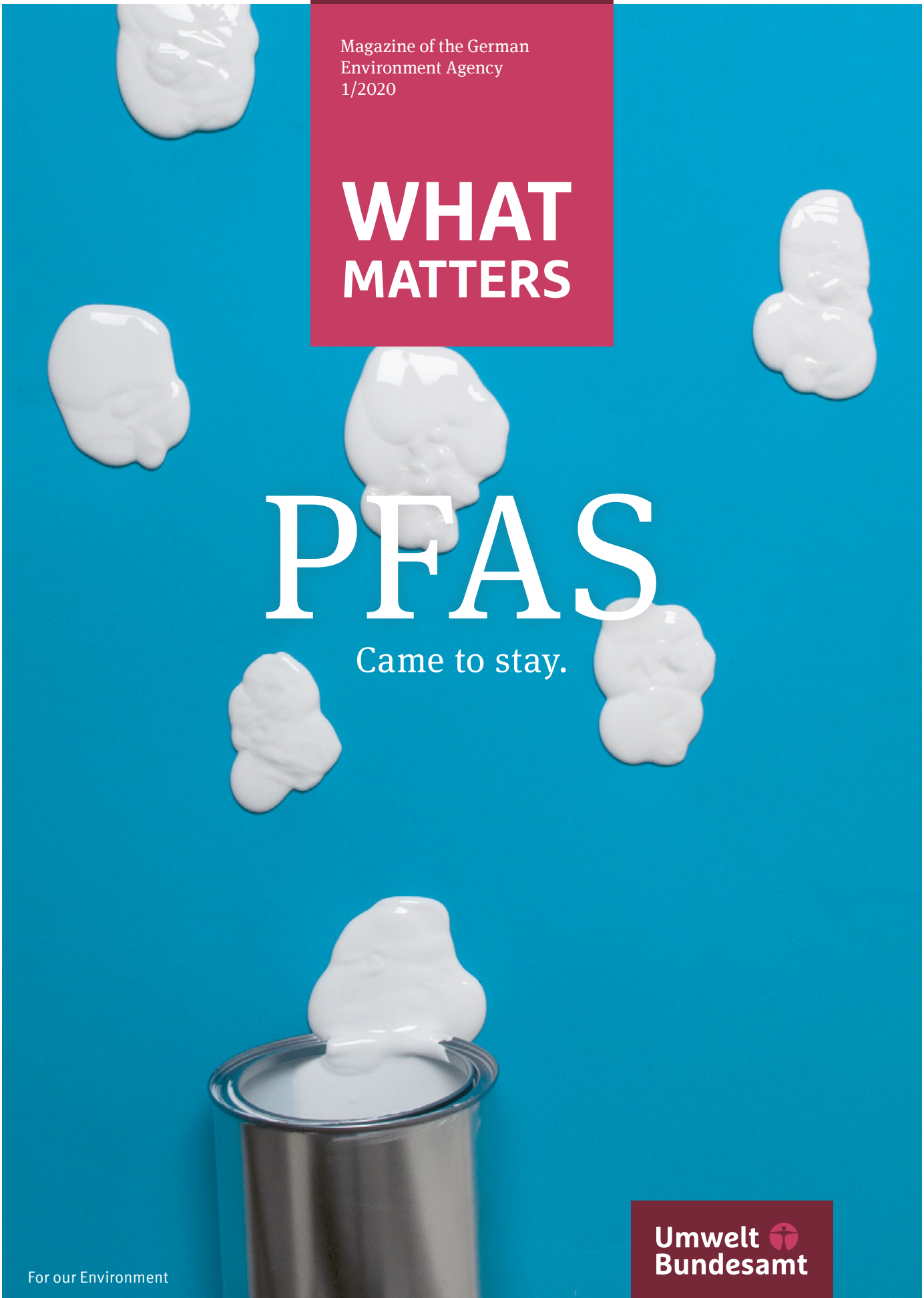
Magazine of the German
Environment Agency
1/2020

WHAT MATTERS

PFAS

Came to stay.



Umwelt Bundesamt

For our Environment

FOREWORD

Dirk Messner, President,
German Environment Agency

Dear Readers,

Countless tons of chemicals from industry and various forms of consumption end up in our lakes and streams, on our fields or are emitted into the atmosphere every year. From there they often find their way into us – via food or the air we breathe.

These chemicals often interfere with ecosystems and can harm plants, animals and people. Some remain in the environment for a very long time. One example are the per- and polyfluorinated alkyl substances or PFAS for short. These substances, of which we know more than 4,700 individual ones, are (almost) indestructible and are transported around the world via air and water. We can even find them in polar bears and penguins living far away from our human civilisation.

We think it is time to confront this problem. The German Environment Agency, together with other institutions, is working to ensure that PFAS substances are banned in the EU for precautionary reasons, or only approved for really essential uses. This is a long road, but we hope to set limits on the input of these 'perpetual' chemicals into the environment in the foreseeable future.

Since March, the Covid 19 pandemic has had a firm grip on Germany and many other countries – and we are still far from a normal situation. What will happen next? What impact will the crisis have on the environment and our climate? The German Environment Agency has made proposals on how Germany and Europe can use the fight against the consequences of the pandemic as a springboard for the transition to a sustainable economy and society. You will also find some highlights on this topic in this issue.

Dear Readers,

Since the beginning of the year I have been head of the German Environment Agency. It is a great and exciting challenge for me. I tried to explain how I felt during the first few months and what I intend to do in the interview at the end of this issue. I look forward to working with the staff in Dessau-Roßlau, Berlin and at all other UBA sites to tackle the challenges of the next decade in environmental, climate, and sustainability policy.

I wish you an inspiring read!

Yours

Dirk Messner

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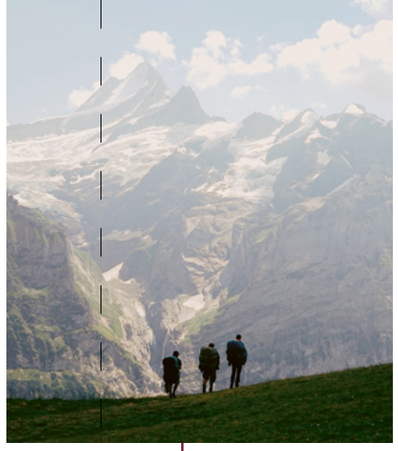
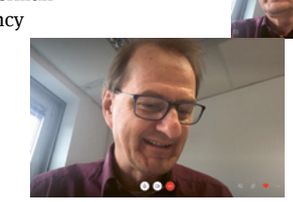




TOPIC

PFAS – our eternal companions

Water repellent, dirt-repellent, grease-repellent. These are the main properties of a group of chemicals abbreviated as PFC or PFAS.

They can be found in numerous products, from outdoor jackets to Teflon pans and fire-fighting foams. PFC stands for per- and polyfluorinated chemicals. Another name is PFAS – per- and polyfluorinated alkyl substances. This group of substances now comprises more than 4,700 different substances.

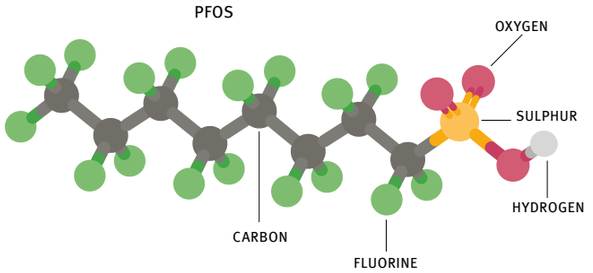
Because PFAS are used in so many different ways, there are a number of means by which they can get into the environment: during the production of the chemicals themselves, their processing into products, the use of the products and then during disposal.

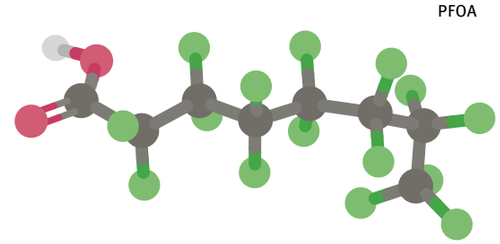
PFAS are used worldwide. PFAS can be distributed through the air, rivers and oceans to remote areas such as the Arctic. The problem is, they are barely degradable and therefore remain in the environment for a very long time. Some PFAS accumulate in animals, plants and humans and also have a harmful effect on health.

What are PFAS?

Chemically speaking, PFAS are organic compounds of various chain lengths in which hydrogen atoms are replaced with fluorine atoms – completely (perfluorinated) or partially (polyfluorinated). In a narrower sense, PFAS refers to fluorinated organic compounds with a functional group such as an acid or alcohol group. These are mainly considered in this publication. The best known representatives are PFOS (perfluorooctane sulphonic acid) and PFOA (perfluorooctanoic acid). They have been produced and used since the 1950s. Toxicological and other scientific information on these two substances is readily available.

For some time now, other PFAS have been increasingly used. These include polyfluorinated substances, which are also called precursor compounds or precursors because they are converted into the stable perfluorinated PFAS in the environment. They represent the largest part of PFAS. PFAS of the latest generation are, for example, ADONA and GenX, also called perfluoroethers, where the fluorinated carbon chain contains bridges of oxygen atoms. There are also PFAS which contain chlorine atoms in their structure in addition to fluorine. Regarding most of the latest PFAS, authorities and scientists have little information on the exact chemical structures, applications, behaviour of the substances in the environment and effects on humans and the environment.





Polymers

Certain PFAS are used for fluoropolymer production such as polytetrafluoroethylene (PTFE). Fluoropolymers are used in various products to reduce either frictional resistance (e.g. as coatings in automobiles and aircraft, in printing inks, waxes and lubricants) or adhesion (e.g. in cookware). PTFE is also frequently used as a waterproof and breathable membrane in weather protection clothing.

Consumer products often contain other polymers based on precursor compounds such as polyfluorinated acrylates. These applications are also diverse and range from textiles, carpets, grease-repellent food packaging to paints and impregnation of wood and tiles.

PFAS are only about 98% firmly bound to the polymer. The free PFAS molecules in the polymer are emitted into air or water during the lifetime of the article/consumer product. Studies indicate that these polymers also degrade over time and release PFAS. Traces of PFAS, which can be detected in fluoropolymers, are also released into the environment through the use of coated products.

