WHAT MATTERS 2017

↗ Agriculture ↗ Indoor air quality ↗ Climate change mitigation

Annual Report of the German Environment Agency (UBA)

For our Environment

Umwelt Bundesamt

WHAT MATTERS 2017

↗ Agriculture ↗ Indoor air quality ↗ Climate protection

Annual Report of the German Environment Agency

Maria Krautzberger
President of the German Environment Agency

DESTROY SOMETHING TODAY AND IT MAY BE LOST FOREVER

One may be led to believe that there has seldom been more unrest in the world. With that, concerns about keeping our environment in good order often fade into the background. Water, soil, air – the basics of our existence seem to have been side-lined in public debates. But the things we destroy today are sometimes lost forever. It is a slow process – and suddenly it could be too late before we realise what has happened.

For example: at the time the Berlin wall was torn down, there were five times as many lapwings populating German fields as there are today. It is us that must bear the responsibility for the decline of this species: our style of living and working means that we farm in such a way as to increase our profits as much as possible. For ourselves and for livestock farming: 60 percent of German agricultural land is used to grow animal feed. Wheat and corn are sprayed with pesticides in order to maximise profits, meaning many other plants that used to grow in the fields are killed. If there are no plants in bloom, insects are unable to find food. And without insects, birds lose their most important source of food.

Or nutrients: large amounts of manure and dung are heaped onto our fields. These substances release nitrates, which then find their way into our groundwater. A quarter of the groundwater in Germany already exceeds the threshold value for nitrates. If nothing changes, the price of drinking water in many places could soon increase due to the expense of remove nitrates from groundwater. As such, we need effective legislation on fertilising to be in place. You can find more information on these topics, as well as on other environmental issues in the agricultural sector, in this booklet.

Climate protection continues to take a central role in Germany and across the rest of the world. Last year, Germany saw an unfortunate increase in their greenhouse gas emissions for the first time in years, according to our calculations. The fact that since 1990 Germany has been unsuccessful in their attempt to reduce road traffic emissions is a principal reason for this increase. We are far from achieving our objective of producing 40 percent less greenhouse gases in 2020 than were produced in 1990.

We have currently achieved just a 28% decrease. As such, we need to put more effort into protecting our climate – not only in the transport sector, but also in terms of the energy sector and building insulation, as well as industry and agriculture.

The Paris Agreement on climate protection entered into force last year. Now it's a matter of whether as many nations as possible commit to implementing the agreement and take on leading roles to show that achieving a low-carbon economy is no utopian dream. This depends on a lot of steps being taken, both large and small. The second chapter of this "What Matters" report deals with the various possible outcomes.

Urban air quality has been the most recent topic of major discussion – keywords being car traffic and nitrogen oxide. However, we Central Europeans spend an average of 80 percent of our time indoors – at home, in the office, whilst shopping. What's the air quality like in those places? Unfortunately, it's often much worse than we think as we can't smell the impurities coming from carpeted or wooden floors.

The good news: within our own four walls, we can often decide on the quality of the air for ourselves. You can find more information about this topic in our chapter "Indoor air quality".

For our environment – that's the motto of the German Environment Agency and we use that as a basis for contributing our research and scientific knowledge to the political arena. To this end, I hope our "What Matters 2017" report can also contribute to making the environment a more central topic of discussion.

Maria Krautzberger

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ENVIRONMENTAL ISSUES IN THE AGRICULTURAL SECTOR

Modern-day agriculture is often a real test of endurance for our environment

2015
50,683 t
of herbicides sold

2015
5,007 t
of insecticides sold

2015
35,472 t
of fungicides sold

Approximately
8.8 kilograms
of pesticide per hectare is used in Germany every year

“LANDSCAPE”

The term “landscape” does not have one clear-cut definition. On the one hand, the term can be used within the field of geography in order to differentiate an area with specific scientific features from other areas – it takes into account soil conditions, altitude and water balance. On the other hand, the term can also have an aesthetic meaning; “landscape” denotes our perception of an area, this perception being influenced by our culture. For example, the term “natural landscape” – a habitat almost untouched by human activity – and “cultural landscape” – every region in which humans have altered nature to their own benefit.

A uniform character structure on the one hand, and on the other an interactive structure serving to create a relationship – at least it is possible to describe the condition of a “landscape” by measuring water quality, for instance. Federal and state authorities operate over 14,000 sites for measuring surface water[1], with over 5,000 monitoring sites being used for monitoring groundwater. The concentration of heavy metals such as lead, zinc, cadmium or nickel provides just as much information about water conditions in a landscape as the concentration of industrial chemicals and agricultural chemicals such as pesticides and the surplus of nutrients, for example.

If you take the figures from 2015, you can see there has only been minor progress with regard to undamaged aquatic ecosystems. Only 8.2% of all surface water was defined as being in a “very good” or “good ecological condition”[2]. This means: more than 90% of the water falls below the environmental target.

2.4 percent of German Federal landscape is covered with water, 30.6 percent with woodland and 0.2 percent with moorland and marshland, respectively. Apart from the survival of a small amount of primary forest, our woodland is not natural, rather it is a product of the forestry industry. The real “natural landscape” takes up less than one percent of the entire German land mass, in the 16 national parks, for example[3]. As such, it is also possible for the landscape that has been heavily influenced by humans to have a high ecological value: many high-quality environments such as moorland and nutrient-poor grassland are often created through human activity. Both residential areas and infrastructure for transportation take up over 13.7 percent of the German land mass[4].

Around 50 percent of the landscape is cultivated for agricultural purposes.

The largest part of German landscape is cultivated for agricultural purposes – around 50 percent of the surface area[5]. Almost 12 million hectares are used as farmland and just short of 5 million hectares are made up of grassland. In 2016, there were around 275,000 agricultural companies in the Federal Republic of Germany, employing around 940,000 people – approximately 1.5 percent of the German working population[6].

Agriculture has an enormous impact on our landscape: it is largely responsible for the condition of the soil, surface water, groundwater, biodiversity, air quality and recreational activities.

Society determines the general conditions under which agricultural activities take place. Politics is responsible for the regulation which stipulates the minimum requirements, as well as for the EU agricultural subsidies which still constitute nearly half of the operating income on average.

When making their purchasing decisions, consumers also have a substantial influence about what products the agriculture sector produces and how they are pro-

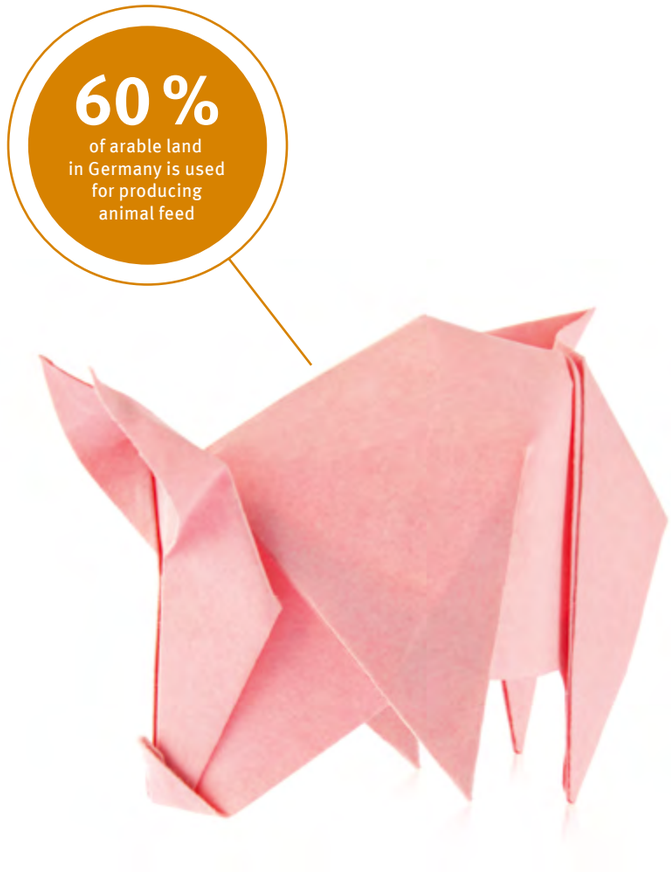
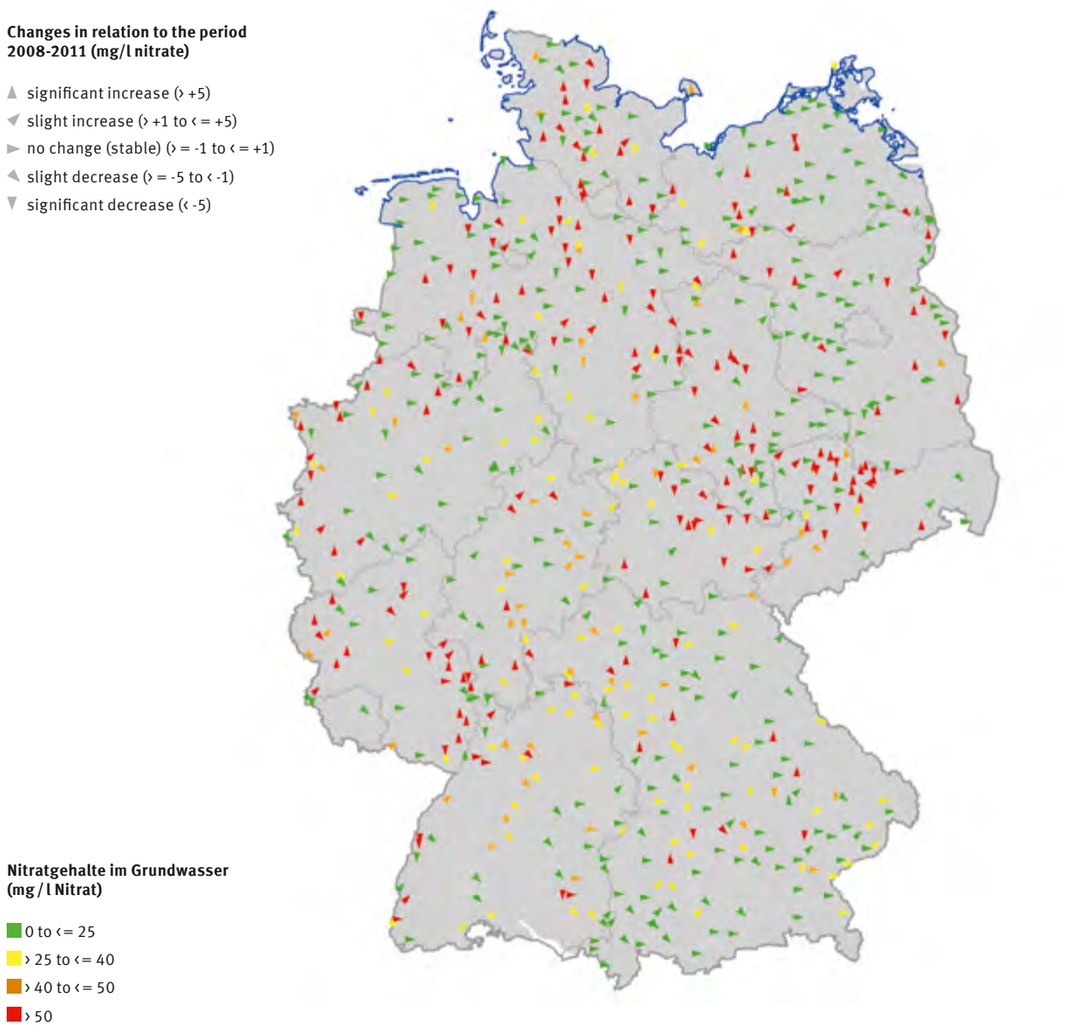


Figure 1

Changes in the average nitrate concentrations at monitoring sites in the EU nitrate monitoring network: comparison between 2008-2011 and 2012-2014



Source: Geospatial data and information DLM1000, 2015, BKG (Bundesamt für Kartographie und Geodäsie [German Federal Agency for Cartography and Geodesy]) / Technical data: Länderarbeitsgemeinschaft Wasser (LAWA) [German Working Group on water issues of the Federal States and the Federal Government represented by the Federal Environment Ministry] / Editing: German Environment Agency, FGI 1.5-SG, 2016

duced. As such, every critic of agriculture is ultimately also a critic of political decision-makers, and of us all.

Agriculture is being industrialised

Since the mid-20th century, high-yielding crops, mineral fertilisers, pesticides and high-performance equipment have increasingly found their way into the agriculture sector and have caused a substantial increase in yield. For example, almost four times as much wheat can be harvested per field as 100 years ago. At the same time, farmers have been able to keep making the production process more efficient, and therefore more economical: in 1900, more than every one in two Deutschmarks of a consumer's expenses would be spent on food – in 2012, the proportion spent on food lay at around just 13 percent[7]. We began to need less and less farmers to feed more and more people. Great for consumers - but difficult for most farmers. Those who were unable to keep producing more for less had to find niche markets or simply give up their work – at the beginning of the 1950s, almost one quarter of the German working population were employed in the agricultural sector, but today the figure lies at just one and a half percent. For farmers, these developments result in few winners and many losers.

With the introduction of synthetic fertilisers, the production of feedstuff has become increasingly disassociated from livestock farming.

Previously, farmers had to keep animals in order to use their manure as fertiliser on their fields, but thanks to mineral fertiliser, this all changed; farmers no longer had to do everything themselves, rather, they could specialise. One farmer could start to produce animal feed and sell this to other farmers who had chosen to specialise in livestock farming.

This increase in agricultural efficiency also meant that more animal feed became available, meaning the production of meat, milk and cheese – that is to say animal products – could be multiplied. In turn, the amount of manure, liquid manure, dung, and recently also digestate from biogas plants also increased. Besides nitrogen, phosphorus and potassium, the main nutrients, these substances contain considerable amounts of trace nutrients such as calcium or magnesium. As such, manure, liquid manure and dung are raw materials that can provide the soil with essential plant nutrients. But that's not all – they also contain organic substances that increase soil fertility and act as a food source for soil-dwelling organisms. Manure and liquid manure lead to problems when not enough area exists for cultivating crops and for absorbing the nutrients from the fertiliser and manure.

Nitrogen – from nutrient to contaminant

The poison is in the dose. At some point in time, the classic Sunday roast became the everyday meal, so the amount of livestock has increased and so has the resulting digestive waste. Agricultural fertilisers have now become a problem: too much manure on the fields can harm both humans and the environment. Too much agricultural fertiliser means that too much nitrogen and phosphorus make their way into the landscape. This nutrient surplus throws the ecosystem out of balance. Too much agricultural fertiliser pollutes groundwater, worsens air quality and decreases biodiversity (see the box entitled "Ammonia – the underestimated air pollutant"). Too much manure or digestate on the fields can accelerate climate change and damage human health[8]. For years, there has been far too many of these substances on fields, mainly where a particularly large number of animals are kept.

In 2002, as part of their sustainability strategy[9], the German Federal Government set the target of limiting the nitrogen surplus to an average of 80 kilograms of nitrogen per hectare by 2010. That would certainly represent some progress, seeing as an annual average of over 110 kilograms of nitrogen surplus could be noted on fields 100 by 100 metres in size at the end of the last millennium[10]. In 2016, the German Sustainable Development Strategy was revised once again: the nitrogen surplus should now be reduced to a five-year average of below 70 kilograms of nitrogen per hectare per year by 2030[11]. The most recent calculated surplus was 97 kilograms[12]. Several compounds can be formed

Box 1

The EU's Common Agricultural Policy – a lot of money with little impact

Hunger. A phenomenon that is practically unheard of in this country today, however one that was widespread in Europe following the Second World War. In order to increase agricultural productivity, the six members of the European Economic Community established the "Common Agricultural Policy" – abbreviated CAP – in 1957. In simple terms, the objective was to increase production, enable employees in the agricultural sector to receive an adequate income and make sufficient amounts of food available to the wider population at a reasonable price.

CAP became one of the largest items on the EU's budget: in the mid-eighties, two thirds of EU funding was being funnelled into agriculture, with this figure remaining at over one third today. In Germany, CAP funding can account for up to 50 percent of the operating income. Used reasonably, these funds may be decisive in turning the agricultural sector around.

Nowadays, the majority of these funds is allocated to farmers via area-related lump-sum direct payments based on the amount of land they cultivate – so the agricultural companies with a lot of land benefit the most from this scheme. It can also be assumed that a considerable amount of these funds is indirectly passed along to land owners via higher rent prices. The direct payments do not have any ecological steering effect. The last reform introduced greening: a portion of the direct payments (30 percent) should be used to comply with measures that serve to protect nature and the environment. However, implementing such measures is not enough to achieve the ultimate goal – the conservation of biodiversity[32]. Greening has turned out to have little impact – especially if you consider the amount of funds used for this purpose in relation to the effect they produce.

The next CAP reform will enter into force after 2020. If issues surrounding nature, animal welfare and the environment are not sufficiently integrated into the policy once again, the amount of tax money currently being funnelled into CAP can no longer be justified.

From the perspective of the UBA (German Environment Agency), there can only be one answer: public money should only be used for the provision of public goods in the future. Consequently, the objective of future CAP reforms should be to only allocate subsidies to those agricultural companies which take concrete action to protect nature and the environment. The measures they take must go above and beyond the minimum legal requirements applicable in every case and ensure that value is added to society. It should also be guaranteed that these measures are financially worthwhile for farmers in reality.

from this excess nitrogen, one being nitrate, which can leach into groundwater. A threshold value of 50mg/l of nitrate has been set for groundwater and drinking water.

