rivers create material wealth in close proximity to water – which also increases the potential for damage in flood-endangered areas.

In order to limit future flood damage both nationally and internationally, long-term strategies are being developed at catchment area level. Increasingly, flood risk is at the centre of these efforts. Water management administrations no longer only examine the danger of a flood event, but link the probability of its occurrence to the damage to be

expected. This makes it possible to design measures more purposefully and cost-effectively. Since November 2007 the "Community directive on the assessment and management of flood risks" (EC Floods Directive) has been in force for Europe [19]. It follows a three-step approach: in a preliminary evaluation by the end of 2011, the flood risk is to be assessed at the catchment area level. In a second step, the relevant authorities compile flood danger and flood risk maps by the end of 2013. By 2015 the respective nations must develop flood risk management plans.

These steps are to be evaluated every six years, so that new results from climate research can be considered. This allows for responsive reactions to any changed flood event occurrence probabilities. UBA's focus for the implementation of flood risk management is the cross-border coordination, the inclusion of climatic consequences in flood assessments, empowering the public to take precautions themselves, as well as an increasing emphasis on ecologically relevant measures such as the recovery of floodplains and the reactivation of marshlands.

COOLING WATER ABSTRACTION – BETWEEN ENERGY PRODUCTION, ECOLOGICAL IMPACT AND CLIMATE CHANGE

Water temperatures are the mirror image of climatic trends. They are heavily affected by cooling water abstraction, e.g. by conventional power stations. In areas where large amounts of cooling water are abstracted from rivers, the Federal States set up heat impact programmes in order to avoid overstressing waters, which could have serious ecological consequences. These heat impact programmes are gaining significance in times of climate change.

Water temperature significantly affects life in watercourses. It plays an important role in the life processes of all aquatic creatures because most of them do not regulate their own body temperature. The direct effects of increased water temperatures as a result of climate change range from heat-induced death, organ damage, to altered spawning seasons or food intake disorders. Beyond that, indirect effects, such as changes of the species spectrum or the promotion of alien species, can occur [20]. There is, however, another problem: When water temperatures rise, oxygen levels in water decrease, but fish need more oxygen in warm waters than in cold. Additionally, biological degradation of organic substances proceeds faster at higher temperatures than in lower water temperatures. Since this process also uses oxygen, the oxygen content of the water is even further reduced.

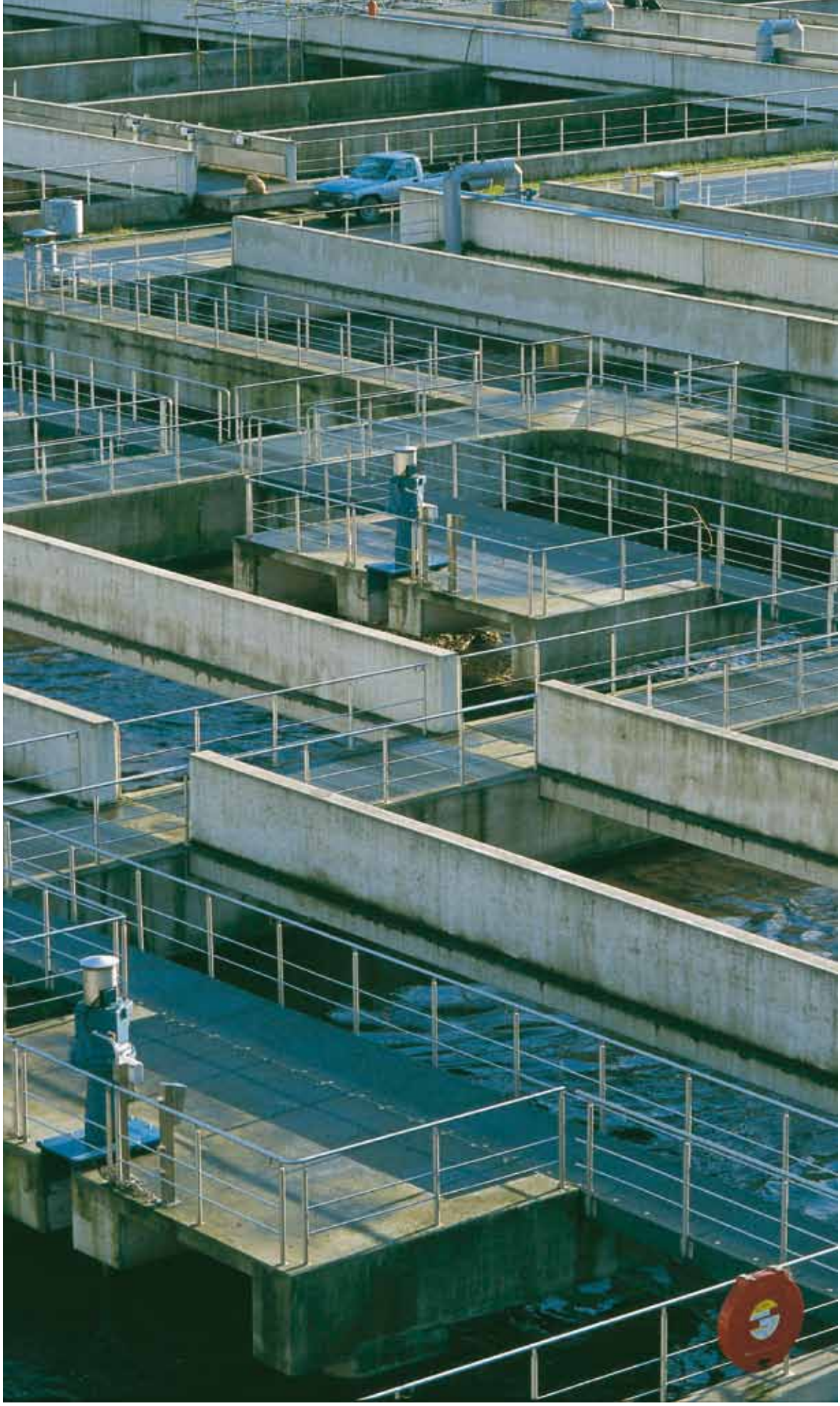
Cooling water abstraction always represents an ecological impact on waters, even if, depending on drainage conditions and water region, it differs in volume. When issuing cooling water abstraction permits, water authorities therefore need to know the precise ecological status of a body of water. According to the Water Framework Directive, cooling water abstraction must not endanger preservation and/or the achievement of "good ecological status" [20]. In the context of cooling water inputs, UBA deems it necessary to take a holistic perspective of all discharge of heat into the entire river basin, and to represent this transparently, e.g. in the form of heat impact programmes. These should be designed such that they allow for easy adaptation if water temperatures rise due to climate change, or if cooling water abstraction needs to be limited because of longer and more frequent low water level periods.

ENERGY-EFFICIENT WASTEWATER TREATMENT LOWERS CO_2 EMISSIONS

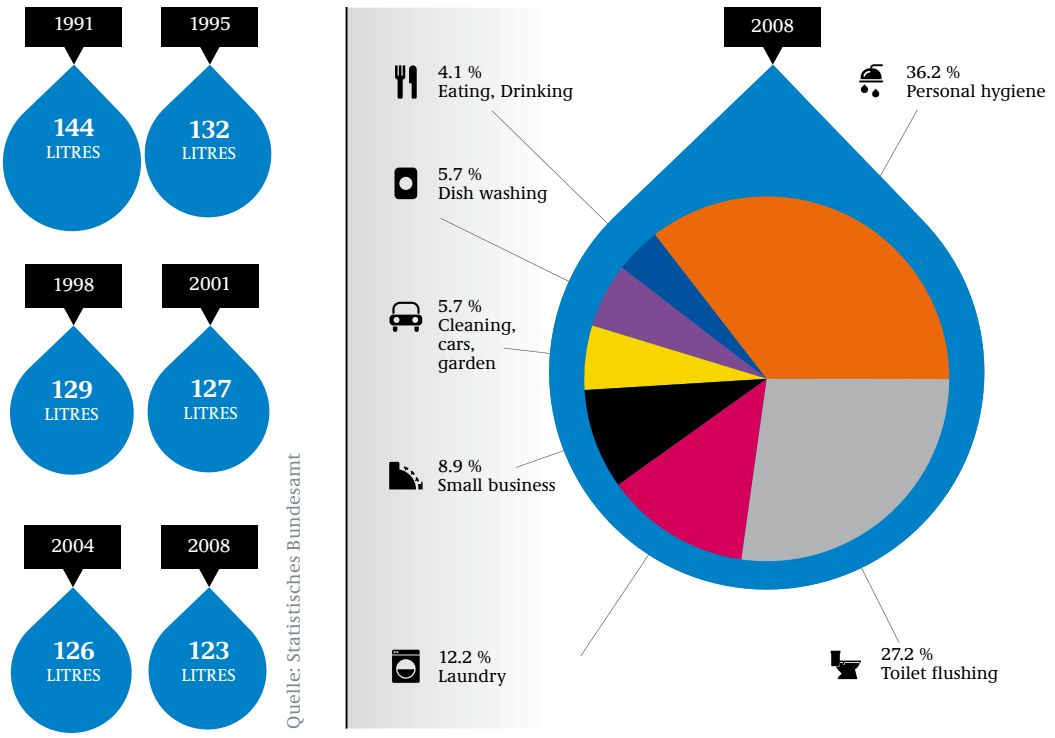
Water management is not only affected by the consequences of climate changes, it can also contribute to climate protection. For example, large amounts of carbon dioxide (CO_2) emissions can be reduced by cutting down energy consumption of wastewater treatment plants. In Germany, 95 percent of the population is connected to local wastewater disposal systems. About 10,000 local wastewater treatment plants are in operation and available. These represent 20 percent of local energy demand. This makes them the single largest local energy consumer – ahead of schools, hospitals or road lighting. They need nearly 4,400 gigawatt hours of electricity per year, which corresponds to the annual output of a modern coal-fired power station and produces approximately three million tonnes of CO_2.

UBA research has shown that up to 20 percent energy savings are possible in the operation of such plants, and that they could also produce four times the amount of energy they currently generate themselves. Wastewater treatment plants can generate power [21] in all of their processes. This includes using thermal and kinetic energy from the wastewater system, as well as power generation from fermentation gases and processes.

As part of its environmental innovation programme and in support of the economic implementation of these measures, the Federal Ministry of the Environment, together with UBA and the KfW banking group (promotional bank of the German economy and development bank for transition and developing countries), initiated the "energy efficient wastewater treatment plant" support programme. It subsidises projects which improve energy efficiency of wastewater transport in the sewer system, waste water treatment up to the point of discharge into a body of water, as well as the sewage sludge treatment and utilisation in connection with wastewater treatment.