Why are PFAS in the environment such a major problem?

A great deal of energy is necessary to break the (atomic) bond between carbon and fluorine. PFAS are therefore very long-lived. Only through high temperature treatment and long dwell times, as is possible in waste incineration plants, can PFAS molecules be completely broken down. This also means: PFAS are not broken down in the environment. Neither bacteria nor water, nor air, nor light can entirely eliminate these molecules. Once PFAS are released into the environment, they spread for example in the water and sediment – and remain there for very long time.

Some PFAS accumulate in organisms and along food chains and can also be harmful to humans. Other PFAS are very mobile in water and soil; they dissolve well in water, are hardly retained in the soil and therefore quickly reach the groundwater.

In the human body, some PFAS can bind to proteins in the blood, liver and kidneys. Compared to other chemicals, some PFAS are eliminated very slowly and can thus accumulate in the body. Particularly critical is that some PFAS pass from mother to child during pregnancy and during the lactation period. Elevated concentrations of PFOA and PFOS in human blood can reduce the effects of vaccinations, increase susceptibility to infections, lead to elevated cholesterol levels and, cause reduced birth weight in offspring.

How do PFAS get into the environment and into the human body?

PFAS are released into the environment along multiple pathways. PFAS can be shifted through exhaust air from industrial plants into surrounding soils and waters. PFAS can also adhere to particles and be transported in this way over long distances in the air, even to remote areas. PFAS can therefore also be found in the polar regions and in alpine lakes, far away from industrial production and human settlements. Rain and snow can finally introduce them into the soil and surface waters from the air.

PFAS spread in the indoor air through volatilisation from products, for example from impregnation sprays. Vapours from carpets or home textiles treated with a dirt-repellent generate PFAS concentrations in indoor spaces.

PFAS get into wastewater treatment plants via domestic wastewater. A fraction of the precursor compounds are transformed there into the long-lived PFAS. Some PFAS are released via treated wastewater into surface waters. Other PFAS remain in the sewage sludge. If this sewage sludge is used, for example as fertiliser in agriculture, these chemicals seep into the groundwater over time. However, the use of municipal sewage sludge in ways that allow it to reach soils, e.g. as fertiliser, keeps decreasing.

PFAS can be introduced directly into soils and waters via specific uses, e.g. via fire-fighting foams. With the uptake of PFAS from contaminated soils and water into plants and their accumulation in fish, these substances also enter into the human food chain.

Humans consequently take in PFAS from the environment through food or from the air.

PFAS are not broken down in the environment.

Uses

Textiles

In the textile and leather industry, PFAS are used in breathable membranes as well as in dirt, oil and water-repellent finishes. They are used among other things for the production of outdoor clothing, shoes, work clothes, carpets and home textiles. Impregnating agents for clothing and shoes also often contain PFAS. The membranes (e.g. Goretex) are composed of polytetrafluoroethylene (PTFE), which is manufactured with certain PFAS (e.g. PFOA).

In order to realise a water-repellent effect, there are alternatives to PFAS, e.g. paraffin formulations, polysiloxanes, modified melamine resins or polyurethanes. Various manufacturers of outdoor clothing already avoid the use of PFAS. These alternatives are also commercially available to consumers.

The German Environment Agency recommends the purchase of PFAS-free textiles and shoes, as the extreme functions are not necessary for everyday use. Moreover, the GOTS and Blue Angel eco-labels for textiles exclude the use of PFAS.

For an oil- and dirt-repellent effect, which is required for protective work clothing and for medical textiles, there are to date still no – comparably effective – PFAS-free alternatives available. The required quantity of PFAS can be reduced in many cases by the additional use of “extenders”. Extenders are based e.g. on hyperbranched and radial-branched polyurethanes.

Paper and printed matter

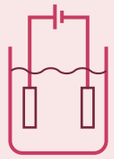
As in the textile industry, PFAS are used for the water- and fat-repellent finishing of paper products such as hamburger wrappers, self-adhesive labels and coffee cups. For this, fluorocarbon resins (FC) and perfluoropolyether-based (PFPE) products as well as polyfluoroalkyl phosphates (PAP) are used. PAP can be degraded, both in the environment as well as in the human body, into fluorotelomer alcohols and eventually into various perfluorinated carboxylic acids, so that PFOS-free does not mean PFAS-free and the substitution products can be just as critical.

Whereas the water-repellent effect is also achievable with other coating materials, there are to date still no PFAS-free alternatives available for the simultaneous oil- and dirt-repellent effect.

PFAS can also be released into the environment via paper for recycling. For instance, PTFE is used in the printing industry for printing on paper in order to improve the brilliance and abrasion resistance of printed matter.

Since August 2018, in Annex 28 of the Wastewater Ordinance, for paper production it is required to avoid the use of chemical additives that contain per- or polyfluorinated chemicals or contribute to their formation. If this is not possible, then the quantities used must be minimised and the emissions are to be reduced according to technical possibilities.

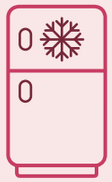
The Blue Angel DE UZ 195 for printed matter excludes the use of PFAS in printed matter.



Electroplating

PFAS-containing wetting agents are used in the chromium plating of metals and plastics in order to lower surface tension and to prevent the spread of chromium aerosols. Since the chromium electrolytes have very low pH values, the wetting agent must be composed of very stable substances. Up to now this was generally perfluorooctane sulfonic acid (PFOS), which could get into waters via the electroplating wastewater, provided that it was not treated with ion exchangers or activated carbon.

Due to the legal pressure, PFOS were replaced by polyfluorinated compounds, generally 6:2 fluorotelomer sulfonate (FTS). The compound is indeed less toxic and is not bioaccumulative but is broken down into correspondingly harmful perfluorinated compounds and is also not as long-term stable as PFOS, of which considerably higher amounts must be used. The metal electroplating wastewater is generally not treated for 6:2 FTS. The search for alternatives must therefore continue.



Refrigerants and foam blowing agents

Halogenated refrigerants and foam blowing agents (F-gases), which are often greenhouse gases harming the climate, are released into the atmosphere during usage. There, some of these gases degrade to persistent organic fluorine compounds, which get via precipitation into the waters. Environmental sound alternatives are fluorine- and chlorine-free natural refrigerants such as CO_2, hydrocarbons, and ammonia.

Fire-fighting foams

The ‘film forming fire-fighting foams’ are commonly used for extinguishing liquid fires. Fire brigades also used such fire-fighting foams in the past for drills. Whereas primarily PFOS were used in the past, now other PFAS are used. With an uncontrolled use of the foams, PFAS get into surface water or through seepage in the soil into groundwater. UBA recommends for this reason, and due to its alarming properties, to employ fluorine-free alternatives.

Taking stock:

PFAS in the human body and in the environment

PFAS are detected everywhere today: in soil, in sediments, in water and in the air, in plants and animals as well as in the human blood and in breast milk.

Around forty different PFAS can be measured with chemical detection methods. For the most PFAS – referring to the precurser compounds – there exists however neither information of the exact chemical structure nor analytical methods for detection. We record therefore only a fraction of the PFAS concentrations because it is precisely the precursor compounds in common use that are difficult to detect. By means of sum parameters, several PFAS can be determined together. This occurs through conversion processes from unknown PFAS to easily detectable PFAS (the „total oxidisable precursors“ method (TOP assay)) or by detection of fluorine: one method that detects adsorbable organic fluorine (AOF), or one method that detects extractable organic fluorine (EOF).

Human exposure is decreasing for important PFAS – but is still considerable

Humans take in PFAS through food and from the air, but for most humans food appears to be the major source. The European Food Safety Authority (EFSA) considers fish, eggs and fruits at present as the main PFAS source in food. The Federal Office for Consumer Protection finds PFOA and PFOS primarily in wild boar meat and wild boar liver (BVL Report 14.4, Food Safety Report 2018). Drinking water only counts as a particular PFAS source if the raw water has been contaminated with PFAS by accidental damage. Only a few cases are known in Germany up to now. Particular focus is on cases in Arnsberg in the Hochsauerland district, in Rastatt in Mittelbaden and in the Altötting district in Bavaria. People who primarily stay in indoor spaces outfitted with PFAS-treated materials (such as dirt-repellent carpets) increasingly take in PFAS out of the air because some PFAS are released from treated textiles and are to be found then increasingly in the ambient air.

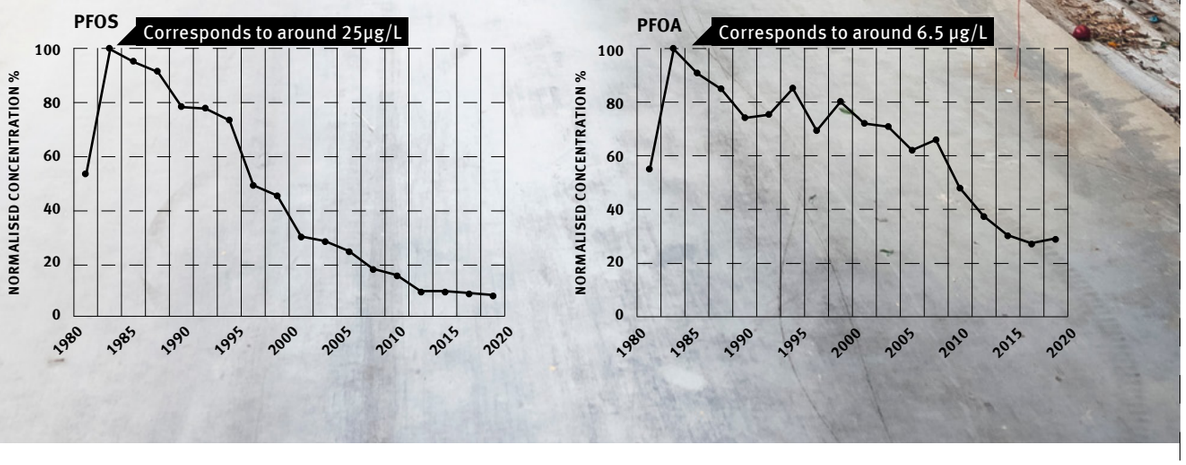
In the most current German Environmental Survey on Child and Adolescent Health[1], GerES V 2014–2017, children and adolescents 3- to 17-years-old were examined. Blood plasma from 1,109 children and adolescents was thereby analysed for 12 different PFAS, besides other substances. PFOS was quantified in all and PFOA in almost all blood samples. Results show that PFAS are detectable in the blood in the general population. As expected, the concentrations of some PFAS in the blood plasma were higher in breastfed children than in those not breastfed, and indeed, the longer the breastfeeding duration, the higher the levels.