Between 2012 and 2014, the average nitrate concentrations exceeded this value at 28 percent of all the German groundwater monitoring sites in the EU nitrate monitoring network. Regions with high levels of livestock density are particularly affected, such as Lower Saxony and Schleswig-Holstein, as well as those where vegetables are intensively cultivated, such as the Upper Rhine.

The Fertiliser Ordinance has been effective in Germany since 1996. This ordinance determines Codes of Good Practices for fertilisation and aims to minimise the risks associated with fertiliser usage.

Among other things, the Fertiliser Ordinance stipulates that a fertilisation process orientated towards crop demand has to be applied, meaning reduced nutrient loss to the environment. After some initial improvements in levels of nitrate measured in waters, it was not possible to note any further improvements since the 2008-2011 reporting cycle (see the 2016 nitrate report). As such, fertiliser legislation required some immediate revision. Amending the Fertiliser Ordinance and fertiliser legislation was a crucial step in the right direction. Both amendments have already been finalised. Another crucial component would be to establish a balance for the flow of materials that can be implemented in business (so-called “Hoftorbilanz”). The corresponding ordinance is currently being negotiated.

EU proceedings initiated against Germany

In 2013, the EU Commission initiated infringement proceedings against Germany, as German waters continued to be contaminated by nitrate, and in the autumn of 2015, a suit was filed with the European Court Of Justice[13]. The nitrate directive was agreed upon over 25 years ago by the Member States of the European Economic Community. Its objective: to considerably reduce the levels of nitrogen inputs from agriculture into waters. In 1996, the German Federal government implemented this directive in national law by way of the Fertiliser Ordinance. As the 2016 nitrates report demonstrates, in recent years Germany has been unsuccessful in considerably reducing the levels of nitrogen inputs into the groundwater, and as such also the pollution thereof.

We have been aware that we have a problem with nitrogen surpluses since the mid-eighties. During the existence of the GDR, the nitrate content increased fivefold and, according to food analysts from Halle and Berlin, every East German citizen was consuming an average of 150 milligrams of nitrate per day. The Leipzig Institute for Hygiene urged mothers to use mineral water rather than drinking water when preparing baby formula[14].

In Western Germany, it was the German Advisory Council on the Environment (SRU) who raised the alarm in 1985 with a special report entitled “Environmental Problems in Agriculture”[15], pointing out the serious problem posed by the excessive nitrate content. In 2015, 30 years later, the SRU published a comprehensive special report on the problem posed by nitrogen, drawing attention to the persisting serious environmental problem caused by the agricultural sector once again. Additionally, in 2009 the Stockholm Institute demonstrated that the maximum amount of nitrogen pollution the Earth is able to bear has already been exceeded[16]. German fertiliser legislation was only revised due to the pressure applied by the aforementioned infringement proceedings. The provisions for the agricultural sector will become stricter and monitoring options will be improved. These are steps in the right direction, however the path to an environmental friendly nutrient management within the agricultural industry is long. There are three options available in order to really deal with this problem. Firstly, the amount of livestock can be reduced. Secondly, animals reared in Germany can be spread out more evenly across the land - and this can be made a requirement for receiving agricultural subsidies. Finally, agricultural fertiliser can be distributed more evenly across the land. The last two options will be costly in terms of time and money.

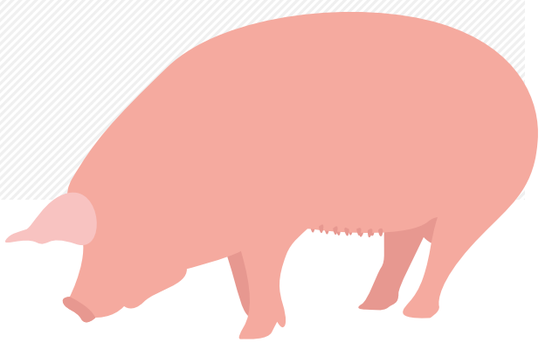
Box 2

Altrenogest – a hormone used as project management software

In order to optimise piglet production, the hormonal compound altrenogest is the current agent of choice for farmers. The hormone ensures that sows’ sexual cycles are synchronised. This means: all female pigs in the same pen area have their piglets at the same time. And the advantage for farmers? They can accurately plan when and how many piglets will be born, when the piglets will be sold for fattening and when the pen can be cleaned. Business procedures are no longer left up to nature, rather they are managed by an artificial sex hormone. This means more piglets are born with less expenditure for personnel and lower total costs.

Using such a sex hormone is legal, and it results in traces of the hormone leaching into our waters via animal waste and pig manure. The German Environment Agency has discovered that even very low concentrations of the hormone can have implications for the environment. Laboratory studies demonstrated that even the lowest concentrations of just a few picograms per litre (one billionth of a gram) drastically reduce fertilisation rates in fish eggs and any fish larvae hatched have a significantly lower chance of survival.

The German Environment Agency has established that altrenogest poses an “unacceptable risk to the environment”[33]. However, the EU commission has continued to approve altrenogest based on the counsel received from the European Medicines Agency (EMA), as according to the EMA there is no economical alternative and the overall benefit/risk assessment was considered positive.



Most pesticides don’t just affect pests, but they are also poisonous for many other plants and animals.

Pesticides – chemistry in the landscape

Nitrogen pollution is not the only problem resulting from agriculture. The large amount of pesticides used on fields is also a serious issue. According to calculations by the German Environment Agency, approximately 8.8 kilograms of pesticides are used per hectare in the Federal Republic of Germany each year[17].

The German Federal Office of Consumer Protection and Food Safety records the amount of pesticides sold each year: in 2015, 50,683 tons of herbicides, 35,472 tons of fungicides (including bactericides and virucides) and 5,007 tons of insecticides (including acaricides and pheromones) were sold. Molluscicides and rodenticides (used to combat snails and rodents respectively), among others, are also included in the total figure, which comes to 123,203 tons of pesticides sold[18].

So the substances used to protect potatoes and other crops are in fact harmful for the environment. Generally, such substances don’t work in a very specific manner, meaning insecticides, though intended to target pests for crops, also affect other “innocent” insects, such as bees, butterflies or beetles. As such, this is also a problem as insects are a very important source of food for other animals, such as birds. And what’s more, they play an extremely important role as pollinators. If insecticides harm populations of non-target organisms, this means that it’s not only the insects themselves that are at risk, but also the ecosystem as a whole. And if herbicides eradicate everything on the field that isn’t a crop, insects lose their basic sources of food – ultimately meaning that this kind of pesticide has the same consequences for the ecosystem as the use of insecticide. As such, the use of pesticides makes significant contributions to depleting the biodiversity of wild plants and animals in the agricultural landscape. And what’s more, groundwater is also contaminated: some substances used in pesticides, such as bentazone or mecoprop, but above all so-called non-relevant metabolites contained in pesticides, are being detected more often in ground water in quantities exceeding the threshold or guide value.

In 2009, the EU passed the sustainable use directive[19] as a means to counteract this undesirable development. The directive was intended to be implemented in order to make the use of pesticides more environmentally friendly. The German Federal government implemented this directive in their "National Action Plan on Sustainable Use of Plant Protection Products", and with limited success, as the UBA stated in their "5-point Programme for Sustainable Plant Protection" at the beginning of 2016[20]: farmers used just as many chemical substances in 2014 as they did back in 2008.

As such, it is necessary to make significant amendments, at least in the forthcoming revised version of the action plan. The use of pesticides must be minimised in order to protect nature and the environment and so politics is urged to take suitable action. The potential threat posed by pesticides is known, therefore it is a legal requirement to assess the risk they pose to the environment before they receive approval. However, this assessment process still does not account for all potential repercussions, meaning that implications for the amphibian, reptile and pollinator populations, for example, are not currently assessed to a sufficient extent[21]. It is also important to consider risk management when paving the way for sustainability. The most effective method for avoiding environmental risks is to also avoid using pesticides, action which can be taken in certain areas at least. As such, it should be prohibited to use pesticides in private gardens, public parks, nature conservation areas, and, where possible, also in protected drinking water zones. In areas where it is not possible to do without pesticides, and as such direct implications of their usage are to be expected, ecological compensation areas could be used to compensate for these implications, as well as any indirect consequences for biodiversity. However, current agricultural policy requirements and instruments are insufficient in terms of counteracting the effects on biodiversity.

Organic farming

conserves resources and is particularly environmentally friendly

In order to achieve this objective, economic factors should be included in regulatory law. One possibility is to implement a plant protection fee, reducing the use of pesticides by means of a financial incentive and replacing high-risk pesticides with substances that are less high-risk. The revenue earned from this incentive could be used for providing agricultural businesses with more in-depth guidance. Examples can be seen in Denmark, France and Sweden, where such schemes are already in place.

Exemplary in many ways: organic farming

Introducing a fee for the usage of pesticides may be a cost advantage for organic farming, for example, a sector of agriculture which forgoes chemically synthesised pesticides and fertilisers and which endeavours to use closed nutrient cycles . As such, organic farming conserves resources and is particularly environmentally friendly. However, organic farmers have a lower yield in comparison to those working in conventional agriculture on the same field space, meaning bioproducts are generally more expensive than other food products.

In 2002, the German Federal Government set the objective of having the proportion of farmland used for organic agriculture to amount to 20 percent by 2010[22]. However, this proportion amounted to just 6.3 percent in 2015[23]. In 2016, the German Federal Government maintained the 20 percent target in the Sustainable Development Strategy, however without setting a deadline for achieving this goal[24]. If the proportion of farmland used for organic farming continues to increase at the same rate as it did in the years before 2016, this 20% target will first be achieved in 2070.

At the same time, Germany also has the largest market for organic food in Europe and in 2014 the sector made a turnover of 7.91 billion euros[25], with this increasing to 9.48 billion in 2016. However, it has long since been impossible to satisfy the demand solely with organic products made in Germany. The German Federal Ministry of Agriculture has estimated that, most recently, 24 percent of organic grain, 37 percent of organic milk and 26 percent of organically-reared pork was imported from abroad. Yet this goes against one of the usual advantages posed by organic farming, namely that of keeping business regional and in doing so ensuring that added value is generated in rural areas and that there is more proximity to the customer[26].

A further advantage of organic farming is that it both preserves and generates practical knowledge of how modern agriculture can function without chemically synthesised pesticides and fertilisers. As long as market prices for agricultural products do not correspond to the ecological truth, organic food products have a clear competitive disadvantage.

Why cheap often means expensive

We pay for our food three times: once in the form of tax reductions and funding awarded to the agricultural sector (see textbox 1). A second time for the compensation of the damage done to our environment as a result of agricultural processes. And we then pay a third time when we buy our food at the till in store.

Agriculture causes environmental damage which incurs high costs for society. Generally speaking, the agricultural and food production sectors do not bear these costs themselves, rather they are passed on and borne by society. One example is that of water supply: around 70 percent of our drinking water comes from groundwater and if levels of nitrate pollution in groundwater are not lowered, water companies have to take countermeasures. These companies have been taking preventative measures, whereby they cooperate with farmers or acquire areas of land, cultivating these areas in such a way that conserves water, or even reforesting them. In addition, they can blend untreated water polluted with nitrate with untreated, unpolluted water, as well as deepen or relocate wells. These measures currently incur additional costs for drinking water customers, and if these measures prove to be insufficient to abide by the threshold value, the only last resort available to water companies is the technical process of drinking water purification – and this is expensive. According to a study conducted by the UBA, nitrate purification procedures cost between 55-76 cent/m^3 on average[27]. That means: in certain regions, the price of drinking water could increase by anything from a third to almost half (32 – 45 percent). In this instance, it falls to water customers to bear the costs of a flawed agricultural policy. There are also many other areas in which the agricultural sector creates costs which society must bear – the costs of climate change, as well as the costs incurred as a result of the loss of biodiversity.

On the other hand, agriculture can also be very beneficial to society, going above and beyond the mere production of food, such as preserving a pleasant landscape – what would the Allgäu be without its pastures, for example? Agricultural policy could reward farmers for having such positive impacts by way of appropriate, goal-oriented subsidies.

In order to make competition fair, the sectors of agriculture and food production must bear the environmental costs for the damage they caused, and farmers should receive the appropriate reward for rendering services which have a positive impact on the environment. Foodstuff which has been produced in such a way that is particularly harmful to the environment would then become more expensive. At the same time, costs resulting from damage to the environment would decrease and the tax money used for agricultural subsidies would be implemented in a more worthwhile manner.

Agriculture: both contributes to and is affected by climate change

Agriculture is the main contributor of methane and nitrous oxide emissions in Germany. Ruminants such as cattle, sheep and goats produce large quantities of methane during digestion, a gas that is 25 times more harmful to the climate than carbon dioxide. Nitrous oxide emissions (N_20) occur as a result of fertilisation, among other things, and are mostly produced on fields which have been heavily utilized. This is due to the fact that nitrogen which is applied on the field at the wrong time, or in quantities that are too large, is not fully absorbed by agricultural crops, rather it is converted into nitrous oxide. Nitrous oxide is around 300 times more harmful to the climate than carbon dioxide.

At first glance, the trend for emissions in the German agricultural sector appears to be positive: as of 1990, greenhouse gas emissions resulting from agriculture dropped from around 78 to 67 million tons of CO_2 equivalent (CO_2e) (valid: 2014).

Nitrate in groundwater

The price of drinking water could increase, reaching €134 per year for families of 4 in extreme cases.

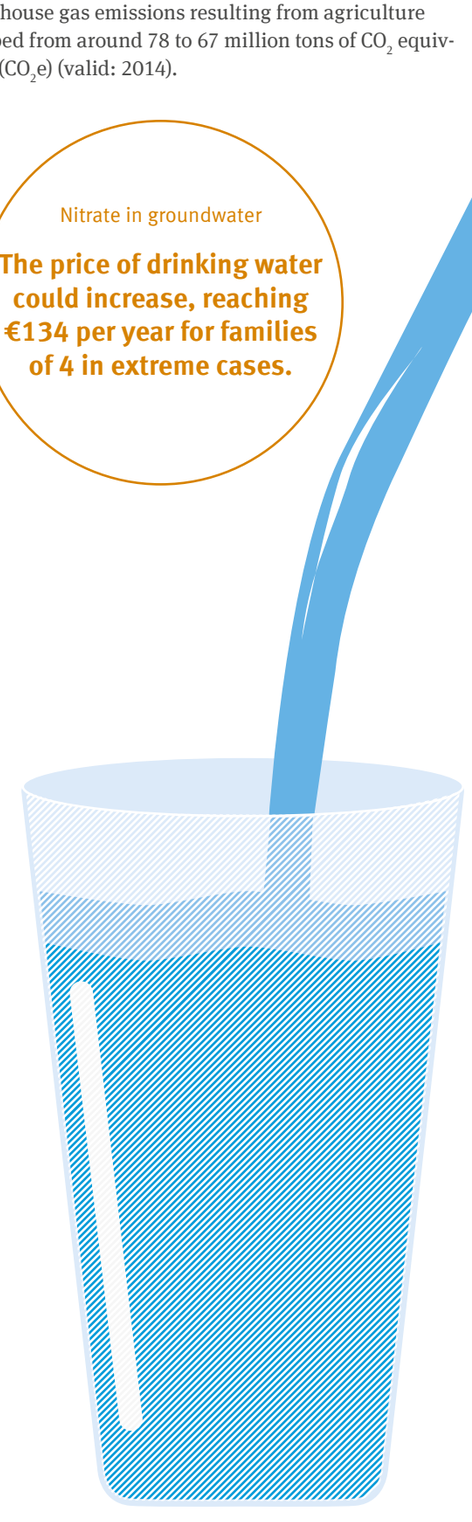
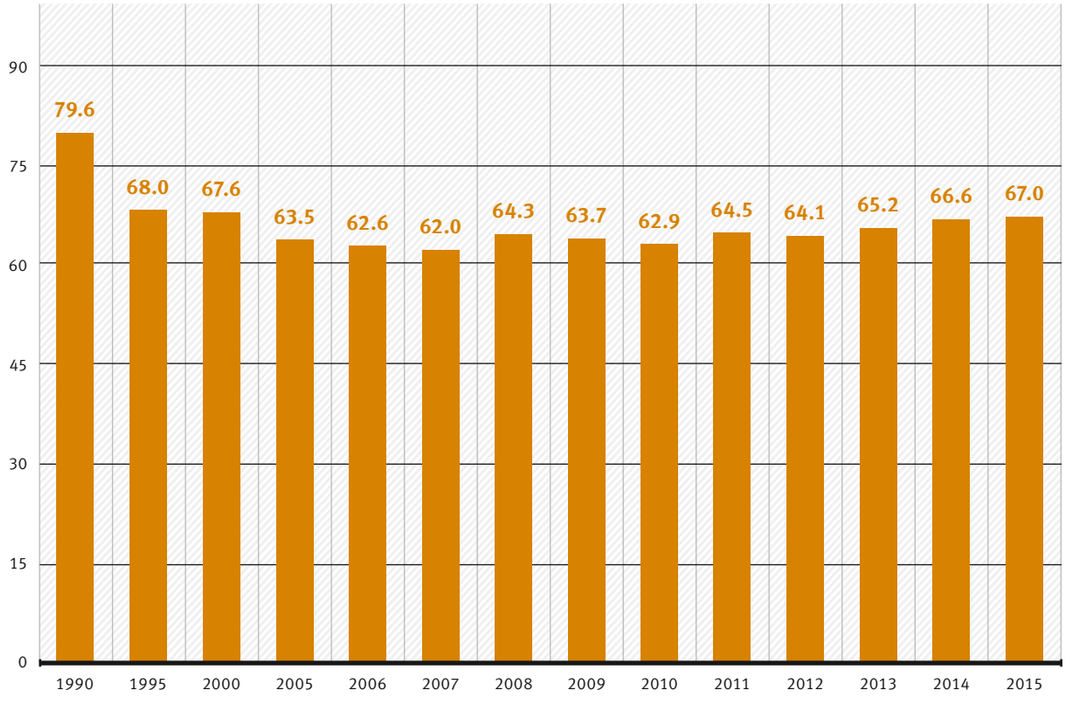


Figure 2

Greenhouse gas emissions in millions of tons of CO_2 equivalent



Source: German Environment Agency, 2016

The main reason is that there are significantly less livestock, and as such less slurry and farmyard manure – a result of the transformation of agricultural structures in the new Federal states. Furthermore, lesser quantities of synthetic nitrogen fertilisers were being applied onto fields. However, emissions have hardly been reduced any further since 1991, after this one-off effect. Nowadays, the agricultural sector achieves values similar to those achieved in the early and mid-1990s and is, all in all, responsible for producing 7.4 percent of all greenhouse gas emissions in Germany. This figure does not include other emissions that are produced when draining and intensively cultivating peatland, or when producing synthetic fertilisers, for example.