DAILY PER CAPITA CONSUMPTION IN HOUSEHOLDS AND SMALL BUSINESSES



Quelle: Statistisches Bundesamt

Source: BDEW-Wasserstatistik 2009

POLLUTANT REGISTER MAKES WATER POLLUTION PUBLIC

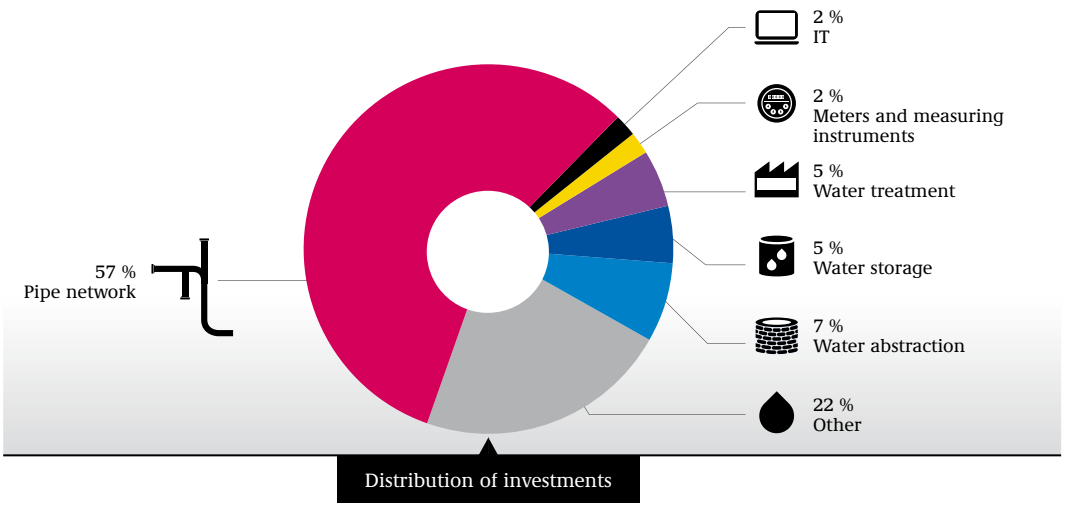
Since 2008 industrial facilities have to annually register their emissions into air, water, land and off-site-transfers of waste and off-site transfers of pollutants of waste water in the Pollutant Release and Transfer Register (PRTR). In accordance with the European PRTR regulation [22], Germany annually forwards this data to the European Union. In addition, Germany has committed to establish a national PRTR register. UBA publishes the data in cooperation with the Federal States and further information on the Internet. As of now, the information of emissions and off-site transfer of waste for 2007 and 2008 is available from more than 4,200 industrial facilities. The purpose of the PRTR is to offer more transparency by providing free access to environmental information to the public, industry, scientists, NGOs and other stakeholders.

The PRTR informs about altogether 65 industrial activities from within nine industrial sectors. The register covers 91 pollutants, which contribute significantly to air pollution, climate change and water pollution – included are only those amounts of waste or pollutants which exceed given threshold values. The list of 91 pollutants which have to be registered comprises greenhouse gases and heavy metals, and organic compounds such as dioxins or PCBs. Even in its current stage, the PRTR provides comprehensive information on current environmental problems. Data for 2007 showed that the majority of mercury emissions in Germany originate as emissions from thermal power stations and combustion installations. The long-term contribution of PRTR will be that facilities which are required to report will reduce their emissions and waste in order to no longer appear in the public register. The data are an important basis for the inventory of emissions, discharges and losses of priority substances which, according to the Water Framework Directive, is to be compiled in 2012. First analyses show that for many substances, the inputs from local wastewater systems into waters represent an important source.

WHAT ARE THE CONSEQUENCES OF THE WATER PRICE JUDGEMENT OF THE FEDERAL HIGH COURT?

In an antitrust case in February 2010, the German Federal High Court (Bundesgerichtshof or BGH) issued a much considered judgement [23]. In it, the BGH confirmed a price reduction ordinance by the Hessian antitrust authority against a private water company and sanctioned the comparison of water prices from water companies of similar type. This led to fears that water companies might in future have to reduce or stop their precautionary protection efforts for water bodies and drinking water for economic reasons. And indeed, the judgment contains some problematic passages. For a price comparison, the antitrust authority must first establish and compare supply density, customer density, number of residents supplied, levy structure, differences in acquisition and treatment costs and total

INVESTMENTS BY PUBLIC WATER UTILITIES IN 2009
TOTAL 1.974 BILLION EUROS

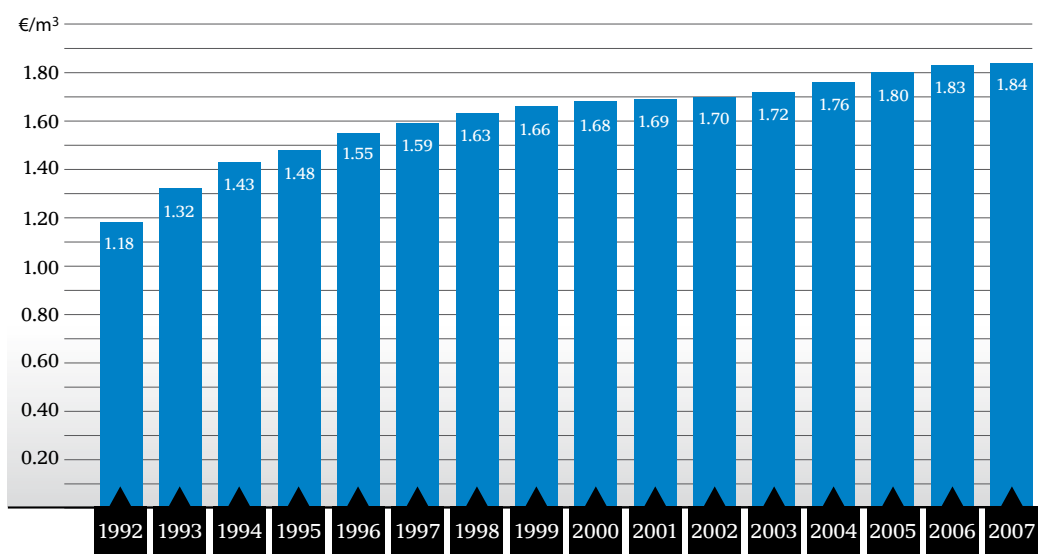


Source: BDEW-Wasserstatistik 2009

earnings. However, the water company must supply proof of other significant cost factors in cases where it has to justify higher prices compared to other suppliers – these could be the structure of the terrain, increased water mains maintenance costs, or special expenditures for precautionary environmental protection measures. This burden of proof reversal is a crucial point of the judgment, since individual companies cannot easily access the books of the company they are being compared with in order to prove that cost differences are justified.

UBA feels it is important to stress the significance of these aspects of the debate, which so far has been focussed on price alone. Going forward, water companies must be able to fully pay the expenditures associated with important water and health protection measures. The costs need to be presented more transparently and in a manner which effectively reaches the public so that consumers can understand what exactly they are paying for and which conditions influence the price of the product. This basic understanding is required to appreciate the service and product they consume. The proof requirements of the BGH should be set up such that, in the course of day-to-day antitrust practice, water companies can comply fully, and at a reasonable cost to them.

DRINKING WATER PRICES 1992-2007
AVERAGE PRICE FOR HOUSEHOLDS IN GERMANY IN EUROS PER 1,000 LITRES (per m^3)



Source: BDEW 2007

WATER PROTECTION – DESIGNING SUSTAINABLE USE

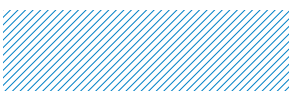
Germany is and has been committed to water protection. Though not yet all German surface waters and groundwater bodies have achieved the desired "good status", the first steps in this direction have been made. Ambitious environmental objectives, as established in the new European Union directives for waters, require time, sometimes several generations. The paradigm shift in water protection which now looks at the whole river basins (instead of just the water itself), as well as a holistic view of all uses and risks, has already served to better protect waters and their natural biotic communities. All the while they are available for important economic uses as potable water supply, for power generation, cooling water abstraction, shipping or as recreational venues.

Efficient wastewater treatment plants reduce pollutant and nutrient contamination of waters. Energy-efficient technology significantly reduces the energy required for this and thereby also decreases CO_2 emissions, which contributes to climate protection. UBA promotes such measures and encourages taking the consequences of climate change into account for water management planning. Continuous observation of the effects on water and soil, as well as choosing flexible adaptive measures, make adaptation possible despite uncertainty, and maintain the ability of water management to react promptly.

While improvements have been made in the area of wastewater treatment, agriculture, with its heavy nutrient inputs, still plays a big role in water pollution today. In addition, hydromorphological alterations to ensure navigability of waters or water power generation are responsible for creating uniformity in waters – a main reason for the fact that "good status" is seldom reached in large waters today.

In marine areas it is fishery which damages marine ecology by overfishing. Other uses such as offshore power generation can cause ecological damage in the sea as well. During the construction phase it is above all noise which drives sea mammals from their traditional biotopes; once in operation there is the danger of bird strike for migratory birds. UBA therefore develops "ecological guard rails" for the evaluation of hazard protection and precautionary environmental protection.

Environmental quality standards for pollutants are in place to prevent long-term damage which is not yet recognisable today from turning into chronic damage in the future. For many substances UBA has already derived standards which find application in the practice of water management. More will follow. UBA pursues a goal of comprehensive environmental protection for waters, i.e. ensuring the safe use of water for different human economic objectives, while simultaneously protecting the natural biotic communities, in order to guarantee continued biodiversity. Water protection measures protect the environment as well as our health, and they make an important contribution to resource protection.



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AMBITIOUS ENVIRONMENTAL POLICY EQUALS SUSTAINABLE

HEALTH PROTECTION

For a healthy life, human beings need an environment that promotes physical and mental well-being. Clean air, proper drinking water, wholesome food, pristine water bodies and undisturbed nature are all essential for health and a high quality of life. An ambitious environmental protection, which the Federal Environment Agency (UBA) pursues since its inception, is aimed at supporting a healthy life. Health can be compromised or even severely endangered by environmental impacts in a number of ways. A current example is the impact of particulate matter in inner cities. Particulate matter may trigger inflammation in lung tissue and lead, among other effects, to increased death rates due to respiratory or circulatory diseases. Polluted air is an issue of concern not only outdoors, but indoors as well. Central Europeans spend abetter part of their time inside. Various impacts on human health could be attributed to the release of chemicals from building materials, coatings or furnishings as well as through humidity and the often resulting formation of mould. ➔

People are concerned about reports on chemicals in the environment and health risks associated with them. Further research is needed particularly in the area of identifying those chemicals that can act as hormones and how they interact. Noise is another environmental factor of concern that can have a significant impact not only on our hearing but also on our cardiovascular system. According to a study by UBA, in Germany 4,000 heart attacks per year are linked to street traffic noise. Climate change too has health impacts, for example as a result of rising heat levels. Chronic and complex diseases such as asthma and allergies can also be due in part to environmental changes. Environmental effects are unevenly distributed throughout our society. According to studies by UBA, socially disadvantaged sections of the population are exposed to and impacted by noise and air pollution to a much greater extent than other groups.

As expressed through its slogan: "For our Environment" – UBA has a long standing commitment to its theme of environment and health. Our experts research and assess factors on the basis of scientific criteria in the natural, technical and social environment that elicit diseases and impact health and from it derive strategies and measures for the protection and promotion of health. UBA cooperates with international institutions such as the World Health Organisation (WHO) to carry out these tasks. Some current issues that UBA is working on in order to protect human health from environmental burdens are presented in the following sections.

HEALTH EFFECTS FROM CHEMICALS

Regulations have led to the improvement of environmental quality in Germany and have contributed much to the protection of human health. Air pollution such as lead and sulphur dioxide emissi-

QUANTIFYING ENVIRONMENTAL HEALTH RISKS

Environmental influences can affect health in various ways. For this reason WHO makes use of the so-called Disability-Adjusted Life Years (DALYs) as a comparative measure for environmental health risks [1]. DALYs take into account the loss of years of life through premature death as well as years of life whose quality is reduced by illness. Because DALY is a uniform measure of health impacts, the diverse health effects of different environmental stressors can be compared with each other. Such information is of great use for setting priorities in health-related environmental protection or for the evaluation of the success of environmental-political measures. This allows for example for the estimation of how many healthy years of life can be gained through noise reduction.

"Children's toys, packaging, household articles: Many things that we are in contact with every day contain chemicals."

ons and their health effects no longer play a major role. Instead, other risk factors are brought to the fore. Chemicals and products containing toxic substances thus belong to the topics that have received considerable public attention.