By means of the German Environmental Specimen Bank, the trend of human exposure to PFAS could also be tracked over the last four decades. Current measurements of 37 different PFAS in samples from the years 2009–2019 show that PFOA and PFOS account for the majority of the exposure. Since 1986 the exposure decreased to PFOA by more than 70% and to PFOS already more than 90% (2019: geometric mean PFOA: 1.88 ng/ml; geometric mean PFOS: 1.93 ng/ml) (Figure 1). However, sporadic elevated concentrations of these PFAS are still found.

The decrease of PFOA and PFOS in human blood confirms that these substances are used to a lesser extent and humans are exposed to them to a lesser extent. However, they are often replaced by other PFAS. Besides PFOA and PFOS, other PFAS are found in human blood. Their concentrations are indeed low until now, but little is known about the long-term effects of these chemicals. No conclusions can be made on the PFAS, for which there are still no validated detection methods available in human specimens or which were simply not measured.

Figure 1

PFOS and PFOA levels in samples of human blood plasma of the German Environmental Specimen Bank
concentrations are normalised to the value of the peak exposure in 1986: 100%



Humans take in PFAS through food and from the air.

1 Since 1985 the German Environment Agency (UBA) has repeatedly conducted representative studies on the exposure of Germany's population to environmental chemicals. The aim of these German Environmental Surveys (abbreviated as GerES) is to provide up-to-date representative data on the exposure situation, to investigate potential associated health risks and to formulate proposals for mitigation measures.

How badly are our waters polluted?

PFAS are transported to our waterways in different ways: via wastewater from industrial and municipal wastewater treatment plants, via fire-fighting foams, via the washing away of soil components contaminated with PFAS (e.g. agricultural land contaminated by PFAS where industrial waste was disposed of improperly) and via the air. If soils are contaminated, PFAS can also reach the surface waters via infiltration through soil and groundwater.

Numerous measurements indicate that other PFAS also accumulate in waters

The States (Länder) determine PFAS concentrations at specific measuring points and by means of special examinations related to specific events. In Baden-Württemberg, North Rhine-Westphalia and Rhineland-Palatinate, for example, waterways around airports are examined for PFAS because PFAS were introduced by fire-fighting foams.

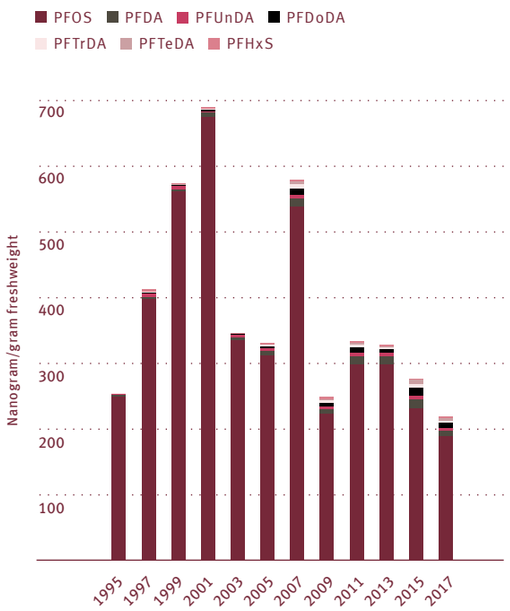
In some States (Länder) PFAS investigations have been carried out for some time, e.g. Bavaria, Hesse and North Rhine-Westphalia. The concentrations of PFOA and PFOS have decreased, which can be explained by the chemical legislation regulations. The concentrations of other PFAS in Bavaria and Hesse are increasing - this is explained by the fact that these substances are increasingly being used as substitutes for PFOA and PFOS.

PFAS enters the oceans mainly via the rivers and the air. PFAS can also be discharged directly into the oceans through the use of extinguishing agents on ships or offshore facilities such as drilling platforms, wind farms or converter stations.

PFAS are detected in water, sediment and animals in the North and Baltic Sea. PFOS, for example, is distributed throughout the German coastal waters of the North and Baltic Seas. Samples taken near the coast are more heavily contaminated than samples from the open sea. Many other measurements indicate that other PFAS also accumulate in our waters.

Figure 2

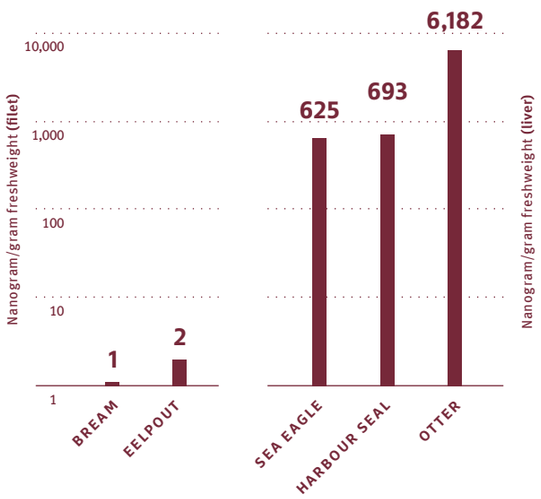
PFAS trends in fish liver (bream) from the Lower Rhine



Source: Environmental Specimen Bank

Figure 3

PFOS in top predators and fish



The University of Athens examines otters and seals of the Institute for Terrestrial and Aquatic Wildlife Research in Büsum (EU LIFE APEX project) and white-tailed eagles of the Leibnitz Institute for Zoo and Wildlife Research.

The Arctic

PFAS are introduced into remote areas such as the Arctic via sea and air currents. Recent results of the Arctic Monitoring and Assessment Programme (AMAP) show that PFAS are detected in all environmental compartments in the Arctic such as fresh water, marine waters, glaciers, air and snow. A large number of PFAS have also been analysed in Arctic organisms: PFAS have been detected in fish, whales, birds, the caribou and polar bears, but also in phytoplankton, lichens, mosses and grasses. In addition to PFAS that have been used for a long time (such as PFOS), less well known PFAS are increasingly being detected in the Arctic. Concentrations of these are already in a comparable range to the better known PFAS and should be investigated thoroughly.

Effective and proactive measures are therefore required to reduce the risk of PFAS to the fragile Arctic ecosystems. Global regulation of PFAS, e.g. through the Stockholm Convention or the Strategic Approach to International Chemicals Management (SAICM), is urgently needed. At the same time, further PFAS should be included in monitoring programmes to ensure the success of any regulation.

How contaminated is our groundwater?

At present, groundwater in 15 States (Länder) is being analysed for PFAS at specific times. These investigations usually concentrate on areas and monitoring sites where PFAS contamination is known or can be expected. PFAS were detected at more than 70% of the measuring points investigated. Linked with the detection of PFAS in other EU Member States, it is clear that certain PFAS are found in groundwater throughout Europe, sometimes in high concentrations. There is, therefore, a need for uniform European regulations on monitoring and setting threshold values for the protection of groundwater.

For EU-wide evaluation, data from all EU Member States were combined (Figure 4, next page). The most common substances found were perfluorobutanoic acid (PFBA) and perfluorohexane sulfonic acid (PFHxS). Perfluorooctane sulphonic acid (PFOS) was the most frequently investigated substance in Europe. PFOA and PFOS have been detected in all participating Member States. It is remarkable that even precursor compounds such as 6:2 diPAP and H4-PFOS have been found in some groundwaters. The investigations show that the insignificance thresholds are in some cases clearly exceeded at a considerable number of measuring points, especially for PFOA, PFOS and PFHxA.

How contaminated are our soils?

In principle, PFAS can be detected in low concentrations in soils everywhere. PFAS can enter the soil in larger quantities via extinguishing foams. Soils can be polluted via sewage sludge, contaminated compost or soil additives as well as through the air. PFAS which reach the ground, move with the percolating water into deeper layers and thus also reach the groundwater. This can happen very slowly when the PFAS in the soil (such as PFOA and PFOS) bind to particles. In this case, transfer into the groundwater can take years or even decades. Other PFAS are mobile and hardly bind to surfaces. Such PFAS, therefore, are more quickly transferred to deeper soil layers and reach the groundwater more quickly. This means that in the initial period after the damage occurs mobile compounds are displaced into the groundwater while compounds such as PFOA are also detected in the subsoil and groundwater but at a later point in time. Soils can therefore act as sinks or sources of PFAS.

How badly are plants contaminated?

Some PFAS may also enter the food chain by being taken up from the soil by plants, where they accumulate. PFAS can also be absorbed by plants when PFAS-contaminated groundwater is used for irrigation of agricultural land.

In general, PFAS can be detected in low concentrations in soils everywhere.

The evaluation of current reports from the Federal Government / States (Länder) Working Group on Soil Protection (LABO) found that some PFAS in plants are mainly found in water-rich areas such as leaves and fruits. Other PFAS accumulate in roots and stems and can thus enter the food chain, e.g. when eating root vegetables.