On the other hand, agriculture is also a sector affected by climate change. Current forecasts predict that summers will become hotter and drier, meaning rainfall would be lacking during the main growing season.

Despite current environmental problems in the agricultural sector, as well as those problems potentially becoming worse as time goes on, a change in current trends is not in sight. In fact, agricultural greenhouse gas emissions have actually increased by 4.8 million tons of CO_2 equivalent since 2007. As such, the sector supersedes industry as the second largest producer of greenhouse gas emissions in Germany, behind the energy sector. In order to achieve the climate change mitigation objective by 2050, that is to say in order to reduce the total amount of emissions by 80 to 95 percent, action needs to be taken in the agricultural sector. Technological innovations present only limited possibilities in terms of reducing greenhouse gas emissions effectively. For this to be achieved, rather structural changes are required: nitrogen surpluses need to be significantly reduced, livestock numbers, ruminants in particular, need to be cut and carbon rich soils should be protected.

Changing trends in agriculture means also changing trends in both politics and consumption

30 years after the special report entitled “Environmental Problems in Agriculture”, the German Environment Agency has taken stock: “to sum up, it can be established that the situation in terms of environmental and nature conservation products, such as biodiversity, landscape, soil and climate, has tended to evidence negative developments since 1985”[28]. There are more and more calls for trends in foodstuff production to change, yet no real countermeasures are being taken.

This is only partially down to the farmers themselves: for those caught in a spiral of falling prices and increased production rates, taking active measures to protect the environment is a great challenge. Within this context, it’s also important to understand: the significant damage that agriculture does to the environment takes place within the legal framework, as the minimum requirements set by agricultural regulations are inadequate, in addition to the fact that these

Vegetables have a significantly better impact on the climate than meat.

regulations have significant shortcomings. For the most part, farmers are not subject to any legal bans, nor are they bound by any regulations, when it comes to nature and soil conservation. Rather, they should follow the “codes of good agricultural practice”. In essence, those involved in politics use these principles to formulate an extensively detailed decree on environmental and nature conservation to be implemented in the agricultural sector. However, their formulation is so vague that the authorities can neither check that they are being observed nor legally enforce them. As a result, the German Advisory Council on the Environment also deems further action necessary in terms of the binding force of these “codes of good agricultural practice”. Politics is therefore required to provide farmers with a clear and effective legislative framework for protecting nature and the environment – as well as to check that this framework is being observed[30].

However, it’s also down to consumers that changes in trends in agriculture are still a long time coming: who concerns themselves with the problem of nitrate when they’re standing before the meat counter? In this country, 60 percent of arable land is used to produce animal feed, rather than being put to much more efficient use to produce food which goes directly to humans? The bottom line is that agriculture policies are proving to be costly.

Subsidies in the amount of five billion euros being granted via EU direct payments[31], major environmental damage and the existential crisis of many agricultural companies all illustrate that agriculture policies have reached a deadlock and need to be reformed urgently. In the future, we need an agricultural policy that brings farmers’ best interests in line with goals for

Box 3

Ammonia – the underestimated air pollutant

The agricultural sector releases large quantities of ammonia into the atmosphere, even more than it does with nitrate. This poisonous nitrogen compound directly harms plants via their leaf organs, whilst also indirectly harming the ecosystem through the processes of eutrophication and acidification. Numerous compounds containing nitrogen can form out of ammonia; if particulates are formed, this may lead to cardiovascular and respiratory illnesses, and if nitrous oxide is formed, this can exacerbate global warming.

In Germany, around 95 percent of the atmospheric pollutant ammonia is produced in the agricultural sector, predominantly from cattle farming (38 percent), pig farming (17 percent) and poultry farming (8 percent)[34], as well as from the application of mineral fertilisers (20 percent) and digestate (8 percent). Five percent comes from industry and traffic. At the end of 2016, following a period of negotiations spanning across years, the EU institutes agreed upon the “Directive on the reduction of national emissions of certain atmospheric pollutants”, the NEC directive in short[35]. The directive stipulates percentage reductions in the emission of certain atmospheric pollutants for each individual member nation. As such, the amount of ammonia emitted in Germany in 2030 must be 29 percent lower than the amount emitted in 2005. However, instead of decreasing, the amount of ammonia emitted in the Federal Republic of Germany has actually increased in previous years: from 678,130 tons in 2005, to 759,000 tons in 2015[36]. As such, there’s still much more work to be done in order to meet the targets set by the EU.

Many farmers nurture the landscape and in doing so encourage biodiversity and foster a scenic landscape appearance. They should receive sufficient payment for providing such services.

both animal welfare, and nature and environment conservation. This cannot be achieved without setting any new parameters, not only for agriculture, but also for our consumption. All political instruments – regulatory law, subsidies and fees – should be adapted accordingly.

It will be a lengthy process to adjust the German agricultural sector – it will be important for farmers to build on a broad, social consensus as no agricultural business will realign its business model if they are worried that the rules of play will completely change within just a few years.

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INDOORS AND HEALTH

The quality of our indoor air
is largely up to us.

VOC

Plasticisers

Preservatives

USE MORE TIME TO SET FOOT OUT OF YOUR FRONT DOOR AND GET OUTSIDE INTO THE FRESH AIR:

As the year begins, many people resolve to get outside more – and then they go back to spending most of their time indoors. Eight hours at the office, then leisure time at home, the cinema or gym, and journeys back and forth by car or train, and then it's time to sleep once again – a normal day for many people in our part of the world. On average, we spend around 80-90 percent of our time indoors, and the majority of this is spent between our own four walls.

We spend most of our time indoors.

Indoor air quality becomes more and more important when we get so little of this proverbial 'fresh air'. Ideally, our indoor air should be "healthy" and free of any pollutants. However, the reality is often a different thing entirely.

Even if outdoor air is fresh and clean, indoor air quality can be poor. Some reasons can be building materials, furniture, fixtures, technical appliances, cleaning products, cosmetics or disinfectants: in principle, every product used indoors can emit pollutants, and sometimes for years at a time. Even we ourselves can make the air quality poor over short or long periods. If we don't open our windows and let some air in, moisture and the carbon dioxide (CO_2) we exhale may accumulate indoors. CO_2 can cause problems in schools and lecture halls, for example. In these indoor spaces, an excess of CO_2 may lead to a drop in concentration levels and – as demonstrated by various studies – also learning ability.

In fact, measuring carbon dioxide concentrations was the first method to scientifically assess the quality of indoor air. The hygienist Max von Pettenkofer established the appropriate guide value as early as the mid-1900s (see box 4).

The breathing and perspiring human as a source of air pollution – this idea should survive longer than a century. Even today, CO_2 is still used as an important indicator of poor air quality and insufficient ventilation.

Box 4

How Pettenkofer defined poor air quality

Indoor air is mainly polluted by humans themselves – Munich chemistry professor Max von Pettenkofer was convinced of this fact. In his 1858 book entitled "Ventilation in Residential Buildings" (German: "Über den Luftwechsel von Wohngebäuden") he explained his theory that air pollution can be significantly reduced by thoroughly cleaning buildings. However, residents also exhale carbon dioxide and emit substances via their skin, meaning air pollution cannot be completely avoided, according to the hygienist from Bavaria. He established an upper threshold value for adequate air quality, whereby the content of carbon dioxide in indoor air can be 0.1 percent by volume higher than in outdoor air. This corresponds to 1000 carbon dioxide molecules per 1 million air particles (parts per million, ppm). This so-called Pettenkofer value has been used as the criterion for measuring indoor air quality for many years. The value was only recently replaced by a more sophisticated classification system. Since 2008, Germany has used guideline values for carbon dioxide concentration levels which establish different classifications: "hygienically safe" (below 1000 ppm), "hygienically noticeable" (between 1000 and 2000 ppm) and "hygienically inacceptable" (above 2000 ppm)

More concrete investigations into building materials and furnishings, and their effect on indoor air quality, began later on. Due to the impact of the oil crisis, and subsequently as a result of the 2002 Energy Saving Ordinance (EnEV), Germany directed more attention towards making buildings more airtight in order to save heating energy. However, less ventilation will simultaneously lead to an accumulation of pollutants and moist air in indoor spaces. Meanwhile, people often forget to actively ventilate.

Many people complain about headaches, drowsiness, fatigue and mucous membrane irritation. These symptoms can often be associated with living environment. In 1983, the World Health Organisation grouped these symptoms under the description ‘sick building syndrome’. Scientists were subsequently able to demonstrate that employees are not able to perform as well if they work in an environment with poor air quality – a decrease in performance of between two and eight percent has been reported in various studies. During the 1980s, awareness on the indoor environment increased, a process that continues to this day: the house, and its impact on health, disease, and quality of life is taking an increasingly central role.

Geological particularities can also have an impact on indoor air quality. For example, increasing amounts of radon, the radioactive noble gas, can ascend from below ground in some regions and seep into buildings, reaching concentration levels which are of public health concern. When we inhale radon, its radioactive daughter products are deposited in our lungs where they then continue to decompose, heightening our risk of lung cancer. One example of how we can minimise the danger posed by radon is to conduct building work on the walls and floors of basements, with the aim of insulating the building against the underground.

In the field of indoor air quality, we are now able to observe a conflict of objectives between constructing energy-saving buildings on the one hand, and maintaining a good quality of indoor air on the other hand. Constructing energy-saving buildings has led to building envelopes that are more and more airtight. It is not just the matter of financial costs that has a decisive impact on the design of buildings, but also climate change mitigation calls for fossil fuels to be used as sparingly as possible, as they are still making substantial contributions to our energy supply, including the heating of buildings. In today’s society, there are low-energy houses everywhere, but it is also not a rarity to find energy-plus houses, which produce more renewable energy than residents use. These buildings are well-insulated and have very thick building envelopes. However, the Energy Saving Ordinance also states that new buildings must observe the minimum air exchange rate required for health protection.

Inhabitants can increase the pollution of indoor air quality by using cosmetic products.

When repainting old chairs, you should ideally look for products with the Blue Angel symbol.

If rooms are not sufficiently ventilated, certain substances can affect indoor air quality. Hundreds of individual chemical substances can be emitted by various materials: for example, insulation materials, wooden composites, flooring, screed, wall paint, solvent-based varnishes and adhesives. Inhabitants can even further increase indoor air pollution by using of various cleaning products or by using cosmetics which emit substances into the indoor air. Synthetically manufactured products are by no means the only sources, rather air can also be polluted by natural products, such as certain types of wood, as well as through microbiological decay and other biological processes. During these processes, it’s not only individual substances that are emitted, such as formaldehyde or ozone, but also complex substance mixtures with variable compositions.

This group of substances is called “volatile organic compounds” or VOC for short, and includes different manifestations, such as VVOC (very volatile organic compounds) or SVOC (semi-volatile organic compounds). All types of VOC are grouped together under the heading TVOC, total volatile organic compounds.

VOC concentration levels are usually low and rather harmless from a hygienic point of view. The occurrence of a high VOC concentration, however, can be associated with unpleasant odours, eye and mucous membrane irritation, rashes, headaches, exhaustion and the inability to concentrate – typical symptoms of sick building syndrome. Controlled impact studies illustrate that elevated VOC concentrations are associated with irritation symptoms and the perception of odours also increases.

Currently, the law does not stipulate any compulsory threshold values for indoor air quality, apart from for workplaces polluted due to reasons of production processes involving harzardous substances. As a way to assess indoor air quality, the German Environment Agency has devised guide values for TVOC in indoor air based on the levels needed to maintain good hygiene. They are divided into five categories, ranging from “safe” (below 300 micrograms of TVOC per cubic

Box 5

Proper ventilation and proper heating

Stale air? Bad atmosphere? It’s high time to open all your windows for a quick burst of proper ventilation to air out your house good and proper. In doing so, all the pollutants and water vapour are carried outside and fresh oxygen is brought inside, preventing mould from building up. The important thing is to make sure as much fresh air flows through the house as possible. You can do this by making sure windows located on opposite walls, as well as internal doors, are opened wide. In winter, you should air out your house several times a day for five to eight minutes at a time. In summer, you should air out your house for at least thirty minutes, ideally in the early morning, or evening when temperatures have dropped. A sudden bout of ventilation by opening all your windows is considerably more effective than keeping your windows slightly open at all times, not to mention it also saves energy costs during the cold months of the year. Virtually all of the moisture generated while bathing, showering or cooking can be removed from your house by immediately and intensively airing out your house by opening the windows. To prevent mould from growing, it’s a matter of proper heating. All rooms should be sufficiently heated as warmer air absorbs more water than cold air. Even rooms that are hardly used should never be left to cool down completely.

More information on ventilation and heating in the kitchen, bathroom and living room:

- https://www.umweltbundesamt.de/themen/gesundheit/umwelteinfluesse-auf-den-menschen/schimmel/richtig-lueften-schimmelbildung-vermeiden
- http://www.umweltbundesamt.de/publikationen/leitfaden-zur-ursachensuche-sanierung-bei

CO_2 calculator to determine the ventilation rate required:

- https://iaqip.org/?id=306

metre of air) to “inacceptable” (over 10,000 micrograms of TVOC). Certain measures are recommended to be implemented for each category (see table 1). There are also indoor air reference values for many individual VOC.

VOC concentrations play a central role in modern-day indoor air analytics and to a large extent, determine how indoor air quality is assessed. Some well-known organic air pollutants are formaldehyde (actually a VVOC) and the solvent toluene. Other indoor air pollutants are inorganic gases such as carbon monoxide (e.g. produced from smoking), nitrogen dioxide (from gas stoves and candles), as well as ozone. Dust (particles) and fibre dust (asbestos, synthetic microfibres) also play a crucial role.

By choosing low-emission products for everyday usage and by regularly airing out your house (see box 5), every single person can improve the air quality in indoor spaces. Developers can opt for low-emission building materials and in doing so set the course for better indoor air quality. However, if you move into a ready-made building, you’ll most likely have to put up with the things other people have built (see the overview on this page).

Particulates in indoor spaces can come from various sources.

Pollutants in building materials

Formaldehyde

Even if levels of pollution have significantly reduced in the past few decades, formaldehyde, a substance hazardous to health and classified as cancerogenic in 2014 (carcinogen in the category 1B), continues to seep out of wood composites and other building materials and into indoor air. In 2016, the Committee on Indoor Guide Values [Ausschuss für Innenraumrichtwerte, AIR], part of the German Environment Agency, set the precautionary value for formaldehyde as 100 micrograms of gas per cubic metre of indoor air: even if someone inhaled the substance in this concentration continually over an eighty-year period, experts would not consider the risk of cancer to be increased. However, any more exposure to the substance should be avoided.

Preservatives

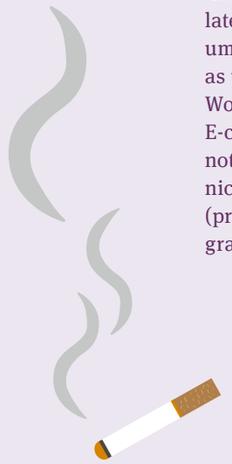
To prevent mould from potentially forming on water-based varnish and paint, preservatives are often added (such as thiazolinone). For those with sensitive skin, these substances can cause eczema. The Blue Angel eco-label provides a solution. Emulsion paints and varnishes have this label if they contain preservatives in small amounts, or not at all.

Substances which can damage hormones

Building materials can contain substances which affect hormones, in particular so-called plasticisers. They are emitted from floor coverings, handrails and furnishings and make their way into household dust and indoor air. These substances are suspected of adversely affecting hormonal development in children, among other things. The German Environment Agency recommends that, where possible, consumers should avoid synthetic materials containing plasticisers, plasticised PVC above all, and use other products made of polyethylene (PE), for example.