Children's toys, packaging, household articles: Many things that we are in contact with on a daily basis contain plastic softeners. These are chemical substances that are mixed in with hard plastics to make them elastic. Counted among the most commonly used plastic softeners are the so-called phthalates. In Europe alone, the production of phthalates amounts to about one million tonnes per year, of which 90 percent are utilised as plastic softeners in the production of plasticised PVC [2]. Phthalates can reach the environment in many ways. They can dissolve or outgas from plasticised PVC. They end up in this way in the air and attach for example to dust particles. Moreover, phthalates are also released into the environment through abrasion. For this reason phthalates are detected in household dust, sometimes in higher concentrations. These releases are relevant to our health because plastic softeners can end up in our bodies and impair fertility, as they act like a hormone and can interfere with sperm production.

PLASTIC SOFTENERS: CHEMICALS WITH SIDE EFFECTS

We absorb phthalates through food, the skin or inhaled air and small children in particular by putting toys in their mouth. Studies by UBA show that we take in phthalates sometimes in alarming amounts. Thus the German Environment Survey for Children of UBA (see box) documents that phthalate decomposition products are detectable in all children in Germany. Levels of the DEHP phthalate – one of the three most widely used phthalates – are found in the urine of 1.5 percent of children, which suggests a possible health risk. Initially, the European Commission banned DEHP in children's toys and baby articles, however imported toys contaminated by plastic softeners are found time and again in the European market. Since October 2009, DEHP is on the list of substances of particular concern (list of candidates), so that consumers of products that contain more than 0.1 per cent DEHP have a right to be informed. In the meantime, it was decided to subject the use of DEHP EU-wide to a licensing procedure. (Added to Appendix XIV REACH.)

GERMAN ENVIRONMENTAL SURVEY FOR CHILDREN

Children are regarded as a risk group for environmentally influenced diseases. Thus, UBA decided to conduct an environmental survey especially for children: the German Environmental Survey for Children (GerES IV – Kinder-Umwelt-Survey). Between May 2003 and May 2006, 1,790 children from three to 14 years of age were examined. Through a tight link between GerES IV and the National Health Survey for Children and Adolescents (KiGGS – Kinder- und Jugendgesundheitssurvey) of the Robert Koch Institute, it becomes possible to study the effects of environmental exposure on children's health.

Besides DEHP, several dozen different phthalates are marketed. Problematic for the assessment of their effect on health is that these substances probably do not act independently of each other in the body. UBA experts have therefore developed basic approaches for evaluating their combined effects on our health [3]. A further problem stems from the fact that well studied and toxicologically questionable phthalates are increasingly being replaced with often less well studied phthalates or other plastic softeners. Significant data are missing on the impact of these plastic softeners on the population. UBA can demonstrate however on the basis of its own analyses that, for example, the softening agent DINCH is found in increasing amounts in house dust [4]. A sufficient basis of data is missing for a conclusive eva-

luation of the resulting health risk for the population. UBA will continue to work to bridge the present gaps in knowledge in order to be able to issue well-founded recommendations for a better regulation of individual plastic softeners. The Agency contributes its experience internationally: In one EU-Project, mother-child pairs, among others, will be examined for phthalate exposure next year (see page 26).

POLYCYCLIC AROMATIC HYDROCARBONS IN PRODUCTS

When doing test purchases, environmental and consumer protection agencies often find problematic chemicals in plastic products. Polycyclic Aromatic Hydrocarbons (PAHs) are found especially often. PAHs are a natural component of coal and petroleum. They result, in addition, from incomplete combustion of organic material such as wood, coal, oil, diesel fuel, but also tobacco or charred meats. PAHs are persistent in the environment and can accumulate in organisms. Many of them are toxic in the environment or have a demonstrable carcinogenic effect on humans. In products, PAHs are found above all in articles composed of rubber or plasticised PVC, such as shoes, air mattresses, tool handles, cable sheathing or flooring. The reason for this is that these plastics are treated with carbon black or process oils containing PAHs, which accrue during coal or petroleum processing. Alternatives to these plasticisers are available, but are more expensive.

The goal of UBA is to protect humans and the environment from PAH. An appropriate instrument for this is the European chemical regulation REACH. Article 68 (2) of the regulation allows for substances with carcinogenic, mutagenic or reprotoxic properties (CMR substances), which could be used by consumers, to be restricted by procedures that can be completed in a few months. However, the European Commission has the sole right of proposal with regard to these shortened procedures. Thus Germany requested the Commission officially in June 2010 to take this path and furnished as support a comprehensive scientific dossier. It is now up to the Commission to forward the proposal so that EU members can decide on it. This would better protect citizens of the EU from toxic products. Manufacturers and importers may then only use process oils and carbon black that contain no PAH or have had these largely removed through purifying treatments. For environmental and health protection, the future work of UBA lies in making further recommendations for the ban of critical PAHs that are utilised in industry and trade and thus achieving a comprehensive regulation of the PAH's also in these areas.

POLY- AND PERFLUORINATED CHEMICALS IN THE ENVIRONMENT, DRINKING WATER AND BLOOD

Poly- and perfluorinated chemicals (PFCs) are utilised in many consumer products due to their fat-, water- and dirt-repellent properties. In the household, PFCs are found as non-stick coatings for pots and pans and as a surface finishing on carpets and furniture. In weatherproof clothing they protect us from snow and rain. In medical and laboratory technology, as well as in other technical areas, they are used in seals and bearings. For all of the beneficial properties for us consumers, PFCs also have negative consequences for humans and the environment: Since PFCs are chemically very stable, they do not degrade in the environment. They are not only found in water and in the air, but in all parts of the food chain as well. Just as alarming is the fact that perfluorooctanoic acid (PFOA – one of the best known PFCs) is found worldwide – even in the Arctic and in the deep sea.

There is the suspicion that some PFCs can negatively affect the fertility of women and sperm production. Perfluorooctanoic acid could be detected in human blood. Small amounts of PFOA have also been found in breast milk. In addition, up to four years pass by until 50 percent of PFOA is eliminated from the human body [5]. As long as the suspicions of negative health effects of PFCs are not refuted, preventative health precautions need to be considered. The health-based guide value for safe lifelong exposure of UBA and the Drinking Water Commission of the Federal Ministry of Health is 0.3 microgram PFC per litre of drinking water (µg/l).

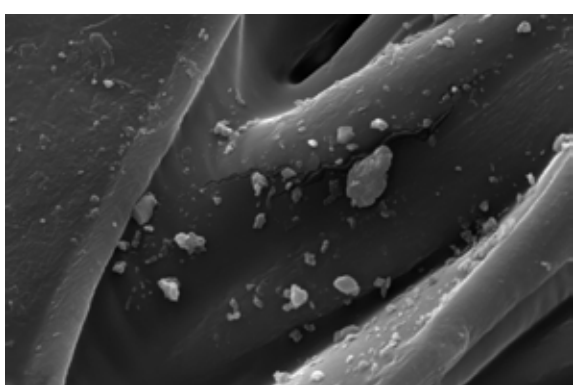
As a general health based precautionary value, the Commission and UBA consider a maximum yearly average value of 0.1 µg/l for the sum of all PFCs as appropriate.

The dispersion of PFCs by air takes place over so-called volatile precursor compounds that are discharged from consumer products and transforms in the environment and in the human body into stable PFCs such as PFOA, for example. UBA is currently evaluating which precursor might contribute to human and environmental exposure and to which extent consumer products are contaminated with PFCs. One UBA study tracks the path of PFCs from consumer products into the environment and from there to humans. For PFOA there is no legal measure in place to date for risk reduction. UBA is working to identify PFOA as a substance of very high concern according to the REACH regulation and subsequently propose a Europe-wide restriction of manufacturing and use of PFOA and relevant precursors. UBA recommends to consumers before purchasing home textiles and fitted carpets to consider whether or not a water and dirt repellent coating with PFCs is absolutely necessary.

NANOMATERIALS

Nanomaterials have existed already for many years in products used in daily life. Because of their special properties (see box on page 60), a great hope is placed on novel developments with nanomaterials. Nanoscale materials are used for example in paints and self-cleaning surfaces. Nanomaterials provide automobile tires with improved handling characteristics. Hospitals can benefit from the antibacterial effect of certain nanomaterials in surface sealing, and nanomaterials offer an effective UV protection in suntan creams. However, the interesting new properties of nanomaterials not only offer opportunities for novel developments, they are also suspected to be harmful to humans and the environment. Because of their small size, they can overcome biological barriers, for example the air-blood barrier in the lungs or in the cell membranes and could be transported from there to other organs. In the lungs, nanoparticles can elicit inflammation and can even cause tumours. From today's state of knowledge, not all nanoparticles are associated with such risks. A differentiated examination of risks and benefits from nanomaterials is therefore required.

The discussion on the risks and benefits of nanotechnology has noticeably increased in recent years in expert groups as well as among the public. The Federal Government reacted early with the nomination of a NanoKommission, by which recommendations for the responsible handling of nanomaterials are being developed. The experts of UBA are just as involved as those of other national and international research groups, in particular the "Working Party on Manufactured Nanomaterials" (WPMN) of the Organisation for Economic Cooperation and Development (OECD). In the test programme (the sponsorship programme) of the WPMN, there are substance dossiers, among others, compiled for 13 marketrelevant nanomaterials and existing gaps in research are bridged through financing by the participating states. To date there is only inadequate transparency for consumers and authorities on the use of nanomaterials in consumer products. UBA therefore recommended a registry for nanomaterials in the form of a product directory [6]. In September 2010, the Belgian EU Council Presidency also spoke out in favour of an EU registry for nanomaterials.



Textile fibres coated with silver nanoparticles as antibacterial protection

HEALTHY AIR INDOORS

We spend most of our time indoors. Children as well often spend more time today in front of the computer or television as they do outdoors. Indoor problems have various causes. Chemical substances, such as volatile or semivolatile organic compounds and microbial pollutants (mould, bacteria), end up in the air from a variety of sources. Particular care is also required with energy-saving construction and restoration techniques. With the Energy Saving Regulation in 2002 (amended in 2007 and 2009), an energy-efficient design is required for new constructions and restored old buildings. This works – in addition to other methods – only with an increased airtightness of the building shell. A consequence of this lower permeability is the accumulation of harmful substances indoors. Unpleasant odours, irritation symptoms from chemical substances and discomfort from mould infestation can result. However: Energy savings and good indoor air do not have to be mutually exclusive. Through targeted measures such as the utilisation of low-emission building products, modification of ventilation patterns and, if necessary, the installation of mechanical ventilation systems, it is possible to build at the same time in an energy-efficient and healthy way. UBA assists in the development of such measures. Moreover, the Agency is testing extensively the quality of indoor air in energy-efficient buildings in a current research project [7].

Since good indoor air quality in airtight buildings – in particular if many persons are present at the same time – is not always feasible with window ventilation, ventilation technology must be increasingly adopted. UBA already requires this in school buildings as of its "Guidelines for Indoor Hygiene in School Buildings" („Leitfaden für die Innenraumhygiene in Schulgebäuden") in the year 2009. In residences this is still problematic as a general requirement. The installation of central ventilation systems in old buildings often involves disproportionately high costs. As an alternative, windows with window flap units or inflow and outflow exhaust units are recommended. Ventilation technology requires regular maintenance and inspection in order to be successful in the long run and not become itself a hygienic indoor air problem, for example through the contamination of components. Plenty of work is required here in educating residential occupants and landlords. The experts of UBA develop recommendations and brochures, answer questions and collaborate with national and international committees on questions of indoor air. UBA, in doing so, often has a formative and initiating role, such as in restricting emissions from building products or developing guidelines for dealing with mould. UBA currently examines how one can take into account, better than in the past, indoor air aspects in the planning and implementation of buildings with low-energy needs.

