

Stockholm Convention on Persistent Organic Pollutants (POPs)

National Implementation Plan

Federal Republic of
Germany

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(English translation)

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Abbreviations

AbfKlärV	Sewage Sludge Ordinance
AbfVerbrG	Act Implementing Regulation (EC) No 1013/2006 of the European Parliament and of the Council of 14 June 2006 on Shipments of Waste and the Basel Convention of 22 March 1989 on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (Waste Shipment Act)
ABS	Acrylonitrile-butadiene styrene
ACEA	European Automobile Manufacturers' Association
AltholzV	Ordinance on the Management of Waste Wood (Waste Wood Ordinance)
AltöIV	Waste Oil Ordinance
AOX	Adsorbable organically bonded halogens (in organic chemistry, X generally stands for any halogen atom)
Art.	Article
BAMBI	Bavarian Monitoring of Breast Milk
BAT	Best available technique
BauA	Federal Institute for Occupational Safety and Health
BbodSchG	Act on Protection against Harmful Changes to Soil and Rehabilitation of Contaminated Sites (Federal Soil Protection Act)
BbodSchV	Federal Soil Protection and Contaminated Sites Ordinance
BfC	Federal Office for Chemicals
BImSchG	Act on the Prevention of Harmful Effects on the Environment Caused by Air Pollution, Noise, Vibration and Similar Phenomena (Federal Immission Control Act)
BioAbfV	Ordinance on the Utilisation of Biowastes on Land Used for Agricultural, Silvicultural and Horticultural Purposes (Ordinance on Biowastes)
BLAC	Federation/Länder Working Group on Chemical Safety
BMU	Federal Ministry for the Environment, Nature Protection and Nuclear Safety
BSH	Federal Maritime and Hydrographic Agency
BStMUGV	Bavarian State Ministry for the Environment, Health and Consumer Protection
BVL	Federal Office of Consumer Protection and Food Safety
ChemBiozidMeldeV	Ordinance on the Notification of Existing Biocidal Products under the Chemicals Act (Biocide Notification Ordinance)
ChemBiozidZulV	Ordinance on the Authorisation of Biocidal Products and Other Procedures in Chemicals Law Relating to Biocidal Products and Biocidal Active Substances (Biocidal Products Authorisation Ordinance)
ChemG	Act on Protection against Hazardous Substances (Chemicals Act)
ChemStrOWiV	Ordinance on the Enforcement of Community Law Regulations Relating to Substances and Preparations (Chemicals Penalty Ordinance)
ChemVerbotsV	Ordinance on Bans and Restrictions on the Placing on the Market of Dangerous Substances, Preparations and Products pursuant to the Chemicals Act (Prohibition of Chemicals Ordinance)
CLP	Classification, labelling and packaging of substances and mixtures (cf. Regulation (EC) No 1272/2008)

CLRTAP	Convention on Long-Range Transboundary Air Pollution
CMR	Carcinogenic, mutagenic and reprotoxic
COMBINE	Cooperative Monitoring in the Baltic Marine Environment
COP	Conference of the parties
CSE	Central System for Emissions Data
DDT	Dichlorodiphenyltrichlorethane
DepV	Ordinance on Landfills and Long-Term Storage Facilities (Landfill Ordinance)
dl PCBs	Dioxin-like PCBs
DM	Dry mass
DNA	Designated national authority
DS	Dry substance
EC	European Community
ECHA	European Chemicals Agency
EEC	European Economic Community
ElektroG	Act Governing the Sale, Return and Environmentally Sound Disposal of Electrical and Electronic Equipment (Electrical and Electronic Equipment Act)
EMEP	European Monitoring and Evaluation Programme
FuttMV	Animal Feed Ordinance
GADSL	Global Automotive Declarable Substance List
GefStoffV	Ordinance on Hazardous Substances (Hazardous Substances Ordinance)
GEMS/Food	Global Environment Monitoring System - Food Contamination Monitoring and Assessment Programme
GHS	Globally Harmonised System
GMMP	German Marine Monitoring Programme
GrwV	Ordinance on the Protection of Groundwater (Groundwater Ordinance)
HBB	Hexabromobiphenyl
HCB	Hexachlorobenzene
HCHs	Hexachlorocyclohexanes
HELCOM	Helsinki Commission
heptaBDE	Heptabromodiphenyl ether
hexaBDE	Hexabromodiphenyl ether
HIPS	High impact polystyrene
ICPE	International Commission for the Protection of the Elbe
IED	Industrial Emissions Directive
IMDS	International Material Data System
IPPC	Integrated pollution prevention and control
ITEq	International Toxic Equivalent Concentration
JAMP	Joint Assessment and Monitoring Programme
JKI	Julius Kühn Institute
KmV	Ordinance on the Limitation of Contaminants in Food (Contaminants Ordinance – KmV)
KrWG	Recycling Management Act

LABO	Federation/Länder Working Group on Soil Conservation
LAGA	Federation/Länder Working Group on Waste
LAI	Federation/Länder Working Group on Immissions Control
LANUV NRW	North Rhine Westphalian Land Agency for Nature, Environment and Consumer Protection
LAWA	Federation/Länder Working Group on Water Issues
LFGB	Foodstuffs, Commodities and Animal Feeds Code (Food and Feed Code)
MONARPOP	Monitoring Network in the Alpine Region for Persistent Organic Pollutants
MUDAB	Marine Environment Database
NachwV	Ordinance on Waste Recovery and Disposal Records
NGO	Non-governmental organisation
OCS	Octachlorostyrene
octaBDE	Octabromodiphenyl ether
OSPAR	Convention for the Protection of the Marine Environment of the North-East Atlantic
PAHs	Polycyclic aromatic hydrocarbons
PBBs	Polybrominated biphenyls
PBDE	Polybrominated diphenyl ether
PBT	Persistent, bioaccumulative and toxic
PCB6	6 PCB congeners after Ballschmiter: PCB 28: 2,4,4'-trichlorobiphenyl, PCB 52: 2,2',5,5'-tetrachlorobiphenyl, PCB 101: 2,2',4,5,5'-pentachlorobiphenyl, PCB 138: 2,2',3,4,4',5'-hexachlorobiphenyl, PCB 153: 2,2',4,4',5,5'-hexachlorobiphenyl, PCB 180: 2,2',3,4,4',5,5'-heptachlorobiphenyl
PCBAbfallV	Ordinance on the Disposal of Polychlorinated Biphenyls, Polychlorinated Terphenyls and Halogenated Monomethyl Biphenyl Methanes (PCB/PCT Waste Ordinance)
PCBs	Polychlorinated biphenyls
PCDD/Fs	Polychlorinated dibenzodioxins and dibenzofurans
PCP	Pentachlorophenol
PCTs	Polychlorinated terphenyls
PeCB	Pentachlorobenzene
pentaBDE	Pentabromodiphenyl ether
PFCs	Polyfluorinated chemicals
PflSchG	Act concerning the Protection of Crop Plants (Plant Protection Act)
PFOA	Perfluorooctanic acid
PFOS	Perfluorooctane sulfonic acid
PFOSF	Perfluorooctane sulfonyl fluoride
PFTs	Perfluorinated tensides
PIC	Prior Informed Consent (cf. Rotterdam Convention)
POP	Persistent organic pollutant
PRTR	Pollutant Release and Transfer Register
PU	Polyurethane
RAC	Risk Assessment Committee

RBC	River Basin Commission
REACH	Registration, Evaluation, Authorisation and Restriction of Chemicals (cf. Regulation (EC) 1907/2006)
RHmV	Ordinance on Maximum Quantities of Residues of Plant Protection Products and Pesticides, Fertilisers and Other Products in or on Foodstuffs and Tobacco Products (Maximum Residue Limits Ordinance)
RoHS	Restriction of the use of certain hazardous substances (cf. Directive 2002/95/EC)
SAICM	Strategic Approach to International Chemicals Management
SchadRegProtAG	Act Implementing the Protocol on Pollutant Release and Transfer Registers of 21 May 2003 and Regulation (EC) No 166/2006
SEAC	Socio-Economic Analysis Committee
SVHC	Substance of very high concern
TEQ	Toxicity Equivalent
tetraBDE	Tetrabromodiphenyl ether
TMAP	Trilateral Monitoring and Assessment Programme
UBA	Federal Environment Agency
UFOPLAN	Federal Environment Ministry Environmental Research Plan
UMK	Conference of Environment Ministers of the Federation and Länder
UNECE	United Nations Economic Commission for Europe
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
UPB	Federal Environment Agency Environmental Specimen Bank
UPEs	Unsaturated polyesters
VersatzV	Ordinance on Underground Waste Stowage
vPvB	Very persistent and very bioaccumulative
WEEE	Waste electrical and electronic equipment
WFD	Water Framework Directive
WHG	Act on the Regulation of Matters Pertaining to Water (Federal Water Act)
WHO	World Health Organisation

1 Introduction

Persistent Organic Pollutants (POPs) are chemical substances that persist in the environment for long periods after their release and accumulate heavily in the food chain, particularly in fatty tissues, ultimately reaching concentrations that have harmful impacts on human health and the environment. In addition to this, POPs can potentially be transported over great distances and dispersed around the globe by air and ocean currents. They therefore pose a risk to the environment and human health not only locally and regionally, but also in parts of the world at a great distance from the point of emission. Arctic and mountainous regions, to which POPs are carried by air currents and where they are deposited as a result of condensation, appear to be at particular risk.

In implementing the Stockholm Convention on Persistent Organic Pollutants (Secretariat of the Stockholm Convention, 2009), the parties to the Convention commit to take appropriate measures to prevent the release of these substances into the environment or at least reduce such releases as far as is technically feasible and economically acceptable.

1.1 The National Implementation Plan

The drafting of a specific National Implementation Plan is one of the obligations entered into by the parties to the Convention. Article 7(1)(a) of the Convention stipulates that each party has to develop its own National Implementation Plan and transmit it to the Conference of the parties within two years of the date on which the Convention enters into force (Art. 7(1)(b)). The plan must be reviewed and updated at regular intervals to be specified by the Conference of the parties (Art. 7(1)(c)).

At the Fourth Conference of the parties in May 2009, nine further POPs were added to the original list. As a result of the listing of perfluorooctane sulfonic acid (PFOS), its salts and perfluorooctane sulfonyl fluoride (PFOSF), the parties to the Convention were called upon to draw up action plans that would be integrated into their national implementation plans. In response, the Federal Republic of Germany has drafted a completely updated version of its Implementation Plan for submission to the Secretariat. It sets out the obligations under the Convention that have already been fulfilled, the results that have been achieved in the efforts to combat POPs since the previous Implementation Plan's entry into force and the strategies that are to be pursued in order to comply with the obligations that still remain to be met.

The Federal Republic of Germany is a party not only to the Stockholm Convention, but also to the POPs Protocol under the Convention on Long-Range Transboundary Air Pollution (CLRTAP – UNECE, 2011a). Furthermore, various pieces of Community legislation on POPs apply. All the obligations these agreements and legislative instruments impose are set out in this Implementation Plan.

A meeting to discuss the planning of measures included in the National Implementation Plan was held by the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) at Bonn on 17 May 2011 and attended by important interest groups (representatives of the Länder, BMU directorates-general that work in this field, representatives of the academic community, non-governmental organisations).

2 Legal framework

2.1 International provisions

The fundamental principles of the management of chemicals at the international level were laid down in 2006 in the Strategic Approach to International Chemicals Management (SAICM).¹ The aim of the SAICM is to create global instruments for the sound management of chemicals. The United Nations Environment Programme (UNEP²) and the World Health Organisation (WHO³) have prominent, leading roles in the work being done on the Approach. One of the first results of the SAICM process was the Globally Harmonised System of Classification and Labelling of Chemicals (GHS – UNECE, 2011b). Another important agreement connected with POPs is the 1998 CLRTAP POPs Protocol.

The other international agreements that are of relevance in this field are the 1998 Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade (Rotterdam Convention Secretariat, 2008), which has been in force since 2004, and the 1989 Basel Convention Controlling Transboundary Movements of Hazardous Wastes and their Disposal. The Federal Republic of Germany and the European Union are parties to all these agreements and are therefore committed to implement their provisions. This is accomplished firstly through European regulations that are directly applicable in the EU Member States and secondly through European directives that require further transposition into national law.

The Stockholm Convention

The Stockholm Convention has the objective of ensuring human health and the environment are protected from POPs, and any action taken is informed by the precautionary approach. To this end, different levels of regulation are laid down for the various substances it covers. Depending on the levels of regulation to which they are subject, the substances are assigned to three annexes to the Stockholm Convention (cf. Table 1, pp. 3f).⁴

- **Annex A**
Substances listed in this Annex are to be eliminated completely from the markets of the parties to the Convention. The following measures are intended to contribute to the elimination of these substances: prohibition of their production and use, prohibition of the import of substances individually or in mixtures and as constituents of articles.
- **Annex B**
The manufacture and use of substances listed in Annex B are restricted in accordance with the requirements set out in this Annex. It does not impose a general ban, but puts

1 <http://www.saicm.org/>.

2 <http://www.unep.org/>.

3 <http://www.who.int/en/>.

4 An overview of the designated substances and background information about the areas in which they are deployed can be found on the Stockholm Convention Secretariat's Internet site.

in place specific provisions for each use. In addition to this, exemptions may be allowed for the use of these substances.

- Annex C

Substances listed in this annex are not produced intentionally, but it is either difficult or impossible to prevent their formation during chemical processes. They are either released into the environment as a result of these processes or are subsequently present in the products as contaminants. This also includes processes in which substances are produced as non-isolated intermediates. The objective with regard to these substances is to minimise any releases as far as possible and, if technically possible, prevent them completely.

Furthermore, the Convention stipulates how stockpiles of the substances individually, in mixtures or in articles are to be dealt with. It requires that provisions be put in place concerning the transport of substances and their management as wastes. Apart from this, reporting is made mandatory for the individual parties.

Table 1 List of POPs designated in the Stockholm Convention

Name	CAS No.	EC No.	Annex to Stockholm Convention
Aldrin	309-00-2	206-215-8	A
Chlordane	57-74-9	200-349-0	A
Chlordecone	143-50-0	205-601-3	A
Dieldrin	60-57-1	200-484-5	A
Endrin	72-20-8	200-775-7	A
Heptachlor	76-44-8	200-962-3	A
Hexabromobiphenyl(HBB)	36355-01-8	252-994-2	A
Hexabromodiphenyl ether (hexaBDE) and heptabromodiphenyl ether (heptaBDE); principal constituents of commercial c-octaBDE ⁵	68631-49-2	207122-15-4	A
	446255-22-7	207122-16-5	
Hexachlorobenzene (HCB)	118-74-1	204-273-9	A, C
Alpha hexachlorocyclohexane (α -HCH)	319-84-6	206-270-8	A
Beta hexachlorocyclohexane (β -HCH)	319-85-7	206-271-3	A
Gamma hexachlorocyclohexane (γ -HCH, lindane)	58-89-9	200-401-2	A
Pentachlorobenzene (PeCB)	608-93-5	210-172-0	A, C
Tetrabromodiphenyl ether (tetraBDE) and pentabromodiphenyl ether (pentaBDE); principle constituents of commercial c-pentaBDE	40088-47-9	254-787-2	A
	32534-81-9	251-084-2	
Perfluorooctane sulfonic acid (PFOS), its salts and perfluorooctane sulfonyl fluoride (PFOSF)	PFOS: 1763-23-1	PFOS: 217-179-8	B
	PFOSF: 307-35-7	PFOSF: 206-200-6	

⁵ The 'c' stands for 'commercial'.

Name	CAS No.	EC No.	Annex to Stockholm Convention
Dichlorodiphenyltrichloroethane (DDT)	50-29-3	200-024-3	B
Toxaphene	8001-35-2	232-283-3	A
Mirex	2385-85-5	219-196-6	A
Polychlorinated biphenyls (PCBs)	Various	Various	A, C
polychlorinated dibenzo-p-dioxins (PCDDs)	Various	Various	C
Polychlorinated dibenzofurans (PCDFs)	Various	Various	C
Endosulfan	115-29-7	204-079-4	A

2.2 European provisions concerning chemicals

2.2.1 POPs

As a party to the Stockholm Convention, the EU has committed itself to implement the requirements of this international agreement. They are addressed within the framework laid down by Regulation (EC) No 850/2004 of the European Parliament and of the Council of 29 April 2004 on persistent organic pollutants and amending Directive 79/117/EEC, as most recently amended (POPs Regulation). The addition of nine new substances at the Fourth Conference of the parties (COP4) on 4-8 May 2009 made it necessary for the Regulation to be adapted. This was accomplished by means of two amending regulations:

- Commission Regulation (EU) No 757/2010 of 24 August 2010 amending Regulation (EC) No 850/2004 of the European Parliament and of the Council on persistent organic pollutants as regards Annexes I and III

and

- Commission Regulation (EU) No 756/2010 of 24 August 2010 amending Regulation (EC) No 850/2004 of the European Parliament and of the Council on persistent organic pollutants as regards Annexes IV and V.

Endosulfan was added as a new POP at the Fifth Conference of the parties (COP 5). The requisite adjustments were made to the Regulation by means of the following amending regulation:

- Commission Regulation (EU) No 519/2012 of 19 June 2012 amending Regulation (EC) No 850/2004 of the European Parliament and of the Council on persistent organic pollutants as regards Annex I.

In the EU, the commitments made under both the Stockholm Convention and the CLRTAP POPs Protocol⁶ are translated into directly applicable law by the POPs Regulation. Furthermore, the POPs Regulation fleshes out the provisions of the international conventions, e.g. by stipulating concrete limit values for contamination with POPs in new substances, mixtures or articles that are placed on the market.

⁶ The POPs Regulation therefore includes other substances that are not regulated in the Stockholm Convention such as polycyclic aromatic hydrocarbons (PAHs).

Article 3 of the POPs Regulation governs a fundamental prohibition on the production, placing on the market and use of substances listed in Annex I to the Regulation individually, in mixtures or as constituents of articles.⁷ According to Article 4(1), the only exceptions from this provision are for small (laboratory scale) quantities of these substances for the purposes of research and unintentionally generated trace contaminants. Annex I lists the substances designated in Annex A and Annex B to the Stockholm Convention. In some cases, it formulates more precise conditions concerning the presence of substances in articles and more detailed requirements concerning the recycling of substances and mixtures.