Asbestos

Asbestos was often used in various forms to construct buildings, due to its many practical qualities. When it was discovered that the substance was carcinogenic, Germany banned it from being used in 1993. Some long-life asbestos products are still in use today, in the form of floor coverings or roofing panels, but also as components in grouts and plasters that have been overlooked. Such firmly bonded asbestos fibres do not pose a threat as long as the products containing them are kept intact and unprocessed. The main risk of asbestos fibres being released and making their way into indoor air is when refurbishments take place. In 2017, the German Environment Agency become involved in a national dialogue on asbestos in order to address this “new” kind of asbestos problem.



Pollutants in everyday products

Products used in everyday life, such as cleaning agents, cosmetics or even technical appliances can have a significant impact on indoor air quality. The good news: to a large extent, each individual can decide whether they expose themselves to any health risks. Those who opt for non-hazardous products have already taken a major step towards improving indoor air quality. We have singled out a few examples below from the many possibilities:

Disinfectants

New products are continuously being brought to the market, and consumers are eager to get their hands on them: household disinfectants are enjoying increasing popularity. In terms of basic hygiene, these products tend to be superfluous and also undesirable. Using them may mean that your health and the environment are damaged due to the chemicals contained. Furthermore, studies have verified that allergies appear more often in households that frequently use disinfectants.

Ethanol fireplaces

Fireplaces operated with bioethanol are used simply for decorative purposes and are becoming more and more popular in Germany. Even though manufacturers promise complete fuel combustion, this is unfortunately not the case: fireplaces do not just emit carbon dioxide and water vapour into indoor spaces, but also carcinogenic substances such as formaldehyde and benzene. Therefore, the German Environment Agency strongly advises against the use of ethanol fireplaces.[2]

Tobacco products and e-cigarettes

Tobacco smoke contains over four thousand chemical compounds, including a multitude of substances which have been categorised as carcinogenic. Besides particulates, these substances also include pollutants such as benzene, arsenic and cadmium. Even non-smokers in the same room are exposed to these harmful substances as they inhale the tobacco smoke in the indoor air, known as passive smoking. The World Health Organisation classifies passive smoking as carcinogenic for humans. E-cigarettes, by contrast, seem harmless according to advertisements. Yet that is not entirely correct. The most notable risk factor posed by e-cigarettes is the added nicotine. Health risks can also arise from other ingredients in the vaporising fluid (propylene glycol, glycerol) and from the added pharmacological substances, fragrances and flavouring agents.

Table 1

Guide values for total volatile organic compounds (TVOC) in indoor air

Category	Concentration range [mg TVOC/m³]	Hygienic assessment
1	≤ 0.3 mg/m³	Hygienically safe
2	› 0.3 - 1 mg/m³	Still hygienically safe as long as individual substances, or substance groups, do not exceed the reference value
3	› 1 - 3 mg/m³	Hygienically perceptible
4	› 3 - 10 mg/m³	Hygienically risky
5	› 10 mg/m³	Hygienically inacceptable

Source: German Environment Agency, 2007.

Assessing indoor air quality

What effects do these various levels of indoor air pollution have on your health? This question is being addressed by the German Committee on Indoor Guide Values (AIR, see box 6).

Specialists at the AIR have deduced indoor air reference values for a variety of chemical compounds. These reference values can be used to assess whether pollutant concentration levels have reached safe, or unsafe, values in each individual case.

Threshold values for indoor air quality in houses, schools or offices are deliberately not used. Indoor air pollution can originate from a manifold of sources and can have a wealth of causes which, for their part, are subject to various legal regulations that can hardly be grouped together – from the Chemicals Act to the Detergents Regulation and all the way to the Biocidal Products Act. There have been increasing calls for a regulation of indoor air quality by means of a law act dubbed “Technical Instruction” (TI), similar to existing Technical Instructions on Outdoor Air Quality or the Federal Emissions Control Act. However, since indoor spaces represent predominantly private areas, it is difficult to negotiate such a legal act due to the protection of privacy guaranteed by the Federal constitution.

AIR guide values are not legally binding in nature, yet they still have a considerable influence when a health-related evaluation of indoor pollutant levels is required. The same goes for health-related evaluations for indoor air pollutants which the committee publishes intermittently.

Box 6

AIR – for a better quality of air

The German Committee on Indoor Guide Values (AIR) is made up of Federal and state specialists. The office is managed by the German Environment Agency. After compiling scientific evidence based on toxicological investigations, the AIR proposed indoor guide values for a range of substances that are harmful to health. Guide value I (RW I) is used if the indoor air concentration levels of a substance reach or come below the value, yet there are no effects on health even after lifelong exposure (precautionary value). RW II corresponds to the value that, if exceeded, requires immediate action to be taken in order to minimise indoor air pollution (intervention value). In the area between RW I and RW II, action needs to be taken either in the short or long term, and the kind of action required may vary. The guide values can be used to assess whether certain pollutant concentration levels reach or may reach unsafe values in each individual case. The list of all indoor guide values can be found on the UBA website.

Rooms with many occupants

Poor air quality often arises in rooms with a lot of occupants - in playschools and nurseries, schools, secondary schools and other educational institutes, for example, as well as in restaurants or transport-related buildings, such as train stations or airports. The indoor climate is mainly polluted by the accumulation of carbon dioxide, high value of air moisture, emissions from building products and furnishings, as well as cleaning agents. Humans themselves contribute to polluting the air with VOC by using cosmetics (e.g. deodorants). What’s more, combustion sources such as candles also release dust and particles into the air.

Regular ventilation is recommended in any case. Before lessons begin at school, as well as during every break, the “Guidelines for Indoor Air Hygiene in School Buildings” issued by the German Environment Agency recommend that windows should be opened wide. Brief periods of sudden proper ventilation are also recommended during lessons. Unfortunately, this is often forgotten, or simply not implemented, during the school day due to loud traffic or bad weather out-

Movement helps to combat tiredness during school hours – opening the windows at the same time also makes sure the necessary fresh air gets into the classroom.

side. However, ventilation is always important, as otherwise large amounts of CO_2 will inevitably accumulate indoors (see figure 3).

In certain cases, ventilating the school classroom by opening the windows may not be sufficient and additional support is required through the implementation of ventilation systems. UBA is currently compiling a guide to detail when and where this may be useful.

Assessing and approving building products

Individuals often only have a limited influence over indoor air quality at school or in the workplace. However, there's greater flexibility within your own four walls – especially if you can make your own decisions on the materials used during construction or renovation, as well as on when to air out the rooms. Future inhabitants hope that building materials contain as little harmful substances as possible, and for years they were able to rely on many different types of products.

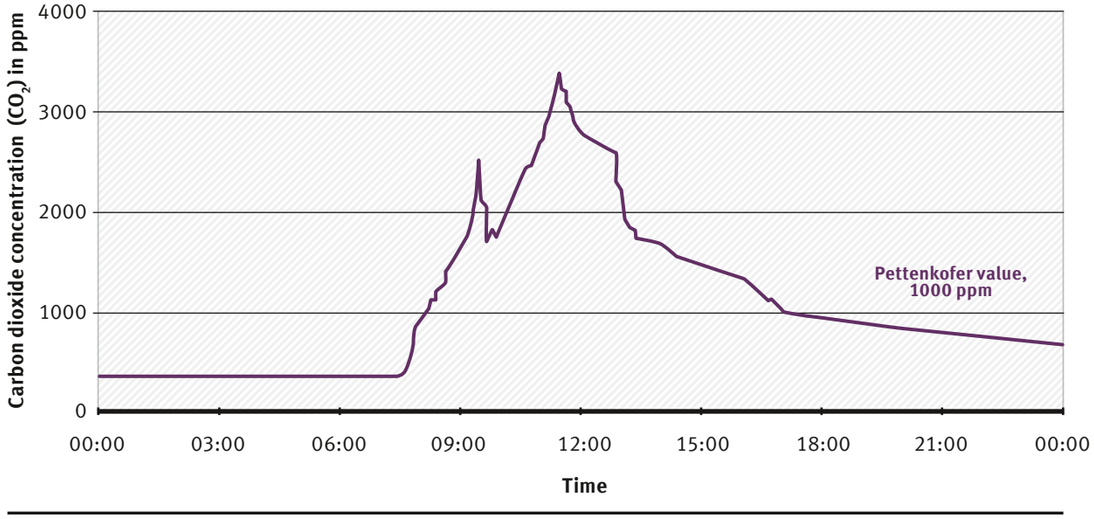
Building materials, or building products liable to emitting pollutants into indoor air had to pass a series of rigorous tests before they could be technically approved by the Deutsches Institut für Bautechnik [German Institute for Structural Engineering]. In Germany, the testing and assessment system devised by the Committee for Health-Related Evaluation of Building Products (AgBB) has been used as a general basis for all types of building constructions. The state health authorities, Conference of Building Ministers, German Environment Agency and German Institute for Structural Engineering are all members of this committee, among other federal authorities. The industry remained, at first, sceptical about the AgBB test system. Yet, over the years the work of the AgBB has received increasing respect, and manufacturers were ultimately able to prove to customers that their building product would meet the requirements with regard to avoiding adverse health effects. Building products that were launched on the market after having been approved by the AgBB often bore an "Ü" symbol ("Ü" stands for Übereinstimmung – English: conformity).

However, this high degree of protection implemented in Germany is at risk due to a judgement made by the European Court of Justice (case C-100/13 from the 16/10/2014) which aims to break down market barriers and ban nation-specific additional requirements for harmonised European building product standards. Germany has been required to modify its Federal Building Law; the negotiations with the EU commission regarding this topic have not yet been concluded.

Meanwhile, many players in the construction industry, as well as planners, tradesmen and developers, are lamenting the resulting gap in protection. Politics has been called upon to act in order to make staying indoors as healthy an activity as possible in the future. The German Environment Agency is actively advocating this objective and is involved in initiatives in order to improve the legal situation (see the interview on pg. 32).

Figure 3

Exemplary evolution of CO_2 concentrations in a primary school classroom. After lessons have started, levels of CO_2 concentration increase rapidly, reaching their peak value just before midday.



Source: Measurements taken by the German Environment Agency, 2010.

Well-known conformity labels, such as the UBA's Blue Angel, are not affected by the judgement of the European Court of Justice. In the construction sector, the Blue Angel will be awarded according to the AgBB quality criteria and provides a guarantee for low-emission products that do not contain harmful pollutants. Private labels such as the GUT symbol, or natureplus, are also a good point of orientation. Informative quality labels, such as the EU eco-label 'EU Flower', can also be found on numerous everyday products, from technical appliances to cleaning agents.

Box 7

Mould growth in indoor spaces

Mould can grow indoors due to high moisture levels. This can lead to health problems for residents, such as respiratory diseases and asthma. However, excessive moisture levels can be avoided if buildings are constructed properly, as well as through proper ventilation and heating (see box 5). You can find the current information about preventing, analysing and cleaning up mould in the guidelines on mould, as well as on the website:

› https://www.umweltbundesamt.de/themen/gesundheit/umwelteinfluesse-auf-den-menschen/schimmel

Mould in houses can lead to health problems

”
There is a gap in protection

Dr. Plehn, the German Environment Agency is worried that the new German construction law, having been adapted to European law, puts both people and the environment at risk. Why is this the case?
It is no longer readily apparent which building products conform to the strict requirements for health and environmental protection, applicable in this country to date, and which building products do not. One concern for the future is that pollutants will only become apparent when the building has already been constructed, and residents complain. In this respect, the new construction law should not lead to unforeseeable risks for tradesmen, architects and developers and to more legal disputes and expensive renovation work.

And what should we think about the CE marking that is located on tiles, parquet floors and other building products?
The CE marking is not a quality label. It only specifies that a product was manufactured in accordance with European harmonised standards and certain technical features are declared. The CE symbol does currently not bear any significance in terms of health and environmental protection – there is a clear gap here.

How could this occur?
The reason behind this are the EU commission's aspirations to remove market barriers under European law and the judgements enacted on building product regulations. Consequently, the EU commission believes that an EU member state must use only the CE marking to signal that a building product has met its requirements. Any symbol of national approval, such as the German "Ü" marking, should be abandoned. This regulation has been applicable for most building products in Germany since October 2016.

Dr. Wolfgang Plehn Plehn is head of the area of "Substance-Related Product Issues" at the German Environment Agency.

Does health and environmental protection not play any kind of role for the EU commission?
It was stated in Brussels that, in principle, they wish to maintain the level of protection. As such, the appropriate features should now be integrated into the CE marking requirements. We estimate that this lengthy procedure will take at least five to ten years.

That's a long period – toxic substances in residential spaces could cause a lot of harm within this time.
In order to minimise this risk, the EU commission wants to introduce a simple product classification system by the end of 2017. It will be an A-B-C style system, whereby building materials suitable for use in playschools will be categorised with A, and products suitable for warehouses with C. But of course, that is only a rough classification.

Is the German Environment Agency committed to making improvements?
Yes, on several levels. We are collaborating with the Federal states to devise a regulatory framework of technical building standards, stipulating high requirements in terms of health and environmental protection. And on an EU level, we are working together with the BMUB (Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety) to advocate transparent product labelling. It is an arduous process which involves establishing all the details concerning links between emissions from building products and indoor air quality.

What advice would you give ecologically-oriented people who want to undertake building or renovation work?
Certification marks, such as the Blue Angel awarded by the German Environment Agency, are a good point of orientation. Such labels do not fall within the scope of EU law and identify building products that comply with strict requirements for health and environmental protection. However, these labels cannot be found on every type of product. Until the scope of the CE marking is extended to cover the lacking features, product test certificates can be used as an interim solution. It is particularly important to continue to provide consumers with a selection of environmentally friendly products that are safe for use in residential buildings. The parties establishing the regulations in particular, but also product manufacturers, are required to offer solutions.

Box 8

Booklets & links

Booklet "A healthier home – but how? –Practical Everyday Tips", German Environment Agency (ed.) 2005, 63 pages, also available in English/Download: https://www.umweltbundesamt.de/publikationen/gesuender-wohnen-aber-wie

"Gesund und umweltfreundlich renovieren", Ratgeber [Renovate your property in a healthy and environmentally friendly way"], German Environment Agency 2012, 40 pages/ https://www.umweltbundesamt.de/publikationen/gesund-umweltfreundlich-renovieren

"Gesund und umweltfreundlich einrichten, Ratgeber [Guidebook "Furnish your property in a healthy and environmentally friendly way"]
German Environment Agency 2015, 28 pages/ https://www.umweltbundesamt.de/publikationen/gesund-umweltfreundlich-einrichten

"Innenraumluftqualität nach Einbau von Bauprodukten in energieeffizienten Gebäuden" ["Indoor air quality after using building products in energy efficient buildings"]
German Environment Agency 2016, 129 pages/ https://www.umweltbundesamt.de/publikationen/innenraumluftqualitaet-nach-einbauvon-bauprodukten

"Guidelines for Indoor Air Hygiene in School Buildings"
German Environment Agency 2008, 139 pages (we are currently working on new guidelines for ventilation in schools)

Links:
- The UBA biocide portal provides information on products for combatting harmful organisms – and also on alternative and preventative measures you can take: www.biozid.info
- You can find the list of indoor air guide values on the UBA website: https://www.umweltbundesamt.de/themen/gesundheit/kommissionen-arbeitsgruppen/ausschussfuer-innenraumrichtwerte-vormals-ad-hoc

Sources (a selection):

Health-related assessment of the levels of carbon dioxide in indoor air – Information provided by the Ad-hoc Working Group for Indoor Guide Values of the Indoor Air Hygiene Commission, part of the German Environment Agency and the Highest State Health Authorities: public health journal Bundesgesundheitsblatt – Gesundheitsforschung - Gesundheitsschutz 2008; https://www.umweltbundesamt.de/sites/default/files/medien/pdfs/kohlendioxid_2008.pdf

"Leitfaden zur Ursachensuche und Sanierung bei Schimmelpilzwachstum in Innenräumen" German Environment Agency 2008 (We will publish new guidelines on mould in 2017) https://www.umweltbundesamt.de/publikationen/leitfaden-zur-ursachensuchesanierung-bei

Formaldehyde: guidelines for formaldehyde in indoor air. Information provided by the Committee on Indoor Guide Values, 2016 public health journal Bundesgesundheitsblatt / http://www.umweltbundesamt.de/sites/default/files/medien/360/dokumente/fa_rw.pdf

1 **Conflict of objectives between undertaking energy-saving construction work and maintaining a good quality of indoor air** – data capture for volatile organic compounds in indoor air in residential and office buildings (solutions), Arbeitsgemeinschaft ökologischer Forschungsinstitute e.V (AGÖF) on behalf of the German Environment Agency, 2014. http://www.agoef.de/forschung/fue-datenerhebung.html

National asbestos dialogue: http://www.bmas.de/DE/Presse/Meldungen/2016/asbestdialog.html

Plasticisers: https://www.umweltbundesamt.de/themen/gesundheit/umwelteinfluesse-auf-den-menschen/chemische-stoffe/weichmacher

Ethanol fireplaces:
2 https://www.umweltbundesamt.de/sites/default/files/medien/360/dokumente/telegramm_04-2016_ethanoloefen-endv.pdf

Laser printers:
https://www.umweltbundesamt.de/themen/laserdrucker-kaufen-dann-aber-emissionsarm

Tobacco smoke:
http://www.umweltbundesamt.de/sites/default/files/medien/pdfs/Ausgabe01-2009.pdf

E-cigarettes:
http://www.umweltbundesamt.de/sites/default/files/medien/2218/publikationen/umid_1_2016_bfr_e-zigarette.pdf

3 **Committee on Indoor Guide Values (AIR):** https://www.umweltbundesamt.de/themen/gesundheit/kommissionen-arbeitsgruppen/ausschuss-fuer-innenraumrichtwerte-vormals-ad-hoc

Options for legal regulations on indoor air pollution – do we need Technical Instructions on indoor air quality?, Umweltbundesamt 2006 / http://www.umweltbundesamt.de/sites/default/files/medien/pdfs/TA-Innenraum.pdf

Sources for box 4:
Birgit Müller; Jana Panašková; Dirk Müller; Wolfgang Horn; Oliver Jann; Ana Maria Scutaru; Wolfgang Plehn (2014): Entwicklungen der Bewertungsmethodik von Gerüchen in Innenräumen, GI - Gebäudetechnik in Wissenschaft & Praxis,vol. 135, no. 02, pg. 70-82

Literature: Max von Pettenkofer (1858): Über den Luftwechsel von Wohngebäuden, Cottasche Buchhandlung, Munich

Sources for box 5:
- Websites specified
- Ventilation periods: it is possible to save energy in buildings and maintain good indoor air quality. Statement of the commission for "Indoor Air Hygiene part of the German Environment Agency", in the 2006 public health journal *Bundesgesundheitsblatt*, 49:320-321. DOI 10.1007/s00103-006-1243-6

WHAT DOES THE PARIS AGREEMENT MEAN FOR GERMANY?