SMALLEST PARTICLES – BIGGEST EFFECT

Nanotechnology refers to a whole series of processes, each having one attribute in common: The size of the particles or structures lies in the nanometre range. A more exact definition does not yet exist. There is discussion in the EU of setting the size range at 1 to 100 nm. A nanometre is one millionth of a millimetre. In this size range, the physical and chemical properties of materials change. Nanoparticles that are technically produced exhibit therefore new properties that not only depend on the kind of basic raw material utilised, but in an extraordinary way on their shape and size.

WHEN THE ODOUR OF PAINT AND ADHESIVE IS DISTURBING

Adhesives, flooring materials, filling compounds: Odours from building products not only disturb, they can also cause lack of concentration, nausea or headaches. With energy-saving houses, these odours are particularly undesirable because rooms must receive more ventilation and heat consumption thereby increases. Low-odour building products therefore count among the criteria of a certification system for modern buildings. With the lack of reliable measurement methods, odour emissions from building products have so far certainly received little attention.

With the new DIN ISO 16000-28 standard, an internationally recognized measurement method for odours has been available since 2010 [8]. A trial of the new methodology, already in the standardisation phase, on flooring materials, adhesives and filling compounds in UBA research projects has demonstrated that an integration of sensory evaluation in the awarding criteria for the environmental label "Blue Angel" and in the evaluation scheme of the Committee for Health-Related Evaluation of Building Products (AgBB - Ausschuss zur gesundheitlichen Bewertung von Bauprodukten) is now possible [9].

It is anticipated that in one to two years, consumers can acquire low-emission building products that have also been evaluated in this way. With the current reorganisation of the legal basis for the commercialisation of building products in the EU, UBA campaigns for transparent labelling of odour emissions from building products for indoor applications as standard information.


"Chemical substances, such as
volatile or semivolatile organic
compounds end up in the air
from a variety of sources."

AVOIDING DAMPNESS AND MOULD IN HOMES

Dampness and growth of mould indoors can lead to adverse health effects for the occupants. All mould species have the potential to cause allergies. Studies within UBA's German Environmental Survey for Children have revealed that 8.3 percent of the children surveyed showed sensitisation to indoor mould. Furthermore, WHO in its "Guidelines for Dampness and Mould" has confirmed a correlation between dampness/mould growth and upper respiratory symptoms, respiratory infections and the development and exacerbation of asthma. Mould growth as a result of dampness is a widespread problem. According to the German Environmental Survey for Children, problems with dampness occur in one-third of homes in Germany. Visible mould is present in 14 percent of the homes. Mould growth occurs more often in older houses and apartment buildings. Even new or renovated houses, however, may face problems with mould growth when energy efficient building techniques are not adequately combined with ventilation requirements.

UBA informs on the prevention and professional remediation of mould growth through its mould guides [10]. Some questions, however, still remain: for example, the causative agent(s) of adverse health effects from dampness and mould growth have not yet been identified. Many different biological contaminants are detected in the indoor air of homes affected with mould. In particular, beside mould fungus, bacteria (actinomycetes) are present, as has been demonstrated in a current research project [11]. Moreover, components from microorganisms (endotoxins, ßglucans, nanoparticles), microbial volatile organic compounds (MVOC), as well as toxins (mycotoxins) are found. To which extent these particles and substances, individually or in synergetic action, are responsible for the observed adverse health effects for the occupants will be a priority field of research at UBA. Reliable detection methods as well as knowledge of naturally occurring background concentrations are essential prerequisites. Modern analysis methods have to be developed to allow for real time detection of contaminants and correlation to adverse health problems.

LOW-EMISSION PRODUCTS FOR INDOORS PROTECT HEALTH

UBA has brought the findings to national and international commissions (VDI, ISO, WHO). The WHO Collaborating Centre for Air Quality Management and Air Pollution Control at UBA has, among other activities, actively contributed to the WHO guidelines for indoor air quality. The first part of these guidelines concerning dampness and mould has as its main goal the reduction or prevention of dampnessin indoor environments in order to prevent adverse health effects [12]. The WHO Collaborating Centre has moreover used its expertise to contribute to the second part of these guidelines concerning chemical pollution indoors.

"Visible mould is present in 14 percent of the homes."

HEALTHY DRINKING WATER, CLEAN BATHING WATER

Drinking water is subject to strict controls. These guarantee first of all that it contains no pathogens or substances in health-compromising concentrations. Poor materials however for water supply facilities, as well as in drinking-water installations in buildings, could contaminate the water up to the final metres of piping. It is generally known that even the low levels of lead that were released from lead pipes used in the past can lead to adverse health effects in small children. However, other raw materials that are used, for example in pipes, taps or water meters, also could release heavy metals or organic substances into the drinking water. Indeed, the transfer of a few molecules into the drinking water, for example from pipe walls, is technically unavoidable as water is a good solvent. The release of organic substances and metals from materials in contact with drinking water must however be minimised as far as technically possible. Moreover, the substances released into the drinking water must be harmless to health as well as inconspicuous to humans in odour and taste.

DRINKING WATER INSTALLATION: CHOICE OF MATERIAL IS CRUCIAL FOR WATER QUALITY

The development of ever newer plastic materials offers on the one hand some very suitable raw materials for drinking water, but it also leads to unknown substances appearing in the drinking water, which must then be evaluated for health effects. New and better materials allow for new components in water supply facilities that help to satisfy our growing requirements for comfort in the kitchen and bathroom. They present many new challenges however for water hygiene. UBA develops guidelines for different groups of raw materials for the approval of materials in contact with drinking water and determines criteria for hygienic suitability. So have the Guidelines for the Hygienic Assessment of Organic Materials in Contact with Drinking Water (Leitlinien zur gesundheitlichen Beurteilung von organischen Materialien im Kontakt mit Trinkwasser) perpetuated as a practical guide for water suppliers, manufacturers of components for water-supply facilities, health agencies and consumers. It serves as a basis for the certification of products in contact with drinking water through the DVGW Cert GmbH. The DVGW approval mark also confirms the hygienic acceptability of products that are used for drinking water installations.

In its laboratories, UBA also carries out "practice checks". In this way, it is determined how good the products on the market actually are and whether or not the test systems developed are appropriate for the new products. This gives an indication into which areas the guidelines need to be expanded or redone and whether or not more reliable self-checking by the manufacturer as well as stricter certification or monitoring measures are required.

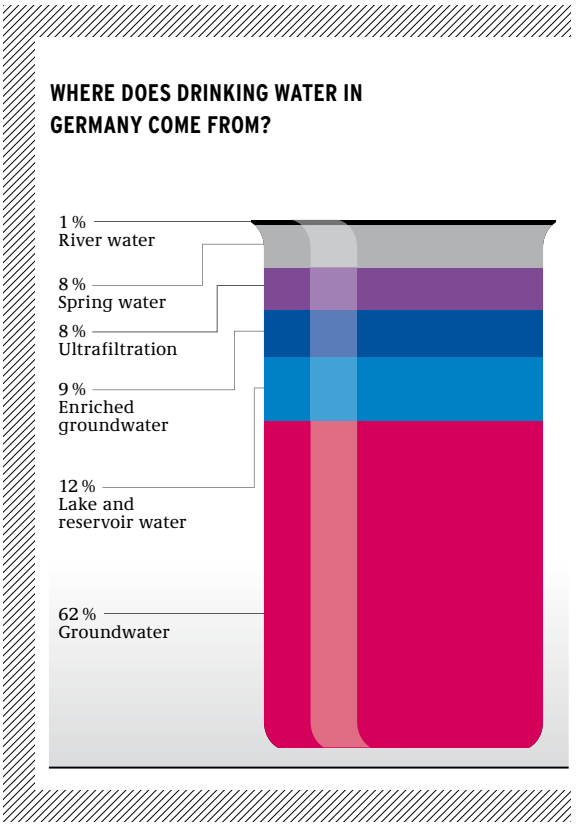
UBA takes an active part in the EU-wide harmonisation of standards for materials in contact with drinking water and thereby strives to harmonize regulations for the marketing of these products as well. This task is difficult however because the EU states often have very different conditions for supplying drinking water – for example different technical structures or other temperatures in the distribution network due to climate. Cooperation with water experts of other EU member states is therefore important for the coordination, standardisation and mutual recognition of standards for materials used in water supply facilities. The first success will be a European-coordinated list of suitable metallic alloys for water taps, couplers, water meters and similar components. The list will also further restrict the use of lead in these components. A long-range goal is a binding regulation for the commercialisation of installation materials in Germany and in the EU.

NEW CHALLENGE: VIRUSES IN THE WATER CYCLE

Viruses as human pathogens can cause a variety of illnesses, such as diarrhoea, hepatitis or meningitis [13]. Viruses end up in the water mainly from human faecal matter. Since they are often not sufficiently retained by sewage treatment plants, they can be introduced into the environment and reach surface waters and groundwater. Special care is taken during drinking water production to avoid significant concentrations of viruses in the drinking water.

The multi-barrier system that is practiced successfully in Germany for drinking water production, with resource protection, multi-stage treatment and, if required, disinfection of raw water, contributes to the elimination of viruses. Outbreaks of viruses through drinking water have only occurred in Europe in past decades when recognised standards of good practice for the production or distribution of drinking water have been violated. The level of protection strived for in Germany for the drinking water supply goes, however, far beyond the prevention of outbreaks and shall also minimise the incidence of individual viral infections in accordance with the specifications of WHO [14].

Few virus particles suffice to cause an infection. End-product monitoring alone is, therefore, not suitable to guarantee such a high level of protection. A comprehensive monitoring of all the steps of drinking water production (examination of the raw-water quality, the effectiveness of the water treatment and, where applicable, the disinfection) is required. For the control of raw-water quality with respect to the presence of human viruses, molecular methods become ever more important, in particular for viruses for which a culture assay is not available (for example noroviruses).



In collaboration with national and international research facilities and authorities, UBA participates in the further development and validation of methods for the detection of viruses in surface waters and drinking water resources. Reliable information on virus concentrations in raw water, a suitable resource protection and site-specific data on the effectiveness of the respective water treatment form the basis for well-founded risk assessment for the presence of viruses in drinking water [15]. For this risk assessment, UBA is developing a data-driven step by step approach to minimise viral infections through the water cycle.

WATER FROM PRIVATE WELLS

Approximately 700,000 citizens in Germany are supplied with drinking water from their private wells. This number is not expected to change much in the future: By now almost all residential areas, for which it makes sense economically and is possible from a technical and hygienic point of view considering the distances to the mains, are already connected to a centralised water supply. Data from different regions in Germany show however that requirements of the German Drinking Water Ordinance (TrinkwV) are noticeably often not met for water from private wells, particularly with respect to microbiological contamination and nitrate. Independent surveillance of the facilities and the enforcement of measures are complicated by the fact that operators nare often not aware of the requirement to notify the health authority of the operation of a private well, as well as of any exceedance of limit values identified. Furthermore, in some regions numerous private wells are operated in addition to a present connection to a centralised water supply, often in order to save costs. Backflow from such systems into the centralised supply can contaminate drinking water for entire residential areas. Private wells and small public water supplies represent a significant problem with respect to drinking water hygiene throughout Europe. Within the scope of the Protocol on Water and Health – a supranational treaty between currently 24 states of the European Union, Eastern Europe, the Caucasus and Central Asia – UBA is leading the development of guidelines for the improvement of such supply systems. For Germany, the focus is on developing information and educational materials for operators and surveillance authorities, as well as on improving the availability of data, which to date has been scarce.