Article 13 of the POPs Regulation obliges the EU Member States to put in place penalties for infringements of the prohibition on the production, use and placing on the market of substances listed in Annex I. In Germany, these penalties are implemented in the Chemicals Penalty Ordinance.

The new substances tetraBDE, pentaBDE, hexaBDE and heptaBDE are subject to a maximum limit of 0.001% by weight (10 mg/kg) as constituents of substances (e.g. contaminants), mixtures, articles or flameproofed components of articles. A limit value of 0.1% by weight applies if the mixture or article (or component of an article) consists wholly or partially of reused materials. A further derogation is allowed if the articles fall within the scope of Directive 2002/95/EC (Restriction of the Use of Certain Hazardous Substances – RoHS - Directive⁸). In addition to this, the Regulation allows the continued use of articles that were already on the market prior to 25 August 2010.

When PFOS was added to the Stockholm Convention and the POPs Regulation, this was the first time a substance had been included while there were still uses in which it could not be substituted over the short term. Numerous exceptions were accordingly provided for concerning the use of this substance and appropriate parameters formulated in the POPs Regulation.

Apart from the general system of penalties under chemicals law in place in the Federal Republic of Germany,⁹ the Chemicals Penalty Ordinance (ChemStrOWiV) allows infringements of the POPs Regulation and other instruments to be prosecuted directly as crimes or administrative offences for which fines may be imposed.

2.2.2 General European chemicals law

The general framework for chemical substances in the EU is formed by Regulation (EC) No 1907/2006, known as the REACH Regulation, and Regulation (EC) No 1272/2008 on classification, labelling and packaging of substances and mixtures, known as the CLP Regulation, which implement the GHS at the European level.

⁷ In this context, the presence of a substance is not equated with the use of that substance. In consequence, chemicals law defines further-reaching limit values for the marketability of articles that e.g. are imported or may be contaminated with a substance.

⁸ An RoHS-compliant component may contain up to 0.1 per cent by weight polybrominated biphenyls.

⁹ Public authorities may issue orders for the cessation of infringements of provisions in EC chemicals law that have been detected or to prevent any such infringements in future under Section 23(1) in conjunction with the first sentence of Section 21(2) of the Chemicals Act (ChemG), and may impose penalties under Section 26(1)(10) ('Imposition of fine') and Section 27b of the ChemG ('Seizure of goods') where an enforceable order issued by a public authority is contravened.

REACH is an abbreviation for the 'Registration, Evaluation, Authorisation and Restriction of Chemicals'. The registration of substances is a notification procedure under which a distinction is made between substances that were already on the EU market prior to September 1981 ('existing substances') and substances that have only been placed on the market since that time ('new substances'). Existing substances must be registered as of an annual volume of > 1 tonne per year per producer or importer. Depending on the tonnage of the substances supplied and whether they have been preregistered, there are various deadlines for their registration, the last of which is 1 June 2018. The registration process requires producers or importers of substances to compile data on their substances, to obtain such data by conducting tests if necessary and to communicate the data to a central authority, the European Chemical Agency (ECHA).

Another aspect of the REACH Regulation is the evaluation of registration dossiers and the assessment of substances. In this respect, it is incumbent upon the ECHA to check the registration dossiers to ascertain whether they fulfil formal requirements with regard to completeness and correctness, and consider any testing proposals submitted by the registrants. The evaluation of a substance, in which all information on an individual substance is examined to ascertain its quality and conclusions are drawn concerning further risk management measures, lies within the province of the Member States.

The third process that gives the REACH Regulation its name is authorisation, which applies to substances that pose a particular danger to human health or the environment and that have been included by means of a formal procedure in Annex XIV. Any use of such a substance must first be authorised before it may be practised. The authorisation application must set out, on the basis of a chemical safety report, how the risks involved in the concrete use in question will be controlled adequately. If it is not possible to demonstrate how this will be done with regard to all risks, the applicant is also able to substantiate the appropriateness of the use by undertaking a socioeconomic analysis. Only in cases in which the appropriateness of a use has successfully been demonstrated may an authorisation be granted. Otherwise, that use is not permissible beyond a certain point in time. The Regulation established a new category, substances that are of very high concern (SVHCs), which include

- substances that are carcinogenic, mutagenic and toxic to reproduction (CMR),
- substances with persistent, bioaccumulative and toxic (PBT) or very persistent and very bioaccumulative (vPvB) characteristics, and
- substances in other groups that give reason for similar concerns (e.g. hormonally disruptive or sensitising substances).

Substances listed in Annexes A–C of the Stockholm Convention are not dealt with in the REACH authorisation process, but are subject to the POPs Regulation. Nevertheless, the registration process under REACH involves examining the substances' persistence, bioaccumulation and toxicity characteristics¹⁰ (which can only be done as of a threshold of > 100 tonnes a year, below which no assessment is possible because insufficient testing results will be available). The crite-

¹⁰ The REACH Regulation defines substances that display persistent, bioaccumulative and toxic or a very persistent and very bioaccumulative characteristics in the environment as substances of very high concern. In contrast to the POPs Regulation, their long distance transport is not examined in the REACH process, and this is not a criterion for the identification of substances of very high concern.

ria for the assessment of such substances can be found in REACH Annex XIII, as most recently amended.¹¹

In addition to this, the REACH Regulation governs the procedure for the restriction of substances and therefore superseded Directive 76/769/EEC (Limitations Directive) on 1 June 2009 (pursuant to Article 139). The extant limitations were incorporated into Annex XVII to the REACH Regulation (Art. 137(3)). With regard to POPs, the limitations on PFOS, pentaBDE and octaBDE were incorporated into Annex XVII to the REACH Regulation. In view of their inclusion in the Stockholm Convention and their subsequent inclusion in the POPs Regulation on the basis of Regulation (EU) No 207/2011, the limitations on PFOS and PentaBDE were removed from Annex XVII again in order to rule out any duplication of legal provisions in the EU. At present, octaBDE and polybrominated biphenyls (PBBs) are listed in both Annex XVII to the REACH Regulation and the POPs Regulation.

Apart from this, the REACH Regulation sets out requirements concerning communication in the supply chain on substances, mixtures and substances of very high concern in articles. The safety data sheet required by Article 31 of the REACH Regulation supplies users of chemicals with information about the dangerous characteristics¹² of the substances and mixtures they have purchased, as well as instructions for their safe handling. Substances or mixtures that do not meet the criteria for classification as dangerous, but nevertheless have to be distributed with instructions on their safe handling are supplied with the information required by Article 32 of the REACH Regulation. The REACH Regulation does not stipulate any format for the information provided under Article 32. The structure and contents of the safety data sheets are laid down in Annex II to the REACH Regulation and were updated by Commission Regulation (EU) No 453/2010 of 20 May 2010. This part of the REACH Regulation therefore repealed Directive 91/155/EEC (with effect from 1 June 2007).

The CLP Regulation is closely interlinked with the REACH Regulation. It lays down rules for the classification, labelling and packaging of hazardous substances and mixtures. In the field of substances, the CLP Regulation superseded Directive 67/548/EEC (Dangerous Substances Directive) on 1 December 2010 as a mandatory Regulation, but parts of Directive 67/548/EEC that relate to mixtures will remain in force until 1 June 2015. With regard to mixtures, the CLP rules will apply in their entirety as of 1 June 2015. The CLP Regulation, together with the rules set out in the REACH Regulation, will then replace the Dangerous Substances Directive and Directive 1999/45/EC (Dangerous Preparations Directive).

The ECHA was newly founded when the REACH system was introduced. Apart from its functions under the REACH Regulation, it also performs functions provided for by the CLP Regulation and will have a role under the forthcoming Biocides Regulation in future as well. The punishment of infringements of the REACH Regulation and the CLP Regulation is a matter for the Member States.

¹¹ Most recently amended by Regulation (EU) No 252/2011 of 15 March 2011.

¹² A substance or mixture is dangerous if it fulfils one of the criteria set out in Regulation (EC) 1272/2008 (substances) or Directive 1999/45/EC (mixtures). This will be the situation until 2015, from which time the relevant criteria will be those set out in Regulation (EC) 1272/2008.

2.2.3 European provisions concerning plant protection products¹³

A uniform, EU-wide procedure for the authorisation of plant protection products is laid down in Regulation (EC) No 1107/2009 of the European Parliament and of the Council of 21 October 2009 concerning the placing of plant protection products on the market and repealing Council Directives 79/117/EEC and 91/414/EEC (Plant Protection Products Regulation). A distinction is made between the procedure for the assessment of active substances at the EU level and the procedure for the authorisation of formulated plant protection products at the level of the Member States.

Active substances in plant protection products are assessed at the EU level. The European Commission decides with the Member States whether an active substance should be accepted and approved. The inclusion of a substance in the positive list (Implementing Regulation (EU) No 540/2011) is one of the preconditions that has to be fulfilled before plant protection products that contain the active substance in question can be authorised. Active substances that, for instance, display CMR characteristics, disrupt the hormonal system or have PBT characteristics may not be included in the Annex to the Implementing Regulation (Annex II(3)). Nor may substances categorised as POPs be included in the Annex.

An application for the inclusion of an active substance in the Annex to the Implementing Regulation involves the submission of an extensive dossier of data and information on the tests that have been carried out (Art. 7, Art. 8). It is necessary to provide documents on a substance's physical and chemical properties, the methods of analysis used, the substance's efficacy, its toxicology, the behaviour of its residues, its behaviour in the environment and its environmental impacts (ecotoxicity). The studies must be carried out by certified testing institutes in accordance with the principles of good laboratory practice or good experimental practice.

An application for the authorisation of a plant protection product has to be submitted in the Member State where there are plans to market it (Art. 33). The authorisation application also has to be accompanied by an extensive dossier, which is examined and appraised by the competent authorities in the Member State.

2.2.4 European provisions concerning biocides

Provisions on the handling of biocides are set out in Directive 98/8/EC of the European Parliament and of the Council of 16 February 1998 concerning the placing of biocidal products on the market (Biocidal Products Directive).

Under the uniform EU procedure, it is necessary to decide whether a biocidal active substance should be included in the list of the active substances permitted at the Community level. The inclusion of a biocidal active substance in one of the annexes to the Directive is a precondition for the authorisation of any biocidal products that contain the substance in question (Art. 5, Art. 10). None of the substances listed in Annexes A–C to the Stockholm Convention has been registered under the EU procedure for the assessment of active substances in biocides. In consequence, the authorisation of biocidal products that contain POPs is not permitted in Germany.

¹³ The account given here only deals with provisions that relate to substances listed in the Stockholm Convention, as most recently amended.

New legislation, Regulation (EU) No 528/2012 of the European Parliament and of the Council of 22 May 2012 concerning the making available on the market and use of biocidal products (Biocides Regulation), was published in June 2012 and will enter into force in September 2013. Under this Regulation, there will continue to be a two-stage procedure for the assessment of active substances (the responsibility of the EU) and the authorisation of formulated products (the responsibility of the Member States¹⁴). By analogy to the requirements of the EU Plant Protection Products Regulation, substances of very high concern will not be approved as a matter of principle (cf. the exclusion criteria detailed in Art. 5); however, exceptions will be possible under particular preconditions, but not for active substances that, as POPs substances, fall under the POPs Regulation. The Member States will be able to formulate conditions when products are authorised. Substances with PBT characteristics within the meaning of the REACH Regulation will have to be replaced as biocidal active substances. Apart from this, products that contain such substances will not be regarded as low-risk products.

2.2.5 Import/export provisions

The granting of consent for the import and export of hazardous chemicals is governed by Regulation (EC) No 689/2008 of the European Parliament and of the Council of 17 June 2008 concerning the import and export of dangerous chemicals (Prior Informed Consent – PIC Regulation), which implements the Rotterdam Convention. This Regulation will be replaced on 1 March 2014 by Regulation (EU) No 649/2012.

If a hazardous substance that is listed in the annexes to the Regulation is exported to another country that is a party to the Rotterdam Convention, the exporting country must notify the authorities in the importing country of the substance. The importing country must then give its consent for the import of the substance into its territory. The substances listed in the annexes also include POPs (the various procedures required by the Regulation are governed by Articles 7, 10, 12 and 13).

2.3 Provisions in national chemicals law

National environmental and chemicals law is shaped to a very great extent by EU law: either in the form of European regulations or in the form of directives that need to be transposed into national legislation. Apart from this, national acts and secondary legislation¹⁵ define responsibilities and govern the sovereign function of enforcing the requirements that apply.

The main pillar of German chemicals law is the Chemicals Act (ChemG). It transposes or fleshes out the provisions of the REACH Regulation, the CLP Regulation, the PIC Regulation and the Biocidal Products Directive. The following ordinances with relevance for the regulation of POPs have been adopted under the ChemG:

- Hazardous Substances Ordinance (GefStoffV): governs the classification, packaging and labelling of hazardous substances, as well as their handling and use
- Prohibition of Chemicals Ordinance (ChemVerbotsV): governs the placing on the market of hazardous substances and the restriction of their placing on the market

¹⁴ With simplified procedures for low-risk products.

¹⁵ E.g. as laid down in administrative instruments.

- Biocidal Products Authorisation Ordinance (ChemBiozidZulV): governs the authorisation of biocidal products and other procedures under chemicals law concerned with biocidal products and biocidal active substances
- Biocide Notification Ordinance (ChemBiozidMeldeV): requires that all biocidal products placed on the market in Germany be notified to the authorisation body

Directive 91/414/EEC concerning the placing of plant protection products on the market governed the uniform authorisation procedure followed throughout the European Union and was transposed into German law by the Act concerning the Protection of Crop Plants (Plant Protection Act – PflSchG). The PflSchG had to be amended following the entry into force of Regulation (EC) No 1107/2009 on 14 June 2011, a piece of European legislation with immediate effect in national law. The revised Plant Protection Act was promulgated on 6 February 2012 and entered into force on 14 February 2012.

2.3.1 Competences for legal functions relating to chemicals

In the case of biocides and plant protection products, the central elements of the relevant law are enforced directly by higher federal authorities.

The Federal Office for Chemicals (BfC), Division 5 of the Federal Institute for Occupational Safety and Health (FIOSH), has extensive competences for the implementation of the REACH Regulation and the CLP Regulation. In exercising its powers, it collaborates closely with other federal authorities that act as assessment bodies:

- the Federal Environment Agency (UBA) as the assessment body for environmental issues,
- the Federal Institute for Risk Assessment (BfR) as the assessment body for health and consumer protection issues, and
- Division 4 of the Federal Institute for Occupational Safety and Health (FIOSH) as the assessment body for occupational safety and health.

It is incumbent upon the Länder to oversee compliance with the REACH Regulation, biocide law and plant protection law. The competences in these fields may be held by various Land authorities, depending on the administrative structures in each Land.

2.4 Provisions in the law on the operation of industrial installations

2.4.1 Provisions in European law on the operation of industrial installations

Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions (integrated pollution prevention and control) (IED) governs the integrated prevention and control of environmental pollution attributable to the industrial activities specified in Annex I. The IED entered into force on 6 January 2011 and is to be transposed into national law within two years.

It also sets out provisions on the prevention and, in so far as this is not possible, reduction of emissions into the air, water and soil, as well as the avoidance of waste with the aim of achieving a high level of protection for the environment as a whole. This may require the consumption of resources to be minimised. Pursuant to Article 13, reference documents are drawn up for each type of installation listed in Annex I. These documents contain conclusions on the best available techniques and the emissions levels associated with them. These 'BAT conclusions' are to be applied in accordance with the requirements of the IED when the national authorities grant permits. As far as the national transposition of the IED is concerned, provision is made for less rigorous emissions limitations and time limits to be set in secondary legislation or installation permits if the application of the BAT conclusions and the associated emissions levels would be disproportionate in view of the technical features of the type of installation in question.

Article 21(3) of the Industrial Emissions Directive requires the implementation of the BAT conclusions at each installation site, as well as the reconsideration of permit conditions and compliance with updated conditions by the installation in question within four years.

Water-specific parts of the BAT conclusions are currently implemented by the Waste Water Ordinance and its annexes. Air-specific parts of the BAT conclusions are implemented by the TA Luft in so far as they are associated with emissions values.

As a minimum, permits must lay down emission limit values for the pollutants included in the list in Annex II to the Directive, as well as any other pollutants emitted by the installations in question where they are relevant in view of their nature and quantity.

The list of pollutants in Annex II to the IED includes the following airborne pollutants:

- Polychlorinated dibenzodioxins and polychlorinated dibenzofurans
- Chlorine and its compounds
- Fluorine and its compounds

Annex II to the IED includes the following waterborne pollutants:

- Organohalogen compounds and substances that may form such compounds in the aquatic environment
- Substances and mixtures that have been proven to possess carcinogenic or mutagenic properties, or that may affect reproduction in or via the aquatic environment
- Persistent hydrocarbons, and persistent and bioaccumulable organic toxic substances
- Biocides and plant protection products
- Substances listed in Annex X to Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy.

This means substances covered by the Stockholm Convention are also taken into consideration.

Provisions concerning installations at which particularly dangerous substances are handled are laid down in Council Directive 96/82/EC of 9 December 1996 on the control of major-accident hazards involving dangerous substances (Seveso II Directive).

2.4.2 Provisions in national law on the operation of industrial installations

Installations that, on account of their nature or their operation, may cause particularly harmful effects on the environment or otherwise cause hazards, or cause significant disadvantages or significant nuisances to the general public or the neighbourhood are subject to licensing under the Federal Immission Control Act (BImSchG). The third sentence of Section 4(1) of the Ordinance on Installations Requiring a Permit (4. BImSchV) stipulates which kinds of installations, in particular, are subject to licensing.

On the basis of the powers conferred upon it by Section 47 and Section 48 of the BImSchG, the German Federal Government promulgates pieces of secondary legislation and administrative provisions for the implementation of the Act.

Technical Instructions on Air Quality Control

The Technical Instructions on Air Quality Control of 24 July 2002 (TA Luft) constitute the first general administrative instrument pertaining to the Federal Immission Control Act. They serve to protect the general public and the neighbourhood against harmful effects of air pollution on the environment and provide precautions against harmful effects of air pollution in order to attain a high level of protection for the environment overall.