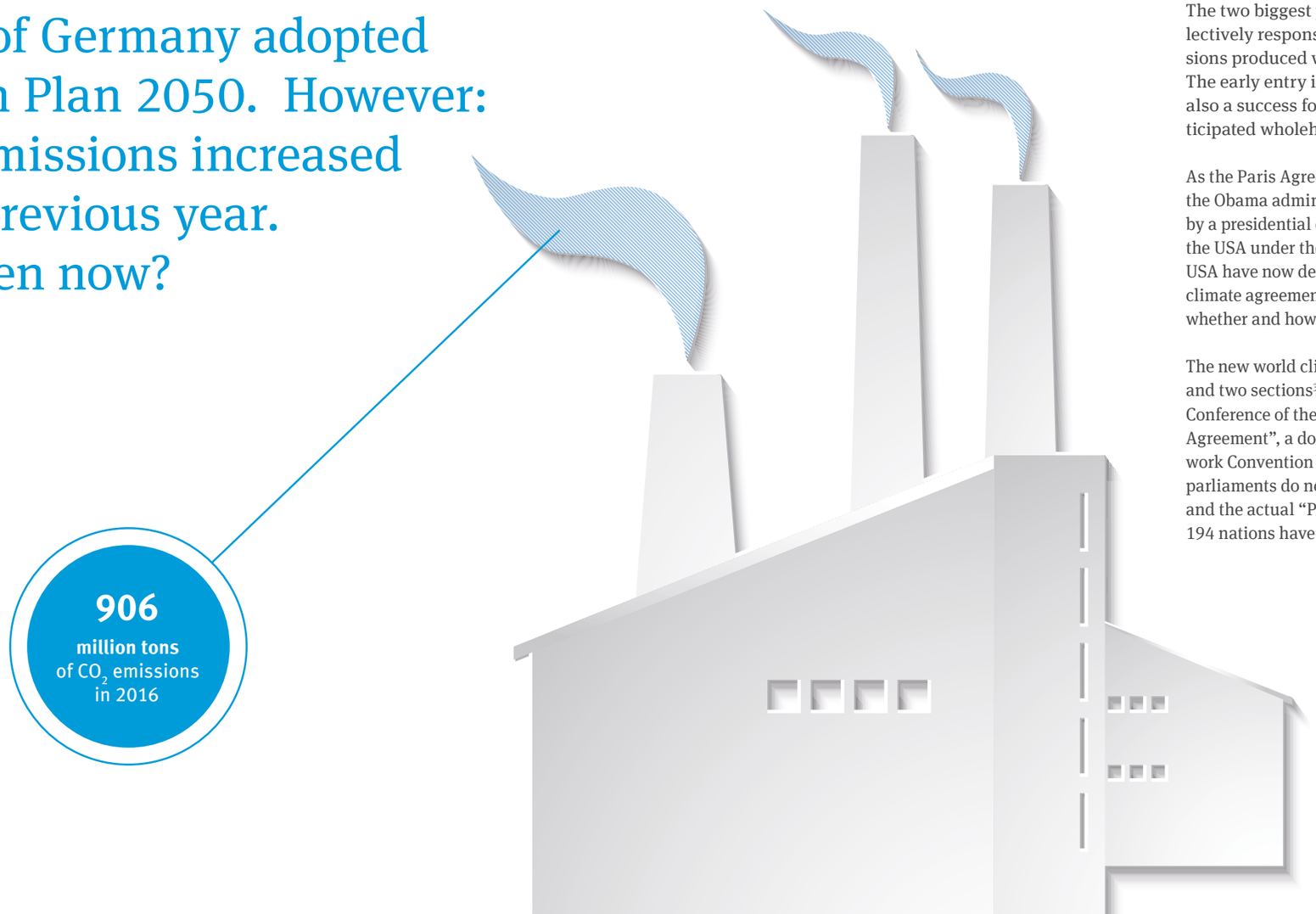
It is possible for Germany to achieve zero greenhouse gas emissions by 2050.

7 bn.
of tax exemption for kerosene per year

In 2016, greenhouse gas emissions increased in Germany once again

2016 WAS AN IMPORTANT YEAR FOR INTERNATIONAL CLIMATE PROTECTION:

The new global climate treaty entered into force. Along the same lines, the Federal Republic of Germany adopted the Climate Action Plan 2050. However: greenhouse gas emissions increased compared to the previous year. What has to happen now?



906
million tons
of CO_2 emissions
in 2016

In this case, it went surprisingly fast: on the 4th November 2016, the "Paris Agreement" on worldwide climate change mitigation entered into force on an international scale, and exceeded all expectations, the first reason being that it entails the necessary objectives: global warming should be kept to well below two degree Celsius, supplemented by the commitment to strive to stop global warming at 1.5 degrees Celsius. Secondly, the agreement implies that the world should stop using coal, gas and oil in the second half of this century when a "balance between anthropogenic emissions by sources and removal of such gases by sinks" has to be achieved. An example of these so-called sinks are newly planted wooded areas to store carbon. Thirdly, financial flows should be in accordance with low greenhouse emissions and climate resilient development. As such, the Paris Agreement aims to provide poor nations improved opportunities to develop, as well as assistance in coping with the effects of climate change.

The "Paris Agreement" was decided upon by climate change diplomates during the World Climate Conference which took place in France's capital in December 2015. After that, the Agreement had to be ratified by national parliaments. For the agreement to enter into force, and become binding under international law, a double threshold had to be reached: 55 nations had to submit their national instrument of ratification to the UN. But that was not enough: these 55 nations had to collectively cause at least 55 percent of the greenhouse gases emitted worldwide.

There was a similar kind of 55-55 quorum for the Kyoto Protocol, the forerunner to the Paris Agreement. At that time, it took eight years until, finally, the 55-55 quorum was achieved in February 2005[1] and the protocol could enter into force.

Diplomatic intuition led to success

Analysts suspected that it would also be a matter of a similarly arduous ratification process for the Paris Agreement, because the articles in the agreement leave some room for interpretation. In the case of the Kyoto Protocol, yearlong renegotiations were necessary to make this room for manoeuvre smaller. However, this time, the administration of US president Barack Obama, together with his Chinese counterpart Xi Jinping, stepped up the pace from the very start. The two biggest producers of greenhouse gases – collectively responsible for almost 40 percent of emissions produced worldwide[2] – were actually united. The early entry into force of the Paris Agreement was also a success for Germany and the EU, who had participated wholeheartedly in diplomatic discussions.

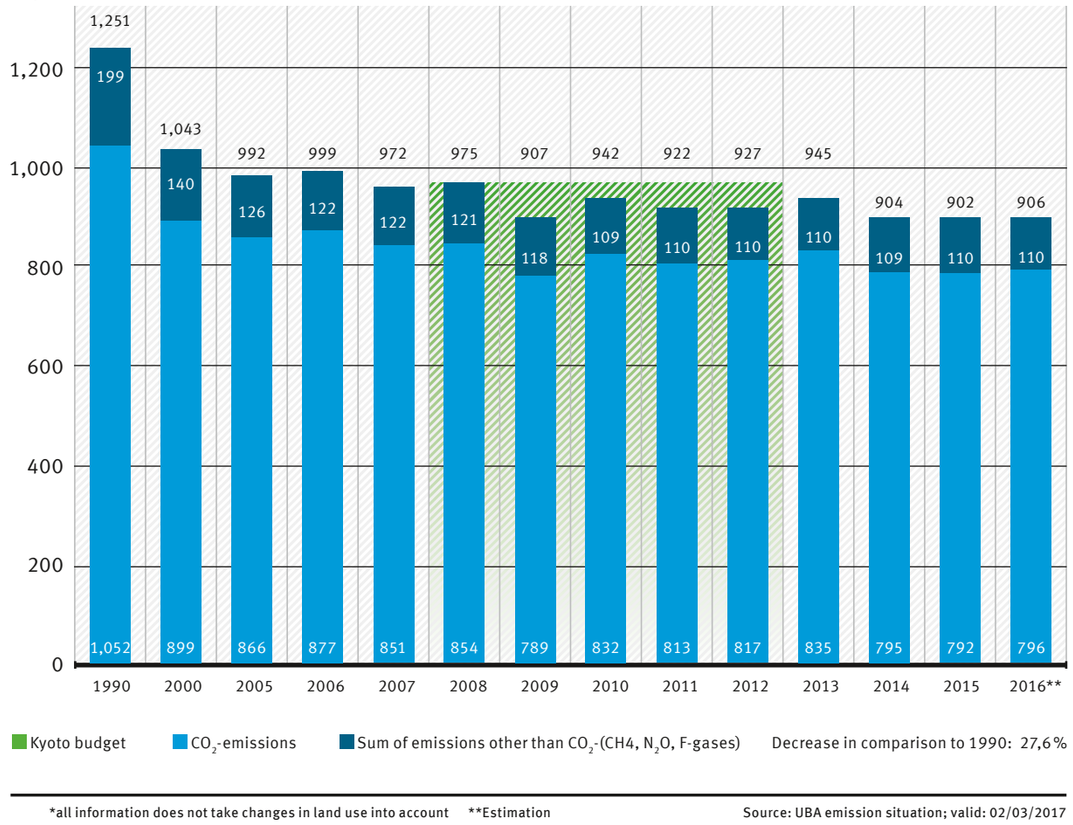
As the Paris Agreement had been cleverly negotiated, the Obama administration was able to swiftly ratify it by a presidential decree. Thus, it remains applicable for the USA under their new president, Donald Trump. The USA have now declared their wish to withdraw from the climate agreement, but this has to first be implemented – whether and how that happens remains to be seen.

The new world climate agreement consists of 32 pages and two sections[3]: the 20-page resolution of the 21st Conference of the Parties "1/CP.21 – Adoption of the Paris Agreement", a document established under the Framework Convention on Climate Change and which national parliaments do not have to implement in national law, and the actual "Paris Agreement", which 148 out of the 194 nations have ratified to date[4] (valid: 28/06/2017).

Thawing permafrost soil is considered a tipping point in climate research.

Figure 4

Greenhouse gas emissions in Germany from 1990 to 2016 in millions of tons of CO_2 equivalent*



*all information does not take changes in land use into account **Estimation Source: UBA emission situation; valid: 02/03/2017

The danger posed by tipping points

For the first time the Agreement includes the objective to hold "the increase in the global average temperature to well below 2 degrees Celsius above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels". A turning point in climate diplomacy: to date, the 2-degree limit was a gage for political action.

Insights provided by climate research into so-called tipping points demonstrate why it is so important to limit the amount by which the temperature is increasing, even when it comes to just half a degree less; after these points have taken place, the consequences of climate change would become incalculable and sometimes irreversible.

The Earth's climate system is very complex and is influenced by many processes which, in turn, influence each other. Both global and local wind systems depend on air and water temperatures, which in turn affect the amount of rainfall across the entire globe. The ice on both the North and South poles also controls the weather in the rest of the world. If parts of these systems experience great change due to human activity, it may mean that they no longer function – they tip. And these changes cannot be reversed. As such, when this occurs, it is called a "tipping point".

One example are the permafrost soils in Siberia and North America: almost one quarter of the Earth's land mass is permanently frozen and stores twice as much carbon below ground as is contained in today's atmosphere[5]. If this frost thaws, carbon will be released as a greenhouse gas, without humanity being able to do anything to stop it. If this were the case, a self-accelerating climate change process would be set into motion, a process which could not be undone.

The permafrost soil, the Amazon rainforest, the ice on the Arctic ocean, the summer monsoons in India and the ice sheet in Greenland – scientists have identified 16 such tipping points in the global climate system. When one of these points in fact tips, it is very probable that this will adversely affect another important element in the climate system. The problem: there is no guarantee that only with an increase in global temperature of more than 2 degrees Celsius these points will threaten to tip. In order to have more assurance that certain tipping points will not be surpassed, it is necessary to limit global warming to 1.5 degrees Celsius.

Therefore, since the climate conference took place in Copenhagen in 2009, the "Alliance of Small Island States" (AOSIS) has been trying to put this 1.5 degrees upper limit on the agenda of negotiations as a political objective. At the same time, the "Climate Vulnerable Forum" (CVF) was established, with 48 countries who are most at risk from global warming joining forces over the course of its existence[7]. These countries also pushed for an upper limit of 1.5 degrees during UN negotiations. It was no longer possible to stop the change in paradigms as the Europeans also expressed their support for the 1.5-degree upper limit at the climate conference in Paris.

Efforts are insufficient

In order to stop the global average temperature from increasing, almost zero emissions must be achieved on a global scale. This means that all countries must play their part. In the run-up to the Paris climate conference, almost every nation submitted their Intended Nationally Determined Contributions – INDCs – for the first time.

This represents historical progress, as, before now, only industrial countries had committed themselves to reducing greenhouse gas emissions under the Kyoto protocol. However, due to global economic growth, the former developing nations will soon produce more greenhouse gases than the old industrial nations.

However, the commitments laid on the table by the states are nowhere near sufficient. Para. 17 of the decision text states that the current INDCs "will result in emissions amounting to 55 billion tons of CO_2 equivalents in 2030". As such, not even the 2-degree limit would be achieved. In order for that to be the case, emissions would need to be under 42 billion tons of CO_2 equivalents in 2030[8]. In comparison: the international community produced approximately 52.7 billion tons of greenhouse gases in 2014[9]. Specifying concrete figures from forecasted emissions is unprecedented in the climate diplomacy and in doing so it makes the global situation clear, highlighting that current efforts are not enough.

This part of the new agreement is specified in the decision text of the 21st Conference of the Parties, that part that did not have to be implemented in national law. As such, the question arises: how can we succeed in making nations do more to mitigate climate change? A special report produced by the Intergovernmental Panel on Climate Change will present the current state of knowledge regarding the impacts of global warming of 1.5 degrees above pre-industrial levels before the 2018 climate conference. Potential global emissions pathways to strengthen the global response to climate change will also be detailed in the report. The report is eagerly awaited, as limiting the increase in global warming to well below 2 degrees is already a challenge in itself.

Germany's objectives for climate change mitigation

The current objective of the German Federal government is to reduce greenhouse gas emissions to 750 million tons of CO_2 equivalents by 2020, in comparison to 1990. This corresponds to a 40 percent decrease in comparison to the emissions produced in 1990. According to estimations made by the German Environment Agency for the year 2016, the current level lies at 27.6 percent below the level produced in 1990. However, the worrying thing about these figures is that the greenhouse gas emissions produced by Germany in 2016 actually increased compared to the previous year, rather than significantly decreasing in the direction of the target level, as before[10]. Even without performing any mathematical calculations it is obvious that Germany has to significantly improve its efforts to mitigate climate change in order to comply with its national obligation.

The 'handbook' for achieving the 2020 objective is the German Federal Government's "Climate Action Programme 2020". Decided upon in December 2014, the action specified in this handbook should result in an additional 62 to 78 million ton reduction in greenhouse gases. "In doing so, we are showing that we are not only setting ourselves targets, but we are also meeting them," explained Barbara Hendricks, German Minister of the Environment for the SPD (Social Democratic Party of Germany), following the cabinet's decision[11].

The programme comprises over 100 individual points of action. 25 to 30 million tons of greenhouse gases should be saved through improved energy efficiency alone, according to this programme. In addition, the National Energy Efficiency Action Plan (NAPE)[12], among other plans of action, was decided upon, in which EU directive 2012/27/EU13 was also implemented: Brussels obliges their member states to increase their energy efficiency and to decrease their final energy consumption by 1.5 percent each year.

The energy industry should contribute 22 million tons of CO_2 equivalents, as such some of the oldest and most inefficient coal-fired power plants should be shut down and placed in so-called "safety reserve" for a period of four years. The transport sector should contribute to the action programme by saving 7 to 10 million tons of CO_2 equivalents, whilst action should also be taken to reduce emissions unrelated to energy in the sectors of industry, trade, commerce, service provisions and waste management (3 to 7.7 million tons), as well as in the agricultural sector (around 3.6 million tons).

Coal combustion has one of the largest potentials for reducing CO_2 emissions.