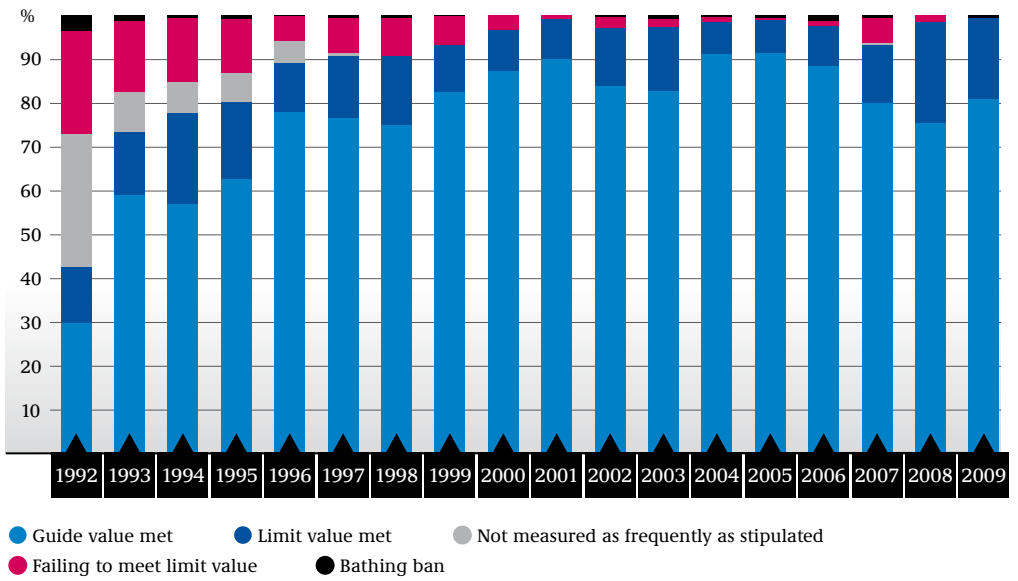
DISINFECTION BY-PRODUCTS IN INDOOR SWIMMING POOLS

Swimming and bathing pool water in public bathing facilities must be disinfected in order to eliminate the risk of infection. The German Protection against Infection Act (Infektionsschutzgesetz) provides the legal foundation. Chlorine is added to the water to kill pathogens. In the process, the chlorine also reacts with pollutants, which are brought into the water by bathers, such as urea and amino acids from skin, urine and sweat to form disinfection by-products (DNP). Some of these are under suspicion of being a health hazard [16, 17]. Counted among these are volatile substances that outgas from the water into the air. An example of this is trichloramine, which is the main cause of the typical chlorinous odour in swimming pool halls and which is mentioned in the technical literature as a possible trigger of asthma [18, 19].

Better knowledge of the kind, appearance, properties, formation conditions and toxic effects of the disinfection by-products is the basis for measures targeting their minimisation and thereby protecting bathers from increased exposure to these substances. These measures not only include pool water treatment and ventilation of swimming pool halls according to generally recognised codes of practice, but also the education of bathers. Thorough showering before bathing demonstrably reduces the introduction of urea and other pollutants into the pool water. UBA is a leading contributor to the further development of generally recognised codes of practice for pool water treatment. It carries out intensive toxicological research towards clarification of the formation of disinfection by-products and their relevance to health. For this it works as part of an international network, for example by organising symposia and through joint research projects. Last but not least, the public is informed on possible risks and their prevention.

"Bathing in rivers and lakes provides enjoyment and relaxation but can also involve health risks."

QUALITY OF COASTAL BATHING WATERS IN GERMANY FROM 1992 TO 2009



Source: European Commission 2010

BATHING WATERS – FROM MONITORING TO MANAGEMENT

Bathing in rivers and lakes provides enjoyment and relaxation but can also involve health risks. Bathing waters, as all water bodies, are used for multiple purposes and are exposed to possible contamination through sewage or agricultural runoff. Pathogens can be introduced by these discharges into the water, which can cause diarrhoeal illness among bathers. Since the EEC Bathing Water Directive came into force in 1976, water quality is tested regularly. UBA compiles the data from the Federal States, tests these for plausibility and forwards them to the EU Commission for analysis. Taken as a whole, the quality of bathing waters has been good during the last years. Problems have arisen through contamination after heavy rainfalls as pollutants are then washed into the bathing waters, through growth of cyanobacteria (blue-green algae) due to over-fertilisation of the water, and in general with river bathing waters.

The Directive as amended in 2006 stipulates a change in policy from passive monitoring to an active bathing water management. To this end, the Federal States must compile for each bathing water by the year 2011 a so-called bathing water profile that identifies, among other items, all sources of pollution that could affect the quality of the water as well as possible problems with cyanobacteria. UBA welcomes this development because possible health hazards can be recognized thereby in advance and appropriate remedial measures taken. If contamination through sewage or effects of rainwater is recognised from the analysis of the bathing water profiles, measures must be taken in the future to improve the hygienic quality of these discharges or to avoid them. Each year, there are bathing waters that must be closed due to heavy growth of cyanobacteria. Further measures are necessary to avoid over-fertilisation of these waters.

In Germany a total of 2,279 bathing waters – 1,873 on inland lakes, 33 on rivers and 373 on the coast – were monitored in 2009 according to the new Directive. The small number of bathing waters on rivers is due to a general problem. Most rivers have fluctuating water quality and carry with them, particularly after heavy rainfalls, a large amount of pollutants. Of the 33 river bathing waters, four were closed in the 2009 bathing season due to problems with pollution. Since many rivers are important recreation areas in densely populated regions, solutions must be found for implementing intelligent management measures to make safe bathing possible under defined boundary conditions. The European Environment Agency in collaboration with the EU Commission issues once a year the bathing water report. In this report, the quality of bathing waters is evaluated in all 27 members states [20]. The Federal States provide current data on the quality of the bathing waters [21].

Common ragweed (Ambrosia) and Ambrosia pollen

CLIMATE CHANGE AND HEALTH

The change in climate influences people's health directly as well as indirectly. Examples of direct health effects are frequent heat waves and extreme weather events such as storms, heavy precipitation or floods. The consequences of such events for human health are substantial. An analysis of the massive heat wave in 2003 showed that it cost the lives of an estimated 35,000 to 50,000 people in Europe [22]. Cause and effect relationships are on the other hand much more difficult to determine for indirect effects. These indirect effects include, among others, the changed appearance of biological allergens and their possible health effects as well as modification of the appearance and spreading of so-called vector-borne infectious diseases. Biological vectors are animals that transmit pathogens from one organism to another.

The latest findings by forest research facilities provide an indication that the currently observed climate change in Germany favours the appearance and spreading of plant and animal pest organisms that prefer a mild climate. The increase of these thermophile pest organisms probably has the consequence that non-communicable diseases such as allergies and asthma increase, of which individual cases have already been registered through public health authorities in Bavaria and North Rhine-Westphalia, and thereby represents a higher potential health exposure for the entire population [23].

ALLERGIES THROUGH CLIMATE CHANGE

The evaluation of health consequences of climate change is a key aspect of UBA's work in the area of environmental medicine. Therefore, in research projects we look into the mechanisms of climate change related allergies and the design of observation and monitoring systems for newly occurring non-infectious diseases. Changed climate conditions represent a cause for the intensified rise and spreading of pest organisms with an increased allergy potential in the past ten years. Examples of this are common ragweed (*Ambrosia artemisiifolia*) and the oak processionary caterpillar. Ragweed spreads increasingly in Europe and Germany, in particular in Baden-Wuerttemberg, Bavaria and Brandenburg. Its highly allergenic pollen intensifies and extends the allergy season for pollen allergy sufferers, for example through hay fever, and can lead to asthmatic discomfort.

A health hazard also comes from the stinging hairs (the *setae*) of the oak processionary caterpillar, that besides triggering itchy skin reactions, for example the so-called "caterpillar dermatitis", can also trigger reactions of the respiratory tract as serious as asthma. Humans can sometimes react with serious adverse health effects to the airborne allergens of these animals. So far, North Rhine-Westphalia and northern Bavaria have been identified as primary regions with incidences of health problems in the population caused by the oak processionary caterpillar.

A problem is that neither ragweed nor the oak processionary caterpillar can be systematically detected and observed nationwide. There are therefore a large number of unreported cases with respect to their appearance and spreading as well as number of health impacts or cases of illnesses. In connection with the German adaptation strategy to climate change, UBA campaigns for the development and implementation of a combined monitoring system for climate change related health disorders (non-communicable diseases) that determine both cause and effect. To this end, UBA is currently developing a strategic plan. It is furthermore planned to systematically study the causal pathologic mechanisms of presently spreading plant and animal allergens.

Oak processionary caterpillar

Castor bean tick

VECTOR-BORNE DISEASES

Climate changes also influence the complex systems of vector-transmitted infectious diseases. Those affected are on the one hand the vectors (above all bloodsucking insects such as mosquitoes, biting midges, sand flies as well as ticks and mites) but on the other hand the pathogens (viruses, bacteria, protozoa) and often also natural reservoir hosts – above all mammals, with particular importance given to rodents as carriers, and birds. Vectors living in the wild react immediately to changing macro- and microclimatic conditions such as changes in the biotope and host availability. This manifests itself for example in their behaviour, survival, reproduction, population density, biotope colonisation and the infestation of hosts and can also affect their potential for pathogen transmission.

An expected consequence of global warming is, for example, the increase in vector reproduction through shorter generation times and longer yearly periods of activity. An increase in activity has already been observed, for example, with the most important vector species in Germany, the castor bean tick *Ixodes ricinus* (sheep tick or European wood tick), during winter months. The major vector-associated diseases in Germany, the viral TBE (tick-borne encephalitis) and Lyme disease, which is caused by bacteria, are transmitted through this species of tick. While for certain diseases such as TBE there is a nationwide notification requirement through the Protection Against Infection Law, there are only fragmentary data for Lyme disease and there are no systematic data at all for its appearance and spreading. In a current UBA research project, data on the appearance of ticks in different regions of Germany are collected and analysed together with climate data in order to show possible correlations. Controlling ticks with biocides is unacceptable for reasons of environmental protection. Therefore, a UBA research project started in 2009 tests biological control measures that take advantage of the ticks‘ natural enemies.

Besides bloodsucking arthropods, rodents can also transmit dangerous diseases through saliva, urine and faeces. In Germany, the bank vole is the primary reservoir for a dangerous hantavirus, which can elicit serious kidney diseases in humans. The long persistence of these pathogens in the environment and the transmission to humans through inhalation are challenging problems. There is a great need for research on how climate change affects viruses in mouse populations and under which conditions their spreading is particularly probable. UBA also sponsors a research project on this topic realised by the Julius Kühn Institute together with the Friedrich Loeffler Institute.

“In Germany, the bank vole is the primary reservoir for a dangerous hantavirus.”

A LIVEABLE ENVIRONMENT FOR ALL

Socially disadvantaged people in Germany are more likely to live in an environment that can make them sick. Studies show that social status above all is decisive on whether or not and to which extent children, adolescents and adults in Germany are exposed to environmental burdens [24]. UBA has made it its duty to work against the (uneven) distribution of health-affecting environmental burdens in Germany and pursue health-related environmental protection in equal measure for all population groups. To this end, UBA has carried out research projects, has organised workshops and has prepared a comprehensive set of informative literature [25].