Figure 4

Relative amounts of PFAS-finds in European groundwaters and number of sampling points

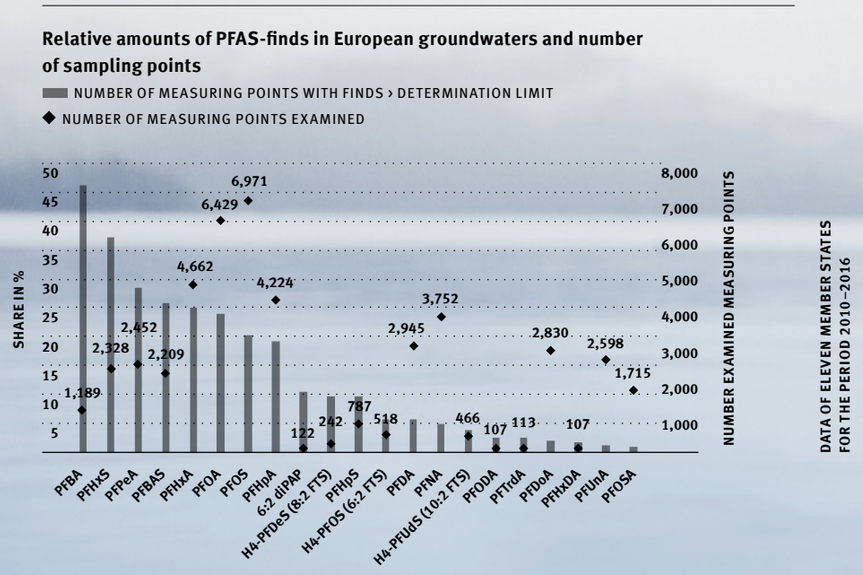


Figure 5

Relative amounts of PFAS-finds in German groundwaters and number of sampled monitoring sites

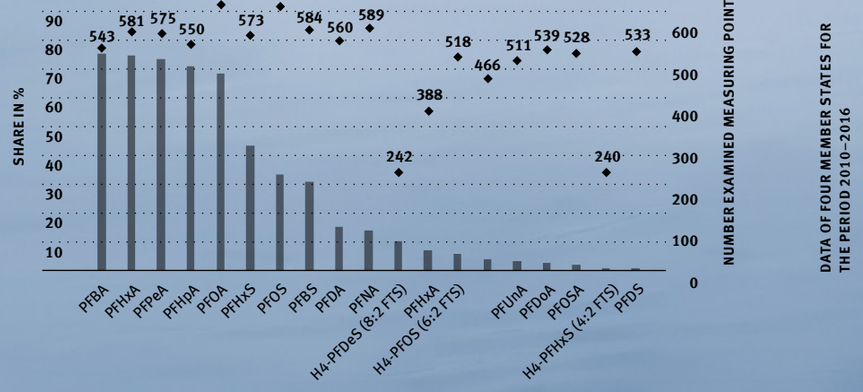


Figure 6

Trends for PFAS in leaves

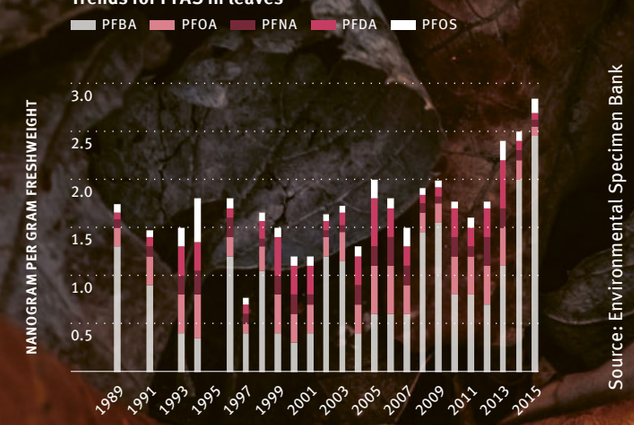
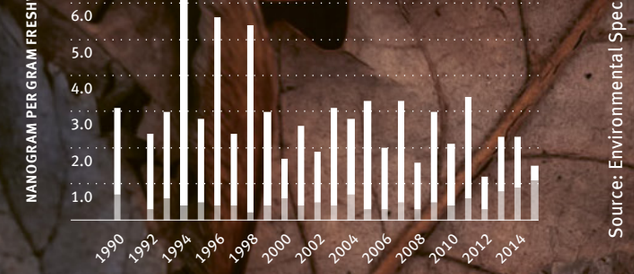


Figure 7

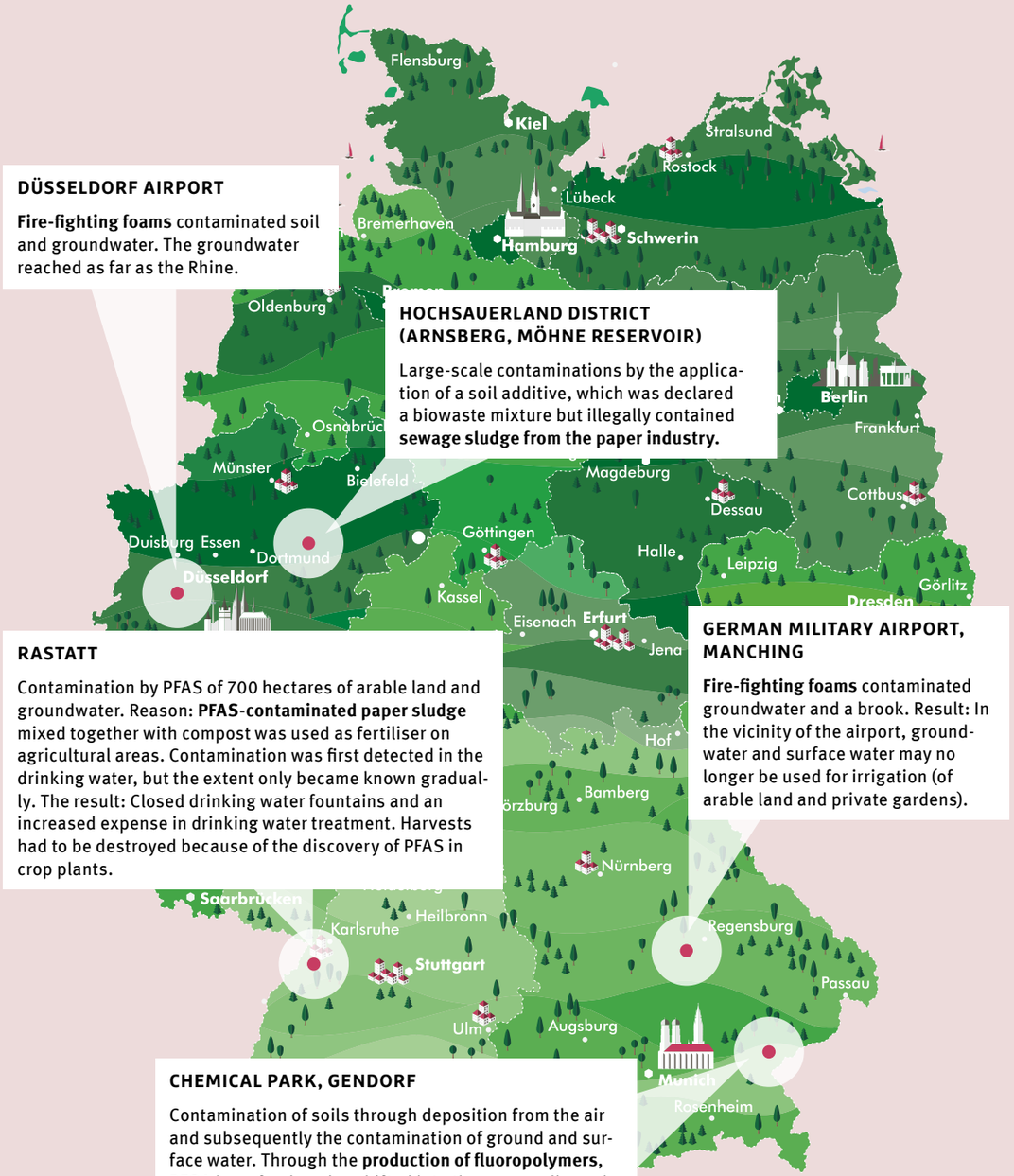
Trends for PFAS in earthworms



PFAS hotspots in Germany

Locations at which fire-fighting foams have been used are often considered suspected PFAS contaminated sites. These include fire-fighting training areas, fire-fighting pools, military airports, airports and areas in which major fires had been extinguished.

(Former) plants with chrome-electroplating baths can also be contaminated with PFAS. In addition, textile processing, paper manufacturing as well as the photography and film industry can cause PFAS release into soils and groundwater through exhaust air and wastewater. Airborne PFAS can also contaminate soils (atmospheric deposition). This is particularly relevant near fluorine chemical plants.



DÜSSELDORF AIRPORT

Fire-fighting foams contaminated soil and groundwater. The groundwater reached as far as the Rhine.

HOCHSAUERLAND DISTRICT (ARNSBERG, MÖHNE RESERVOIR)

Large-scale contaminations by the application of a soil additive, which was declared a biowaste mixture but illegally contained **sewage sludge from the paper industry.**

RASTATT

Contamination by PFAS of 700 hectares of arable land and groundwater. Reason: **PFAS-contaminated paper sludge** mixed together with compost was used as fertiliser on agricultural areas. Contamination was first detected in the drinking water, but the extent only became known gradually. The result: Closed drinking water fountains and an increased expense in drinking water treatment. Harvests had to be destroyed because of the discovery of PFAS in crop plants.

GERMAN MILITARY AIRPORT, MANCHING

Fire-fighting foams contaminated groundwater and a brook. Result: In the vicinity of the airport, groundwater and surface water may no longer be used for irrigation (of arable land and private gardens).

CHEMICAL PARK, GENDORF

Contamination of soils through deposition from the air and subsequently the contamination of ground and surface water. Through the **production of fluoropolymers,** PFOA have for decades shifted into the surroundings via exhaust air and wastewater.

Can PFAS be removed from the environment?

It is very costly to remediate PFAS-contaminated soils and groundwater due to the stability of these substances. Many processes that are used for other pollutants do not work for PFAS.

Some PFAS such as PFOA and PFOS, adsorb (bind) to surfaces and for this reason can be removed from groundwater with activated carbon filters. If mobile PFAS such as trifluoroacetic acid are also contained in the groundwater, the loading capacity of the activated carbon is reached much more quickly so that these filters must be replaced more frequently. However, promising processes are currently being developed that can extend the service life of these activated carbon filters with mobile PFAS.

Based on current knowledge, 100% removal of PFAS from soils is only possible by a high-temperature treatment that depends in particular on the dwell time and turbulence in the combustion chamber. However, the soil thereby loses its biological function and can only be used as filling material. PFAS can also be removed from soils by washing processes. The soil is first sorted into various grain-size fractions. PFAS can be washed out of the coarse grain-size fraction and then find themselves in the washing water. This must then be further processed and incinerated together with the finer grain-size fraction for which PFAS leaching is not as effective. The considerable reduction in mass is advantageous, as it can reduce remediation costs. This method is already being tested in Germany.