Emissions levels are at a standstill

"Almost 70 percent of the points of action specified in the action programme have now been fully implemented," according to the "2016 Climate Action Report" issued by the German Federal government[14]. Nevertheless, as occurred previously, emissions produced in Germany have slightly increased in recent times[15]. Emissions produced in the transport sector in 2016 are even higher than those produced in 1990. By way of explanation, it is plausible that the action implemented has not produced its effects immediately, however, additional political instruments, or reinforced points of action compared to what is currently being implemented, are required in order to achieve the minus 40 percent objective by 2020.

For this purpose, the German Environment Agency (UBA) has compiled an entire range of recommendations. Whilst it is hardly possible to significantly reduce emissions produced in the transport and construction sectors within a short period of time, the same cannot be said for the energy industry, a sector which is responsible for over a third of the emissions produced in Germany. As such, the UBA have identified a point worthy of special attention in climate change policy.

According to the German Environment Agency, the energy industry should reduce their emissions to 274 million tons of greenhouse gases by 2020, corresponding to 60 percent of the level produced in 1990[16]. However, the emissions produced by the sector are currently just 25.5 percent below the level produced in 1990 – that is to say, 347 million tons[17]. As such, the energy industry has the greatest technical and economic potential for reducing emissions: In no other economic sector could it be simpler to replace production technology which produces high amounts of greenhouse gases with technology that produces low amounts of emissions, or even none whatsoever. That is why the German Environment Agency proposes that the energy industry should now reduce its emissions by a significantly higher amount than all other sectors[18].

Above all, companies generating power by using fossil fuels have a key role to play in achieving this: if each sector has to reduce their emissions by 22 million tons, as specified in the "Climate Action Programme 2020" and no changes are made, the contribution made by energy industry to achieving the climate target would be proportionally less than the contributions made by other sectors – the sector in which it is easiest to cut back greenhouse gas emissions would only reduce their emissions by 36.6 percent compared to 1990. Consequently, the German Environment Agency proposes a certain order for the fossil fuel phase-out. For example, all lignite or coal-fired power stations which have been in existence for 40 years or more could be gradually shut down. This would also be a promising strategy for 2030: the installed capacity of lignite-fired power stations would decrease by 55 percent, with that of the coal-fired power stations reducing by 60 percent compared to 2015[19].

Box 9

The Kigali agreement on phasing out HFCs

2016 saw the international community decide upon the world climate agreement, however it was also the year in which they resolved to significantly reduce the use of gases particularly harmful to the climate, in other words, a group of partially fluorinated hydrocarbons (HFCs) that are up to 14,800 times more harmful to the climate than carbon dioxide. In October, the contracting states of the Montreal Protocol agreed to extend the agreement to include these substances during a meeting in Kigali, the Rwandan capital.

In 1987, the members of the United Nations met in the Canadian city of Montreal and agreed to not to use chlorofluorocarbons (CFCs) anymore in order to protect the ozone layer. Scientists first warned against the effects of these substances on the environment in 1974 and since the beginning of the 1980s, it has been clear that CFCs are forming a hole in the ozone layer and as a result, the basis of our existence is put at significant risk due to increased UV radiation. However, just like the issue of global warming, these findings were not taken seriously to begin with and were then questioned by both sceptics and the industrial sector.

CFCS were used in refrigerators as a low-cost cooling agent. At that time, the industrial sector explained that there was no alternative. However, in 1993, Greenpeace, the organisation for environmental protection, developed the first CFC-free refrigerator in the world together with Foron, the East German fridge manufacturer from Niederschmiedeberg, a district located in the Erzgebirge region. The cooling agent used was a propane-butane compound.

Even though Foron technology was being used more and more in the manufacture of refrigerators, HFCs were being used as a CFC replacement in other cooling appliances (air conditioning systems, supermarket refrigeration systems etc.), namely the cooling agent tetrafluoroethane, known as refrigerant R-134a. Such HFCs proved to be extremely potent greenhouse gases and a yearlong debate ensued regarding their usage. This usage only ceased following the Kigali agreement, and even then not immediately: the industrial countries have to reduce their HFC emissions by 10 percent by 2019, and by 85 percent by 2036 compared with the average quantity used between 2011 and 2013. Most developing countries, including China, have to start curbing their usage of these substances from 2024 and they have until 2045 to achieve a reduction of 85 percent. And then there are still a group of hardliners who pushed for even longer transitional periods during negotiations. India, Iran, Iraq, Pakistan and the Gulf States only have to start restricting their HFC usage in 2028. The Kigali agreement should prevent around 65 billion tons of CO_2 equivalents from HFC emissions from being released across the globe before 2050.

Implementing these points of action as soon as in the next few years could make additional contributions to achieving the 2020 objective.

By using the technology around today, greenhouse gas emissions produced by the energy sector can be reduced to almost zero if this sector switches to the exclusive use of renewable energy whilst simultaneously exploiting the efficiency potential[20]. Central components for having a completely regenerative energy supply are known collectively as “Power to X technologies” – that is to say the various types of technology used to store and convert power into other forms of energy, for example as propulsion energy via the “power-to liquid” process, or using “power-to-heat” technology to generate thermal energy. By weighing the benefits against the risks, the German Environment Agency also show that using cultivated biomass to generate energy, as well as nuclear energy or techniques such as carbon capture and storage, are not useful for establishing a sustainable energy system that does not emit additional greenhouse gases.

Taxpayers are subsidising the damage being done to the atmosphere

According to a report conducted by the German Environment Agency, the state subsidies implemented in such a way that is harmful to the environment totalled 57 billion in 2012[21]. Almost all these subsidies adversely affect climate change mitigation, “It is a paradox: on an international level, Germany commits itself to mitigating climate change. At the same time, in our own country we reward behaviour that harms the climate with the taxpayers’ money,” according to the judgement made by UBA president Maria Krautzberger. Especially the subsidies within the transport sector stand in opposition to the objectives of climate change mitigation: this sector is responsible for around 18 percent of the greenhouse gases emitted in Germany, nonetheless the political arena

subsidise it with 28.6 billion euros per year - for example, tax concessions for diesel fuel, energy tax exemption for Kerosene and distance-based allowance for commuters.

The energy industry comes just after the transport sector and is responsible for over one third of the emissions produced in the Federal Republic of Germany. An annual total of over 20 billion euros is used in subsidies for activity that is harmful to the environment within the areas of energy production and usage. For example, it costs German citizens three billion euros just to exempt the production industry and the agricultural and forestry sectors of energy tax, as well as tax on electricity. As businesses which consume high levels of electricity have so little incentive to save energy, these subsidies actually impede climate change mitigation. Even lignite – the source of energy the most harmful to the climate by a good margin - reaps considerable benefits from these subsidies. This is competitive distortion, which takes place at the expense of renewable energy and in favour of fossil fuels.

As such, it is necessary to award less subsidies that can be implemented in such a way that damages the climate. Only then can we provide economic incentives for saving energy.

The 2030 climate goal

Central components for a long-term climate change mitigation strategy should be, in order to achieve the German climate goal for 2020 and all subsequent goals before 2050, to decide upon an orderly way to stop generating energy using coal as soon as possible, as well as to reduce the subsidies awarded for activity that is harmful to the environment.

The “Paris Agreement” comes into play once again in terms of achieving the climate goal set for 2030: the new world climate agreement incorporates a so-called “lifting mechanism”. This is spread out across various paragraphs and functions as follows: the collective effort

Subsidies harmful to the environment: 57 billion in total, 53 billion of which harms our climates

18.78 billion
energy provision and use

e.g.
2.7 billion
The EEG’s special equalisation scheme for businesses and railways that consume high amounts of electricity

28.6 billion in the transport sector

e.g.
7 billion
Energy tax exemption for Kerosene

over 7 billion
Tax concessions for diesel

5.75 billion
Agriculture and forestry

The transport sector has virtually been unable to reduce their greenhouse gas emissions since 1990.

specified in the INDCs – the national climate plans of the countries involved in the UN Framework Convention on Climate Change - will be reviewed for the first time in 2018. This should encourage countries to improve their self-imposed contributions to climate change mitigation for 2020. The agreement specifies that every nation should set new objectives every five years and that these objectives should become increasingly more challenging. As of 2023, the international situation will be reviewed every five years as part of the UN climate process. This review will include an evaluation of the efforts being made in the areas of adjustment and support, as well as of how financial flows are organised, and it should attract a lot of political attention as a means of demonstrating the necessity of accelerating the process of reducing greenhouse gas emissions. It also serves as a starting point for formulating new objectives for the following period; initially lasting from 2026 to 2030.

By implementing the 2050 Climate Change Mitigation Plan, the German Federal government is well on the way to decarbonising Germany by the middle of the century. For this purpose, they set interim targets to reduce greenhouse gases: minus 40 percent by 2020, minus 55 percent by 2030, minus 70 percent by 2040 and minus 80 to 95 percent by 2050. Despite all the political compromises made during negotiations, one thing remained in the 2050 Climate Change Mitigation Plan: concrete targets for reducing emissions specific to each sector, that, when taken as a whole, guarantee that the national climate change mitigation goal of minus 55 percent can be achieved by 2030. For this purpose, an action programme is due to be created in 2018 as concrete action is required for targets to be achieved. This must then be readjusted if projections produced different results to the political action adopted if projections produce different results to the political action adopted.

Germany's course for climate change mitigation requires two kinds of action to be implemented on a long term basis in order for climate change goals to be achieved: a revolution in the energy industry and all other sectors that influence climate change (transport, industry, agriculture, construction), as well as a lifestyle transformation.

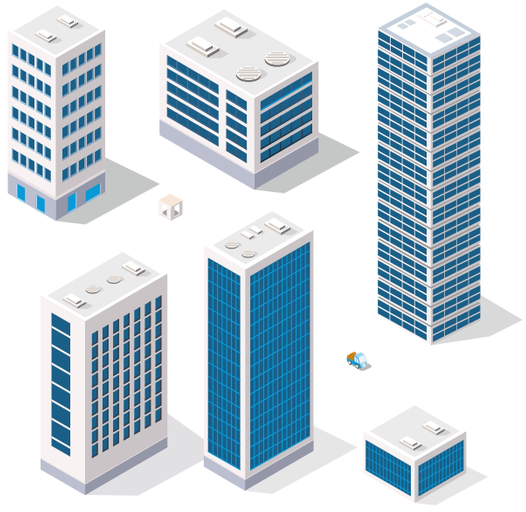
Instead of accelerating the development of renewable energy, it was resolved that developments within the framework of calls for tenders would be capped. This leads to less developments. The German government missed their self-imposed development objective of 2,400 to 2,600 megawatts by a significant amount in 2016 for the third year in a row due to a considerable reduction in the allowances given to the photovoltaics industry[23]. After 1,890 megawatts in 2014 and 1,460 megawatts in 2015, only 1,530 megawatts of power from solar energy power plants was connected to the grid in the previous year. Only the wind energy sector expanded in line with objectives and an average of 4,000 megawatts of wind power has been connected to the grid each year – more than the government planned[24]. However, on-shore wind power is also being developed at a slower pace due to the aforementioned caps – it appears that, in light of the increasing amounts of demolitions, there is a risk that wind power could remain at a standstill for the next decade.

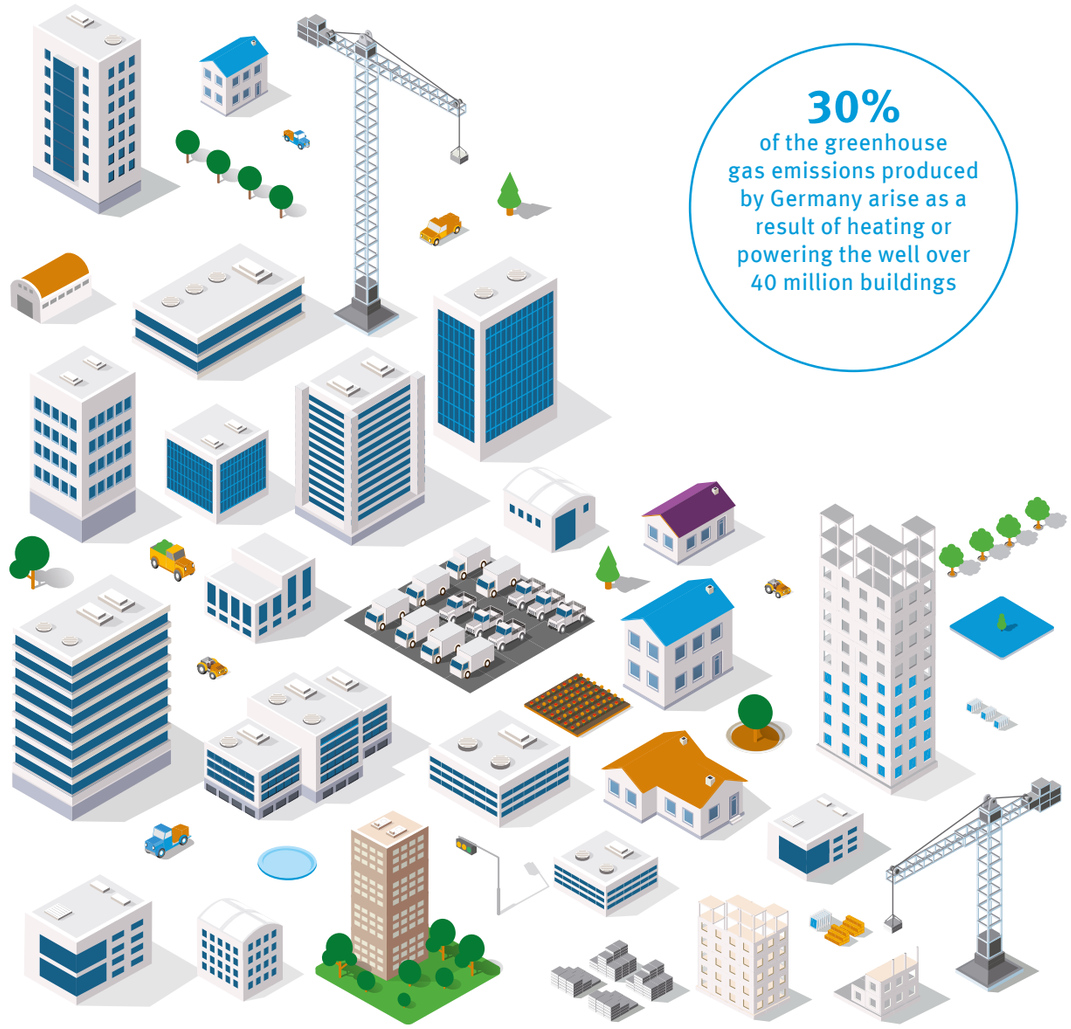
Adjust your lifestyle and finally take action

Simply restructuring our energy supply is no longer a sufficient method of achieving Germany's obligation to climate change mitigation – "minus 55 percent" by 2030, in comparison to 1990. We also have to change our lifestyles. Take the speed limit, by way of example: if the speed limit on our motorways was set at 120 kilometres per hour, CO_2 emissions produced by cars could be reduced by nine percent compared to current figures[25], corresponding to around three million tons of greenhouse gases per year – a third more than the amount produced by the Republic of Congo[26].

Within the transport sector, practically no means to mitigate climate change whatsoever have been implemented in this country. In 2015, the sector produced 163.6 million tons of greenhouse gases, meaning it was responsible for almost the same amount of emissions as in 1990[27]. There has not been any reduction in the past 25 years - yet according to the "Climate Change Mitigation Plan 2050", it is now obligatory to reduce 40 to 42 percent of the emissions produced by transport by 2030. This cannot be achieved without changing our "mobility culture".

A large amount of decarbonisation can be done within the construction sector. Around 30 percent[28] of all greenhouse gases produced by Germany are related to heating or powering the well over 40 million buildings in Germany. The German Environment Agency has performed model calculations to check whether it is possible for current buildings to become climate-neutral by 2050[29]. There are two ways for this objective to be achieved: (1) to comprehensively refurbish buildings together with (2) improving their supply of renewable energy. There is sufficient proof that it is technically possible to refurbish, as well as construct, buildings in a climate-neutral manner thanks to numerous demonstration projects. What is lacking, however, is the incentive to get this refurbishment process underway, as in actual fact the rate of buildings being refurbished to become more energy efficient has kept on falling[30] – most recent figures lie at under one percent. In order to make buildings climate-neutral by 2050, around 3 percent of all buildings in Germany must be refurbished to become more energy efficient each year. If nothing else, we can start by addressing residents, as heating performance provides significant leverage in terms of enhancing the potential for energy efficiency.





30%
of the greenhouse gas emissions produced by Germany arise as a result of heating or powering the well over 40 million buildings

We should also consider our meat intake as, within the agricultural sector, it is mainly livestock farming and manure management that contribute to global warming. Livestock farming causes large amounts of methane to be released, a gas 25 times more harmful to the climate than carbon dioxide. Ruminants such as cattle, sheep and goats produce large quantities of methane when digesting their food. Nitrous oxide emissions (N2O) are mainly produced when fields are used intensively, as a result of fertilisation. If too much nitrogen is applied on the fields, or if it is put on at the wrong time, it cannot be fully absorbed by the crops and the greenhouse keeps heating up: nitrous oxide is actually 298 times more harmful to the climate than carbon dioxide

The German agricultural sector is responsible for a total of eight percent[31] of the greenhouse gas emissions. Some main ways of reducing this figure are to also reduce the amount of livestock, to use fertiliser more sparingly and to improve the way we conserve the soil. As such, the state should stop giving out subsidies that the agricultural sector can use for activities that are harmful to the environment. Rather, they should aim to reward ecological achievements within this sector according to the "public money for public goods" principle, by promoting action taken to mitigate climate change and make agriculture more environmentally friendly. It is also of great importance to amend the EU's agricultural support scheme. The German Environment Agency also advises that the use of peat in hobby gardening should be urgently banned: peatland is crucial for storing greenhouse gases and must not be further damaged.