The Technical Instructions on Air Quality Control set out general and special requirements concerning the restriction of emissions. The general emissions level expressed as the mass concentration of PCDD/Fs in exhaust gas may not exceed 0.1 ng/m³ and the mass flow may not exceed 0.25 µg/h unless exemptions are authorised for particular installations under the parts of the Technical Instructions that deal with special cases. Emissions of other, particularly environmentally damaging substances, such as carcinogenic, reprotoxic and mutagenic substances, e.g. polybrominated dibenzodioxins, polybrominated dibenzofurans or polyhalogenated biphenyls, are to be restricted as far as possible, while taking account of the principle of proportionality (the emissions minimisation principle formulated in section 5.2.7 TA Luft).

The national ordinances on the operation of industrial installations that relate to POPs include the following:

- **First Ordinance for the Implementation of the Immission Control Act (1. BImSchV)**

The 1. BImSchV governs the construction and operation of small and medium-sized firing installations. It is a national ordinance that is not based on legislation that applies throughout the EU. Installations that burn solid fuels, in particular, may emit relevant quantities of POPs, including PCDD/Fs. The Ordinance contains limit values for PCDD/Fs that relate to the combustion of what are known as agricultural fuels (straw, cereals, other regenerative raw materials), compliance with which is to be demonstrated in test bed conditions.

- **Thirteenth Ordinance for the Implementation of the Immission Control Act (13. BImSchV)**

This ordinance governs the construction, characteristics and operation of firing installations, including gas turbine plants and gas turbine plants intended to power mechanical drives, with a rated thermal input of 50 MW or more for the use of solid, liquid or gaseous fuels. According to the Ordinance, an emissions limit value for PCDD/Fs of 0.1 ng TEQ/m³ applies when solid and liquid fuels are burned in firing installations.

- **Seventeenth Ordinance for the Implementation of the Immission Control Act (17. BImSchV)**

This Ordinance governs the requirements placed on the construction, characteristics and operation of incineration and co-incineration installations for the wastes and substances specified in Section 1 of the Ordinance. For example, the Ordinance sets an emission limit value of 0.1 ng TEQ/m³ for PCDD/Fs at incineration installations.

2.5 Provisions in water law

2.5.1 Provisions in European water law

The 2000 Water Framework Directive (Directive 2000/60/EC - WFD) sets the European legal framework for the protection of waters. The WFD demands that all waters (surface waters, groundwater and coastal waters) achieve or retain good status by the end of 2015. Surface waters are to achieve or retain good chemical and ecological status, while groundwater is to achieve or retain good chemical and quantitative status. The Member States should pursue this goal by means of defined planning and management activities.

As far as surface waters are concerned, good chemical status is determined by environmental quality standards for 33 'priority substances'. These environmental quality standards are derived from the 2008 Priority Substances Directive (Directive 2008/105/EC). By 2020, 'priority hazardous substances' should no longer be released into waters. This therefore represents a minimisation target that is more ambitious than the environmental quality standards. The limitations on 'priority substances' that are provided for only require compliance with the environmental quality standards.

The following POPs are listed in Annex 1 to the Priority Substances Directive.

- Polycyclic aromatic hydrocarbons (PAHs)
- HCB
- Endosulfan
- Hexachlorobutadiene
- PeCB
- HCHs (combinations of isomers, lindane)
- Brominated diphenyl ethers (although not all brominated diphenyl ethers are POPs)
- DDT

The following POPs candidates are already priority hazardous substances:

- C10-13-chloroalkanes

The following POPs substances and candidates are being discussed for inclusion in the priority substances list when it is updated:

- Dicofol
- Dioxin
- PFOS
- HBCD

Under the 2006 Groundwater Directive (Directive 2006/118/EC), good chemical status for groundwater is determined, firstly, by groundwater quality standards that derive from this Directive (Annex I) and, secondly, by threshold values the Member States have to establish for the pollutants listed in the Directive (Annex II).

Annex I to the Groundwater Directive sets 0.1 µg/l for active substances in pesticides as a general quality standard for groundwater. This requirement also covers possible contaminations of groundwater with POPs. The threshold values for other pollutants are based on the background levels found in specific areas and are to be established by the Member States.

The Member States must take suitable measures to ensure their surface waters and groundwater retain or achieve good status by 2015. This obligation goes further than the requirements of the Stockholm Convention because it also demands the restoration of waters contaminated with POPs.

Furthermore, the WFD and the Groundwater Directive contain special provisions concerning the discharge of harmful substances into waters.

For instance, the WFD obliges the Commission to put forward proposals for the cessation or phasing out of discharges, emissions and losses of priority hazardous substances. The necessary measures must be taken at the EU level; in addition to which the Member States have a duty to transpose this requirement of the WFD.

Since the POPs discussed above are also priority hazardous substances, they are subject to the phase-out obligation as well. No concrete measures for the implementation of the phase-out obligation have been taken to date, either by the EU or the Member States.

De facto, the obligation to phase out these POPs is implemented at least to some extent by the European POPs Regulation. In this context, the systematic monitoring of waters functions both as a way of reviewing the progress that has been made and as a safety net.

In addition to this, according to Article 6 of the Groundwater Directive, the discharge of certain groups of substances, which are specified in Annex 8 to the WFD, into groundwater is prohibited as a matter of principle. Some of these groups of substances, such as organohalogen compounds, include POPs.

2.5.2 Provisions in national water law

In Germany, the WFD is transposed by the Federal Water Act (WHG) and the ordinances adopted under this legislation, such as the 2010 Groundwater Ordinance (GrwV) and the 2011 Surface Water Ordinance (OGewV). The duty to achieve good chemical status is derived from these legal instruments. The Groundwater Ordinance and the Surface Water Ordinance provide for appropriate quality standards. They also set out the requirements that apply for the relevant POPs. Since the two ordinances lay down provisions that relate to substances, the Länder cannot derogate from these requirements.

Uses of waters are subject to preventive state control; i.e. such activities require prior state authorisation before they are undertaken. The introduction or discharge of substances represents a use within the meaning of Section 9(1)(4) of the WHG for which a license is required under water law. Measures that are likely to bring about permanent or not merely insignificant changes to water quality are also regarded as uses (Section 9(2)(2) WHG). Uses are only permissible provided no detrimental changes to the water are to be expected that cannot be prevented or compensated for by means of ancillary provisions (Section 12(1)(1) WHG) and the requirements of other public legal instruments are fulfilled (Section 12(1)(2) WHG). Furthermore, when waste water is discharged, the minimum expectation is that there will be compliance with the state of the art in the field of emissions prevention and reduction (Section 57(1)(1) WHG).

Competences for functions under water law

The legal requirements in the field of water resources management are laid down by the German Federation in the Federal Water Act. The Länder are able to supplement or derogate from these federal requirements by adopting Land legislation unless they are requirements that relate to substances or installations. Compliance with the requirements of water law is solely a matter for the Länder.

2.6 Provisions in soil protection law

2.6.1 Provisions in European soil protection law

At the European level, the Thematic Strategy for Soil Protection, a communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, supplies the Member States with the requisite basis on which to formulate their own national provisions.

2.6.2 Provisions in national soil protection law

In Germany, there is a national act on the protection of soil and a national ordinance adopted under this legislation:

- BBodSchG – Federal Soil Protection Act (Act on Protection against Harmful Changes to Soil and on Rehabilitation of Contaminated Sites of 17 March 1998)
- BBodSchV – Federal Soil Protection and Contaminated Sites Ordinance of 12 July 1999

The purpose of the BBodSchG and the BBodSchV is to secure or restore the functions of soil. Dangers to soil and dangers posed by soil to the individual or the general public are to be averted in the light of any existing and future requirements placed on the use of soil.

In conjunction with the BBodSchV, the BBodSchG governs, above all, the standards and necessary procedural steps for the testing and rehabilitation of contaminated sites and harmful changes to soil. The legislation establishes two types of values in soil that also cover POPs:

- Trigger values

When trigger values are exceeded, this indicates that it is necessary to investigate the individual case in question, taking into account how the soil is used, and determine whether a harmful change to soil has occurred or a site is contaminated. Annex 2 to the BBodSchV lays down trigger values for aldrin, DDT, HCB, HCHs and PCB6 (sum of the six principal PCB congeners) for the soil-human and soil-groundwater exposure pathways.

- Action values

Values for impacts or pollution levels. When they are exceeded, this signals that a harmful change has occurred in soil or a site is contaminated and the authorities are required to take action, taking account of how the soil in question is used. Annex 2 to the BBodSchV lays down action values for PCDD/Fs and PCB6 for the soil-human and soil-plant exposure pathways.

Where sites are contaminated or soil has undergone harmful changes, soil protection law requires the rehabilitation of soils in which the concentrations of substances classified as POPs exceed the action values. In so far as this is the case, soil protection law goes further than the requirements of the Stockholm Convention. Measures other than protective and restrictive measures may only find application if the possible rehabilitation measures would be disproportionate.

Apart from this, the BBodSchG also imposes an obligation to take precautionary measures against harmful changes in soil. The BBodSchV determines precautionary values that are applied as follows:

- Precautionary values

When precautionary values are exceeded, it is usually to be assumed there are grounds for concern that soil has undergone a harmful change, taking into account geogenic¹⁶ or settlement-related pollutant loads found over large areas. Precautionary values for PCB6, PAHs and dioxins in soil are laid down in Annex 2 to the BBodSchV.

Property owners, the occupants of sites and the parties that carry out or arrange for actions on a site that may lead to changes in soil characteristics are obliged to take note of the precautionary values when they engage in activities that affect soil.

¹⁶ I.e. natural concentrations of substances in environmental media unaffected by human activities, e.g. salinity levels in waters or heavy metal levels in soils, in contrast to anthropogenic concentrations of substances, i.e. concentrations of substances discharged as a result of human activities.

In line with the case law, the trigger and action values that derive from the BBodSchV are also taken into consideration when it comes to the enforcement of other legislation, e.g. mining law.

The Sewage Sludge Ordinance (AbfKlärV) too has consequences for soil protection. Section 4(10) and (11) lay down the limit values for PCDD/Fs and PCBs set out in Table 2, as well as a limit value for the sum of organohalogen compounds (AOXs).¹⁷ If one of these limit values is exceeded, the spreading of the sludge on land utilised for agricultural or horticultural purposes is prohibited.

Table 2 Limit values for POPs under the Sewage Sludge Ordinance

Parameter	Limit value
PCBs, concentration of each of 6 individual constituents	0.2 mg/kg DM
PCB6 (calculated as: 6 x 0.2 mg/kg x 5)	(6 mg/kg DM)
PCDD/Fs (TEQ)	100 ng/kg DM
Organohalogen compounds (AOX)	500 mg/kg DM

Competences for functions under soil protection law

The German Federation has made use of its legislative powers in the field of soil protection with the adoption of the BBodSchG and the BBodSchV. The enforcement of the BBodSchV lies within the competence of the Länder, which are also able to adopt supplementary procedural provisions (BMU, 2004a). In the field of sewage sludges, the competent authorities in the Länder are able to extend the mandatory analyses that are carried out to examine further constituents (Section 3(5) AbfKlärV).

2.7 Provisions in waste law

2.7.1 International provisions

At the international level, the Basel Convention on Waste is relevant, in particular, because it constitutes a global control system for transboundary movements of hazardous wastes. It provides for a prohibition on the export of hazardous wastes from OECD states to non-OECD states, which has still not entered into force because the Convention has not yet been ratified by a sufficient number of participants. Nonetheless, it has already been implemented by the EU and Germany (Sander and Schilling, 2010).

Under the Basel Convention, five technical guidelines on the environmentally sound management of wastes consisting of, containing or contaminated with POPs have been drawn up. In addition to this, there are training manuals published by the Secretariat of the Basel Convention and guidelines issued by the European Waste Correspondents (Secretariat of the Basel Convention, 2011a; European Waste Correspondents, 2011). These documents include:

¹⁷ The parameter AOX for the sum of adsorbable organic halogen compounds also covers POPs, but has only modest evidential value due to the broad spectrum of substances it encompasses. Furthermore, by virtue of its definition, it does not include any fluorine compounds (e.g. PFOS).

- *Technical guidelines for the environmentally sound management of wastes consisting of, containing or contaminated with polychlorinated biphenyls (PCBs), polychlorinated terphenyls (PCTs) or polybrominated biphenyls (PBBs)* (Secretariat of the Basel Convention, 2011b)
- *Updated general technical guidelines for the environmentally sound management of wastes consisting of, containing or contaminated with persistent organic pollutants (POPs)* (Secretariat of the Basel Convention, 2011c)
- *Destruction and Decontamination Technologies for PCBs and Other POPs Wastes* (UNEP, n.d.),
- ‘Correspondents’ Guidelines No 5: Subject: Classification of wood waste under entries B3050 or AC170’ (European Waste Correspondents, 2007).

2.7.2 Provisions in European waste law

The following European legal instruments, as most recently amended, are relevant to the work done on POPs and waste:

- Regulation (EC) No 850/2004 on persistent organic pollutants and amending Directive 79/117/EEC
- Directive 96/59/EC on the disposal of polychlorinated biphenyls and polychlorinated terphenyls (PCB/PCT)
- Directive 2008/98/EC on waste and repealing certain Directives (Waste Framework Directive)
- Regulation (EC) No 1013/2006 on shipments of waste (Waste Shipment Regulation)
- Directive 1999/31/EC on the landfill of waste
- Council Decision of 19 December 2002 establishing criteria and procedures for the acceptance of waste at landfills (2003/33/EC)
- Directive 2002/96/EC on waste electrical and electronic equipment (Waste Electrical and Electronic Equipment – WEEE – Directive)¹⁸
- Directive 2011/65/EU on the restriction of the use of certain hazardous substances in electrical and electronic equipment (recast) (RoHS Directive)

Regulation 850/2004 stipulates that the upper limit values do not apply for underground disposal, see Footnote 1 to the Table in Part 2 of Annex V:

‘The limits apply exclusively to a landfill site for hazardous waste and do not apply to permanent underground storage facilities for hazardous wastes, including salt mines.’

Furthermore, upper limit values are listed for many POPs in this Regulation.

¹⁸ A revised version has been announced, Directive 2012/19/EU of the European Parliament and of the Council of 4 July 2012 on waste electrical and electronic equipment (recast). Under this new legislation, Directive 2002/96/EC will be repealed with effect from 15 February 2014.

2.7.3 Provisions in national waste law

According to the Landfill Ordinance, wastes consisting of, containing or contaminated with POPs, i.e. wastes that exceed the lower limit value under Annex IV of Regulation (EC) No 850/2004, may not be disposed of at surface sites in Germany, i.e. only at underground landfill sites (which are all constructed in salt rock) or by means of stowage in mines in salt rock. The upper limit values therefore play no role in the disposal practice for wastes consisting of, containing or contaminated with POPs in Germany.

German waste law lays down requirements concerning the collection, storage, transport (incl. transboundary shipments), recovery and disposal of wastes, as well as record keeping at both waste treatment installations and disposal facilities.

The Act Promoting Closed Substance Cycle Waste Management and Ensuring Environmentally Compatible Waste Disposal (Recycling Management Act - KrWG) of 24 February 2012 entered into force on 1 June 2012. In contrast to the previous legislation, it contains a hierarchy of waste management measures. It is, in particular, of significance for the disposal of wastes consisting of, containing or contaminated with POPs that 'priority should be given to the measure that best ensures the protection of humans and the environment where wastes are generated and managed, taking into consideration the precautionary principle and the principle of sustainability. The whole life cycle of the waste is to be taken as a basis for the analysis of the impacts on humans and the environment under the first sentence of this section' (Section 6).

The disposal of wastes that contain POPs is discussed in Section 6.3 of this Implementation Plan.

Competences for functions under waste law

The enforcement of waste law is the responsibility of the Länder, which are able to regulate their various functions and internal Land competences individually. In some Länder, there are obligations to supply or offer hazardous substances that require special supervision to the Land-owned companies responsible for the disposal of special wastes.¹⁹

With regard to transboundary movements of waste under Section 14(1) of the Waste Shipment Act (AbfVerbrG), Land authorities are responsible as a matter of principle for measures and duties in connection with the shipment of wastes from and into German territory. These Land authorities are published on an Internet site (UBA, 2010a). Under Section 14(4) of the AbfVerbrG, the Federal Environment Agency is responsible for transit movements.

2.8 Provisions in food and animal feed law

2.8.1 European provisions

In the EU, food and animal feed law is governed by several regulations. Regulation (EC) No 178/2002 formulates the fundamental principles of general food law. Apart from this, it contains provisions on the establishment of the European Food Safety Agency (EFSA). The Agency collaborates with national authorities on risk assessments, working in Germany with the BVL and the BfR. The Regulation lays the foundations for the protection of human health

¹⁹ Further information can be found at <http://www.info-ags.de/>.

and consumer interests with regard to foodstuffs. It stipulates uniform principles and competences for the creation of a scientific basis for Community measures, an efficient organisational structure and a procedure to strengthen decision making on issues of food and animal feed safety. The Regulation applies to all stages in the production, processing and marketing of foodstuffs and animal feeds. Under Article 10, if there is any suspicion that a foodstuff or animal feed represents a risk to human or animal health, the public is to be informed about the nature of that risk.

Regulation (EC) No 396/2005 on maximum residue levels of pesticides in or on food and feed of plant and animal origins is of great significance for the implementation of the requirements of the Stockholm Convention because many POPs were used as pesticides. Annexes II and III to the Regulation stipulate maximum levels for aldrin, chlordane, chlordecone, DDT, dieldrin, endosulfan, endrin, HCB, HCH, heptachlor and toxaphene.