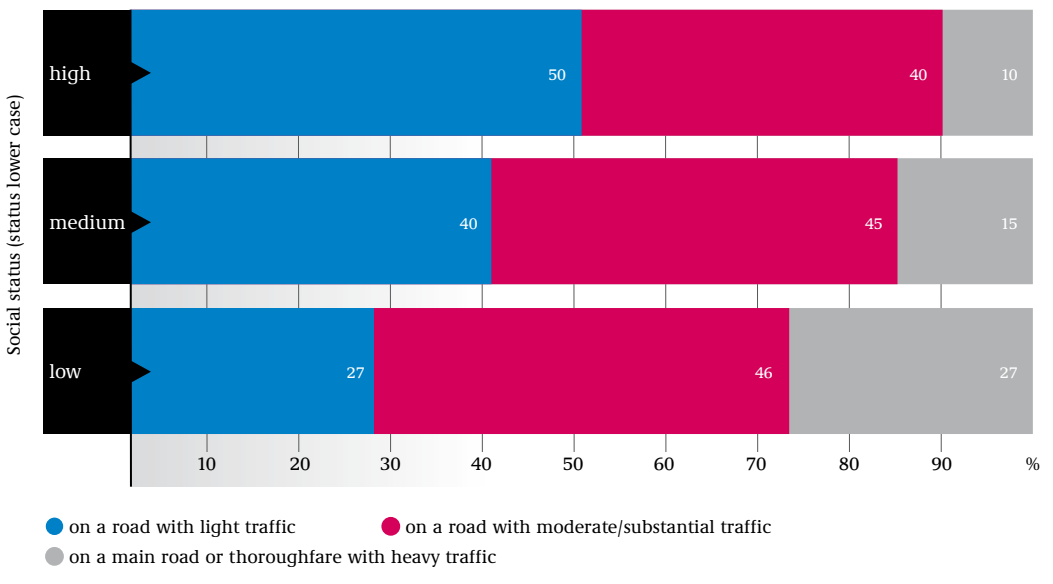
Socially disadvantaged population groups are often more affected by environmental problems and frequently do not dispose of the necessary prerequisites such as income, financial assets and education in order to avoid such exposure. This shows that the social dimension of health and the environment must be taken more into account in research, in administration, in politics and in practice. In some cases new instruments and methods are needed to ensure this. An integrated environmental, health, urban development and social reporting is an important element for recognising social differences and creating equitable environmental and living conditions for people of all social groups. By overlapping layers of maps with different spatial information about environmental, health, social and urban development issues, regions with multiple burdens can be identified. Integrated reporting and monitoring systems constitute appropriate control mechanisms and a necessary basis for political decisions and cross-sectorial strategies. Moreover, instruments already in existence, such as environmental impact assessments and assessment of potential impact of new legislation, should be adapted and expanded to include social factors.

ENVIRONMENTALLY FRIENDLY TRANSPORT SERVICES AND ACCESS TO GREEN SPACES

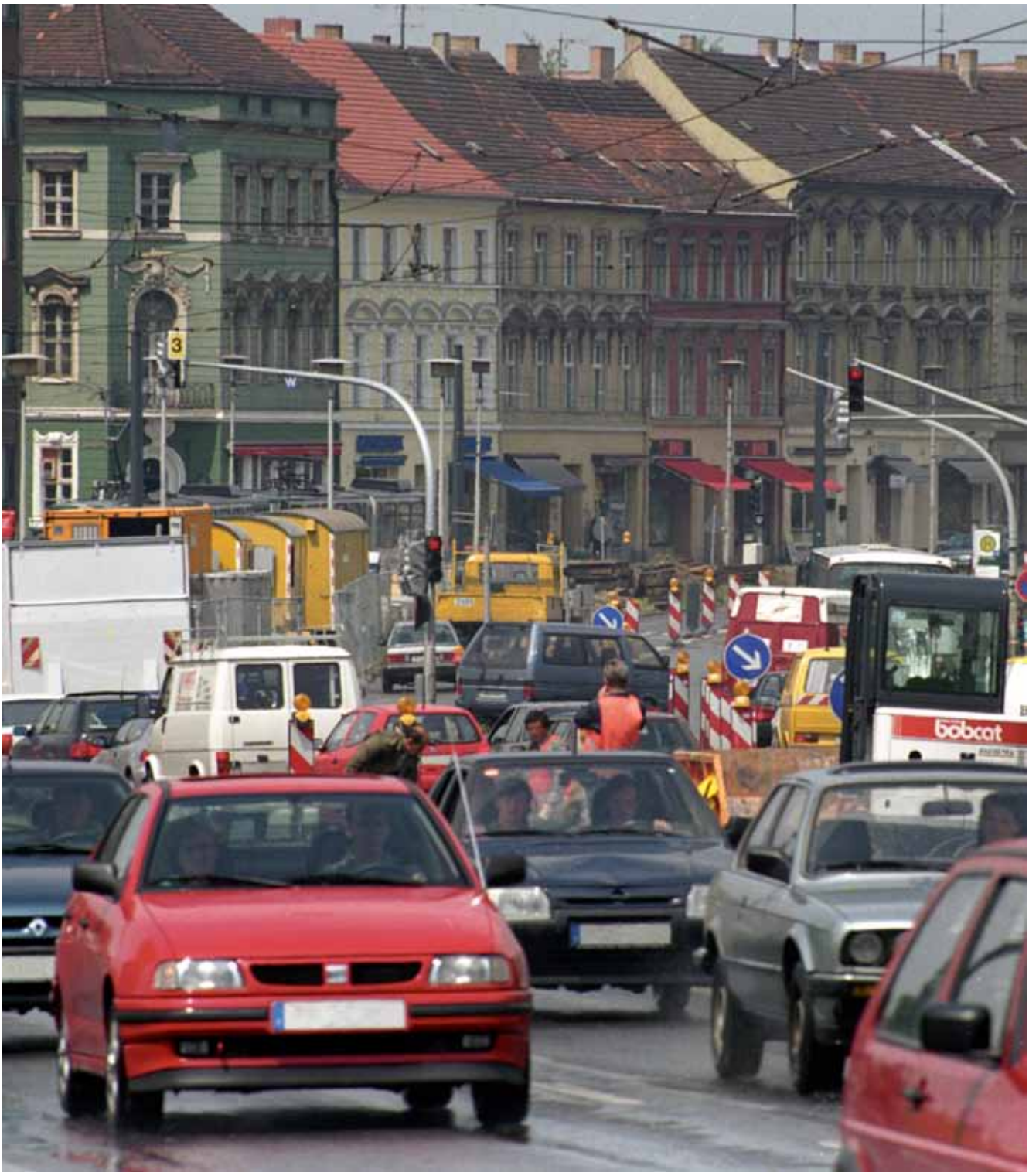
Data on exposure on the population, for example from UBA's German Environmental Survey for Children [26], shows: Residents on main roads and thoroughfares with heavy traffic are exposed to comparatively high levels of air and noise pollution (see Figure). Socially disadvantaged people above all live on these streets and have therefore higher risks of developing respiratory diseases and cardiovascular disorders. Urban development and traffic planning is needed to arrive at a comprehensive reduction of traffic. A consistent promotion of public transport as well as the use of bicycles can reduce the total exposure.

In many cases, those socially worse off are disadvantaged with respect to access to green and open spaces in an urban setting. Green spaces in urban areas have however a health promoting influence and a positive effect on people's well-being [27]. Through integrated urban development programs and the creation of green spaces near homes in socially disadvantaged neighbourhoods, one can succeed in improving the environmental conditions and quality of life for residents in these parts of the city. Green and open spaces in urban areas are an important criterion for the attractiveness of city districts. They can compensate for negative urban climate effects and alleviate health-related environmental burdens.

SOCIAL STATUS AND LOCATION OF RESIDENCE



Sources: KUS; KiGGS



“Residents on main roads and thoroughfares with heavy traffic are exposed to comparatively high levels of air and noise pollution.”

ENVIRONMENTAL JUSTICE – RIGHT FROM THE BEGINNING

Between March 2009 and July 2010, the association "Women in Europe for a Common Future" offered expectant parents and young families from socially disadvantaged districts, and in particular families with a migration background, advice on forming a healthy home environment for their newborns. In Berlin and Munich, on-site consultation and office hours took place regularly in neighbourhood-based facilities and meeting places on the topics "Avoiding mould infestation at home", "Clean ecologically – in a healthy and environmentally friendly way without disinfectants" and "Avoiding health risks from passive smoke". In addition, the association organised training for disseminators and developed multilingual flyers. The Federal Ministry for the Environment and UBA have supported the project financially.

TARGETED INFORMATION AND ADVISORY SERVICE

Information provisioning and advisory services must be organised with respect to specific target groups. Socially disadvantaged households often have a greater need of assistance and because of access barriers, difficulties in receiving information and advice through traditional means – such as brochures and presentations. Outreach information services, which provide practical on-site assistance, are therefore particularly successful. Advising on moisture damage and mould formation, which examines the situation as it is in the home, is for example a sensible intervention measure. For this, it is necessary that different institutions and lobbying groups collaborate at the local level, such as health services, social services, housing associations and tenant associations. A strategy conference is planned for 2011 on the theme of environmental justice. It should further promote the debate on this topic and discuss concrete measures.

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Christiane Bunge, Section II 1.1

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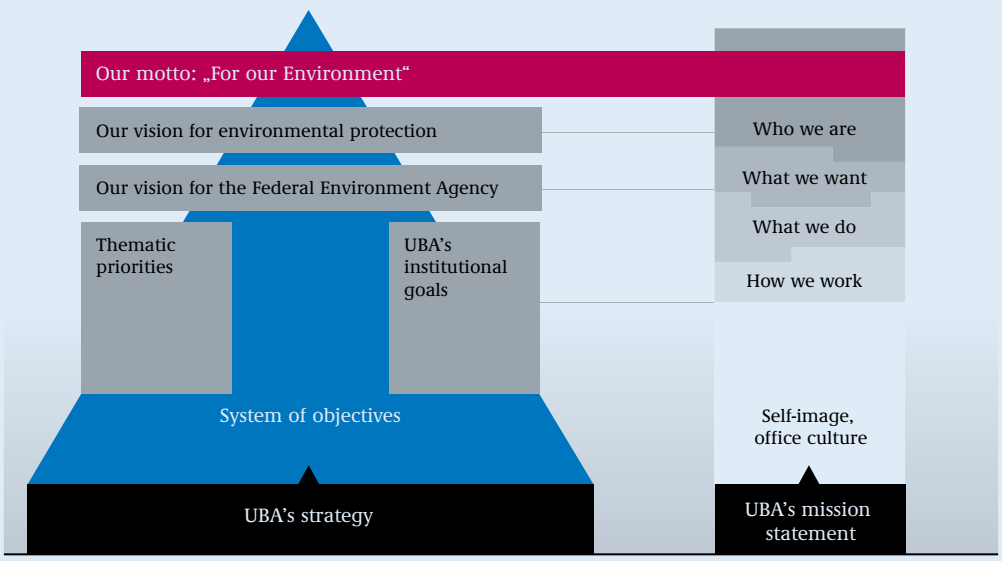
THE FEDERAL ENVIRONMENT AGENCY

OUR TWO PILLARS FOR THE FUTURE – THE FEDERAL ENVIRONMENT AGENCY'S STRATEGY

It's not only businesses, but authorities too are faced with ever-increasing demands and changing basic conditions. In the face of new, additional tasks and limited financial and personnel resources, there is an obligation to increase efficiency. Our partners in business, science, administration and associations expect an increase in service quality. In addition, the Agency must adjust to many social and technological changes. All this requires a high degree of adaptability and innovation, focussing on key objectives and central areas of work as well as modernising administration.

To meet these challenges successfully, in a slim but all-embracing process, UBA's management and employees have outlined their visions and common goals for UBA's future. We have expressed our views and agreed on a strategy of where we want to go and what goals to work for. As a result, at the end of 2009, UBA for the first time set up a strategy which complements the Agency's long-standing mission statement (see Figure). This strategy represents UBA's system of objectives, while the mission statement describes our self-image and our office culture.