Cultivating pulses encourages fertile soil.

Organic farming can make even more important contributions to mitigating climate change in Germany. This kind of agriculture encourages humus enrichment by forgoing the use of mineral fertilisers and by cultivating pulses and catch crops, meaning that at the same time more carbon dioxide is stored within the soil. By switching to organic farming, 20 percent of greenhouse gas emissions could be saved, in comparison to the continued implementation of conventional agricultural methods. As such – as incorporated into the national sustainability strategy - 20 percent of agricultural land should be used for organic farming. This can be achieved not least by giving increased support to the changeover to organic agriculture.

Climate legislation is necessary

Eat less meat, make our consumption habits more sustainable, reduce greenhouse gas emissions produced by going on holiday – it's a long and rocky road to making Germany greenhouse gas neutral. The German Environment Agency deems it necessary for the German government to legally define the objective of reducing greenhouse gases. We need "German climate legislation". Despite becoming increasingly important, German climate law is spread out over many individual acts, as such it is heterogeneous and convoluted. That makes it difficult to develop the law further, as well as to locate, use or implement the individual provisions. We need climate legislation that provides a good point of orientation and concrete framework conditions for the areas of both politics and economics, as well as the general public. This legislation should fix interim targets for reduction for the years 2020, 2030 and 2040. This way, it makes it possible to check whether the political instruments in place are sufficient for realising Germany's decarbonisation project. Likewise, the framework conditions for adapting Germany to the negative effects of climate change should also be determined.

Great Britain have implemented this kind of legislation with great success since 2008[31]. Every four years, the Committee on Climate Change[32] – a board of independent experts – checks whether politics is pursuing the self-imposed objective with sufficient intent. If this is not the case, amendments are called for. In this way, the United Kingdom have already reduced their carbon dioxide emissions by 36 percent in comparison with the levels produced in 1990.

Act now

In 1991, the Federal Republic of Germany set out to be a global role model for climate change mitigation. And not without cause: at that time, reunified Germany, with a population of 82 million, was the fourth largest global emitter of greenhouse gases – behind the USA, China and Russia, which all have populations at least three and a half times as large.

As both a technological and export nation, the energy transition also offered great economic potential.

The enthusiasm surrounding the energy transition should not wane 25 years on. Germany is running the risk of losing its reputation as the pioneer. Naturally: it is inevitable for those who tread new paths to make errors along the way. There is no shame in failing to achieve an objective you have set yourself at one point in time. However, it would be disastrous for Germany, the hub of technology, to miss out on developing innovative climate-friendly products and technologies and launching these onto the market, as well as to fail to achieve the next self-imposed targets on the agenda. Our message to the rest of the world would be: German politics and German engineers are simply not up to it. This message could go hand in hand with the question: if not even Germany can successfully change their economy and their society to protect the climate, how can others achieve such a goal?

As such, it seems evident that now is the time to step up the pace and improve the efforts being made for the energy transition: anything not achieved by 2020 must be made up for as fast as possible later on so that the targets set in the Paris Agreement can be fulfilled. This is also the case from an economic perspective: the costs involved in climate change mitigation are lower than the costs incurred due to climate change. And: any action for climate change mitigation is all the more cost-effective the earlier it is taken. If we want other countries to tackle climate change with comparable levels of ambition, then we urgently need to do our homework. And only then do we have a chance of preventing tipping points from leading to disaster.

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THE GERMAN ENVIRONMENT AGENCY (UBA)

CAN ART BE USED TO SHAPE THE TRANSITION?

A wooden hut nestled amidst idyllic scenery with birds chirping in the distance. A constant stream of thick smoke can be seen rising from the chimney on the rooftop. The realisation quickly dawns on you that the fire is eating away at the wooden hut bit by bit until only the oven remains. Sparks fly into the night sky one last time. The hut burnt itself. “Self-immolation or a transformation. Can we drawn upon art and culture to escape from the climate crisis?” That was the title of a panel debate organised by the German Environment Agency (UBA) in cooperation with the Academy of Arts in Berlin in July 2016. The video work entitled “3 Ster mit Ausblick” (2002) by object and installation artists Michael Sailstorfer and Jürgen Heinert was shown during this debate.

Can art reveal new ways of looking at complex phenomena such as climate change? To what extent are societies ready for change, and as such to what extent are they oriented to the future? And can art and culture lead to a different understanding between humanity and nature? These questions, among many more, were at the heart of the debate. Art and culture cannot provide a magic formula to escape the climate crisis, nor is it their task to make societies accept climate policies. The conclusion was made, however, that art can reveal new perspectives on ways of living together in the future. It may also be possible for art to shed light on matters – we could learn how to perceive the climate beyond the abstractness and complexity of climate research.

The art of Ólafur Elíasson can be regarded as a school for mindful and reflective viewing. The Danish-Icelandic concept artist is an established name in the art world and he is renowned for his spectacular installations. He made a gigantic representation of the sun rise in a British museum and built breath-taking waterfalls along the East River of New York with his colleagues. During the climate conference in Paris, Elíasson created a clock face out of twelve large blocks of ice, entitled “Ice Watch”, in the middle of a square using glacial ice from Greenland. Whilst representatives from 195 nations were in the middle of arduous discussions over a new climate agreement, people could visit the art installation, press their ear to the ice and hear a quiet cracking noise. This noise was generated by air pockets, formed thousands of years ago, escaping from the melting ice. And that’s what climate change sounds like, so the artists’ message seems to be.

Picture on page 50/ picture on the left
Ólafur Elíasson: Ice Watch, 2014, 12 ice blocks, Place du Panthéon, Paris, 2015 / Photo: Martin Argyroglo, © Olafur Eliasson

Picture on the right
Michael Sailstorfer / Jürgen Heinert: 3 Ster mit Ausblick, 2002, Video still / © Siegfried Wameser

Social change in practice

For all intents and purposes, art and culture could become allies of environmental politics when it's a matter of reflecting on the challenges currently faced by society and discovering ways forward. As beyond presentation and representation, art is essentially the practice of reflection, and as such can be understood as an agent of social change. It can inspire people to look at certain practices and conceptions in the world from a critical point of view and call them into question. Art can create and spread images of change, creating scope for experimentation that can, for example, also inspire people to develop or change their lifestyle so it is accepted by the planets' limitations and so that it does not put the future of the next generations in jeopardy.

The German Council for Sustainable Development concerned themselves with the question of how art and culture could be significant to the concept of sustainable development as early as 2002. In a publication issued by the Council, they stated that, to date, "the issue of sustainability is scaled down in environment programmes (...) and it is misunderstood as a primarily technical concept", "during discussions, experts for technical and sectoral solutions" dominate and it was argued in favour of broadening the "debates on ecology and sustainability to include aesthetics, values, culture and lifestyle, meaning the discourse becomes social"[1]. According to the recommendation of the German Council for Sustainable Development, the topics of art, culture and aesthetics should play a bigger part in general discussions on sustainability, as the sustainable development model requires a fundamental review of current standards, values and practices in all areas of society and as such is a cultural challenge[2]. This aspect is also touched upon in the German sustainability strategy[3]. All the same, implementing the concept of culture into the idea of sustainable development is still in its first stages.

In recent times, artists and cultural professionals have occasionally addressed such questions. Some examples are the two-year "Anthropocene Project" by the Haus der Kulturen der Welt (HKW) in Berlin, the project entitled "Über Lebenskunst. Initiative for Culture and Sustainability" by the German Federal Cultural Foundation in collaboration with the HKW, as well as the focus on "Klima-Kunst-Kultur" by the Goethe Institute. Nevertheless, art and culture have only played a minor role in the debate on sustainability so far, with policies on sustainability concentrating far too little on subjects, topics, processes and concepts from the fields of art and culture.

Is it possible for art and culture to advance our transition and create a sustainable and future-oriented society? What's more, can ecological issues become a part of artistic practices and cultural-political concepts? The Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB) and the UBA would like to instigate dialogue both between artistic practice and cultural politics, as well as between science and sustainability politics, by way of a research project. The aim of this project, entitled "Fresh Perspectives – Surprising Insights – Positive Prospects: Culture and Sustainability Politics in Dialogue", is to test out new ways of communicating about the culture of sustainability within the scope of the objectives set by the German sustainability strategy and the UN "2030 Agenda for Sustainable Development", as well as to illustrate the links between cultural discourse and sustainability politics. As part of the projects which began in spring 2017, a grant for artists in residence will be put to the test (visual arts, literature and music), expert discussions will be organised and partnerships with institutions from the areas of culture, science and education will be formed and fostered. The work results and experiences from the three-year project will be incorporated into a thematic exhibition with an accompanying programme, as well as published for public reading.

For a long time, environmental conservation has been regarded as a part of natural, legal and technical sciences. However, without society's acceptance and without the participation and cooperation of the general public, it will prove difficult for environmental conservation to achieve any kind of results. In terms of raising people's awareness, what kinds of ecological issues can we expect to be raised by the topics of art and culture? Last but not least, and over and above what has already been stated, perhaps these topics can also give us a feel of how fragile and how beautiful our world really is.

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PUBLICATIONS BY UBA STAFF

Many of the staff members who work at the German Environment Agency publish the findings of their research and technical work: as papers in scientific journals, as individual publications, by doing presentations or by contributing to a congress.

These publications are stored centrally in the Agency's specialist library for environmental documents and archived on a long-term basis via the online public access catalogue (OPAC) http://doku.uba.de or via the environmental discovery system (EDS) http://www.uba-eds.de. They can be viewed by any interested parties.

Each year, the library creates a 'list of publications by UBA staff' from the reported articles. This list is not complete. It only includes the titles registered in the library for the respective reporting year.

A total of 442 titles written by UBA employees were registered in the library for 2016 – 28 more than the previous year.

The current list can be found:
› on the UBA website: www.uba.de
› on information from the library
› via a direct link on the following page: www.uba.de/mitarbeiterveroeffentlichungen

The list from previous years can be found here:
http://www.umweltbundesamt.de/das-uba/fachbibliothek-umwelt

THE UBA AS A DESIRABLE EMPLOYER

Work at the UBA: it’s more than just a job.

According to a survey completed by our employees: over 85 percent of our employees like working at UBA, around 80 percent would recommend the UBA as an employer. This shows: work at UBA appears to be more than just a job.

“For our environment” – our mission to protect the natural environment and health of the people makes the UBA a point of interest for many dedicated individuals, especially as working at the UBA combines performing scientific research in cooperation with other disciplines, discussing and shaping politics, as well as informing the public, on both a national and international scale. In Germany, the UBA is an important player, having partners from the areas of politics and, of course, science, as well as from various organisations, businesses and environmental associations. Within the scope of its globalisation strategy, the Agency provides expertise within Europe, as well as in other regions across the world.

As such, the UBA has all the good prerequisites for being a desirable employer. However, it takes more than just exciting and interesting tasks for staff to stay with the company in the long term: a cooperative working environment and good working conditions are on many employees’ wish lists. And the agency does everything to ensure that this is the case.

The UBA fosters a culture of respect, interdisciplinary collaboration, open professional discourse, critical thinking and trust in staff and their capabilities.

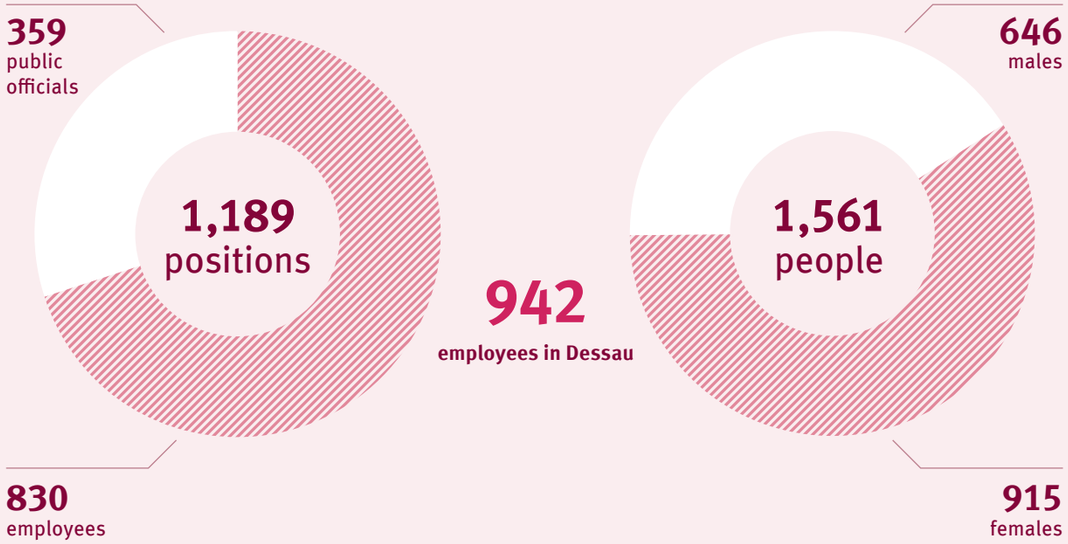
The health of their employees is extremely important to the UBA, as it lies at the core of good performance, and as such, also the agency’s success. Everything in terms of occupational safety and health protection is covered by corporate health management: making sure the workplace is arranged in such a way that is beneficial to health, as well as organising events and training sessions to help employees cope with stress in the workplace and stay healthy. Furthermore, the following also come under the heading of health management: opportunities with the company sports group, the reintegration of those employees who have been on long-term sick leave, welfare counselling, as well as the standard health services, such as health days which deal with topics such as movement, nutrition and stress.

In order to know what UBA employees need, or what they’re missing, they complete a survey on their health and happiness in the workplace every four years. An annual “satisfaction index” also allows any necessary short-term readjustments to be made to ensure employees are happy.

The UBA in numbers

UBA budget

		Amount debited in 2015 in thousands of euros	Amount debited in 2016 in thousands of euros
1.1	**Total expenditure**	**123,349**	**121,608**
	Personnel costs	77,973	80,874
	Capital spending	3,660	4,009
	Administrative expenses for (among other things)	41,686	36,685
	› Scientific publications and documents	409	409
	› Information and documentation system (UMPLIS - environmental planning and information system)	5,282	5,436
	› Information technology (IT)	6,946	6,792
1.2	**Assignments undertaken for the German Federal authorities and third parties**	**1,252**	**2,130**
2.	**Funds carried over from other chapters for the management of (among other things)**		
	Investments made to reduce environmental pollution	3	0
	Assigning and managing research projects (department research plan, environment section)	33,400	35,500
	Assigning and managing research projects (department research plan, nature conservation section)	376	332
	Assigning and managing energy research projects (on behalf of the German Federal Ministry of Economics)	0	240
	Environmental Specimen Bank	4,214	4,031
	Subsidies given to associations, organisations and other groups		
	› Institutional funding	1,410	3,643
	› Project funding	6,809	4,399
	Action taken to raise awareness	838	980
	Advice on environmental conservation in nations located in Central and Eastern Europe, as well as new independent states (NIS)	2,490	2,500
	International collaborations	867	812
	Sum of the total funds carried over from other chapters for management purposes	**253,775**	**296,681**



Finding a work-life balance has a positive impact on an employee's state of health and motivation to work. Highly flexible working hours and locations, flexible working times for service hours as arranged within the team, the possibility to work part-time, remote working and teleworking: these are just some of the options available to our employees, which they use with pleasure and hold in high regard.

As one of the first German Federal authorities, the UBA established teleworking in the nineties – that is to say, working from home. Our employees can do this for up to 50 percent of their working hours. Nowadays, the process of digitalisation is rapidly advancing, meaning working hours and locations are becoming even more flexible, and by using electronic documents, we're on the way to a paper-free office; it is possible to work from almost anywhere and as such, teleworking can become even more flexible.

There are also other measures which make it possible to achieve that work-life balance: parent-child office areas on all our premises, family afternoons, child holiday programmes, places at day care facilities at our Dessau-Roßlau offices, and even a free of charge family support service which employees can use to find out more about child care, as well as caring for relatives. In 2016, for the aforementioned activities, as well as others, the berufundfamilie Service GmbH (formerly the non-profit Hertie Foundation) awarded the UBA with a certification to recognise them as a family-friendly employer for the fourth time in a row following their "berufundfamilie" (work and family) audit.

Yet again in 2016, the UBA also received the "Total E-Quality" award for the second time for setting an example in terms of gender equality, achieving a work-life balance, as well as gender mainstreaming. After having received the "Total E-Quality" award, UBA can show their employees that they can progress in their career, as well as achieve a work-life balance which suits them, regardless of gender.

The agency do not just consider aspects of gender mainstreaming in terms of staff development, but also in the development of the organisation and technical scientific work. At the moment, the UBA are working to develop a diversity strategy oriented towards gender equality.

The UBA provides unique support and assistance for people with disabilities – they will find a respectful workplace environment at the UBA. The current office building, located in Dessau, is an 100 percent accessible model construction and makes the interests and the objectives of the UBA clear.