Apart from this, Regulation (EEC) 315/93 stipulates a Community procedure for the control of contaminants in foodstuffs. A contaminant is defined as any substance not intentionally added to food, but present in food as a result of production processes or environmental contamination. No particular substances are mentioned, but Article 2(3) states that the Commission is able to define maximum tolerances for specific contaminants. It initially did this in Regulation (EC) No 194/97, which was superseded on 1 March 2007 by the third revision of this legislation, Regulation (EC) No 1881/2006. This regulation sets maximum levels for PCDD/Fs and dioxin-like PCBs (dl PCBs) in foodstuffs. An amending regulation with new maximum levels, Regulation (EU) No 1259/2011, entered into force on 1 January 2012.²⁰

Table 3 Action levels²¹ and maximum levels for dioxins and dioxin-like PCBs (dl PCBs) in selected food groups applicable Europe-wide since 1 January 2012

Foodstuffs	EU action levels (pg WHO-TEQ/g fat)		EU maximum levels (pg WHO-TEQ/g fat)	
	Dioxins	dl PCBs	Dioxins	Dioxins + dl PCBs
Poultry				
Meat and meat products	1.25	0.75	1.75	3.0
Oils and fats	–	–	1.75	3.0
Hen eggs and egg products	1.75	1.75	2.5	5.0
Bovine animals and sheep				
Meat and meat products	1.75	1.75	2.5	4.0

²⁰ Commission Regulation (EU) No 1259/2011 of 2 December 2011 amending Regulation (EC) No 1881/2006 as regards maximum levels for dioxins, dioxin-like PCBs and non dioxin-like PCBs in foodstuffs (*OJ L*; 320; 3 December 2011; pp. 18-23).

²¹ Commission Recommendation of 23 August 2011 on the reduction of the presence of dioxins, furans and PCBs in feed and food (2011/516/EU; *OJ L*; 218; pp. 23-25).

Oils and fats	–	–	2.5	4.0
Milk and dairy products, including butter fat	1.75	2.0	2.5	5.5
Pigs	Dioxins	dl PCBs	Dioxins	Dioxins + dl PCBs
Meat and meat products	0.75	0.5	1.0	1.25
Oils and fats	–	–	1.0	1.25
Animal products	Dioxins	dl PCBs	Dioxins	Dioxins + dl PCBs
Liver and derived liver products made from poultry, bovine animals, sheep and pigs	–	–	4.5	10.0
Mixed animal fats	1.0	0.75	1.5	2.5

Unit: 1 pg (picogram) = 0.000 000 000 001 grams

The maximum levels are supplemented by action levels to be applied voluntarily to dioxins and dioxin-like PCBs in various foodstuffs. The action levels lie below the maximum levels and serve as an early warning system. They are intended to help identify above-average levels of contamination, i.e. levels of contamination above the background levels food producers are unable to prevent, and contribute to the reduction of the levels of dioxins and PCBs in foodstuffs. They serve as aids in detecting local sources for possible contamination and restricting or eliminating such sources before the maximum levels are exceeded. Dioxins and dioxin-like PCBs are emitted by different sources. In consequence, separate action levels have been stipulated for each group of substances.

The maximum levels of undesirable substances for animal feeds are stipulated in Directive 2002/32/EC. This directive anchors maximum levels for aldrin, chlordane, DDT, dieldrin, endosulfan, endrin, HCB, HCHs, heptachlor, dl PCBs, PCDD/Fs and toxaphene in certain foodstuffs. Furthermore, it stipulates action thresholds for PCDD/Fs and dl PCBs, and investigations by the Member States are triggered when these thresholds are exceeded.

2.8.2 National provisions

The Foodstuffs, Commodities and Animal Feed Code (Food and Feed Code – LFGB) is the umbrella law for German food and animal feed legislation. It covers all production and processing stages along the food value creation chain, apart from which it also applies to cosmetics and commodities. According to Section 9(1), it is prohibited to place foodstuffs on the market

- if plant protection products, fertilisers, soil treatment products, biocidal products or their transformation or reaction products are present in or on these foodstuffs and exceed the stipulated maximum levels,
- if unauthorised plant protection products that may not be used in foodstuffs or their ingredients are present in or on these foodstuffs, or

- these foodstuffs do not meet the requirements set out in Article 18(1) of Regulation 396/2005 on maximum levels of pesticides, also in conjunction with Article 20(1) of the Regulation.

The Ordinance on the Limitation of Contaminants in Foods (Contaminants Ordinance – KmV) lays down maximum levels for PCBs in certain foodstuffs that may not be exceeded.

According to Section 17, it is forbidden to produce or handle animal feeds in such a way that, should they be fed correctly to animals as intended, the foodstuffs obtained from the animals

- could impair human health or
- are unsuitable for human consumption.

Furthermore, it is not allowed to produce animal feeds, place them on the market or feed them to animals if they harm animal health or the quality of the foodstuffs obtained from such animals, or endanger the natural functioning of ecosystems as a result of undesirable substances present in animal excreta.

European Directive 2002/32/EC on undesirable substances in animal feed is transposed into national law by the Animal Feed Ordinance (FuttMV). According to the FuttMV, it is prohibited to place on the market animal feeds that contain undesirable substances in excess of a maximum level specified in Directive 2002/32/EEC, to feed such feeds to animals or to mix them with other animal feeds (Section 23 FuttMV).

Competences for functions under food and animal feed law

The field of food and animal feed law is a matter for the Federal Ministry of Food, Agriculture and Consumer Protection (BMELV). The authorities in the Länder are responsible for surveillance measures under the LFGB. The Länder can adopt yet further provisions concerning the performance of surveillance activities.

Food and animal feed suppliers themselves are obliged to inform the competent authorities of available test results indicative of levels of dioxins, dioxin-like and non dioxin-like polychlorinated biphenyls, and other undesirable substances in and on foodstuffs and animal feeds. The authorities then forward all the results they receive to the BVL.

The exact scope of the mandatory communication of test results, and the extent to which these results should be communicated in practice have been regulated in concrete terms since 1 May 2012 by the Ordinance on Notification and Communication Duties concerning Substances with Undesirable Effects on Health.

Since 4 August 2011, as a result of an amendment to the Food and Feed Code, private laboratories in Germany have had a general duty to notify the authorities if they have reason to believe a foodstuff is unsafe. For instance, they must notify the competent authorities of their analytical results and the client for whom analyses have been carried out if they detect worrying quantities of dioxins and polychlorinated biphenyls (PCBs) that are damaging to health in animal feeds and foodstuffs.

2.9 Implementation of environmental requirements by various bodies

The Conference of Environment Ministers of the Federation and Länder (UMK) coordinates action on issues of superordinate environmental law between the Federation and the Länder in Germany (UMK 2011). The environment ministers and senators of the Federation and the Länder are represented and hold voting rights on this body. Within the UMK, the Länder agree the approach they will take, adopt positions on the activities of the Federation and seek solutions for technical issues in consensus with the Federal Government. The decisions adopted by the UMK have no direct effect in law. The UMK has established what are at present eight Federation/Länder bodies in its field of competence that work on various environmental topics. The following bodies are of relevance with regard to the legislative foundations and POPs discussed above:

- Federation/Länder Working Group on Chemical Safety (BLAC),
- Federation/Länder Working Group on Soil Conservation (LABO),
- Federation/Länder Working Group on Immission Control (LAI),
- Federation/Länder Working Group on Water Issues (LAWA),
- Federation/Länder Working Group on Waste (LAGA),
- Federation/Länder Working Group on Dioxins (reactivation planned).

By way of example, reference is made here to the work of LAGA, which is responsible for the following POPs-relevant publications and decisions.

- LAGA Circular Decision No. 2010/04: LAGA recommends that, as a lower limit value for the four PBDEs listed in Annex IV to Regulation (EC) No 850/2004 (tetraBDE, pentaBDE, hexaBDE and heptaBDE), the Länder apply the value of 1000 mg/kg as a parameter for the sum of the four substances for a transitional period.
- Decision on agenda item 5.4 at the 95th meeting of LAGA: LAGA recommends that, as a lower limit value for PFOS (perfluorooctane sulfonic acid and its derivatives) as a substance listed in Annex IV to Regulation (EC) No 850/2004, the Länder apply a value of 10 mg/kg (recycling) and a value of 50 mg/kg (surface landfill) for a transitional period,
- *Bericht an die Amtschefkonferenz: Persistente organische Schadstoffe im abfallrechtlichen Vollzug* [Report to the Conference of Heads of Administration: Persistent Organic Pollutants in the Enforcement of Waste Law] (LAGA, 2010).

3 Measures to prevent releases from intended production and use (Art. 3)

3.1 Substances listed in Annex A to the Stockholm Convention

With the exception of PCBs and polybrominated diphenyl ethers (PBDEs), the substances listed in Annex A to the Stockholm Convention are compounds that were deployed primarily for the control of insects, fungi and arachnids (above all mites). They were therefore constituents of plant protection product formulations, biocides for the protection of materials (e.g. wood), hy-

giene products or veterinary medical products (against mites, ticks, lice, etc.). Their use was subject to special legislative provisions in Germany or at the European level.

3.1.1 Plant protection products

Directive 79/117/EEC originally placed the Member States under an obligation to prohibit the placing on the market and application of plant protection products that contained certain active substances. Aldrin, chlordane, dieldrin, endrin, heptachlor, HCB, toxaphene, HCHs and DDT were affected by this prohibition. Subsequently, pursuant to Directive 91/414/EEC (Plant Protection Directive), active substances in plant protection products had to be examined and placed on a positive list. None of the POPs were included in the positive list. The Prohibition Directive (79/117/EEC) was amended by the entry into force of the POPs Regulation with the effect that the prohibition of chlorine compounds was deleted and the prohibition formulated in the POPs Regulation found application. Following the adoption of new POPs and the exclusion of substances with POPs characteristics from use as active substances under the Plant Protection Products Regulation, there is a general prohibition on the use of any POPs in plant protection. Directive 79/117/EEC was repealed by the Plant Protection Products Regulation (Regulation (EC) No 1107/2009).

With the exceptions of mirex and endosulfan, the application of the specified active substances has been prohibited in the Federal Republic of Germany for some years by the Ordinance Governing the Ban on the Use of Plant Protection Products of 10 November 1992 (Plant Protection Use Ordinance). However, plant protection products that contained mirex were never authorised in Germany. The last authorisation for a plant protection product that contained endosulfan in Germany expired in 1994. An application for the inclusion of endosulfan in Annex I to the Plant Protection Directive failed in 2005, as a consequence of which authorisations for plant protection products that contained endosulfan were revoked throughout Europe (Decision 2005/864/EC). Endosulfan was still being exported by Germany up until the end of 2009 (BVL 2009).

PeCB itself was never used as a plant protection product, but deployed as an intermediate for the production of another plant protection product, pentachloronitrobenzene (quintozene). In Germany, the last authorisations for plant protection products with this active substance expired in 1987. Since 1988, there has been a general prohibition on the application of quintozene in plant protection products in Germany (Annex 1 Plant Protection Use Ordinance). Since 1988, there has been no known production or use of PeCB. As a result of the EU's examination of the active substances used in plant protection products, quintozene was not included in Annex I to Directive 91/414/EEC (Commission Decision 2000/816/EC).

3.1.2 Biocidal products

According to the ChemBiozidMeldeV, none of the substances designated in the Stockholm Convention has been registered as an active substance in Germany. In consequence, there is no legal basis for their continued use. It is therefore to be assumed that there are no biocidal products that contain these active substances on the market.

The same is also true of the new POPs α -HCH and β -HCH. Both compounds are to be found as contaminants in another POP, lindane. Lindane was merely notified as an active substance for

product-type 3 (veterinary hygiene biocidal products). Lindane was authorised in preparations to control head lice (Jacutin Gel) until the end of 2007 (UBA, 2007a). As a result of the identification of lindane as a POP and its consequent inclusion in the POPs Regulation, there is a complete prohibition on the use of lindane without exception. Another substance that counts as one of the new POPs and was deployed as an insecticide, chlordecone, was still listed as an active substance in a product for the control of pharaoh ants until 2001, but was prohibited in 2002 at the instigation of the UBA in the interests of the implementation of the POPs Protocol (BMU 2004b).

3.1.3 Polychlorinated biphenyls (PCB)

Until 1982, PCBs were produced on an industrial scale in the Federal Republic of Germany. They were used as liquid dielectrics in transformers and condensers, as plasticisers in plastics (joint sealants, suspended ceilings, cable sleeves, etc.) and as fire retardants in decorating paints, lacquers, adhesives and hydraulic oils.

From 1978 on, the use of PCBs was gradually phased out until 2010, when the last PCB-contaminated transformers had to be decommissioned. Up until this point, they had represented the only exemption from the complete ban on PCBs that was still permissible, and they had to be disposed of once their use had been discontinued, in which respect the PCBs had to be irreversibly transformed or destroyed as of a PCB concentration of 50 mg/kg (Art. 7 in conjunction with Annex IV POPs Regulation). As a transitional provision under Section 54(2) of the GefStoffV, products that contain PCB-contaminated components with less than 100 ml PCB-contaminated fluid and were in operation on 29 July 1989 are exempted from this provision until such time as they are decommissioned.

3.1.4 Hexabromobiphenyl (HBB)

HBB was used in the 1970s as a flame retardant. The production of highly brominated compounds was discontinued in Germany in 1985 (UNEP, 2006). The use of HBB in textiles has already been limited throughout Europe since 1983 by Directive 83/264/EEC (as part of the group of substances known as 'PBBs'), a measure transposed in Germany under the Prohibition of Chemicals Ordinance (ChemVerbotsV). The RoHS Directive also contains provisions on PBBs, and has prohibited the placing on the market of products with a concentration of more than 0.1 per cent by weight relative to the homogeneous material since 2006 (Art. 4 in conjunction with the Annex). PBBs had already ceased to be deployed in electrical and electronic devices (UBA, 2007b). Other applications are not known. It may therefore be assumed that these facts, together with the legal provisions in place, meant that HBB did not play a role in Germany.

3.1.5 Polybrominated diphenyl ethers (PBDEs)

Overall, PBDEs encompass more than 200 compounds. In the context of this report, the term PBDEs refers to the four groups of congeners that are regulated in the Stockholm Convention (UNEP, 2009a; UNEP, 2009b). These four substances are:

- TetraBDE²²
- PentaBDE²³
- HexaBDE²⁴
- HeptaBDE²⁵

In the past, PBDEs were deployed in different commercial mixtures. The two most common mixtures were c-pentaBDE, the principal constituents of which are tetraBDE and pentaBDE with two other POPs, hexaBDE and heptaBDE, in smaller proportions; and c-octaBDE, the principal constituents of which are hexaBDE and heptaBDE, with pentaBDE in smaller quantities. The typical composition of c-pentaBDE is shown in Table 4.

Table 4 Composition of c-pentaBDE (UBA, 2011a)

Name	CAS No	Congener name**	Typical concentration in mixture (per cent by weight)*	Mean concentration (per cent by weight)
TriBDE	49690-94-0	BDE 17 BDE 28	0-1	0.5
TetraBDE	40088-47-9	BDE 47 BDE 66	24-38	32.3
PentaBDE	32534-81-9	BDE 99 BDE 85 BDE 100	50-62	58.4
HexaBDE	36483-60-0	BDE 138 BDE 153 BDE 154	4-12	8.3
HeptaBDE	68928-80-3	BDE 183	Traces (<0.5)**	0.5

Basis for data: *POPRC (2005), **Bergmann (2007), rows with grey background contain information on Stockholm Convention substances.

The composition of c-octaBDE varies widely and has changed over the years. Table 5 gives an overview of its evolution.

Table 5 Composition of c-octaBDE mixtures over time (UBA, 2011a)

	Until 1994 (per cent by weight)	Samples from three suppliers, 1997 (per cent by weight)	OECD Voluntary Industry Commitment, 2000 (per cent by weight)	Selected producers, 2000-2001 (per cent by weight)	Mean concentration (per cent by weight)
PentaBDE	10.5-12.0*	N/a	1.4-12	< 0.5	4.7%
HexaBDE		5.5	N/a	< 12	7.4%

²² According to SC 4/18, primarily denotes BDE 47, CAS No. 40088-47-9, but also includes other congeners.

²³ According to SC 4/18, primarily denotes BDE 99, CAS No. 32534-81-9, but also includes other congeners.

²⁴ According to SC 4/18, primarily denotes BDE 153, CAS No. 68631-49-2, and BDE 154, CAS No. 207122-15-4, but also includes other congeners.

²⁵ According to SC 4/18, primarily denotes BDE 175, CAS No.446255-22-7, and BDE 183, CAS No. 207122-16-5, but also includes other congeners.

	Until 1994 (per cent by weight)	Samples from three suppliers, 1997 (per cent by weight)	OECD Voluntary Industry Commitment, 2000 (per cent by weight)	Selected producers, 2000-2001 (per cent by weight)	Mean concentration (per cent by weight)
HeptaBDE	43.7–44.5	42.3	43–58	< 45	44.5%
OctaBDE	31.3–35.3	36.1	26–35	< 33	31.6%
NonaBDE	9.5–11.3	13.9	8–14	< 10	10.7%
DecaBDE	0–0.7	2.1	0–3	< 0.7	1,1 %

Basis for data: POPRC (2008), rows with grey background contain information on substances designated in the Stockholm Convention (n/a = not available)

The parties to the Stockholm Convention are obliged to prevent the production and use of PBDEs. Exemptions for the recycling of end-of-life products that contain PBDEs, and the use and disposal of products made of recycled materials will continue to operate until 2030, subject to the conditions that such products are recycled and disposed of in an environmentally sound fashion and that no PBDEs are recovered separately. The goal should therefore not be the recovery of POPs, but the recovery and reuse of POPs-contaminated materials. As the maximum concentration of tetraBDE, pentaBDE, hexaBDE and heptaBDE, the POPs Regulation stipulates a limit value of 0.1 per cent by weight, relative to the material in an article that contains recyclates (Annex I, Part A). According to Article 7 of the POPs Regulation, waste must be treated in such a way that any PDBEs are destroyed or irreversibly transformed.

In this respect, prior to the adoption of a uniform, EU-wide limit value, Germany recommended a national limit value for enforcement by the Länder of 1000 ppm (1000 mg/kg) as the total concentration of PBDEs for a transitional phase (LAGA, 2010). Germany therefore fulfils the requirements of the Stockholm Convention and the POPs Regulation in relation to the management of POPs-contaminated waste flows up until the final disposal of the POPs. Thanks to the specification of a limit value for the sum of the various PBDEs (including non-POP PBDEs) the German requirement is at least as ambitious as the limit value for materials that contain recyclates of 0.1 per cent relative to each material that is laid down in Annex I to the POPs Regulation.