THE FEDERAL ENVIRONMENT AGENCY'S STRATEGY AND MISSION STATEMENT



Source: Federal Environment Agency 2009

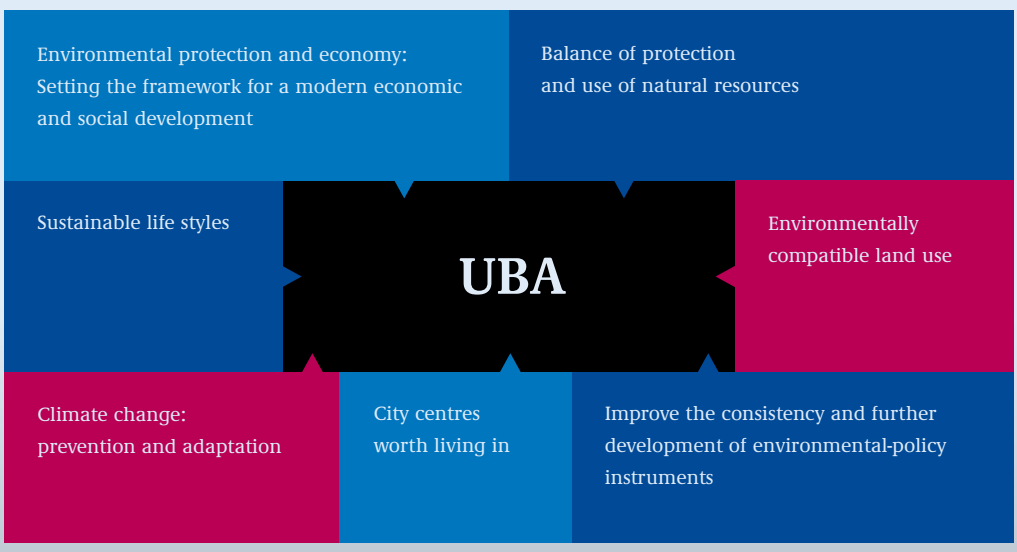
WHAT DOES UBA'S STRATEGY LOOK LIKE?

At the top of the UBA strategy is the motto: "For our Environment". Beneath this umbrella, we have developed our visions and goals for environmental protection and for UBA. Our vision for environmental protection is that the natural environment, human health and the integrity of the ecosystems – also as an act of responsibility towards future generations – must be protected and maintained. We want to advance sustainable development and promote environmental protection as a matter of course in the thinking and action of everybody. Our vision is for UBA to be the most influential adviser to the government on environmental issues in Germany, while maintaining our scientific independence. We want to preserve our diverse range of topics and to advance discussions about environmental protection both at national and international levels. We want to be an important contact for the public and offer high-quality and efficient services to our partners.

We intend to achieve our visions through our thematic priorities and UBA's institutional goals. These are the two pillars of UBA's system of objectives. In the first column we have compiled seven thematic priorities for the coming five years (see Figure). It is this area where we see the most urgent need for environmental action, the greatest importance for environmental policy and the public, as well as the most important legal requirements in environmental and health protection. The thematic priorities are being regularly reviewed and updated.

The second pillar of our strategy consists of eleven institutional goals of UBA. Among other aspects, they include research, public information, policy advice and enforcement of environmental laws. We will do our best to arrange our work more efficiently, to implement it more effectively and to steadily improve the quality of our work. For example, we want to make UBA faster and more flexible and put greater emphasis on the themes of globalization, knowledge management and human resource development. Our attention is concentrated not only on internal processes, but is particularly directed at the needs of our partners. So we want to constantly improve our services for the people, industry and the government. UBA started to fill its strategy for life in 2010. The implementation of our visions and goals did not start at zero, but there is still a lot to do. Based on the new strategy we are about to realign the planning processes and to develop Strategic Controlling. Thus the project group "UBA 2015" headed by the vice-president is working on the achievement of the institutional goals across all disciplines. The implementation of the strategic goals will also be the focus of our work for 2011.

THE STRATEGY'S THEMATIC PRIORITIES



Source: Federal Environment Agency 2009

WORK-LIFE BALANCE, OCCUPATIONAL HEALTH MANAGEMENT

The Federal Environment Agency (UBA), a family-friendly employer, has held the prestigious certificate “berufundfamilie” (Work and Family Audit) granted by the Hertie Foundation since 2006. Because family, leisure time, the company of friends and raising children or caring for older people occupies a large part of our employee’s life, maintaining the balance between work and private life is an important objective for UBA. UBA accepts its responsibility to support its employees by creating family-friendly working conditions. Naturally, the way family and work should be reconciled in individual cases cannot be predetermined by UBA, however, the framework for different models can be and is being created. Our strategy aims to avoid the loss of highly motivated and qualified staff when family duties temporarily become a priority.

The “berufundfamilie” certificate was confirmed for another three years in 2009, valuing UBA’s success in creating family-friendly working conditions: flexible working hours, flexible work arrangements such as teleworking and mobile working as well as ‘parent & child’ office support at UBA’s various locations which all boost our work-life balance. In addition, a number of individual part-time modules and the opportunity to gain strength and creativity in a sabbatical i. e. paid time-off, provide a good balance between life and work.

The external service provider “PME Family Services” helps employees to find child-care places. With places reserved at a nursery in Dessau for children under three, available for UBA employees at short notice, UBA can support employees with young children directly and efficiently. In the 2010 holiday season, UBA for the first time helped parents by providing a holiday programme for children at the Dessau headquarters and Berlin site. While the children were enjoying swimming and crafts, a forest rope-climbing experience and a beaver outdoor facility, parents were able to work in peace, knowing that their children were well cared for. Also when employees’ relatives need nursing care, the external family service provider gives help and advice: it advises employees as to how the care of relatives can be best organized in individual cases and even helps find a nursing service or a place in a home. In addition, UBA has appraised its employees with a comprehensive series of lectures on nursing, from basic questions about the legal aspects of nursing care to the topic of dementia. The huge response indicated how relevant the topic of care is for the employees.

UBA puts great emphasis on the fact that the Agency’s management regards family-friendly human resource management as an important task and provides help to their employees. Family-friendly management also means that the Agency’s managers realize and use the opportunities a good work-life balance can provide. Another point, which should be implemented within the audit, is organized keep-in-touch support. This is intended to support employees during maternity leave by keeping them up to date with information and help them to re-enter professional life after the break.

CONTENTMENT – HEALTH – MOTIVATION

The health of our employees is very important to us because it is the basis for good performance and thus for the Agency's success. UBA needs and wants healthy employees who feel comfortable coming to work, are contended and motivated and can mobilise their resources in order to work "For our Environment". Therefore the Agency has introduced the Occupational Health Management scheme CHM where CHM stands for Contentment, Health and Motivation (or BGM for Befinden – Gesundheit – Motivation in German). The Agency's goal in facilitating the CHM scheme is to systematise and combine all topics and actions concerning work safety and health protection.

Two of CHM's prime targets are the creation of good working conditions (e.g. style of leadership) and healthy work organisation (e.g. flexible work times). Other modules include holistic relaxation courses, massage sessions and sport at work, especially football, cycling, badminton and golf. In addition, social counselling, the benefits of a good work-life balance and reintegration of the long-term sick are all components of the CHM.

Comprehensive, periodic surveys of employees within the CHM scheme are the corner stone which helps to improve the employees' job satisfaction. The Agency, together with its employees, wants to identify those health issues where UBA must help, and give their employees instructions and tips on how to behave properly in work in terms of maintaining one's health. In addition, the Agency offers support for dealing with stress in the workplace and provides suggestions to eliminate specific health problems and complaints in the workplace. Improvement of communication and co-operation between the Agency and employees is also one of the CHM scheme's key objectives.

ENTRY INTO WORKING LIFE

UBA provides many young people with the opportunity to complete a vocational training in public/private partnership for many different trades. The range includes administrative specialists, specialists for media and information services to chemistry and biology laboratory assistants. Since 2009 the number of apprenticeships in UBA has increased – from the then seven to a total of nine career directions. The existing training diversity has been extended by event manager and office communication assistant.

UBA counted 81 trainees in different professions at the end of August 2010. 42 trainees have their main training site in Dessau-Roßlau and 84 young people have successfully completed their training since 2007. All of them received an offer of a one-year term post-training contract. 13 of these young job-starters now work permanently in UBA, 52 of them have a temporary contract. In addition, UBA offers practical courses to university students and arranges long-term volunteer services – for example the volunteers' ecological year (Freiwilliges Ökologisches Jahr or FÖJ).

JOB SPECIFICATION

NUMBER OF TRAINEES, 2006 TO 2010

	2006		2007		2008		2009		2010	
	1st half	2nd half	1st half	2nd half	1st half	2nd half	1st half	2nd half	1st half	2nd half
Administrative specialist	24	27	27	20	20	28	28	28	28	26
Specialist for media and information services	15	16	16	10	10	13	13	14	13	14
Biological laboratory assistant	7	8	12	14	7	11	11	12	9	10
Chemical laboratory assistant	13	11	13	17	13	15	14	17	14	15
Information technology specialist	2	2	2	2	2	4	4	6	7	7
Plant mechanic	1	1	1	2	1	1	1	1	1	1
Electrician for buildings and infrastructure	1	1	1	2	2	1	1	1	1	2
Event manager	-	-	-	-	-	-	-	1	1	1
Office communication assistant	-	-	-	-	-	-	-	2	2	4

ENVIRONMENTAL MANAGEMENT – BEING CONSISTENT IN OUR OWN HOUSE

We implement environmental protection consistently also in our own house. The Federal Environment Agency (UBA) has practiced an environmental management system since the mid-1990s. This system has met the strict requirements of the European EMAS regulation since 2001 – at that time UBA was the first federal institute to comply and its activity is now running at six sites. The Eco-Management and Audit Scheme or EMAS stands for systematic operational environmental protection at a high level and helps to reduce the consumption of natural resources thereby saving costs. In our environmental guidelines we commit ourselves to an environmentally friendly behaviour which means that we procure the most environmentally friendly products, use resources economically and reduce, reuse, recycle and dispose of wastes in an environmentally friendly way. We organise our business travel as environmentally carefully as possible and involve our contractors in our environmental management scheme. In order to make all this possible and identify other improvement opportunities, we carry out regular environmental audits and publish the results and the following actions. This contributes significantly to UBA's credibility and strengthens our position in the environmental debate, where one of our goals is to present EMAS as an important tool of environmental policy.

Energy conservation and resource management within UBA enjoy high priority. Whether it is the construction and maintenance of buildings, repair of machinery and equipment or the care of outdoor facilities: The structural and technical infrastructure must be as energy efficient as possible. We want to reduce our energy consumption, which is low anyway, by another five percent by 2012. Our production and use of renewable energy will increase and we intend to double our own electricity production from renewable sources by 2012. We will achieve this environmental goal by combining the already planned construction measures with the installation of additional photovoltaic systems and other renewable energy technologies.

EMAS
GEPRÜFTES UMWELTMANAGEMENT

EMAS – VARIFIED ENVIRONMENTAL MANAGEMENT

We keep our employees informed regularly and extensively about opportunities for environmental protection in the workplace and support them specifically in making their everyday work environmentally friendly. We also encourage our employees to become actively involved in the operational issues of environmental management which focuses their consciousness on practical environmental protection. We preferably procure products whose manufacture, use and disposal excel with regard to environmental compatibility. With our tenders for green electricity, PC workstations, network printers and office and conference furniture, we not only promote environmental protection within UBA, but also set the standards for other institutions. Our green procurement scheme was awarded the European EMAS Award by the European Commission in 2009.

In order to reduce the environmental impact of our extensive business travel, we established guidelines for environmentally friendly business travel management. We have committed ourselves to reducing business trips by organising videoconferences or bundling the business issues in meetings, preferring environmentally sound means of transport, possibly selecting accommodation with an environmental management system (for example EMAS) and to offset the climatic effects of our travel by ambitious climate protection projects. We will reduce our business travel by increasing the number of videoconferences by another twelve percent by 2012 in comparison to 2009. We want to increase the percentage of our employees who walk, cycle or use public transport to and from work, from a current 67 to 70 percent by 2012. By comparison, the share of these environmentally sound means of transport to and from work in Germany is around 30 percent. Energy consumed by UBA's information and communications

“We want to increase the fraction of our employees, who walk, cycle or travel by bus or train to work, from a current 67 to 70 percent by 2012.”

technology including services assigned to external providers will be reduced by at least 40 percent by 2013 compared to 2009. To achieve this, a modern, efficient data centre will be built on our Berlin site, climate control will be improved, the server optimised and consistently energy-efficient appliances will be acquired (also see page 86). In addition, activities such as the automatic night time shut down of network printers will also contribute to achieving the energy savings target.