In terms of their gender equality plan, the UBA aims to fill 45 percent of their management positions with women by the end of 2019. The percentage of women in management positions has increased: from 28.7 percent in 2011 to a current figure of 37 percent. It is particularly noteworthy that half of the management roles at the top managerial levels – agency management - are occupied by women at the UBA. The objective is to draw closer to this figure at other managerial levels.

The UBA fosters their employees' development in their various stages of life and they offer a multitude of different personal development services, ranging from training in various vocational professions to a junior management development programme, mentoring and coaching and all the way to conflict management. These services are available to all employees.

The UBA is an agency with high scientific standards, as such it is very important for them to continuously train their employees and they offer specialist training courses which can be selected as required by the unit of work. Furthermore, the UBA also fosters employees' skills in non-technical domains: communicative competences, stress and conflict management, intercultural skill sets and much more. This is all tailored towards the needs of the individual employee as much as possible. Employees can also gain knowledge by shadowing other members of staff in order to improve and reflect on their own work.

Through diverse expert activities, employees have the opportunity to broaden their own experience by spending time abroad. The agency also has options for those scientists who want to complete a PhD, opportunities which will be expanded in the coming years.

The UBA attaches particular importance to good leadership and highly-qualified managerial staff. Regular dialogue between managers and other members of staff contributes to their professional and personal development.

Therefore, the UBA offers a special programme, besides the mandatory managerial training courses: the summer academy. Throughout the summer months, every manager can undertake the necessary important training session in a compact form.

Naturally, the UBA would like specialists to pass their knowledge on to others and as such they encourage staff to take up teaching positions at secondary schools, or other educational institutions. This ultimately helps to people to keep in touch with science.

80 percent of UBA employees would recommend the UBA as an employer.

PROJECTS FUNDED BY THIRD PARTIES 2015

BMG – Bundesministerium für Gesundheit | German Federal Ministry of Health		615,957.00 €
FG II 3.3	Chromium in raw water – Treatment of raw water contaminated with chromium for the public supply of drinking water	2015 – 2017
FG II 3.4	Migration of plastic additives	2015 – 2017
FG II 3.5	Legionella in the drinking water installation – Analysis of drinking water tests and epidemiological case-control study	2015 – 2019
FG III 3.1	BMG WHO – Collaborating Centre for Research on Drinking Water Hygiene	Annual

BMBF – Bundesministerium für Bildung und Forschung | German Federal Ministry of Education and Research		301,431.80 €
FG II 1.2	GeUmGe – Gender, environment and health	2015 – 2016
FG II 1.4	River hygiene – Hygienically relevant microorganisms and pathogens in multifunctional waters and water cycle	2015 – 2018
FG II 1.6	UKAGEP – Analysis and evaluation of social and economic connections/ investigation of connections between environmental factors and health parameters	2015 – 2020
FG II 3.3	INIS/KURAS – Urban rain-water management concepts for sewage systems, sub-project 11	2013 – 2015
FG II 3.3	Pathotrack – Pilot project with new viral substitutes for assessing the removal of pathogenic substances during water filtration in porous media	2015 – 2017
FG II 3.6	CYAQUATA – Recording and evaluation of the toxicological risk potential of cyanotoxins in reservoirs in Saxony	2015 – 2018
FG IV 2.2	DENANA – Design criteria for sustainable nanomaterials	2014 – 2017
FG IV 2.2/2.4	nanoGRAVUR – Nanostructured materials – Grouping in terms of occupational safety, consumer protection, environmental protection and risk mitigation	2015 – 2018

BMVI – Bundesministerium für Verkehr und digitale Infrastruktur | German Federal Ministry of Transport and Digital Infrastructure		512,516.00 €
FG I 1.5	COPUBA – Support for the technical coordination of Copernicus land services at the national level and rooting Copernicus within the UBA	2015 – 2018
FG I 3.1	NRVP2020 – Provision of technical, scientific and administrative assistance with the funding process, as well as project support for implementing NRVP 2020 based on the new funding guidelines	2013 – 2016

KOM – Europäische Kommission | European Commission		991,804.64 €
FG I 1.2	Twinning Israel 2 – Support for the Israeli Ministry of Environment Protection in improving and modernising environmental, regulatory and management tools for the Israeli industry – Regulatory tools for SMEs, resource efficiency, eco-management and audit scheme	2015 – 2017
FG I 3.5	INSPIRATION – Integrated spatial planning, land use and soil management research action	2015 – 2 018
FG II 1.2	Bridge Health – Effect of pollution on the development of diseases – Human biomonitoring for recording pollution in the EU	2015 – 2017
FG II 2.4	ENV51 MeTra – Traceability for mercury measurements	2014 – 2017
FG II 2.5	ENV08 – Development of the metrological basis for comparable measurement results in monitoring priority substances according to the EG Water Framework Directive	2011 – 2015
FG II 4.4	ENV55 MetNH3 – Metrology for ammonia in ambient air	2014 – 2017
FG II 4.4	MacPoll – Improvement in the accuracy and comparability of measurements of harmful gases in outside air	2011 – 2015
FG III 2 ATF	PowerStep – Full-scale demonstration of energy-positive sewage treatment plant concepts towards market penetration	2015 – 2018
FG IV 2.2	iPiE – Intelligence-led Assessment of Pharmaceuticals in the Environment	2015 – 2019
FG IV 2.2	Prosafe – Promoting the Implementation of Safe by Design	2015 – 2016

BMWI – Bundesministerium für Wirtschaft und Energie | Federal Ministry for Economic Affairs and Energy		152,339.00 €
FG II 3.3	MOL – Efficacy study of a catalytic method for biofilm disinfection of drinking water and drinking water conservation	2015 – 2016
FG IV 1.4	ATRAP – Automated optical detection and classification of vectors	2015 – 2017

Bundesländer und Bund | Federal States and Federal Government		346,458.00 €
FG II 2.2	PRTR - Pollutant Release and Transfer Registers	From 2007
FG III 2.1	BREF – Translations of BREF and BVT reference sheets	From 2003
FG III 2.1	IPPC office – Financing of a German expert at the European IPPC office by the Federal States	From 2011

Vereine und Sonstiges | Associations and other		574,886.00 €
Bavarian State Ministry of the Environment and Consumer Protection		
FG II 4.4	VAO II – Trends regarding greenhouse gases and aerosols	2014 – 2017
Bundesländer – Federal States		
FG II 2.2	Calculation tools – Development of a precise tool for calculating the entry of pollutants from municipal sewage systems into water for the targeted planning and implementation of environmental measures (first phase)	2012 – 2015
DFG – German Research Foundation		
FG II 3.3	INTERNANO II – Mobility, aging and functioning of engineered inorganic nanoparticles at the aquatic-terrestrial interface	2015 – 2018
DIN –Deutsches Institut für Normung		
FG II 4.5	Validation of a CEN method – Comparative field measurements for the validation of the CEN method for determining carbon species in particulate matter	2014 – 2017
DVGW – German Technical and Scientific Association for Gas and Water		
FG II 3.4	DVGW odour – Plastic pipe testing as part of the DVGW research project “Evaluation of plastic pipes in the drinking water installation” regarding compliance with hygienic requirements	2015 – 2016
EEA – European Environment Agency		
FG II 2.4	ETC ICM – – Framework Partnership Agreement concerning the European Topic Centre in Inland, coastal and marine waters 2014-2018	2014 – 2019
EU – Environment and Sustainable Development Advisory Councils		
SRU	SRU-EEAC – Coordination and support for the EEAC network	2014 – 2016
RIVM – National Institute for Public Health and the Environment		
FG III 3.1	Workshops on Water Safety Plans (WSP) in Ethiopia	2013 – 2015
VRH – Verein Rohrleitungssysteme in der Haustechnik		
FG II 3.6	Migration waters – Biotest-based strategies for recording risk potential in migration water	2015 – 2016
WHO – World Health Organization		
FG III 3.1	Kirgisistan II – Workshops on Water Safety Plans (WSP) and small drinking water systems in Kyrgyzstan and Ukraine	2015

PROJECTS FUNDED BY THIRD PARTIES 2016

BMBF – Bundesministerium für Bildung und Forschung | German Federal Ministry of Education and Research		155,130.00 €
FG II 3.6	HyReKA – – The biological and medical hygienic relevance, as well as monitoring, of antibiotic-resistant pathogens in hospital, agricultural and municipal waste water and their significance in raw water	2016 – 2018
FG II 3.6	MiWa – Impact of microplastic on drinking water from a toxicological perspective with respect to humans	2016 – 2018
FG III 2 ATF	RISKWA Joint Research Project MiWa – Microplastic in the water cycle	2016 – 2019
FG III 2	OEMP – Optimised materials and methods for removing microplastic from the water cycle – Sample treatment and assessment	2016 – 2018

KOM – Europäische Kommission | European Commission		364,729.08 €
FG I 1.2	Twinning Croatia – Improvement of Croatian Environment Pollutant Register (Croatian EPR) and its Integration Environmental Information System (CEIS)	2016 – 2018
FG I 1.6	SystemRisk – A Large-Scale Systems Approach to Flood Risk Assessment and Management	2016 – 2019
FG II 1.2	EHBMI – European Human Biomonitoring Initiative	2016 – 2021
FG III 1.1	EcoDesign Circle – European ecodesign initiative for promoting green product design as a driver of innovation in the Baltic Sea Region	2016 – 2018
FG III 1.4	SuperSmart – Expertise hub for a market uptake of energy-efficient supermarkets by awareness raising, knowledge transfer and pre-preparation of an EU ecolabel	2016 – 2019
FG III 2.1	HAZBREF – Identification of hazardous chemicals in the IED BREFs	2016

Vereine und Sonstiges | Associations and other		67,500.00 €
BMI – Federal Ministry of the Interior		
FG II 2.2	Z6-D MRN – Metropolitan Rhine-Neckar region as a testing area for the large-scale introduction of the P23R principle	2016 – 2018
BMVI – Federal Ministry of Transport and Digital Infrastructure		
FG II 4.2	Copernicus-Luft – Satellite-based services and mobile applications for air quality	2016 – 2017

PROJECTS FUNDED BY THIRD PARTIES 2017

BMG – Bundesministerium für Gesundheit | German Federal Ministry of Health		651,000.00 €
FG II 3.3	Chromium in raw water – Treatment of raw water contaminated with chromium for the public supply of drinking water	2015 – 2017
FG II 3.4	Migration of plastic additives	2015 – 2017
FG II 3.4	4 MS – European harmonisation of national standards for materials coming into contact with drinking water	2017 – 2018
FG II 3.5, II 3.3, II 3.2	Salt water baths – Microbiological and physicochemical characterisation and development of suitable processes for testing the quality of water used in salt water bathing pools	2017 – 2019
FG II 3.5	Legionella in the drinking water installation – Analysis of drinking water tests and epidemiological case-control study	2015 – 2019
FG III 3.1	BMG WHO – Collaborating Centre for Research on Drinking Water Hygiene	Annual

BMVI – Bundesministerium für Verkehr und digitale Infrastruktur | German Federal Ministry of Transport and Digital Infrastructure		480,400.00 €
FG I 1.5	COPUBA – Support for the technical coordination of Copernicus land services at the national level and rooting Copernicus within the UBA	2015 – 2018
FG I 3.1	NRVP2020 – Provision of technical, scientific and administrative assistance with the funding process, as well as project support for implementing NRVP 2020 based on the new funding guidelines	2013 – 2017

Bundesländer und Bund | Federal States and Federal Government		364,500.00 €
FG II 2.2	PRTR - Pollutant Release and Transfer Registers – PRTR	From 2007
FG III 2.1	IPPC office – Financing of a German expert at the European IPPC office by the Federal State	From 2011
FG IV 2.1	GSBL - Joint Substance Data Pool of the German Federal Government and Federal States	2016 – 2018

BMBF – Bundesministerium für Bildung und Forschung | German Federal Ministry of Education and Research		948,900.00 €
FG II 1.4	River hygiene – ReWaM – River hygiene joint research project: hygienically relevant microorganisms and pathogens in multifunctional waters and water cycles – sustainable management of different water types in Germany, sub-project 2	2015 – 2018
FG II 1.4	WavE joint research project TrinkWave - planning options and technologies for water reuse as a means of supporting the supply of drinking water in urban water cycles	2016 – 2019
FG II 1.6	UKAGEP – Analysis and evaluation of social and economic connections/ investigation of connections between environmental factors and health parameters	2015 – 2020
FG II 3.3	Pathotrack – Pilot project with new viral substitutes for assessing the removal of pathogenic substances during water filtration in porous media	2015 – 2017
FG II 3.5	Zoonotic risk assessment of non-tuberculous mycobacteria (NTM), these will be taken from a variety of water reservoirs in the environment and drinking water distribution systems and identified	2017 – 2022
FG II 3.6	HyReKA – The biological and medical hygienic relevance, as well as monitoring, of antibiotic-resistant pathogens in hospital, agricultural and municipal waste water and their significance in raw water	2016 – 2018
FG II 3.6	Microplastics - Impact of microplastic on drinking water from a toxicological perspective with respect to humans	2016 – 2018
FG II 3.6	CYAQUATA – Recording and evaluation of the toxicological risk potential of cyanotoxins in reservoirs in Saxony	2015 – 2018
FG II 3.6	Neuro-Box – Advancements in the methodology for assessing neurotoxic effects in the water cycle	2017 – 2019
FG III 2 ATF	RISKWA Joint Research Project MiWa – Microplastic in the water cycle	2016 – 2019
FG III 2	OEMP – Optimised materials and methods for removing microplastic from the water cycle – Sample treatment and assessment	2016 – 2018
FG II 4.2	Copernicus-Luft – Satellite-based services and mobile applications for air quality	2016 – 2017
IV 2.2	DENANA – Design criteria for sustainable nanomaterials	2014 – 2017
IV 2.2	nanoGRAVUR – Nanostructured materials – Grouping in terms of occupational safety, consumer protection, environmental protection and risk mitigation	2015 – 2018

KOM – Europäische Kommission | European Commission		14,934,800.00 €
FG I 1.2	Twinning Croatia – Improvement of Croatian Environment Pollutant Register (Croatian EPR) and its Integration Environmental Information System (CEIS)	2016 – 2018
FG I 1.2	Twinning Israel – Support to the Israeli Ministry of Environment – Protection in improving and modernizing environmental regulatory and management tools for the Israeli industry – regulatory tools for SMEs, resource efficiency, eco-management and audit scheme	2015 – 2017
FG I 1.6	SystemRisk – A Large-Scale Systems Approach to Flood Risk Assessment and Management	2016 – 2019
FG I 1.6	GoApply – Multidimensional governance of climate change adaptation in policy making and practice	2016 – 2019
FG I 3.5	INSPIRATION – Integrated Spatial Planning, land use and soil management Research Action	2015 – 2018
FG II 1.2	HBM4U – European Human Biomonitoring Initiative	2016 – 2021
FG II 1.2	Bridge Health – Effect of pollution on the development of diseases – Human biomonitoring for recording pollution in the EU	2015 – 2017
FG II 2.4	ENV51 MeTra – Traceability for mercury measurement	2014 – 201?
FG III 2 ATF	PowerStep – Full scale demonstration of energy positive sewage treatment plant concepts towards market penetration	2015 – 2018
FG II 4.4	ENV55 MetNH3 – Metrology for ammonia in ambient air	2014 – 2017
FG III 1.1	EcoDesign Circle – European ecodesign initiative for promoting green product design as a driver of innovation in the Baltic Sea Region	2016 – 2018
FG III 1.4	SuperSmart – Expertise hub for a market uptake of energy-efficient supermarkets by awareness raising, knowledge transfer and pre-preparation of an EU ecolabel	2016 – 2019
FG III 2.1	HAZBREF – Identification of hazardous chemicals in the IED BREFs	2017 – 2020
FG IV 2.2	iPiE – Intelligence Assessment of Pharmaceuticals in the Environment	2015 – 2019
FG IV 2.5	AQUACOSM – International network of infrastructure – Project for coordinating research into mesocosms	2017 – 2020

Vereine und Sonstiges | Associations and other		371,500.00 €
EEA – European Environment Agency		
FG II 2.4	ETC ICM – Framework Partnership Agreement concerning the European Topic Centre in Inland, coastal and marine waters 2014-2018	2014 – 2019
FG II 4.2	CLC 2018 – Update and advancement of land-cover data within the framework of the Copernicus land monitoring system for the reference years 2015 and 2018	2017 – 2019
Bavarian State Ministry of the Environment and Consumer Protection		
FG II 4.4	VAO II – Trends regarding greenhouse gases and aerosols	2014 – 2017
WHO – World Health Organization		
FG II 3.6	Preparing fact sheets and working on background documents on chemicals in drinking water for the WHO	2017
SET foundation		
FG IV 1.4	Bedbugs and clothes lice – Developing and establishing methods of membrane feeding for the mass breeding of Cimex lectularius bedbugs and Pediculus humanus clothes lice in the laboratory	2017 – 2019
German Federal Foundation for Environmental Conservation		
FG II 3.5	Quantitative evidence for Pseudomonas aeruginosa – comparison of different verification processes	2016 – 2017
Berliner Wasserbetriebe		
FG II 3.5	Basic investigations into how the “PHOIBE” detection system is used from the practical viewpoint of the Berliner Wasserbetriebe	2016 – 2018
DFG – German Research Foundation		
FG II 3.3	INTERNANO II – Mobility, aging and functioning of engineered inorganic nanoparticles at the aquatic-terrestrial interface	2015 – 2018

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