A party to the Stockholm Convention is obliged to stop the export of PBDE-contaminated articles if the concentration of these substances exceeds the authorised limit value for the placing on the market of an article in the territory of that party. In Europe, this is implemented by the complete prohibition of the substances individually, in mixtures and in articles under the POPs Regulation. Certain levels of contamination are allowed: a limit value of 10 ppm (10 mg/kg) applies for articles made of new materials, while a limit value of 0.1 per cent by weight (1000 mg/kg) applies for articles that contain recyclates. The limit values are stipulated in Annex I to the POPs Regulation and apply individually to each of the substances.

3.2 Substances listed in Annex B to the Stockholm Convention

3.2.1 Dichlorodiphenyltrichloroethane (DDT)

The production, placing on the market and use of DDT has been prohibited in Germany since 1972 by the DDT Act. It is possible to apply to the BVL for exemptions for research and analyti-

cal purposes (ChemVerbotsV, Annex to Section 1, Heading 1). In 1994, the provisions of the DDT Act were incorporated into the Hazardous Substances Ordinance (GefStoffV) and the ChemVerbotsV (Section 1(1) ChemVerbotsV in conjunction with the Annex, Heading 1), and were deleted from the GefStoffV again when it was revised at the end of 2010.

3.2.2 Perfluorooctane sulfonic acid (PFOS)

PFOS is one of the group of substances known as perfluorinated and polyfluorinated chemicals (PFCs). On account of the surfactant properties of PFOS and the related compounds, they are also referred to as perfluorinated tensides (PFTs). PFTs have been utilised since the 1950s in various technical processes and products deployed in surface refinement and speciality chemistry.

On account of its problematic behaviour in the environment, the US company 3M – until this point the largest PFOS producer in the world – decided in 2000 to withdraw gradually from the production and use of PFOS by the end of 2002 on a voluntary basis (3M, 2000). This corporate decision brought about a significant fall in the use of PFOS across the EU (RPA, 2004). PFOS has been banned in the EU since 2006, with certain exceptions. In 2009, PFOS was also added to the Stockholm Convention and the POPs Protocol. Table 6 gives an overview of the PFOS compounds that have been included in Annex B to the Stockholm Convention.

Table 6 PFOS compounds listed in Annex B to the Stockholm Convention

PFOS compound	CAS No.
Perfluorooctane sulfonic acid	1763-23-1
Perfluorooctane sulfonyl fluoride	307-35-7
Potassium perfluorooctane sulfonate	2795-39-3
Diethanolammonium perfluorooctane sulfonate	70225-14-8
Ammonium perfluorooctane sulfonate	29081-56-9
Lithium perfluorooctane sulfonate	29457-72-5
Tetraethylammonium perfluorooctane sulfonate	56773-42-3
Didecyldimethylammonium perfluorooctane sulfonate	251099-16-8

The parties to the Convention are obliged to restrict the production and use of these substances. In this respect, a series of acceptable purposes and specific exemptions are listed in Annex B to the Stockholm Convention. Acceptable purposes are applications that continue to be permitted. The Secretariat must be notified of specific exemptions by the parties if they are to be used. Since, apart from Germany, the EU is also a party to the Stockholm Convention, it has already complied with this duty on behalf of all the EU Member States. This means all specific exemptions are permissible in Germany without separate notification. In consequence, the following exemptions from the prohibition on the use of PFOS are permitted:

Acceptable purposes:

- Photo-imaging, coatings
- Anti-reflective coatings for photolithographic procedures and photo-resist coatings for the production of semi-conductors

- Etching agent for compound semiconductors
- Aviation hydraulic fluids
- Use as mist suppressant in metal plating systems (in particular hexavalent chromium plating in closed-loop systems)
- Certain medical devices (ethylene tetrafluoroethylene-copolymer layers, in-vitro diagnostic devices and charge-coupled device colour filters)
- Fire fighting foams²⁶
- Insect baits for control of leaf-cutting ants

Furthermore, the following specific exemptions apply:

- Photo masks in the semi-conductor and liquid crystal display industries
- Use as mist suppressant in other metal plating systems (in particular hexavalent chromium plating in open systems)
- Electrical and electronic parts for some colour printers and colour copy machines
- Insecticides for the control of red imported fire ants and termites
- Chemically driven oil production
- Carpets
- Leather and apparel
- Textiles and upholstery
- Paper and packaging
- Coatings and coating additives
- Rubber and plastics

These accepted purposes and specific exemptions will be reviewed in 2015 at the latest and every four years thereafter to ascertain whether they should be extended.

On account of the exemptions put in place for certain uses of PFOS, it still continues to be produced. According to one study (RPA, 2004), approximately 12.2 tonnes of PFOS compounds were used in Europe in 2004. Other sources indicate that approximately 20–60 tonnes were produced in Germany in 2003 (LRTAP, 2006; CHEM, 2006). One recent study (BiBRO, 2011) starts from the assumption that about 7.8 tonnes are still being used each year in Europe.

PFOS, its salts, halogenides, amides and other derivatives, including polymers, have been prohibited since June 2008 by Directive 2006/122/EC (Limitations Directive²⁷) individually, in mixtures and in articles, although certain exemptions were allowed, similar to the exemptions in the later POPs Regulation. In June 2009, this prohibition and the exemptions provided for were incorporated into Annex XVII to the REACH Regulation (Regulation (EC) No 552/2009).

²⁶ Not allowed as a use in the EU since June 2011 because the exemption provided for in the POPs Regulation has expired.

²⁷ And the legislation that transposes it at the national level (Eleventh Ordinance Amending Chemicals Ordinances).

When the European POPs Regulation²⁸ was amended, the exemptions for PFOS provided for in Annex XVII to the REACH Regulation were taken up and incorporated with a few modifications into Annex I to the POPs Regulation. The restrictions set out in Annex XVII to the REACH Regulation were deleted.

Germany has recommended a national limit value of 50 mg/kg for the PFOS concentration in waste (as a limit value for Annex IV to the POPs Regulation) to be enforced by the Länder for a transitional phase prior to the adoption of a uniform EU-wide limit value (LAGA, 2011).

4 Measures pertaining to the register of specific exemptions (Art. 4)

Article 4 of the Stockholm Convention makes it obligatory for the parties to register for limited periods if they wish to make use of the exemptions for the production of substances designated in Annexes A and B or certain uses of those substances.

The Federal Republic of Germany has not itself registered under Article 4 of the Stockholm Convention for any specific exemption for the production or use of a substance listed in Annexes A and B, as most recently amended. As a party to the Stockholm Convention, the European Union complies with this obligation on behalf of its Member States.

5 Measures to reduce or eliminate releases of substances listed in Annex C (Art. 5)

Article 5 of the Convention prescribes the minimum measures to reduce or eliminate releases of undesirable byproducts the parties should take with the goal of ‘their continuing minimization and, where feasible, ultimate elimination’.

The substances in question, which are specified in Annex C to the Stockholm Convention, are regarded as undesirable byproducts. At present, this Annex lists the following groups of substances: PCDD/Fs, HCBs, PCBs and PeCB.

5.1 Article 5(a): Development of national action plan

Article 5(a) of the Stockholm Convention obliges the parties to identify the sources of emissions of the above-mentioned pollutants, to quantify the amounts released each year and report on the measures taken. National action plans, which document the measures for the elimination or reduction of these substances, are elaborated on the basis of emissions inventories that are compiled for this purpose.

Apart from the Stockholm Convention, the CLRTAP POPs Protocol and the POPs Regulation also require the compilation of emissions inventories for unintentionally formed POPs as part of the parties’ emissions reporting. The Federal Republic of Germany must report the emissions recorded under these international agreements.

Emissions of unintentionally released POPs are recorded by the UBA and made available for reporting in the Central System for Emissions Data (CSE). The CSE is a central database that

²⁸ The Regulation was amended by Regulation (EC) No 757/2010 and Regulation (EC) No 756/2010.

makes it possible to fulfil a large number of national and international reporting duties with regard to atmospheric emissions (e.g. for the 1992 UNFCCC, UNECE, the EU, etc.). The data in the CSE are regularly reviewed and updated. An expert report drawn up in 2010 was intended to improve the data on which the CSE is based, but very few emissions data are available on POPs. Comprehensive tests on possible sources had to be carried out in order to improve the data situation. However, the expert report showed that, compared to 1990, there had been no increase in POPs emissions in Germany (Rentz et al., 2010). Despite the review and updating of the data, great uncertainties attach to the POPs inventories, and some of them are incomplete.

National trend tables for the German reporting of atmospheric emissions of POPs since 1990 can be found on the UBA's Internet site (UBA, 2011b).

5.2 Article 5(b), (c), (d) and (e): Measures and best available techniques promoted and ordered to reduce releases and eliminate sources

Measures ordered

Installations that, on account of their nature or their operation, may cause particularly harmful environmental impacts are subject to mandatory licensing under the Federal Immission Control Act (BImSchG). Material requirements are stipulated by the secondary legislation, i.e. the relevant ordinances for the implementation of the Federal Immission Control Act ('BImSchV' ordinances) and the Technical Instructions on Air Quality Control (TA Luft).

Waste water discharges are governed by the Federal Water Act (WHG). Under the WHG, permits and approvals are issued by public authorities for the use of waters. The secondary legislation consists of the Waste Water Ordinance and its annexes, which govern the requirements placed on the discharge of waste waters.

Pursuant to the Industrial Emissions Directive (IED), reference documents are to be drawn up on the best available techniques (BATs), setting out the emissions levels associated with them. Water-specific BAT conclusions are currently implemented through the Waste Water Ordinance and its annexes. Air-specific BAT conclusions are implemented through the TA Luft if they are associated with emissions levels.

Annex C to the Stockholm Convention lists a series of source categories that, for technological reasons, exhibit an increased potential for the formation/release of undesirable byproducts.

The above-mentioned pieces of legislation provide for measures with which it is also possible, in principle, to attain the aims of the Stockholm Convention concerning the reduction or prevention of releases of undesirable byproducts. The following provisions in the Convention are touched on directly or indirectly:

- Application of practical measures to reduce releases and eliminate sources (Art. 5(b) Stockholm Convention)
- Substitution of materials (Art. 5(c) Stockholm Convention)
- Application of best available techniques (Art. 5(d) Stockholm Convention in conjunction with Annex C, Part V)

Measures taken to promote best available techniques (Art. 5(e) Stockholm Convention)

In Germany, the measures to promote the application of the best available techniques to existing and new sources within the source categories listed in Annex C to the Stockholm Convention are of a regulatory nature.

All sources listed in Part III of Annex C to the Stockholm Convention are covered by the ordinances discussed in section 2.6.

Because small firing installations cause considerable emissions of PCDDs and PCDFs, particular emphasis is to be placed on Small and Medium-Sized Firing Installations. According to § 4 of the BImSchG, these need no licensing. Regulations for this kind of installations can be found in Ordinance on Small and Medium-Sized Firing Installations, First Ordinance Implementing the BImSchG, 1.BImSchV. The Ordinance is specific to Germany and does not serve to transpose an EU directive. Although no limit values are specified for substances listed in Annex C, the requirements placed on the quality of fuels, the mandatory advice for operators on permissible fuels and the proper handling of installations, and the regular surveillance of emissions are included here. These requirements are aimed at a general reduction in pollutant emissions, including those on PCDDs, PCDFs and other POPs.

These requirements are implemented as elements of the regular surveillance of small and medium-sized firing installations by chimney sweeps.

6 Measures to reduce or eliminate releases from stockpiles and wastes (Art. 6)

Article 6(1) requires that the parties take action,

‘to ensure that stockpiles consisting of or containing chemicals listed either in Annex A or B and wastes, including products and articles upon becoming wastes, consisting of, containing or contaminated with a chemical listed in Annex A, B or C, are managed in a manner protective of human health and the environment...’

In particular, this obligation is to be implemented by means of

- the identification of stockpiles of POPs,
- the identification of products that contain POPs, and
- their environmentally sound collection, storage, transport and eventual disposal.

The central requirement is the destruction or irreversible transformation of the POPs contents of wastes (Art. 6(1)(d)(ii)).

6.1 POPs stockpiles

Article 5 of the POPs Regulation required the Member States to notify the Commission of stockpiles that consisted of or contained POPs (> 50 kg) by 19 July 2005 (twelve months after the Regulation entered into force). No stockpiles of this kind were notified to the competent Land authorities, so it is assumed that there are no PCB stockpiles (any longer) in Germany. However, studies have found that PCB-contaminated transformers, above all, were not drained as prescribed prior to their emplacement underground, but were deposited with the PCB-contaminated fluid. Apart from this, it is evident from the export statistics compiled under the

Environmental Statistics Act for the years 2005–2010 that a total of 23,499 tonnes of PCB-contaminated transformers were exported. Furthermore, PCB-contaminated materials with a total mass of 3,450 tonnes were imported for permanent storage between 2005 and 2009 (UBA, 2012a).

6.2 POPs in end-of-life products and articles

6.2.1 PBDEs in end-of-life products and articles

In the past, PBDEs were used in various products as flame retardants. These applications are now prohibited throughout Europe. However, they were deployed in products with long life cycles, some of which are still being used today, so it is still possible for humans and the environment to be exposed to PBDEs. Furthermore, there is a danger that the inappropriate disposal of PBDEs, e.g. by means of uncontrolled incineration, may encourage the production of dioxins and furans on account of the bromine they contain.

An overview of the known uses of c-pentaBDE is given in Table 7.

Table 7 Overview of the most important former areas of application of and products made from c-pentaBDE

Historic use		Applications	Finished products (e.g.)	Current status
As a flame retardant in polyurethane foam (PUR)	Most common use of c-pentaBDE in the EU (95%): pentaBDE concentrations: 2-18%	Seat cushions, headrests, dashboards, etc. Mattresses, packaging, padding	Road vehicles, upholstery, transport, acoustic installations, packaging, packaging foam, wood imitations	All uses prohibited on the EU market, articles consisting exclusively of new materials marketable with concentrations up to 10 mg/kg tetraBDE, pentaBDE, hexaBDE or heptaBDE. Articles that contain recyclates marketable up to a concentration of 1000 mg/kg tetraBDE, pentaBDE, hexaBDE or heptaBDE. Articles subject to RoHS marketable in principle up to a (total) PBDE concentration of 1000 mg/kg.
In polyvinyl chloride (PVC)	Little use in the EU (5%): precise concentrations not available	N/a	Floor coverings, window profiles, pipes, cable insulation and sheaths	
In epoxide resin		Insulating materials, fibre-reinforced plastics Structural adhesive, corrosion proofing	Printed circuit boards, boat-building and modelling, internal walls on ships, electronic parts	
In unsaturated polyesters (UPEs)		Insulating material	Casings, lacquers, handles for saucepans, etc.	
Rubber		Insulating material	Conveyor belts, foam pipes, insulating parts	

Historic use		Applications	Finished products (e.g.)	Current status
Paints/lacquers		Coatings	Marine and industrial lacquers for the protection of containers	
Textiles		Coating and impregnation	Carpets, car seats, furniture, protective clothing	
Hydraulic oils		Drilling oils, hydraulic fluids	Offshore extraction, coal mining	

(UBA, 2012d)

An overview of the known uses of c-octaBDE is given in Table 8.

Table 8 Overview of the most important areas of application of and products made from C-OctaBDE

Historic use	Application	Products (e.g.)	Current status
Acrylonitrile butadiene styrene (ABS)	Electrical and electronic equipment	Computer and television casings, and all types of electrical and electronic equipment	The production, placing on the market and use of c-octaBDE individually are prohibited but:
High impact polystyrene (HIPS)	Plastic casings	Computers, televisions and all types of electrical and electronic equipment (mobile telephones)	Contaminated articles marketable up to a concentration of 10 mg/kg tetraBDE, pentaBDE, hexaBDE or heptaBDE.
	Toy materials	Plastic toys	
	Cold-resistant layers	Fridges	Articles that contain recyclates marketable up to a concentration of 1,000 mg/kg tetraBDE, pentaBDE, hexaBDE or heptaBDE .
Polybutylterephthalate	Casing material	Electronic devices	Articles subject to RoHS marketable in principle up to a (total) PBDE concentration of 1,000 mg/kg.
	Vehicle industry	Pin and socket connectors	
	Household	Shower heads or irons	
Polyamide polymers	Textiles	Furniture	
	Building materials	Pipes and mouldings, plastic sheeting	

(UBA, 2012d)

The articles in which commercial PBDEs have been used in relevant quantities and that are still on the market today, in part on account of their long life cycles, are road vehicles, electrical and electronic equipment and (upholstered) furniture.

Brominated flame retardants were utilised by the automotive industry in various areas of application. Treated polyurethane (PU) foams were used in seat cushions, headrests, dashboards, inside door panels, ceilings, steering wheels and loudspeaker systems. PU foams were mainly treated with c-pentaBDE, which was also used in other plastics and textiles (BiPRO, 2011).

Material and substance databases for the automotive industry were introduced in Germany from 1998 on and throughout the EU from 2000 on (the International Material Data System

(IMDS)²⁹ and the Global Automotive Declarable Substance List (GADSL)³⁰). As a result, it is possible to trace back the points in time when these substances ceased to be used in the European automotive industry. According to data and further information from the automotive industry, no uses of POPs PBDEs have been known since 2000 (ACEA, 2010).

PBDE-contaminated materials from scrapped end-of-life vehicles are not recycled in Germany. For the most part, PBDE-contaminated materials are disposed of (by incineration) or used to generate energy. The only known pathways for the recovery of these substances are the use of certain fractions for landfill body engineering and stowage in mines (Lower Saxony, 2007, pp. 20f.).

In 2010, the waste stream from end-of-life vehicles contained an estimated 3.4 tonnes of c-pentaBDE and 2.6 tonnes of c-octaBDE (UBA, 2012d).

C-octaBDE was mainly used for electrical and electronic equipment as a flame retardant in plastic casings made of ABS, and to a lesser extent in casing plastics made of HIPS, polybutylene terephthalate and polyamide polymers (BiPRO, 2011). On account of the restrictions to which it is subject, c-octaBDE is only to be expected in waste electrical and electronic equipment. The RoHS Directive limit value of 0.1 per cent by weight relative to the flameproofed material applies to articles newly placed on the market.

Waste electrical and electronic equipment (WEEE) is collected and managed separately from other wastes in Germany. According to the Act Governing the Sale, Return and Environmentally Sound Disposal of Electrical and Electronic Equipment (ElektroG), the manufacturers of devices are responsible for the return and disposal of waste equipment. Devices from private households are collected at the collection sites run by public disposal services, while waste equipment from commercial sources is usually accepted back by manufacturers and traders (UBA, 2012d).