SUSTAINABLE CONSTRUCTION

The Federal Environment Agency (UBA) wants the construction and operation of its buildings and property to become a model for other developers in the public sector in terms of environmental protection and sustainability. Current Agency building and reconstruction projects are expected to fulfil the same requirements that UBA requires from third parties. Examples include the energy quality of buildings, energy efficiency of technical equipment and building materials used for construction. Whenever it makes sense, these requirements should exceed the legal specifications and should apply in the future as far as possible. This applies to the building process itself and for the on-going operation of buildings.

RECONSTRUCTION AND RENOVATION OF THE UBA BUILDING IN BERLIN

The UBA office building built in the 1930s will be reconstructed and thoroughly modernized in order to take full advantage of it in the future. But UBA will close two other buildings: Immediately after completion of this reconstruction the office building in Corrensplatz in Berlin will be closed, and over the medium term the office building in Langen near Frankfurt will also close. The resulting merger of organisational units will lead to an improvement in the Agency's efficiency which, in turn, will save costs and energy – which benefits climate protection.

Despite the difficulties of preservation of our historic monuments, the building in Bismarckplatz in Berlin should attain the new building standards stipulated by the amended Energy Saving Ordinance (EnEV 2009). The possibility of improving the exterior insulation could not be achieved because of aesthetic issues. The main focus therefore must be on the windows, the roof and energy efficiency of the technical equipment to be installed. On behalf of the Federal Office for Real Estate Management and UBA, the Federal Office for Building and Regional Planning put out an urban design tender for this project in August 2010. The project is being undertaken by a collaboration of architects.

EXTENSION BUILDING IN DESSAU-ROSSLAU

UBA moved to its new office building in Dessau-Roßlau in Saxony-Anhalt six years ago. Since then the Agency has been commissioned with new duties such as the implementation of environmental laws. This resulted in the need for more office workspace, which is currently covered for example by rented offices in Dessau-Roßlau. However, since this is not reasonable over the long term due to financial reasons, a new office building will be built on the plot adjacent to UBA's site. The plot has been owned by the Government since 1 January 2010.

Similar to the existing building, the extension should become a model project for sustainable construction. The goal is to build a zero-energy or even a negative energy building, which means that more energy is produced than consumed over the year. For this, UBA and the Saxony-Anhalt State Office for Building and Construction are compiling the so-called "Construction Decision Support Base", which will contain the quantitative and qualitative requirements for the building. On this basis the Saxony-Anhalt State Office for Building and Construction will put out a design tender. As things currently stand, the new building should be completed by the end of 2014.

"BUILDING 2019" IN BERLIN-MARIENFELDE

On its laboratory site in Berlin-Marienfelde, UBA needs accommodation for 31 office work stations, showers and changing rooms for laboratory use. This project will also be a showcase project. It will be built as an ecologically optimized zero-energy building using timber construction technology which meets the requirements of the 2019 draft Directive of the European Union's overall energy efficiency of buildings. Renewable energy generation using photovoltaics and geothermal probes will satisfy the building's energy needs over the full year. The planned building was awarded the Berlin Chamber of Industry and Commerce's "Climate Protection Partner of 2010" prize in May 2010. UBA evaluates the success and the quality achieved of its projects continuously by comprehensive monitoring. Construction of the "House 2019" is scheduled to start in the summer of 2011.

"Building 2019"

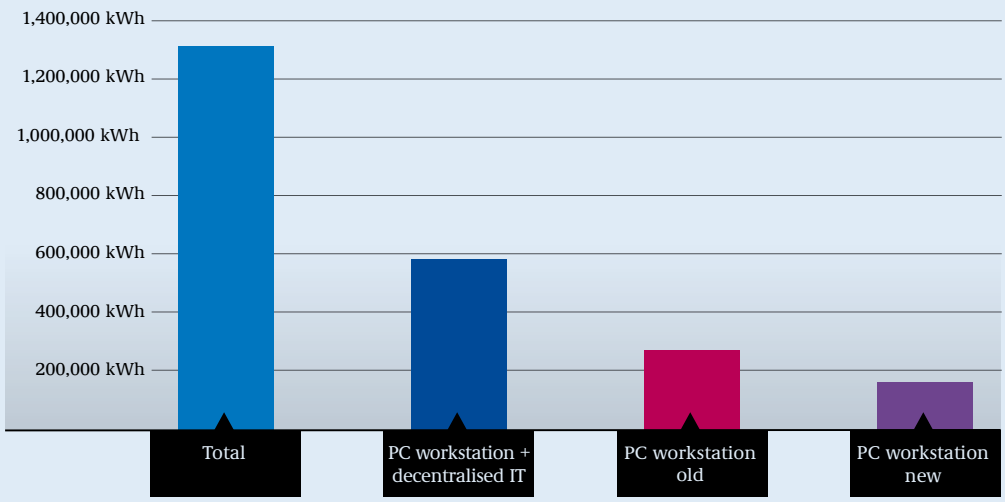
ENVIRONMENTAL PROTECTION IN INFORMATION AND COMMUNICATIONS TECHNOLOGY

Over a billion computers are currently in use world-wide. Computers are indispensable in their work for about 58 percent of employees in Germany according to data from the Federal Statistical Office. The downside of this development in information and communications technology (ICT) is a poor environmental record in terms of manufacture and operation of the ICT equipment, caused mainly by high energy consumption and the use of raw materials. However, the potential for reducing energy and resource consumption in ICT is very high because of the eco-efficiency concept which only played a minor role in the past. For this reason the German Federal Government's IT Council on 13 November 2008 decided on two goals: to reduce energy consumption in the operation of IT technology in the federal administration by 40 percent by 2013 and to include energy consumption of IT solutions into the procurement criteria in all major new investments in the future.

The Federal Environment Agency (UBA) has already included ecological criteria in its ICT procurements. In addition to energy consumption of the device, health-protection and resource-saving aspects have also been considered – specifically, whether the materials from which the products are manufactured affect health and the environment. Recyclability and modular design, which prolongs the service life of equipment, thus preserving precious natural resources, are important procurement criteria. Since autumn 2010, UBA has replaced its PC workstations, notebooks and monitors throughout the entire Agency with new technology. The re-equipping coincided with the creation of guidelines for green procurement of desktops and notebooks based on UBA's procurement needs [1]. Thus UBA could show in practice that "green" procurement recommendations can be implemented. Some of the tenders deliberately went beyond the requirements of the guidelines. The intention was to demonstrate that "enhanced" requirements are feasible and meet with acceptance in the market.

Re-equipping the workstations with so-called zero-Watt computers, which consume no energy in idle and stand-by mode, leads to energy savings of 43 percent over the legacy systems. This means in absolute figures, about 120,000 kilowatt-hours of energy, nearly 69 tonnes of carbon dioxide and 12,000 euros in energy costs can be saved in UBA per year. The figures clearly show that there is an immense saving potential in this area. Further energy savings from workstations are expected from the widespread introduction of efficient power management targets through centrally controlled group policy.

ENERGY SAVING IN THE FEDERAL ENVIRONMENT AGENCY USING ZERO-WATT PCS



Source: Federal Environment Agency

However, it would be short-term thinking to only consider energy consumption during use when deciding about the purchase of new equipment. For the environmental balance it is also important to consider the energy consumption during manufacture and disposal of the equipment. The consumption of raw materials needed for the manufacture of the products must also be included. What is more, some of the materials used, such as certain metals, are highly toxic or very rare. It is therefore important to determine the optimum time for technology renewal. If a device is replaced too early in favour of a newer, more energy-efficient device, power consumption may decrease during use, but the total energy balance may be worse than if the old unit had still been in use. In order to answer the question about the optimal time more effectively, UBA has commissioned research projects in 2009 and 2010 [2].

The consolidation of UBA's printing equipment took place some years ago when almost all local printers were removed in favour of server printers. The change to so-called multi-functional devices which can print, fax and copy also reduced the number of scanners, printers and fax machines in the Agency. Other comparatively small actions, such as suppressing the addition of separation sheets between two jobs and defaulting to duplex printing, also had positive environmental effects: paper consumption was considerably reduced. In addition, UBA has set itself the goal of saving energy in the operation of its large and efficient data center.

In order to achieve this target, we want to optimize climate control, better exploit the servers using data consolidation and virtualization and implement ambitious environmental regulations in the modernization of the computer centre on UBA's Berlin site. From this package of measures we expect an energy saving of about 50 percent. In addition, many other activities for a "green" IT are being planned in UBA. They are formulated in the Agency's EMAS environmental declaration.

SOURCES:

[1] The manuals can be downloaded from the Internet at www.itk-beschaffung.de. This project is based on a joint initiative of the Federal Procurement Office, the Federal Ministry of the Environment, the Federal Environment Agency and BITKOM.

[2] R+D projects „Ressourcenschonung im Aktionsfeld Informations- und Kommunikationstechnik" ("Resource Saving in the Field of Action of Information and Communications Technology") (Project No 3709 95 308) and „Informationsgewinnung über die Wertschöpfungskette von Produkten der Informations- und Kommunikationstechnik" ("Information Acquisition over the Value Chain of Products of Information and Communications Technology"). Completion of the project and publication of data are expected in September 2011 the earliest.

FACTS
AND FIGURES

The Federal Environment Agency is Germany's central environmental protection authority. Established in Berlin in 1974, the Federal Environment Agency has had its headquarters in the Bauhaus city Dessau-Roßlau since May 2005. It has – in addition to the administration department – five divisions with 13 departments and employs more than 1,400 employees in about 1,170 posts on 13 sites – seven of them measurement stations of our own Air Monitoring Network. They are manned by 467 civil servants and 700 employees. Nearly 800 people are employed in Dessau-Roßlau. Besides "pure" scientific work, the enforcement of environmental law – for example the Chemicals Act or the Plant Protection Act – and informing citizens on environmental protection issues are other key areas of our daily work. The Federal Environment Agency is partner and Germany's contact point for numerous international institutions, for instance the World Health Organization (WHO) and the European Environment Agency.

BUDGET OF THE FEDERAL ENVIRONMENT AGENCY

	Goal 2009 in 1,000 Euro	Goal 2010 in 1,000 Euro
I. Budget of the Federal Environment Agency		
I.1 Total expenditure	102,960	101,689
To		
- Personnel	69,754	68,246
- Investment	5,878	3,925
- Administration	27,308	29,240
To		
· Scientific publications and documentation	359	429
· Environmental information and documentation system (UMPLIS)	2,704	5,468
· Information technology	4,820	6,246
I.2 Services provided to Federal Institutes and third parties		
- Federal Institutes (actual expenditure)	523	-
- EU, others (actual expenditure)	1,307	-
II. Managed funds transferred from other chapters for distribution		
To		
- Investments towards pollution abatement	48	167
- Allocation of funds for research projects (UFOPLAN)	18,441	21,700
- Environmental Specimen Bank	4,331	4,331
- Grants to associations, federations, etc.		
· support for institutes	1,279	1,279
· support for projects	6,344	6,077
- Educational measures	1,005	1,020
- Environmental protection consulting for countries of Central and Eastern Europe and the Newly Independent States (NIS)	1,275	2,250
- International co-operation	547	603
Sum total of funds transferred for distribution from other chapters	33,270	37,427

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