PFAS-containing soils can also be deposited in landfills, but this can run up against the inadequate landfill capacities in Germany, so it cannot be a long-term solution. In order to contain the spread of PFAS into soils and groundwater, various methods are currently being tested for immobilising PFAS, i.e. methods that hold PFAS in place in the soil or groundwater so that they cannot spread and shift any further. However, it has not yet been proven whether these methods bind PFAS in soil and groundwater in the long term, as there is little experience with this to date.

Current standard wastewater treatment plant technologies cannot effectively remove PFAS from treated wastewater. They would need to be supplemented by process steps analogous to those in drinking water treatment, which however are expensive.

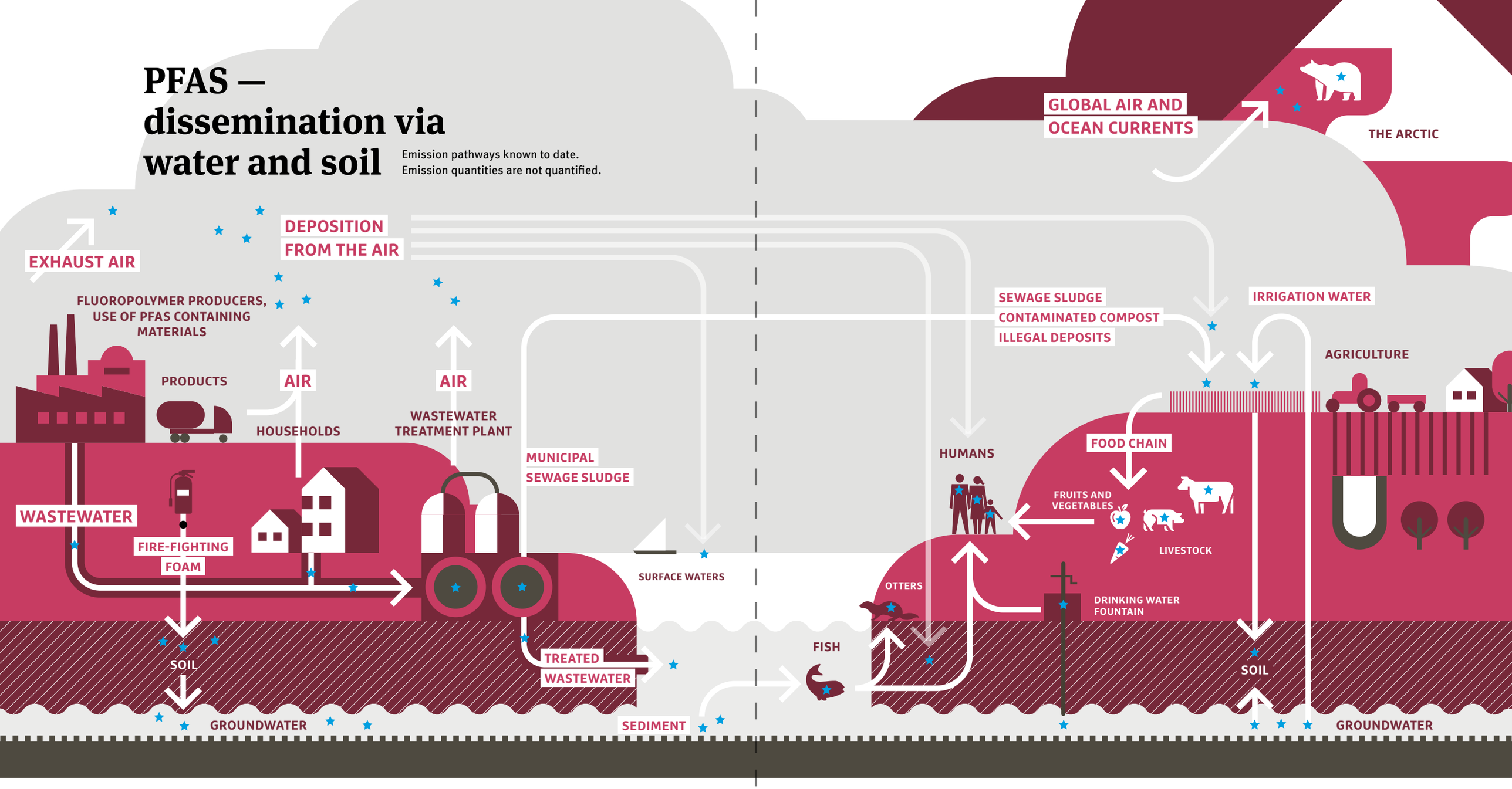
According to Regulation (EU) 2019/1021 on persistent organic pollutants, thermal treatment processes are particularly suitable for recovering or eliminating PFAS-containing waste.

At present, PFAS can only be completely removed from soils by high temperature treatment.

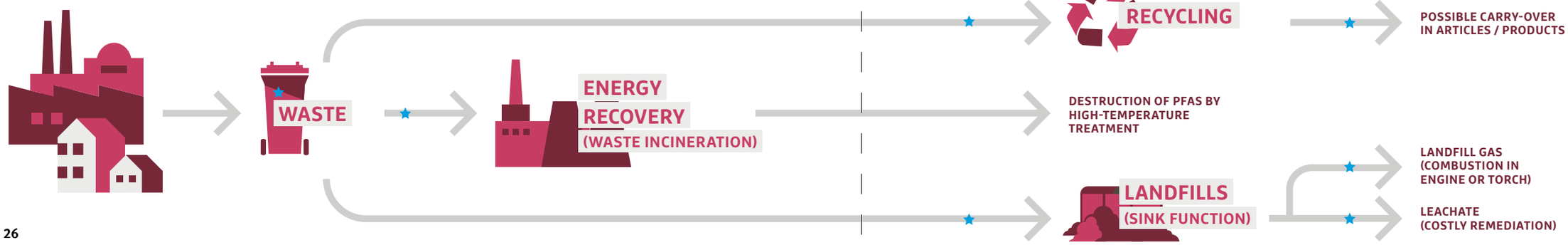
The removal of PFAS from drinking water necessitates specific process steps that are currently only applied in few waterworks. Suitable but cost-intensive processes for treatment include adsorption on activated carbon, ion exchange, nanofiltration and reverse osmosis. State-of-the-art scientific knowledge indicates that in long-term operation, only reverse osmosis is capable of removing all PFAS to the greatest possible extent. In the drinking water sector, the effectiveness of different processes is currently evaluated and optimized.

PFAS — dissemination via water and soil

Emission pathways known to date.
Emission quantities are not quantified.



PFAS — Pathways from waste disposal



How PFAS have been regulated to date

Under the European Chemicals Regulation REACH, EU-wide restrictions can be imposed on production, placing on the market, use and import.

Some PFAS are already considered substances of very high concern (SVHC), as they are very long-lived, accumulate in organisms and can be harmful to humans. For substances of very high concern within the scope of REACH regulation, particular duties of disclosure apply and an authorisation requirement can arise, i.e. only explicitly allowed uses may be further exploited. PFOA for example is one of the substances of very high concern under REACH. Furthermore, for some PFAS (e.g. for PFOA, including the precursor compounds) there are already restrictions in their production and use – so PFOA may no longer be produced in the EU as of July 2020. Strict limiting values apply for PFOA and precursor compounds used for consumer products.

A world-wide regulation of long-lived organic pollutants is possible through the Stockholm Agreement. The international community has imposed bans on PFOA and PFOS and their precursor compounds with exceptions for essential uses. Another representative of the group of substances, perfluorohexanesulfonic acid (PFHxS), should follow shortly.

The German Environment Agency deems necessary a regulation of the entire group of substances, particularly in consideration of the precautionary principle, because all PFAS remain in the environment for long periods of time. Therefore, UBA is collaborating with other authorities from Germany, the Netherlands, Denmark, Sweden and Norway to develop an EU-wide restriction proposal under REACH for this group of substances.

The proposed restriction will include a ban or restriction on all uses that are dispensable to society or for which alternatives are available. There are alternatives to PFAS, as for water-repellent coatings for textiles and for fire-fighting foams for most fire scenarios. PFAS should no longer be used in, among other things, disposable tableware, disposable tablecloths and home textiles, as these are not essential.

Furthermore, classifications exist for some PFAS in accordance with the Europe-wide classification and labelling requirement (CLP regulation), by means of which hazardous material properties are identified and characterised through hazard symbols.

In addition to the regulation of individual substances, requirements are also being developed for PFAS in drinking water, surface waters, soils and wastewater. For example, in the Wastewater Ordinance, the application of PFAS is restricted to specific industrial sectors such as textile and paper manufacturing and in electroplating.

International cooperation

PFAS are a world-wide problem due to their persistence and widespread use. Because of this, UBA has long cooperated with international partners. Experts from science, industry and authorities share information regularly on new research results (e.g. to properties of very high concern, analytical methods or alternatives) and regulatory measures. In addition to an expert group at the level of the EU Member States, worth mentioning here are, for example, the OECD / UNEP Global PFAS Group and the Global PFAS Science Panel. UBA supports efforts to establish a Europe-wide strategy for PFAS that also convinces at a global level.

A group of international scientists, also supported by UBA staff, demands world-wide bans on production and use and the development of environmentally friendly alternatives in the ‘Madrid and Zurich Statement’.

Interview

Mr. Scheringer, in the film “Dark Waters”, PFAS have also found their way into cinemas. It’s about a lawsuit between industry and citizens that began in America in the 2000s. There have been various bans on PFAS since then. How do you see the current situation?
A start has been made, which is important for the parties concerned. However, the problem is much greater. Up to now only certain individual PFAS have actually been banned. There are however about 4000 PFAS that may be in use. As there is no labelling requirement, nobody knows the exact figure. We are working now on an elaborate investigation to specifically identify a good 1500 PFAS and their applications.

Would it be proper from your perspective, in line with the precautionary approach, to regulate chemicals only because of their persistence?
Yes, very high persistence is a reason to regulate a substance so that it cannot be released into the environment. High persistence means that a substance is broken down only very slowly in the environment. This is certainly the case for PFAS. Chemically, they are extremely stable. A substance is never only persistent, but as of a certain concentration also harmful, and if it is persistent, higher concentrations keep accumulating in the environment, which leads to harmful effects. In this respect, it is not necessarily the precautionary principle that leads to the regulation of persistent substances. We know that persistent substances in the environment have harmful effects. Therefore, it would otherwise be rather negligent not to regulate persistent substances.