Furthermore, the ElektroG demands that all waste electrical and electronic equipment be collected separately from unsorted domestic waste (Section 9(1) ElektroG).

Calculations find an average c-octaBDE concentration in the plastic fractions of electrical and electronic waste streams of 0.12 per cent relative to the total plastic fraction. If it is assumed that 1,400 tonnes of these wastes were generated in Germany in 2008, two different calculation methods find a range for the possible quantity of c-octaBDE in the waste streams from electrical and electronic equipment that year of between roughly 1.7 and 35.6 tonnes of c-octaBDE (UBA, 2012d).

²⁹ International Material Data System: Archive, forum and administrative system for vehicle engineering materials. It is used to draw up material datasheets that specify the materials and proportions of different substances used in vehicle parts, as well as recording all the data needed for the subsequent recycling of those parts: <http://www.mdssystem.com/magnoliaPublic/en/public.html> (IMDS, 2011).

³⁰ Global Automotive Declarable Substance List: The list of substances used in road vehicles that are declarable in different parts of the world on which the IMDS is based. GADSL is an instrument for communication about prohibitions imposed on the use of substances in materials and is also consulted by automotive manufacturers to verify parts materials datasheets before they are released: <http://www.gadsl.org> (GADSL, 2011).

When waste management pathways are examined, it is evident that PBDE-contaminated plastics are usually destined for thermal energy generation or disposal in Germany. These procedures destroy PBDEs. According to Section 3 in conjunction with Annex 3(2) of the Landfill Ordinance (DepV), waste from human settlements with an organic carbon content of ≤ 1 per cent by weight may be deposited at landfill class I sites, while waste with an organic carbon content of ≤ 3 per cent by weight may be deposited at landfill class II sites. Historically, however, articles from the electrical and electronic sector have also been used in landfill engineering and are accordingly to be found in various landfill structures today (UBA, 2012d).

According to information from the recycling sector, there are no known recycling procedures in which plastic fractions that may contain PBDEs (e.g. printed circuit boards, casing plastics) are used as materials (UBA, 2012d).

One recent study (BiPRO, 2011) showed a large proportion of the c-pentaBDE consumed in the EU was used in the manufacture of PU foams for the upholstered furniture and mattress industry. It may be assumed that a large proportion of these foams were placed on the market in the UK (JRC, 2001) because higher fire safety standards apply there (BiPRO, 2011).

Figures from the German Association of Flexible Polyurethane Foam Producers (VWI) indicate that no PBDE substances have been used for the manufacture of PU flexible foam since 1995, at least as far as mattresses, upholstered furniture and vehicle seats/interior fittings produced in Germany are concerned. In consequence, it may be assumed that PBDEs will not be encountered when these products are recycled or disposed of in future (VWI, 2011).

Under Annex 3 to the DepV, such items cannot be landfilled on account of the excessively high organic concentrations they contain. In consequence, it must be assumed that the waste stream from upholstered furniture and mattresses is disposed of thermally, and as a result no c-pentaBDE is contained any longer in the substance stream that is generated.

6.2.2 Use of PFOS

Diverse applications of PFOS are mentioned in the literature. However, it is frequently difficult to distinguish whether use is actually being made of PFOS itself or of a closely related compound that may only be contaminated with PFOS because it was used in the production of the second substance. In most cases, PFOS is deployed as a process chemical and does not remain in the articles at relevant concentrations.

According to the current exemptions under the POPs Regulation, PFOS is or has been used for the following purposes:

- Surface refinement
- Photographic industry
- Fire fighting

Lanxess is now the only producer of PFOS in Germany. It is sold via intermediaries to German surface engineers for use in surface refinement (Lanxess, 2010). According to the calculations set out in a study commissioned by the Federal Environment Agency, the quantity of PFOS consumed in the surface treatment industry is estimated at approximately 3,600 kg a year (UBA, 2011a). The utilisation of PFOS is still allowed in this field and it continues to be used.

Figures from the Central Association of Surface Treatment Professionals Germany (ZVO) suggest there are about 2,050 businesses in the surface treatment sector in Germany (UBA, 2011a). Approximately 50 per cent of the PFOS consumed in Germany in surface treatment processes is used in hard chrome electrolytes (Breidenbach, 2011).

Possible emissions into the environment mainly follow the aquatic pathway, being released either from the process itself or indirectly as a result of the disposal of baths and their subsequent treatment as waste. To date, measures to treat waste water (during processes or as waste) have failed to make targeted contributions to the reduction of PFOS levels because there is still no state of the art for the separation of PFOS from waste water within the meaning of the AbwV, so PFOS is regularly detected at sewage treatment plants in Germany.

Another area of application for PFOS was the photographic industry. According to figures from I&P Europe, no PFOS-contaminated photographic material is being produced by I&P Europe's corporate members in Germany at present (2011). Currently, PFOS is only being used for the production of photographic negatives. Originally, however, it was also used for the production of photographic plates and paper. PFOS-free chemicals are now being deployed in this field (I&P Europe, 2011).

In 2010, most of the PFOS consumed by the photographic industry in Germany (approx. 80 per cent) was used for X-ray films (I&P Europe, 2011). Thanks to voluntary efforts by the photographic industry, the use of PFOS-contaminated substances has been considerably reduced over the last ten years, and at present (2011) no PFOS-contaminated photographic material is being produced in Germany (I&P Europe, 2011).

With regard to wastes from the photographic sector, it is possible to distinguish between private wastes and commercial wastes. Photographic materials that are disposed of via household waste (waste code 20 03 01) are therefore among the wastes from human settlements destined for thermal disposal. In the commercial sector, photographic materials are recycled, mainly due to their high silver contents and large plastic fractions. In consequence, it may be assumed that large quantities of PFOS-contaminated material are still primarily to be found in the medical sector, above all because, under Sections 18, 27, 28 and 36 of the Ordinance on Protection against Injuries and Damage caused by X-Rays and the Announcement concerning the X-Ray Record Card, X-rays of individuals over 18 years of age have to be kept for 10 years after the date of the last examination.

The precise proportion of PFOS in the environment that originates from photographic materials cannot be recorded (e.g. by measuring residual levels in waste water). Generally, however, it may be concluded that the photographic industry does not represent a significant source of PFOS emissions into the environment in Germany under the current waste management rules.

PFOS-contaminated fire fighting foams were used in fire fighting to extinguish combustible liquids and melting solid substances. In the EU, the placing on the market and use of PFOS individually or as a constituent of preparations in a concentration of 0.005 per cent by weight or more was prohibited as of 27 June 2008 by the Limitations Directive³¹ (Directive 76/769/EEC,

³¹ Later superseded by the REACH Regulation, which has in turn been superseded by the POPs Regulation in respect of PFOS.

Annex I(52)). Among the exceptions were fire fighting foams that contained PFOS. PFOS-contaminated fire fighting foams that were placed on the market before 27 December 2006 had to be used up by 27 June 2011. Since that date, Article 7 of the POPs Regulation has required that they be treated as waste and disposed of without undue delay. The remaining stockpiles were incinerated, in the course of which the PFOS was decomposed thermally and no emissions generated (BiPRO, 2011).

6.2.3 DDT in end-of-life products and articles

DDT contamination is to be expected, in particular, in timber constructions within buildings on the territory of the former German Democratic Republic (GDR), where agents that contained DDT³² were widely used in interior spaces until 1989 (LAGuS, 2005).

No separate limit value for DDT is stipulated in the Waste Wood Ordinance. Wood identified as having been treated is (co)incinerated in coincineration or waste incineration plants and biomass power plants. The dioxin and furan emissions generated during incineration must be below the limit value of 0.1 ng/m³ set in the 17. BImSchV. The same limit value is stipulated in Directive 2000/76/EC (Annex II), which is currently still in force, and the IED (Annex VI, Part 3), which will enter into force in 2013.

6.3 POPs-contaminated wastes

Article 7(2) and (4)(b) of the POPs Regulation formulate requirements concerning the disposal or recovery of

- wastes that are known to consist of POPs,
- wastes that contain or are contaminated with POPs and
- wastes that exceed the lower concentration limits of 15 µg/kg for PCDD/Fs and 50 mg/kg for other POPs.

Furthermore, the provisions of the KrWG and a number of special instruments in waste law that are discussed below find application.

6.3.1 PCDD/PCDF-containing waste

Under Article 7 of the POPs Regulation, as of a concentration limit of at least 15 µg/kg PCDD/F-contaminated wastes must be disposed of or reused in such a way that the PCDD/Fs are destroyed or irreversibly transformed (Art. 7(2) in conjunction with Annex IV). As a rule, these wastes are destined for high temperature incineration. According to Annex V of the POPs Regulation, PCDD/F-contaminated wastes that result from thermal processes, e.g. fly ash, are deposited permanently underground in underground landfills or are stored in mines in salt rock.

6.3.2 PCB-contaminated wastes

Apart from the provisions of the POPs Regulation, specific instruments in waste law apply for PCB-contaminated wastes, e.g. the PCB/PCT Waste Ordinance (PCBAbfallV), Section 2(3) of which stipulates that when construction wastes are generated PCB-contaminated fractions are

³² Technical DDT with approx. 70 % pp'-DDT, 20 % o,p-DDT, and p,p'-DDE, p,p'-DDD and o,p'-DDD.

to be removed and disposed of separately before these wastes are sorted, in so far as this is technically possible and economically acceptable.

On account of their applications, PCBs are not found separately, but as constituents of devices and materials destined for disposal, so the volume of PCB waste to be disposed of is considerably greater than the quantity of PCBs consumed (UBA, 2010b). The Federal Statistical Office published the following figures for inputs of PCB-contaminated wastes of German origin that arrived at German waste disposal plants in 2008 (see Fig. 1).

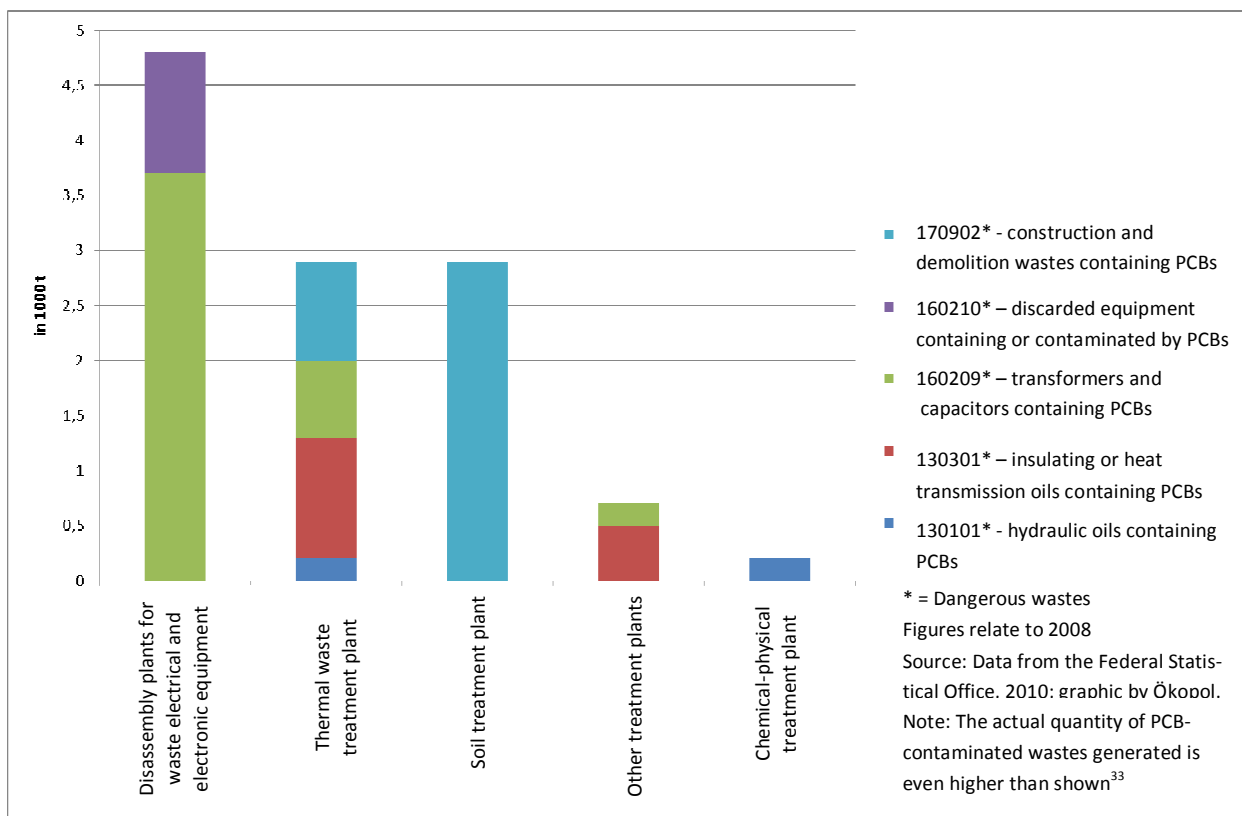


Figure 1: Inputs of PCB-contaminated wastes from Germany at German waste disposal plants (Data: Federal Statistical Office/Cahsun, personal communication, 2011)³³

Apart from this, since 1998 waste statistics have been available from which it is evident what types and quantities of waste are imported and exported (UBA, 2012a).

Specific information on various PCB-contaminated waste streams is given below:

PCB-contaminated waste wood

Insulating boards and soundproofing panels, in particular, were treated with agents that contained PCBs in the past. According to Annex II to the Waste Wood Ordinance (AltholzV), waste wood may only be used for the production of derived timber products made of wood chips

³³ The actual volume is greater because, for reasons of confidentiality, the Federal Statistical Office is unable to cite quantities in all cases, because some of the hazardous wastes are also used in landfill engineering, underground and opencast mining, and installations for the processing and recovery of construction and demolition wastes, and because a number of other wastes classified with different codes may also contain PCBs without this being explicitly stated in the waste code descriptions (DESTATIS/Stute, personal communication, 2011).

when the concentrations of PCB are < 5 mg/kg. According to the AltholzV, the production of synthetic gas or active carbon/industrial charcoal is possible where there are levels of contamination between 5 and 50 mg/kg. Under Section 1(2) of the PCBAbfallV and Section 2(4)(b) and Section 2(5) of the AltholzV, 'waste wood containing PCBs' is to be disposed of in accordance with the PCBAbfallV when PCB levels exceed 50 mg/kg of the waste wood.

PCB-contaminated waste oil

Section 2 of the German Waste Oil Ordinance (AltölV) states that the reprocessing (i.e. the repeated placing on the market) of waste oils is to be given priority over their use to generate energy or their disposal. Under Section 3, however, waste oils may only be processed if they contain less than 20 mg PCB/kg, or if the recovery process results in products that do not exceed the relevant limit value. According to Article 4(1) of the POPs Regulation, reprocessed waste oils too may only contain PCBs if they occur as unintentional trace contaminants. Otherwise, Article 7 of the POPs Regulation stipulates that wastes are to be disposed of or irreversibly transformed as of a PCB concentration of 50 mg/kg PCB. This means that the requirements that apply for the reprocessing of waste oils in Germany (recycling, no PCB enrichment in the material cycle) are more rigorous than those prescribed in the EU.

Remaining uses of PCBs in large enclosed devices

In 1994, there were still over 300,000 tonnes of PCB-contaminated devices and liquids to be dealt with. More than 99 per cent of these wastes had already been disposed of by 2004 (BMU, 2004c). Two PCB-contaminated transformers with exemptions were still being operated up until 2010. A survey carried out for the European Commission discovered PCB-contaminated transformers that had been overlooked by previous checks. There were 30 of these PCB-contaminated transformers with a total weight of 35.9 tonnes. Appropriate disposal plans have been drawn up for these pieces of equipment. As of 1983, PCB-contaminated transformers were emplaced in underground landfills, and some of the transformers were drained prior to their deposition. In the years from 2004 to 2010, about 14,000 tonnes of emplaced devices were dismantled, drained and decontaminated with their metals being recovered (MKULNV and MAIS, 2011).

Remaining uses of PCBs in small enclosed devices/applications

Up until 2004, small capacitors were emplaced in underground landfills. Since 2005, PCB-contaminated small capacitors have been disposed of at high-temperature incineration plants (UBA/Friedrich, personal communication, 2011). It is impossible to estimate the volume of PCBs in products that are still in use, such as sealants and fluorescent lamp capacitors. Instructions about correct disposal for the owners of PCB-contaminated electrical devices and components have been published by some Länder, e.g. Hamburg (Free and Hanseatic City of Hamburg, 2002).

Remaining uses of PCBs in unenclosed systems

On account of their broad range of uses, PCBs are still contained in various articles. According to Section 1(2) of the PCBAbfallV, mixtures or articles within the meaning of the ChemG are to be disposed of if they contain more than 50 mg/kg of PCBs. According to Article 4(2) of the

POPs Regulation, the recovery of recyclable substances, i.e. the production of new articles, is only allowed when PCB is merely present in the products as an unintentional trace contaminant. Several Land authorities have drawn up guidelines on the rehabilitation of PCB-contaminated buildings, e.g. North Rhine-Westphalia (2003), Bavaria (1994) and Baden-Württemberg (2001).

6.3.3 Disposal of POPS-contaminated wastes at landfills

The provisions of Article 7(4) of Regulation (EC) No 850/2004 (POPs Regulation), which derogate from the requirement that POPs be destroyed laid down in Article 7(2) by making it possible for POPs-contaminated wastes to be deposited at landfills, are implemented in their entirety in German law by the Landfill Ordinance (DepV). According to the DepV, wastes mentioned in Annex V to the POPs Regulation that exceed the concentration limits for the substances listed in Annex IV to the Regulation may not be deposited at surface landfills (Section 7(1)(7) DepV). The same applies for wastes containing other long-lived or bioaccumulative toxic substances that give grounds for concern that the public's welfare might be impaired if they were deposited at landfills.

In practice, the concentration limits given in Annex IV to the POPs Regulation represent the limit values for landfill class III.

Concrete and considerably lower limit values for BTEXs, PCBs, mineral hydrocarbons and PAHs have been stipulated for landfill sites for inert wastes (landfill class 0) by the Landfill Directive and incorporated into the DepV (Annex 3(2), Table 2 DepV). Furthermore, even stricter limit values apply when wastes are deployed at landfills to improve the geological barrier or in the recultivation layer.

The Länder enforce individual limit values for classes I and II (landfills for non-hazardous wastes) that range between the values for classes 0 and IV. On the basis of a report from the Federation/Länder Working Group on Waste (LAGA) dated 21 June 2011, the Conference of Environment Ministers of the Federation and Länder recommends the application of proposed uniform limit values.

According to Article 7(4)(b) of the POPs Regulation, the competent authority may also approve an alternative procedure provided for in Annex V when the Annex IV limit values are exceeded if it is demonstrated by the waste holder that the decontamination of the wastes and the destruction of the POPs does not represent the environmentally preferable option. Of the alternatives specified in Annex V to the POPs Regulation, only permanent deposition in underground landfills in salt rock is permitted by the DepV in Germany. Waste management records approved by the competent authority are to be presented to the operator of the underground landfill in good time before the first delivery of wastes.

The reference to the POPS Regulation in the First Ordinance Amending the Landfill Ordinance is formulated flexibly ('as most recently amended'), so the DepV will always refer to most recent text of the Regulation whenever its annexes are amended.

6.3.4 Use of wastes that contain POPs for mine stowage

Section 4 of the Ordinance on Underground Waste Stowage (VersatzV) lays down limit values for certain parameters relevant to the stowage of waste underground. These limit values are quantified in Annex 2. PCBs are the only POPs covered by this Ordinance. Under Section 4(2), it is only permissible for the limit values to be exceeded in the following exceptional cases:

- *'where the geogenic levels of the same substances in the rock are not exceeded [not relevant for POPs],*
- *where "incineration residues from the burning of coal" are stowed in carbonaceous and secondary rock and*
- *where wastes are stowed in salt rock provided a long-term safety record is held'* (LAGA, 2010).

6.3.5 Biowastes

The Ordinance on Biowastes (BioAbfV) governs the recovery of composts from biowaste. A conclusive list of appropriate biowastes for the production of composts from households, commercial operations and production facilities has been compiled. This encompasses vegetable and animal waste substances, such as wastes from food processing, food wastes, garden and park wastes, etc. that contain biowastes. Limit values are stipulated for heavy metals, but not for organic pollutants.

'However, the BioAbfV imposes an obligation for the biowaste treatment entity to have tests for further pollutants carried out on the unmixed input materials or the treated biowastes, in particular if there are reasons to suspect elevated concentrations on account of the nature, properties or origins of the input materials (Section 4(8)). The obligation to test for additional pollutants covers POPs where there are corresponding reasons to suspect their presence.' (LAGA, 2010)

The new version of the Ordinance on Biowastes entered into force on 1 May 2012 (BioabfV, 2012). Information on the amended legislation and the updated German text of the Ordinance can be found along with other materials on the BMU's Internet site at <http://www.bmu.de/abfallwirtschaft/abfallrecht/national/doc/40696.php>.

6.3.6 Sewage sludge

The parameters and limit values for sewage sludge quoted in Section 2.6.2 may be extended by the competent authority to further constituents (Section 3(5) AbfKlärV). This includes POP pollutants. Some Länder³⁴ have made use of the power they hold to test for additional pollutants to introduce tests for perfluorinated tensides (PFTs) and have stipulated elevated values for these tests (see Table 9, p. 43).

As a result of their broad range of application, these pollutants are to be found in numerous industrial and consumer products, such as detergents and cosmetic articles. In consequence,

³⁴ Hamburg, Bremen, Mecklenburg-Western Pomerania and the Saarland.

they can also be detected in sewage sludges from municipal waste water treatment facilities that may, in turn, be spread on agricultural land (LAGA, 2010).

Table 9 Land-specific elevated values

Land	Elevated values for PFTs in sewage sludge for agricultural recovery ($\mu\text{g}/\text{kg DM}$)	Comments
Brandenburg	100	Sum of PFOS + PFOA
Berlin	100	
Baden-Württemberg	100	Sum of nine PFTs incl. PFOS
Bavaria	100	Sum of 11 PFTs incl. PFOS, 25% tolerance
Hesse	100 (recommended)	Sum of PFOS + PFOA
Lower Saxony	200 (recommended: 100)	Sum of PFOS + PFOA
North Rhine-Westphalia	100	Sum of PFOS + PFOA
Rhineland-Palatinate	100	Sum of 10 PFTs incl. PFOS
Schleswig-Holstein	200 (recommended: 100 ³⁵)	Sum of PFOS + PFOA
Saxony	100	Sum of PFOS + PFOA
Saxony-Anhalt	100 ³⁶	Sum of PFOS + PFOA, 25% Tolerance
Thuringia	200 (recommended: 100)	Sum of PFOS + PFOA

(LAGA, 2010)

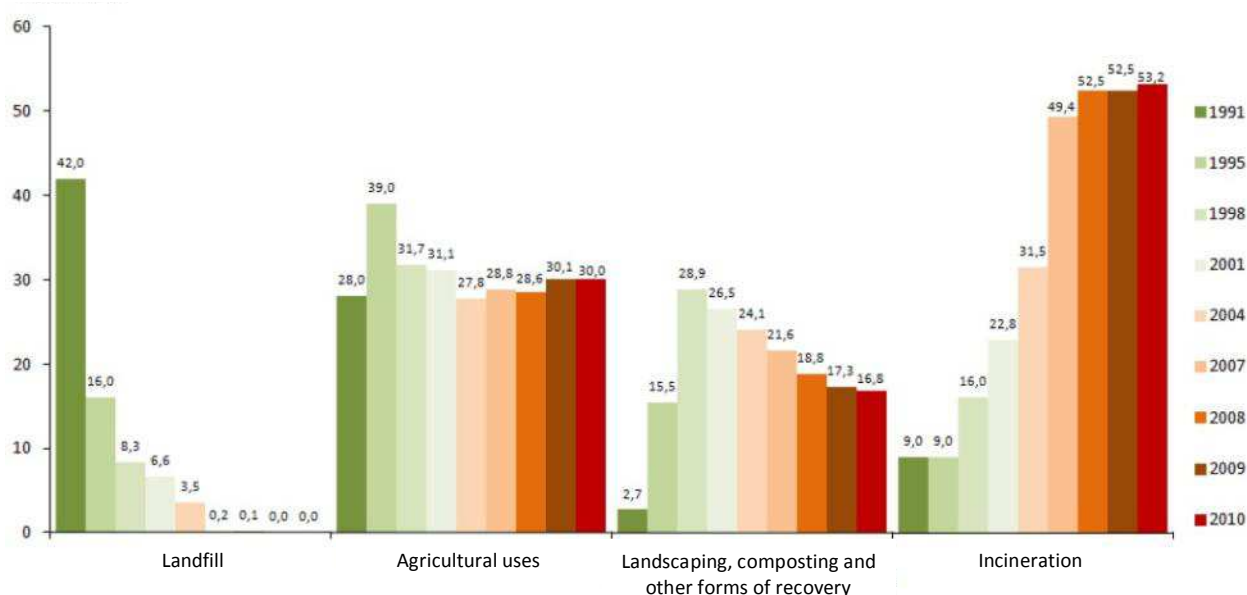
According to the BMU (2008), the levels of the individual organic pollutants tested for in municipal sewage sludges have either fallen or stagnated over the last few years. At the same time, the proportion of sewage sludge used for agriculture, landscaping or composting has declined slightly. In 2004, approximately 52 per cent of sewage sludge was used for these purposes, but by 2010 this figure had fallen to 46.8 per cent (see Fig. 2).

³⁵ The PFT concentrations detected to date in Schleswig-Holstein in sewage sludges utilised for agricultural purposes have all been below the recommended level of 100 $\mu\text{g}/\text{kg DM}$.

³⁶ Apart from purposes on land used for agriculture and horticulture, this also applies where recultivation and civil engineering measures are undertaken (e.g. landscaping).

Sewage sludge disposal

Proportion in % DS¹⁾



¹⁾ There have been changes in the statistical survey methodology, which is why the pre-2007 figures do not add up to 100%; DS = dry substance

Figure 2 Disposal pathways for sewage sludge over time, 2010 (UBA, 2012b)

In order to rule out any possible accumulation of pollutants in soil over the long term, efforts are being made to further tighten up the requirements placed on sewage sludges that may be used in agriculture. According to the Closed Substance Cycle and Waste Management Act, it will only be possible for chemical requirements for the utilisation of sewage sludges on agricultural land to be governed by waste law in future if the proper and harmless utilisation of sewage sludges is not already guaranteed by the provisions of fertiliser law (third sentence of Section 11(2) KrWG). The Fertiliser Application Ordinance sets a labelling threshold for PFTs in fertilisers of 0.05 mg/kg dry mass as the sum of PFOA and PFOS, and a limit value for the placing on the market of fertilisers, soil conditioners, growing media and plant aids of 0.1 mg of PFTs per kg of dry mass.

At the same time as the developments discussed above, the proportion of sewage sludges disposed of thermally by means of co-incineration went up from 31.5% in 2004 to 53.2 % in 2010. The clear rise in the thermal treatment of sewage sludges is to be attributed to the requirements of the Waste Deposition Ordinance, according to which the deposition of untreated sewage sludges at landfills has been prohibited since 2005. The incineration of sewage sludges in incineration and co-incineration plants that are suitable for this purpose is therefore, alongside the use of sewage sludges on soils as fertilisers, the second pillar of sewage sludge disposal (UBA, 2012b). However, incineration at mono-incineration plants is to be preferred because this is the only way of ensuring the raw materials contained in the sewage sludge ashes that are generated (particularly phosphorous) can be channelled into resource-efficient forms of reuse (BMU, 2011d, pp. 72f), unless the raw materials can be recovered prior to the thermal treatment.

6.3.7 Contaminated sites/harmful soil contamination

At present, more than 271,000 sites in Germany are officially suspected of being contaminated (BMU, 2011b). Details of the current numbers of designated sites can be obtained from the relevant contaminated site registers in the individual Länder or from the Federal Environmental Agency (LABO, 2011a; UBA, 2011c). As a rule, these sources provide information about all former uses, the technologies previously deployed at these sites and sector-specific types of contamination. The production of lindane (γ -HCH) generated large quantities of α -HCH and β -HCH as 'byproducts', which once used to be deposited at surface facilities in Germany as well. Following the listing of these compounds as POPs, these landfills are to be regarded as sites contaminated with POPs (UBA/Friedrich, personal communication, 2011). Vijgen (2006) assumes there are between 390,000 and 450,000 tonnes of HCH residues in Germany.

7 Public information, awareness raising and education activities (Art. 10)

Public information, awareness raising and education activities about POPs-related topics are undertaken at present by the Federal Environment Agency and the Länder.

The Federal Environment Agency supplies the public with information about topical cases (UBA, 2010d), fields in which POPs are utilised and problems that arise as a result of their use in print media, publications in the press and content provided on the Internet (UBA, 2010c; UBA, 2011d; Dioxin Database, 2011).

7.1 German Environmental Information Portal (PortalU)

The German Environmental Information Portal (PortalU), which is provided free of charge, is a central resource for the administrative bodies that deal with environmental affairs at the federal and Land levels. It offers links to more than 3.6 million web pages and more than 500,000 database entries made available by over 450 public-sector institutions and organisations in Germany (PortalU, 2012a), covering the whole diversity of environmental information within the meaning of Directive 2003/4/EC. The aim of the portal is to give the user a quick, reliable overview of all relevant public environmental information. It features a shared, standardised search function that calls up results from all the linked databases. The labelling of environmental information with metadata plays a particular role. As a contribution to the transposition of the INSPIRE Directive (2007/2/EC), the metadata on the geodata in the Federation and the Länder environmental data catalogues bundled by PortalU are forwarded to the Geodata Infrastructure Germany (GDI-DE) geodata catalogue. PortalU is operated jointly by the Federation and the Länder, and administered by the Coordination Center PortalU at the Lower Saxon Ministry for the Environment and Climate Change (PortalU, 2012b).

7.2 Pollutant Release and Transfer Register Germany (PRTR Germany)

The Pollutant Release and Transfer Register Germany (PRTR Germany) provides information online, e.g. about pollutants that are released by large industrial enterprises in particular regions. It therefore makes a contribution to greater transparency with regard to environmental information and is intended to motivate enterprises to raise their environmental performance (PRTR, 2012).

On the basis of the European PRTR Regulation (Art. 5 Regulation (EC) No 166/2006) and the German PRTR legislation (Section 3 Act Implementing the Protocol on Pollutant Release and Transfer Registers – SchadRegProtAG), industrial enterprises in Germany report to the UBA (Section 5) in electronic form about

- the release of pollutants into air, water and soil,
- the off-site transfer of quantities of waste, and
- the off-site transfer of pollutants in waste water that is destined for waste water treatment,

if certain emission thresholds or quantities of waste are exceeded.

Apart from this, the PRTR Germany contains information on emissions from diffuse sources, e.g. transport and agriculture.

Businesses report to the PRTR on an annual basis. The first reporting year was 2007. The data are to be forwarded to the EU and entered into the national register 15 months after the end of the reporting year in question (i.e. by 31 March of the next year but one).

According to Annex II to the PRTR Regulation, a total of 91 pollutants are relevant when it comes to releases into the air, water and soil, and transfers of pollutants in waste water. A facility that exercises a PRTR activity is required to report its emissions if it belongs to a particular sector (e.g. the chemicals industry or the mineral oil industry) or carries out certain activities in other sectors above a capacity threshold (cf. PRTR Regulation, Annex I).

The PRTR Regulation distinguishes between hazardous and non-hazardous wastes. According to Article 5(1) of the PRTR Regulation, such wastes must be reported to the PRTR if

- hazardous wastes exceeding two tonnes per year or
- non-hazardous wastes exceeding 2,000 tonnes per year

are transferred off the site.

In this respect, a distinction is to be made in each case between waste destined for recovery and waste destined for disposal.

Further to the provisions laid down in Regulation (EC) No 1013/2006, when hazardous wastes are transferred abroad the operator has an obligation to state the name and address of the company that recovers or disposes of the wastes and the actual place of recovery or disposal.

The PRTR Regulation sets out information on all POPs listed in the Stockholm Convention with the exception of PFOS. The complete list of substances covered by the PRTR Regulation can be found in Annex II to the PRTR Regulation.

The data are also added to the European database (ePRTR, 2012). Apart from this, individual authorities provide information about Land-specific POPs data, e.g. LANUV NRW (2011).

7.3 Dioxin Database Federation/Länder

The Federation/Länder Working Group on Dioxins was mandated to initiate the establishment of a central Dioxins Database by a decision of the 37th meeting of the UMK in 1991. During a

development phase from 1993 to 1997, the UBA elaborated a concept for a cross-media database management system focussed on persistent organic substances. The data set covering various environmental compartments has been expanded continuously since 1997 in cooperation with the Federal authorities and the Länder. The BVL supervises the scientific content that relates to foodstuffs and animal feeds, while the same role is played by the BfR in the health field.

The database serves as the central instrument for the documentation and evaluation of the results of testing programmes on dioxin loads in the environment, foodstuffs, animal feeds, and humans. In addition to this, data on wastes, recyclable materials, residual substances, sewage sludge and other technical products are included and evaluated. As well as the programmes and tests for which the Federal authorities and Länder are responsible, data from research work, special projects and incidents that have come to light in which foodstuffs have been contaminated are increasingly being entered into the database system (Dioxin Database, 2011).

Apart from dioxins, data on other environmental pollutants (incl. other POPs) are also recorded. The pollutants in question are:

- Chlorobenzenes
- Chlorophenols
- Polychlorinated biphenyls
- Organochlorine pesticides
- Polybrominated diphenyl ether
- Perfluorooctane compounds
- Musk compounds
- Nitromusk compounds
- Polycyclic musk compounds
- Polyhalogenated dibenzodioxins/dibenzofurans

The specialised application further developed for the Dioxin Database has the functions of storing the quantitative data gathered from testing programmes in the Federal Republic of Germany, structuring these data uniformly, presenting evidence about chronological and spatial trends in the pollution situation across various compartments, and providing data and information when contamination is detected, e.g. in foodstuffs. These evaluations and assessments can ultimately be used to implement environmental policy measures (for instance, to amend legislative provisions), to identify what further data are required, and to fulfil national and international obligations concerning the documentation of the status of the environment. The Federal Environment Agency published three reports in 2002 and 2007 that evaluate and assess the status of POPs in the environment.

7.4 Environmental Data

Interested parties can consult the Environmental Data Internet site to obtain information about the causes of environmental pollution, changes in the status of the environment, effects on

humans and the environment, and environmental policy goals, strategies and measures. It offers tables and graphics on these topics, as well as background information about data sources, legal foundations, environmental policy quality targets and goals for action. In addition to this, it provides references to further literature and links to the Internet sites of other German and international institutions with more detailed information.

The website also supplies comprehensive information on POPs, e.g. about emissions, immisions, soil contamination, etc. The content is created in cooperation with other federal authorities, above all the BMU and the Federal Statistical Office (UBA, 2012c).

7.5 Small firing installations

Small firing installations are a relevant source of POPs. It is possible to reduce emissions primarily by avoiding the use of impermissible fuels (e.g. treated wood, other wastes). The UBA and many Länder provide extensive information materials on the correct handling of small solid fuel firing installations, which are intended to educate operators and support chimney sweeps in their advisory role under the 1. BImSchV (see section 2.4.2).

8 Research, development and monitoring activities (Art. 11)

Article 11 of the Stockholm Convention calls upon the parties to act within their capabilities at the national and international levels to encourage or undertake suitable research, development and monitoring work on

- POPs,
- alternatives to POPs where relevant and
- candidate persistent organic pollutants.

Apart from sources and releases into the environment (Art. 11(1)(a)), this also relates to the presence of POPs, concentrations, trends in humans and the environment (Art. 11(1)(b)), and their effects on human health (Art. 11(1)(d)).

8.1 Research

Research activities undertaken at various levels in Germany are discussed below. They include activities conducted by the Federation that e.g. have been or are being carried out under the UFOPLAN³⁷ and research projects conducted by the Länder. The difference between research and monitoring is that research is intended to investigate discrete circumstances and not to record the variation in or evolution of phenomena on an ongoing basis.