Can we as consumers avoid persistent chemicals?
In certain areas, yes, e.g. with clothing, where you can ask for PFAS-free products.

What would you like to pass on to authorities, the EU and industry to guide them on their way?
The regulation of persistent substances (and thereby above all of the PFAS group) should be significantly speed up.

Professor Martin Scheringer has actively pursued the study of the behaviour of long-lived chemicals in the environment ever since his PhD thesis. He is a private lecturer at ETH Zurich and a professor of environmental chemistry at Masaryk University in the Czech Republic.

These values apply to PFAS in humans and the environment

Surface waters

The European Water Framework Directive (WFD) defines PFOS as a priority hazardous substance. Authorities are therefore obliged to measure PFOS levels in surface waters. Fish or mussels are tested for PFOS because the chemical accumulates in aquatic organisms that serve as food. The environmental quality standard for PFOS is 9.1 µg/kg fish / mussels. To protect human health, this value must not be exceeded. In the event that the value is exceeded, measures must be taken to reduce PFOS levels in the water body. Since PFAS cause problems in the water bodies of several EU Member States, the EU Commission proposes to analyse for additional PFAS in surface waters in the future and to reduce the inputs.

PFOS is also being monitored in the North Sea and Baltic Sea against the backdrop of the European Marine Strategy Framework Directive (MSFD). In order to evaluate the pollution load of the Baltic Sea, the current comprehensive assessment of the Baltic Sea's state (State of the Baltic Sea – Holistic Assessment, 2018) of the Helsinki Convention (HELCOM) for the Protection of the Baltic Sea also includes PFOS concentrations in water and biota.

PFOS is also listed as a 'chemical for priority action' under the Oslo-Paris Convention for the Protection of the North-East Atlantic (OSPAR). It is expected that PFOS in biota will be included as an indicator in future assessments.

Groundwater

There are currently no threshold values for PFAS at either the European or German level for the assessment of the chemical status of groundwater. An expert group proposed ten PFAS to the EU Commission for which EU-wide threshold values should be derived in the EU Groundwater Directive (2006/118/EC). Two further PFAS are to be included on a groundwater watch list, since there are not yet sufficient monitoring results for these substances in the Member States but they are nevertheless considered relevant for regulatory purposes.

In Germany, the Working Group on water issues (LAWA) and soil issues (LABO) of the States (Länder) and the Federal Government have derived insignificant threshold values for groundwater (GFS) (Figure 8). GFS values specify a concentration for groundwater up to which no relevant adverse effects can occur for humans and the environment. However, the current state of knowledge on these PFAS health risks is being reassessed by the European Food Safety Authority (EFSA). It is therefore expected that the GFS values will also need to be adjusted in the future in line with the EFSA assessments.

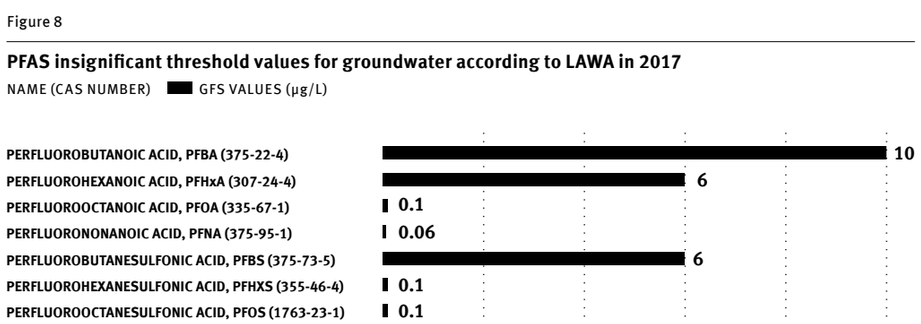
Soils

The soil-plant and soil-groundwater impact pathways are particularly relevant in soil protection.

Seven GFS values for PFAS were included in the draft of the amended Federal Soil Protection Act as test values for the soil-groundwater pathway. If these values have been reached or exceeded, individual case examinations must be carried out and measures taken if necessary. According to the Sewage Sludge Ordinance and the Fertiliser Ordinance, sewage sludge and fertilisers applied to soils must be tested for PFOA and PFOS. However, other PFAS in sewage sludge may also be relevant. It is unclear whether the permitted levels of PFOA and PFOS in sewage sludge and fertilisers can be the cause of why insignificance thresholds in groundwater are being exceeded. A harmonisation of the different legislation areas is therefore urgently needed.

Figure 8

PFAS insignificant threshold values for groundwater according to LAWA in 2017



There are currently no nationally uniform rules or recommendations for the evaluation of PFAS contamination in soils or the handling of such cases. These are however in preparation. A recommended course of action for handling PFAS-contaminated soils and groundwater is available on UBA's website.[2]

There are currently no maximum levels for PFAS for food and feed which is why Germany advocates their establishment at EU level. The exact processes, i.e. which PFAS are absorbed into which plants and to what extent, are still relatively unknown. State (Länder) authorities and the German Environment Agency have therefore initiated research projects to enable scientists to clarify the transfer of PFAS from soil to plants. The regions of Baden-Württemberg, which are known to have PFAS-contaminated agricultural land, have introduced pre-harvest monitoring to prevent harvests with elevated PFAS concentrations from reaching the market or being used as animal feed.

Sewage sludge

Since 2015, sewage sludge used for soil-related purposes has been subject to the requirements of the Fertiliser Ordinance (DüMV) and may not exceed a PFAS concentration of 100 µg/kg (sum of PFOA and PFOS) in the dry substance – otherwise it must undergo thermal treatment (i.e. usually incinerated as waste). Sewage sludge also contains other PFAS which should be analysed in the future; especially PFAS that are relevant for groundwater and plant absorption.

Drinking water

Based on the first findings of PFOA and PFOS in drinking water in the North Rhine-Westphalian Möhne Reservoir in 2006, the Drinking Water Commission derived health-based tolerable guideline values for both substances. Since 2016, there have been health-based maximum values (guideline values and health-related indicator values) for 13 PFAS, e.g. 0.1 µg/l as a guideline value for PFOA and PFOS. The derivation was based on a tolerable intake of 0.03 µg/kg body weight per day for both substances. Recent assessments by the European Food Safety Authority (EFSA) suggest that these values may be too high.

For this reason, the German Environment Agency, in cooperation with the Federal Ministry of Health, has already reduced the action values of PFOA/PFOS for the particularly sensitive population groups – pregnant women, nursing mothers, infants and toddlers – to 0.05 µg/l PFOA and PFOS as a precautionary measure in December 2019.

There is currently no obligation to measure PFAS in drinking water in Germany. However, the voluntary measurements carried out so far show that, apart from particularly affected regions such as the districts of Altötting and Rastatt, PFAS concentrations in drinking water are within the range of ≤ 0.01 µg/l, which is below the action values.

In future, water suppliers throughout the EU will be obliged to test drinking water for PFAS.

The EU Drinking Water Directive, which is due to be adopted in 2020, is expected to set two minimum requirements for PFAS: 'total PFAS' as the total perfluoroalkyl and polyfluoroalkyl substances at 0.5 µg/l and the 'sum of PFAS' of 20 particularly relevant individual substances at 0.1 µg/l. In future, water suppliers throughout the EU will therefore be obliged to test drinking water for PFAS.

PFAS and human health

The Human Biomonitoring Commission of the German Environment Agency (HBM Commission) has established toxicologically and epidemiologically justified assessment values (called HBM I and HBM II values) for the health-related assessment of physical pollution.

If the HBM I level in human blood is not exceeded, no health impairment is to be expected. The values are 2 ng PFOA and 5 ng PFOS per ml blood plasma or serum.

If the HBM II value is exceeded, a potentially relevant health impairment of those affected is possible in principle but may not necessarily occur for everyone given the many individual factors that play a role (see below).

The following HBM II values were established:
- for women of childbearing age: 5 ng PFOA per ml blood plasma and 10 ng PFOS per ml blood plasma, and
- for the remaining population groups: 10 ng PFOA per ml blood plasma and 20 ng PFOS per ml blood plasma

Plasma concentrations above the HBM I value but below the HBM II value indicate an exposure where current knowledge can no longer exclude effects with sufficient certainty.

Both HBM I and HBM II values are based on an assessment of the population-related risk, meaning the risk to individual population groups with regard to developmental toxicity and reduced birth weights, reduced fertility, reduced antibody formation (immune system), increased LDL and total cholesterol concentrations and diabetes mellitus type II.

When assessing individual risk, other factors such as age, lifestyle, genetic and family predisposition etc. must always be included in the assessment.

21.1% of children whose blood plasma was tested for PFOA in the latest German Environmental Survey on Child and Adolescent Health[1], (GerES V) exceeded the HBM I value of 2 ng/ml, while 7.3% of the survey participants exceeded the HBM I value of 5 ng/ml blood plasma for PFOS. The HBM II value for PFOA was not exceeded, whereas the HBM II value for PFOS was exceeded by 0.17% of the subjects examined[3]. The analysis of blood samples from the Environmental Specimen Bank taken from young adults showed no exceedance of HBM II values for either PFOA or PFOS in 2019.

2 https://www.umweltbundesamt.de/publikationen/sanierungsmanagement-fuer-lokale-flaechenhafte-pfas

3 The percentages result from the consideration of inclusion and exclusion criteria and statistical weighting in the evaluation of the data.

MEASURES

How can we protect people and the environment from PFAS

Aside from the durability of the substances, the biggest challenge in protecting people and the environment from PFAS is their large number. For this reason, the German Environment Agency is committed to considering not just the well-studied PFAS such as PFOA and PFOS in all measures to protect people and the environment. It must always be borne in mind that the existing measured values often represent only the tip of the iceberg. UBA proposes a number of measures, particularly for precautionary reasons:

RESTRICTING THE UNNECESSARY USE OF PFAS ACCORDING TO REACH

The planned restriction of all unnecessary uses for the entire substance group according to REACH is an important milestone and should be supported by all relevant stakeholders. Examples of unnecessary uses include the use in home textiles or disposable tableware. These are either unnecessary or can be substituted with alternatives that serve the same purpose.

IMPROVING ANALYSIS AND MONITORING

Standardised analytical processes are necessary to measure the PFAS content in industrial products, food and in the environmental media. This can be used to monitor the success of regulatory measures. For most PFAS, however, these methods have yet to be developed. Furthermore, an EU-wide monitoring of PFAS in surface waters, groundwater, soil and food is useful. However, monitoring should also be expanded in the international conventions on marine protection such as OSPAR and HELCOM.

SETTING BINDING LIMITING VALUES AND ENSURING COMPLIANCE

The existing gaps in PFAS limiting values, e.g. in food, feed, soil and groundwater, should be closed as soon as possible. At the national level, tolerable PFAS contents in the Federal Soil Protection Ordinance, the Sewage Sludge Ordinance and the Fertiliser Ordinance must be designed in such a way that there is no risk to groundwater resources, crops and livestock, or to humans. The derivation of the limiting values is based on the current database; at the same time, knowledge of the PFAS effects on human health and the environment must be improved.

MORE RESEARCH ON REMEDIATION AND CLEANING

In order to remove PFAS from the environmental media and thus avoid its transfer to food and feed, more research is needed into the remediation of soil and water and the treatment of raw water. The PFAS content of waste must be analysed. Waste with a particularly high PFAS content may need to be disposed of in new ways. Some aspects of cycle management must also be queried (e.g. the use of sewage sludge on agricultural land) in order to avoid accumulation and to separate PFAS.

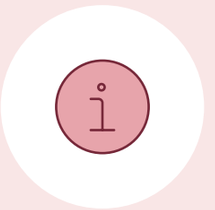
BUILDING ON ALTERNATIVES

In some areas, PFAS are currently essential and there are no substitutes. In the case of protective work clothing (e.g. for firefighters), the advantages of PFAS coatings clearly outweigh the disadvantages. However, this does not mean that substitutes and processes should not be sought.

In many cases, non-halogenated substances can replace halogenated refrigerants and foam blowing agents (F-gases). For this end, the German Federal Government's Refrigeration and Air Conditioning Directive, for example, supports operators with subsidies to change to natural refrigerants such as ammonia, CO_2, or hydrocarbons. For vehicle air conditioning as well, first systems using carbon dioxide have been brought to the market.

THINKING GLOBALLY

All measures must take into account the global dimension, since PFAS are distributed globally by air and ocean currents. Outsourcing the production and use of PFAS to countries outside the EU must be prevented in favour of an international PFAS exit. The tolerable contents in soils and groundwater must also be uniform throughout Europe in future to guarantee safe food on the European internal market.

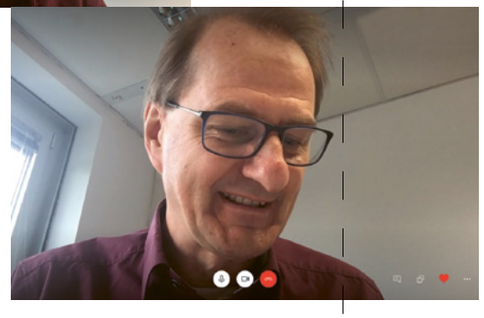


INFORMATION FOR CITIZENS

Consumers need more opportunities and information to avoid products containing PFAS, for example through seals such as the Blue Angel. So far there are few possibilities to circumvent PFAS. In the case of clothing such as outdoor jackets, there are already appropriately advertised products. Instead of a coated pan, an iron or enamel pan also works – these are even more durable because they are scratch-resistant. And reusable tableware made of glass or porcelain instead of coated disposable paper cups is better for the environment anyway. Even in the case of impregnating agents, natural fats and waxes can be used instead of PFAS-based sprays. As for carpets, one can rely on the natural dirt repellence of wool carpets instead of PFAS-based coatings.

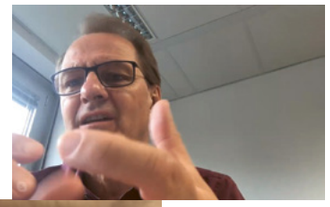
The German Environment Agency offers further information on its website, e.g. an introduction for consumers – the PFC Planet.
www.umweltbundesamt.de/pfc-planet

The German Environment Agency



‘Beyond technical solutions, we must prove that environmental and climate protection improves health and the quality of life.’

Interview with Dirk Messner, President of the German Environment Agency. Prof. Dr. Dirk Messner has been President of UBA since 01/01/2020. The sustainability researcher was most recently Director of the Institute for Environment and Human Security at the United Nations University in Bonn and Co-Chair of the German Advisory Council on Global Change (WBGU).



Mr Messner, how many video conferences have you had since the beginning of the corona pandemic?
Well over a hundred. Between two and five video conferences every day.

And how much CO_2 have you saved by avoiding business trips?
Quite a lot. I had three transatlantic and Asian flights scheduled for conferences, which have now all taken place online. That is of course several tonnes of CO_2, which could be saved this way – and only by me.

So you’ll stay on the ground in the future?
At UBA we always try to avoid flights. But sometimes that just doesn’t work. Video conferences are no substitute for physical meetings or informal discussions at conferences. Video cannot replace the chance of taking someone aside or staying longer at a dinner. But me and all of us will certainly not get back to the normal frequency of travel before corona. Because many people are now realising that many topics can also be clarified by video or in a telephone conference without having to make a journey. Video conference tools now offer very good options.

You were only able to work “normally” for two and a half months after you took office. How difficult was the beginning for you now? How has the work changed for you?
Of course, that came too early for me, I must say. I was able to work closely with some very quickly such as with the Executive Committee or with the staff at the President’s Office – of course the work continued well after the lockdown. But it was naturally more difficult with other business units in UBA. I missed this very much – I wasn’t even able to get to know all the departments directly, I had just started to do that together with Vice President Franziska Kersten. I have a number of ideas on how UBA could be further developed. But most of the knowledge is of course within UBA itself. Since the 2020s are a decisive phase in advancing environmental, climate protection and sustainability policies in Germany and Europe, how can we best contribute to these processes? How can we network even better with the scientific system and become an even more efficient spider in the web of application-oriented environmental research in Germany and Europe. What are the central challenges that require our special attention? Where are the most important levers for advancing the environment and sustainability? How can we use our implementation to contribute to changes? What lessons can we learn from our policy advice to make UBA a centre and driver of sustainability changes? How can we communicate our solutions as effectively as possible to politics, industry and society? What strategic goals do we want to set ourselves for this decade? These are questions we must discuss broadly within UBA. That is why I am glad that we gradually have more opportunities for real encounters again. UBA is a place where so many creative and highly motivated people work. Mobilising this potential to the best of their ability must be at the heart of all efforts by UBA executives.

Has the focus as regards content also changed now?
Much talk has been about corona in the last few months: how does society and industry react to corona and what does this mean for sustainability issues? But we have of course kept all the other lines of work going, as far as it was possible in the home office. The fact that this has been successful shows how efficient UBA is even in such difficult times. We have achieved this as a team! The focus where I have also been personally strongly involved, is the connection between the corona crisis and the impacts on the environment. How can we combine sustainability transformation and environmental issues with a new start for industry and society? In other words, the crisis classically seen as a threat to environmental issues on one hand, is on the other seen as an opportunity for accelerated change. We at UBA have set up a task force on these issues which has done an excellent job that has attracted a lot of recognition. Large amounts of money are now being spent to combat the socio-economic consequences of the corona crisis. The question is how can it be used as sustainably as possible? The G20 is estimated to spend between US$ 12 and 20 trillion over the next 12 months. An enormous sum!

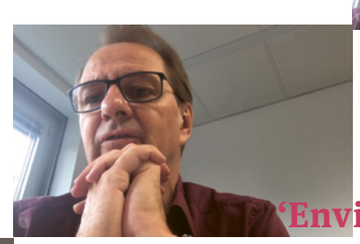
Will the corona pandemic rather help or weaken environmental protection?
In contrast to the 2008/2009 financial market crisis, environmental and sustainability issues play a major role in the discussion of economic stimulus packages and in the business press. These topics are now part of the discussion on the modernisation of the economy and society, that is a huge step forward. The Federal Government's economic stimulus package also has a strong impact on climate policy, even though of course more would have been desirable[4]. But I do see opportunities here, especially in Germany and Europe, where the Green Deal is being maintained as a response to corona. In addition to environmental issues, it is important to prevent corona from accentuating social imbalances in our societies. On the other side are the developing and threshold countries. There are many losers in this crisis. Europe is focused on itself and the USA is a total failure as an international partner in solving global issues. The impacts of the pandemic are also much more serious in many developing and threshold countries: health care systems are weaker, the opportunities for economic stimulus packages are limited, and value chains are torn apart because some production is being shifted back to Europe. I fear a stronger schism in the global economy after the pandemic. We'll have to deal with that because the challenges of biodiversity or climate protection are global and we naturally need these countries as partners along the way.

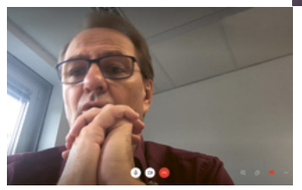
What priorities do you want to set for UBA next year?
Let's return to corona. We as UBA established a position quickly and have become visible with our 'Action Plan for Germany' and other papers are in preparation on the social consequences of the corona crisis and its challenges for our environmental and sustainability paradigms. It was a great experience to work so quickly and with such a depth of content with colleagues in UBA. And we will carry on: we are evaluating the most important studies worldwide on 'Green Recovery' and want to feed this into the international debate.

What else are you planning?
UBA's scientific seriousness and strength is the basis for working effectively and with a high reputation in all areas. I want to further develop and invest in UBA's research strengths. Of course, climate protection and the circular economy are high on the agenda – and they will profoundly change our industry and society. In the next decade we must set the course for the future: energy, mobility, urban areas, the future of agriculture. Another field I would like to develop further is how we can combine climate and environmental protection with issues such as quality of life, health and positive future outcomes for water, air, soil and chemicals management? Beyond technical solutions, we must show that environmental and climate protection also improves health and quality of life. We should emphasise this connection more clearly so that we can motivate people for the profound changes that we are proposing. Digitalisation and artificial intelligence are the next areas where major changes are pending. The Paris Climate Agreement and the UN's global sustainability goals do not even mention this yet! But I want to anchor it in this Organisation so that the two fundamental drivers of change, climate protection and digitalisation, will be dealt with. How to combine these trends to create a sustainable digital society.

What about the classic environmental issues: water, soil, air? How important are they still?
Those are our absolute basic position: clean air, clean water and fertile soils remain our challenges – the limits of ecosystems and the impacts of environmental transition on people and our societies. And these issues are also linked to the major global issues, especially climate protection and the future of biodiversity. Overall, the challenges in the environmental and sustainability sector are becoming more systemic. One can see this in our departments, for example the close cooperation between water, soil, chemical inputs into the environment and ecosystems. And of course our implementation remains important. It is a special feature of German environmental policy that environmental legislation is implemented based strongly on a science-based footing. This is one of UBA's great strengths.

4 More about the assessment of the economic stimulus package on p. 44ff.

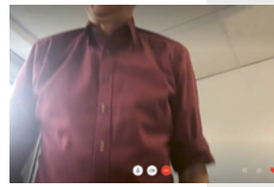




'Environmental and sustainability issues play a major role in the discussion of economic stimulus packages and in the business press.'

Is UBA well positioned for digital work – will you now have more virtual conferences?
As far as the infrastructure is concerned, we are well prepared, also in terms of working from home – certainly better than some other authorities. But we need even better systems in many areas – databases, AV systems, we are going to have to invest even more. Digitisation is already part of many of our issues: energy efficiency, mobility, agriculture, there are many examples. Of course, we have been working on many of them as cross-cutting issues. But I would like to build up even more competence and bring researchers into our organisation who are keenly researching digitalisation issues, working on artificial intelligence, analysing big data. If we can succeed in this, UBA will be a long way forward in linking sustainability and digitalisation – something that has not yet been sufficiently achieved.

What are you most looking forward to when the contact restrictions are lifted again?
That we all can finally meet again at work. I miss the interpersonal encounters and I am looking forward to when it will be possible again very much.



Corona and the environment

The novel coronavirus has had a firm grip on the world since the beginning of this year. Europe was almost completely on emergency power for several weeks and economies have been running at half speed all over the world. This also impacts on the environment: traffic dropped significantly, industrial production decreased and air quality improved, in some cases, in many cities and countries. Although dolphins in the canals of Venice are among the false reports, it is certain that the corona pandemic has had and will have an impact on the environment and climate. The German Environment Agency has been dealing with these issues from the very beginning and has also investigated the extent to which the coronavirus can be transmitted through environmental media.

Can corona save the climate?

No. Greenhouse gas emissions fell because there were fewer cars on the roads and industrial production was partially halted. However, it is not yet possible to estimate by how much. It would also only be a short-term effect.

What impact does the corona crisis have on air quality?

In principle, the following applies: if emissions are reduced, air pollution will also decrease. However, it is not yet clear what effect this reduction will have on compliance with the annual limits for 2020.

Although the measures of the corona crisis may have a positive effect on air quality, this will only be a short-term effect. A long-term and lasting improvement in air quality can only be achieved with a targeted clean air policy, e.g. by implementing measures from clean-air plans.

Do we still need import bans for certain vehicle types?

It can be assumed that after the relaxation of the corona restrictions, road traffic will return to the usual level or even exceed it, because for example, fewer people will want to travel by train or bus. As the NO2 limit value for the protection of human health refers to an average value for the whole calendar year, there is no reason to lift import restrictions at present.

Is there a link between Covid-19 infections due to the novel coronavirus SARS-CoV-2 and air pollution?

There are high levels of particulate matter and NO_2 pollution in some areas particularly affected by severe Covid-19 disease. Air pollutants can contribute to causing, promoting and aggravating respiratory diseases. This may lead to people in areas with high air pollution levels being more sensitive to SARS-CoV-2 infection or the disease may become more severe. However, it is unlikely that the viruses adhere to and are transmitted by particulate matter according to current knowledge.

Can one get infected with SARS-CoV-2 when swimming in natural bathing waters?

SARS-CoV-2 viruses may enter bathing waters via wastewater discharges if the viruses are excreted with the faeces or via infected bathers. It is not clear whether infection is possible in this way, whether it is by the sea or the lake. However, the probability of infection is extremely low due to dilution in water. As a general rule, people suffering from an acute infection of the respiratory tract or diarrhoea should not bathe in order not to endanger other bathers. This applies regardless of the type of potential pathogens involved.

Can one get infected with SARS-CoV-2 when visiting a swimming pool?

In general, direct transmission of SARS-CoV-2 via swimming and bathing water is highly unlikely. The water in outdoor or indoor swimming pools is subject to constant treatment. Filtration and disinfection are effective methods for inactivating bacteria and viruses transported into the water. Coronaviruses are enveloped viruses that are easier to inactivate by disinfection processes than non-enveloped viruses such as noroviruses or adenoviruses. However, according to the WHO, there is no evidence to date that the novel SARS-CoV-2 is transmitted by water.

What can one do for good air in one's flat?

Due to the Covid-19 pandemic, many people are spending more time at home. Regular and sufficient ventilation is also necessary for other reasons.

It is best to air rooms several times a day. It is recommended to air two or three times a day with the windows wide open for 5 minutes. The exchange of air ensures that used air (carbon dioxide, odours), chemical vapours from furniture and building products and humidity are transported outside which then prevents mould. According to current knowledge, there is no risk that coronaviruses from the outside air may enter the interior through ventilation and cause an infection.

Do I need disinfectants to clean my flat?

Damp cleaning reduces the amount of dust in the home and also the amount of possible allergens. However, additional indoor air pollution can occur when cleaning with chemical cleaning products that release substances into the indoor air. Using disinfectants when cleaning one's home as a precautionary measure is not necessary even in the current corona situation, moreover it is harmful to people and the environment.

A sustainable way out of the corona crisis

The corona pandemic has a strong impact on the economy. That is why the German Federal Government has launched a stimulus package to stimulate the economy and employment. In a comprehensive paper, the German Environment Agency had already made proposals in advance on how Germany could emerge from the crisis in a sustainable manner. UBA President Messner said: ‘Environmental and climate protection have been high on the political agenda of late. Both remain of overriding importance even after corona.

We must be careful not to lose sight of these very serious problems in the economic restart. The restart can only be sustainable if we also use the financial aid to transform the country into a sustainable and climate-neutral society. If we invest in outdated technologies and structures, this will aggravate the environmental crisis, hinder innovation, reduce our competitiveness and put off the implementation of the Paris Climate Agreement in the distant future.’

The main goal of the UBA paper was therefore to use this crisis as an opportunity to move towards more sustainable and climate-friendly economies, from the financial system to the transport system. The complete paper can be downloaded here: www.uba.de/15-punkte-corona.

Naturally, the German government‘s economic stimulus package did not take up all of these proposals one-to-one. And yet, in the transport sector, for example, it has a strong climate policy focus that goes beyond a conventional economic stimulus package. UBA also has ideas for some of these points as to how they can be designed to provide optimum protection for the environment and climate.

Corona Sustainability Compass

More ideas can be found in our blog ‘Corona Sustainability Compass’: **www.csc-blog.org**

CLIMATE / ENERGY

Reducing the EEG levy

The current low exchange electricity price would lead to a higher EEG levy due to the EEG levy mechanism (the lower the exchange electricity price, the higher the EEG levy).

Therefore, the minor reduction of the EEG levy is a correct signal. A more substantial reduction could, among other things, provide greater relief for lower-income households and make sector coupling, i.e. the use of electricity in transport (e.g. electric cars) and in buildings (e.g. heat pumps) more practical.

Supporting the National Climate Initiative (NKI)

The German Environment Agency considers the reduction in the municipal share very positive because it enables financially weak municipalities to benefit from the support programmes for effective Nationally Determined Contributions.

Expansion of renewables

Both the removal of the 52 GW cap on photovoltaics and the raising of the expansion target for offshore wind energy to 20 GW by 2030 is good news for climate protection. Likewise, the 1000-metre distance stipulation for wind turbines is no longer a blanket regulation. Now it is important to accelerate the expansion of photovoltaics and wind power even further in order to achieve the climate protection targets.

Enhancing the CO_2 building refurbishment programme

UBA had suggested that KfW (Reconstruction Credit Institute) support programmes should be enhanced to enable better heat planning. It is still open to comment as to how this will be structured. In view of the great need for action in the building sector, the extent of the support is important to provide a wide impact for the programme.

TRANSPORT

Automobile innovation premium

The temporary doubling of the buyer's premium for electric vehicles is good news, so is the waiver of a premium for vehicles with purely internal combustion engines. The promotion of electric mobility in social services and for trade is also beneficial to the climate.

Bus and lorry fleet modernisation programme

Ideally, the focus here should also be on promoting electric vehicles. Increasing the subsidy for electric buses is a helpful measure. It is still unclear whether companies will invest in new vehicles despite the subsidy against a background of the difficult economic situation.

Investment in charging infrastructure, electromobility and battery promotion

It is not clear what the focus of this measure will be or how the additional funding (2.5 billion euros) will be distributed. UBA considers the increased expansion of the charging infrastructure to be absolutely necessary to make electromobility a success. This investment offensive should include support for the expansion of an overhead line infrastructure and the purchase of overhead catenary hybrid lorries.

German Rail (DB)

The increase in German Rail's equity capital by five billion euros partly cushions DB's loss of revenue during the corona crisis, estimated at 13.5 billion euros. At the same time, however, DB will be obliged to cut billions in expenditure in return to make up the shortfall. From a climate protection perspective, these cuts must not lead to a deterioration in the competitiveness of rail. UBA recommends that greater support be given to the expansion, electrification and digitalisation of rails.

Shipping

We welcome the increase in various support programmes for the shipping industry. However, there are concerns about the use of methane in shipping for climate protection reasons (slip, upstream emissions etc.). If LNG is used, care must therefore be taken to minimise methane slip.

Short-distance public transport

Here too, half of the loss of income will be compensated. However, no further investments are being planned. If subsidies were increased or raised, supply could be improved over the short term and, if ordering options were brought forward, this would strengthen the vehicle industry.

Aviation

The support for lower emission aircraft should be implemented in such a way that it is linked to the scrapping of old aircraft. The assessment should also include emissions that cause non-CO_2 climate effects. Some of the funding should be invested in an 'Aviation Innovation and Demonstration Fund'.

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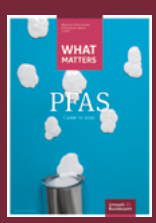

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