³⁷ The Federal Environment Ministry requires scientifically sound foundations and aids for decision-making if it is to achieve its environmental policy goals. The BMU's departmental research does a great deal to meet this need. The Ministry's research focuses on the priorities and objectives of environmental policy. The research required for this purpose over the medium term is specified in the BMU's Research Framework. The Research Framework is used to plan concrete research projects, which are specified each year in the BMU's Environmental Research Plan (UFOPLAN).

8.1.1 Activities conducted by the German Federation

Identification of substances with POPs characteristics

The methods currently used to predict the potential of semivolatile organic compounds for long-distance transport are being further developed in order to elaborate criteria and identify chemicals with POPs characteristics. This relates to instruments deployed to identify substances with characteristics referred to in Annex D to the Stockholm Convention and evaluate them to ascertain whether they have POPs characteristics.

The further development of the POPs criteria has been driven ahead for this purpose with funds from the BMU's research budget, in this case with an emphasis on PBT substances and the identification of potential new POPs (BMU, 2011e; BMU, 2010). Furthermore, new detection procedures for POPs in the environment are to be trialled in research projects (BMU 2010).

Apart from this, research projects have been initiated that are focussed on the presence of POPs in the environment and products, and intended to determine the *status quo* in Germany as far as the new POPs (in particular) are concerned.

8.1.2 Activities conducted by the Länder

An overview of the research and monitoring projects undertaken in the individual Länder is given in Table 10 on page 74 of the Annex. Table 11 on page 81 provides links to public information portals. The Land-level activities referred to in the table, and research project data and reports can be accessed via the Dioxin Database information portal (see section 7.3).

8.2 Monitoring activities carried out by the Federation

This section discusses activities at various levels that involve the monitoring of POPs. A number of different monitoring programmes are conducted by the Federation and Länder with different objectives and parameters in order to assess the contamination of the environment – including human beings – with organochlorine compounds in Germany.

8.2.1 Dioxin Database Federation/Länder

The Dioxin Database Federation/Länder is a good example of cooperation between the Federation and the Länder. It is a cross-media instrument that documents data gathered from the environment, foodstuffs and human beings in Germany, including the metadata required for their assessment.

At present, the database contains exposure data from about 220 compartment-specific monitoring programmes with more than 12,000 congener-specific individual specimens from the different environmental compartments, soil, water, air and biota (plants, animals); from waste, recyclable substances, residual substances, preparations and articles; from domestic and attic dusts; from animal feeds and foodstuffs; and from human beings (tissues, body fluids). In addition to this, extensive information is provided on sampling and analytical methods, as well as descriptions of the sampling sites.

The Federation and the Land authorities are jointly responsible for the administration of the data records. The foundation for the exchange of data is the Administrative Agreement be-

tween the Federation and the Länder concerning the Exchange of Data in the Environmental Field in the version of March 1996, in particular Annex II.3., 'Exchange of data on polyhalogenated dibenzodioxins and dibenzofurans, and other chloroorganic substances'.

Since 2003, it has been possible to access these data and information via a Web portal. This application simplifies the exchange of data between participants, quality assurance by data suppliers and access to the aggregated data (e.g. evaluation of trends), as well as the individual data on which they are based. A concept of rights and roles facilitates the management of access to the database. At present, more than 200 expert users have online access to the database system. They are therefore able to generate enquiries and carry out evaluations themselves. A Web interface also allows the downloading of quality-assured data.

Human health

The UBA (Section IV 2.2) coordinated the German contribution to the global *Fourth WHO-coordinated survey of human milk for persistent organic pollutants* (WHO, 2009). Building on measurements of concentrations of PCDD/Fs and PCBs in samples of breast milk from earlier surveys carried out from 1987 to 2003, the participating bodies gathered new data in order to build up evidence about chronological trends in the occurrence of these substances (UBA, 2008).

In contrast to earlier years, the testing programme, which was carried out on behalf of the WHO's Global Environment Monitoring System - Food Contamination Monitoring and Assessment Programme (GEMS/Food), was not limited to PCDD/Fs and PCBs, but extended to all the substances listed in the annexes to the Stockholm Convention. In addition to this, PBDEs were also to be measured optionally. The report on this project was published in 2007 by the WHO (WHO, 2007).

8.2.2 Environment

There are no specific monitoring programmes in Germany devoted exclusively to POPs listed in the POPs Regulation. As a rule, the substances measured in the course of environmental monitoring activities are those that have to be monitored under European legislation (e.g. WFD priority substances) or other international monitoring programmes (HELCOM, OSPAR). The substances monitored in each of the programmes also include individual substances listed in the annexes to the Stockholm Convention and/or the CLRTAP POPs Protocol.

National Forest Soil Condition Survey – Background Pollution with Persistent Organic Substances

During the planning of the Second National Forest Soil Condition Survey (BZE II), the Federation-Länder BZE II Working Group felt it was necessary to survey persistent organic substances (organics) separately, and included this in the BZE II concept paper (BZE, 2007). In view of the dangers and general dissemination of POPs, the goal of the Federation/Länder BZE II Working Group was to improve the fundamental stock of data about their dissemination and the contamination of forest ecosystems. The survey was carried out with a division of labour between the forestry and environmental sides. The determination of typical levels of organic pollutants in forest soils was a stand-alone project carried out on the environmental side. The soil samples required for this purpose were obtained by the Länder in the course of the BZE II project. Back-

ground levels for the following substances were determined in representative areas across the Federal Republic of Germany: DDT and its metabolites, HCB, HCHs, PCB6, aldrin/dieldrin and PAH16.

The BZE II sampling concept was taken as the basis for the survey, with the plots of the ICP Forest and EU BioSoil programmes (16 km x 16 km grid, approximately 450 plots) being selected from the grid of approximately 2,000 BZE sampling plots (8 km x 8 km grid) (BMELV, 2012). This ensured the comparability of the results at the European level. In addition to this, the density of the grid was increased in certain areas. Samples were therefore taken at a total of about 475 plots. The sampling horizons investigated were the O-horizon and the 0–5 cm and 5–10 cm topsoil layers.

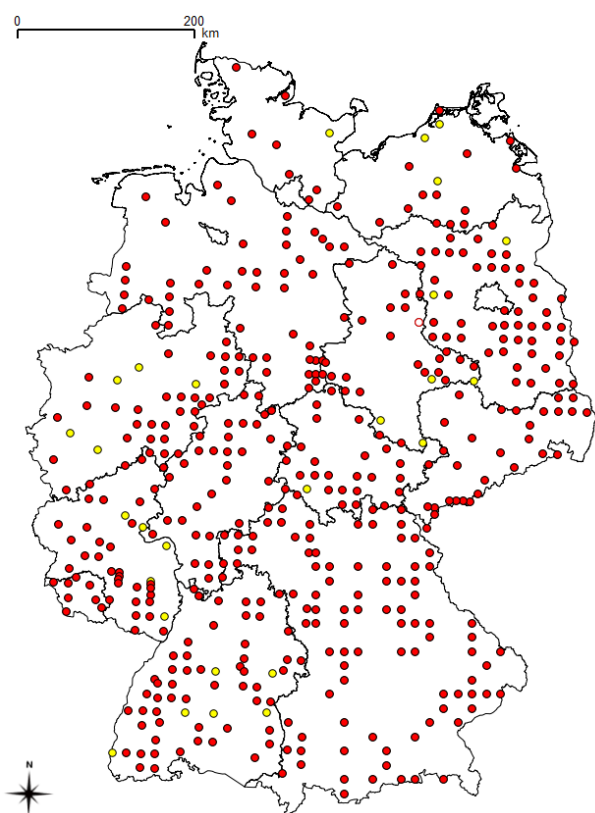
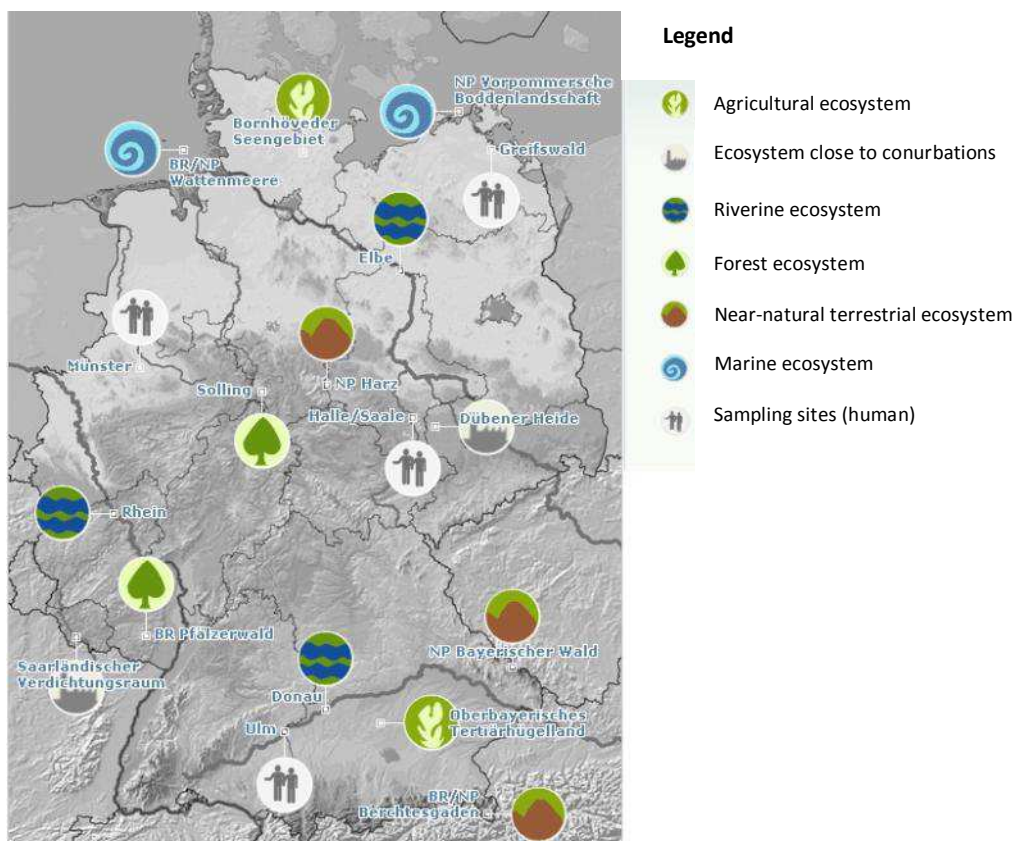


Figure 3 Sampling plots for the BZE II Supplementary Organics Programme; red: ICP Forest and EU BioSoil programmes (16 km x 16 km grid; approximately 450 plots); green: plots added to increase grid density (26 plots)

Environmental Specimen Bank

The Federal Environment Agency has been operating the Federal Environmental Specimen Bank (UPB) on behalf of the BMU since the beginning of the 1980s (Environmental Specimen Bank, 2011a). This instrument pursues the goal of tracing the behaviour and fates of, in particular, persistent chemicals in the environment and recording the contamination of human beings with these substances by means of the collection and long-term storage of defined environmental and human specimens.

The environmental specimens include organisms from terrestrial, limnetic and marine habitats. Apart from this, various human specimens are also taken (blood plasma, whole blood, saliva, 24 hour urine samples, head and pubic hair). The specimens are taken repeatedly from the same ecosystems/populations because this makes it possible to delineate long-term trends. Figure 4 on p. 52 gives an overview of the individual areas/populations sampled.



Technical data: © Federal Environment Agency; geospatial base data: © Federal Agency for Cartography and Geodesy

Figure 4 Sampling areas for the Environmental Specimen Bank (source: Environmental Specimen Bank, 2011b)

Eight substances/groups of substances listed in the Stockholm Convention (aldrin, dieldrin, heptachlor, HCB, PCBs, DDT, PeCB, HCHs), as well as other chlorinated hydrocarbons (octachlorostyrene (OCS), pentachlorophenol (PCP)) and PAHs (17 individual PAHs) are analysed regularly under the UPB monitoring programme. Furthermore, archived materials have been tested retrospectively for PFOS and other perfluorinated compounds, PBDEs, dioxins/furans/dl PCBs and potential POPs candidates (incl. HBCD, organotin compounds). The data are available as downloads and/or in report form on the UPB Web site (Environmental Specimen Bank, 2011a).

MONARPOP

The international Monitoring Network in the Alpine Region for Persistent Organic Pollutants (MONARPOP) surveyed POPs in the Alpine region from July 2003 to December 2007. On account of the region's high precipitation and low temperatures, POPs are deposited in greater quantities there. However, the significance of this pollution had hardly been recorded prior to

the launch of this project. MONARPOP investigated POPs and other organic pollutants, in particular with regard to

- their long-range transport to remote alpine regions,
- prevalent source directions
- loads within the Alpine range, including regional differences,
- variation with altitude,
- present stores, bound in forests of the Alpine region, and
- possible biological effects of the detected loads.

Apart from this, the intention was to supply decision-makers with information and, in this way, create an instrument with which the progress made under the Stockholm Convention could be reviewed (Monarpop, 2012). Almost all the POPs surveyed were also found in environmental samples. What is particularly astounding is that both mirex, which has never been used in Central Europe, and DDT, which was banned as long ago as the 1970s, were found in samples indicative of current pollution. For example, they were detected in the air, depositions and needle specimens (Monarpop, 2009).

EMEP

Another scheme in this field is the European Monitoring and Evaluation Programme (EMEP, 2011). Under the EMEP, the UBA coordinates the German contribution to a network that provides monitoring data on the long-range transmission of chemical substances (UBA, 2011e). The programme was launched in 2003, since when it has continued to run continuously. On the basis of the emissions data made available by the states, EMEP provides information on the transport and transformation of all relevant emissions in the atmosphere, as well as their concentrations and depositions. EMEP also records the transboundary transport of pollutants in 'source-receptor matrices' that show the quantities of pollutants each country imports and exports. The measurements for the German part of the project are taken by the UBA at six stations in its air monitoring network (two coastal stations, two lowland stations and two upland stations). Of the POPs, DDT, aldrin, dieldrin, endrin, chlordane, endosulfan, HCHs, heptachlor, HCB and PCB are covered (EMEP 2001).

Water surveillance

The implementation of the WFD involves carrying out tests on what are known as priority substances (Art. 16). The tests are carried out in the aqueous and/or suspended phases. Some of the surveillance programmes are supplemented by biomonitoring programmes (accumulation monitoring of fish or shellfish, effect monitoring with biomarkers).

Furthermore, specific substances are also tested for during the mandatory monitoring carried out by the international commissions for the protection of the Danube, Elbe, Oder and Rhine (e.g. ICPDR, 2011; ICPE, 2011a; ICPO, 2011; ICPR, 2011). The selections of substances are specified by working groups of delegates from the states through which these rivers run and the

results published. The monitoring programmes are adjusted on an ongoing basis and are increasingly focussing on the priority substances listed in the WFD.

PFOS was included for the first time in the monitoring programme for the International Commission for the Protection of the Elbe (ICPE) network in 2011 (ICPE, 2011b). Apart from this, a number of other POPs are tested for. It has been possible to consult information on these monitoring programmes at <http://www.ikse-mkol.org/index.php?id=199&L=2> since 2003.

The German Marine Monitoring Programme (GMMP) collaborates with other national and international institutions and programmes, e.g. the river monitoring programmes administered by

- the River Basin Community Elbe (RBC Elbe, 2011),
- the River Basin Commission Weser (RBC Weser, 2011) and
- the Trilateral Wadden Sea Monitoring and Assessment Programme (TMAP) with its seats in Tönning and Wilhelmshaven (Wadden Sea National Park, 2011).

8.3 Monitoring activities conducted by the Länder

The enforcement activities carried out by the Land authorities in Germany include programmes that contribute to the observation of the status of the environment. The results of these testing programmes are taken as the basis for the conception and design of regional measures.

One example of this is a project undertaken by the Bavarian Health and Food Safety Agency. BAMBI 2007/2008: Bavarian Monitoring of Breast Milk made it possible for evidence to be obtained about the contamination of samples of breast milk taken all over Bavaria with substances that are damaging to health. The samples were tested, in particular, for chloroorganic pesticides, standard PCBs, dioxin-like PCBs, polychlorinated dioxins and polychlorinated furans (PCDDs/PCDFs), PFT and phthalates (Verdugo-Raab et al., 2008). Under the auspices of the Federation/Länder Working Group on Soil Conservation (LABO, 2011b), Germany's environment and forestry ministries collaborated on a concept for measures to survey background levels of POPs in forest soils. This was done as part of the National Forest Soil Condition Survey (UBA, 2010e).

Representative long-term soil-monitoring sites have been set up at selected locations in all the Länder, at which testing is conducted for POPs, as well as other soil contaminants (UBA, 2010f). The aim is to use these monitoring sites to identify possible long-term changes in soils, and to forecast and assess their causes and impacts. The immission and accumulation of anthropogenic substances are significant drivers for chemical changes in soils, although POPs are not incorporated systematically into the tests in all the Länder. Apart from this, there are variations in the intensity of the sampling and the sampling cycles.

8.4 Surveillance

In contrast to monitoring, surveillance activities involve the enforcement of statutory provisions. At the same time, they may display overlaps with monitoring measures. The monitoring and surveillance activities conducted by the Länder are listed in the Annex (Tab. 10, p. 74).

8.4.1 Activities conducted by the Federation and the Länder

The competent ministries of the Federation and five Länder, Bremen, Hamburg, Mecklenburg-Western Pomerania, Lower Saxony and Schleswig-Holstein, have been collaborating since 1997 on the surveillance of the marine environment of the North Sea and Baltic Sea under the German Marine Monitoring Programme (GMMP).

To support the implementation of the EU Marine Strategy Framework Directive (2008/56/EC), the GMMP was replaced with effect from 30 March 2012 by the Administrative Agreement concerning Cooperation between the Federation and the Länder on Marine conservation (Marine Conservation Administrative Agreement, 2012). The cooperative activities undertaken until now for the surveillance of the marine environment are being continued with full account being taken of the extant division of competences between the Federation and the coastal Länder, as well as the additional requirements imposed by the MSFD.

The goal of this cooperation is the efficient and complete fulfilment of national, European and international obligations. The cooperation between the Federation and the coastal Länder for the purposes of marine conservation is undertaken in particular

- *‘in the transposition and implementation of the EU’s Marine Strategy Framework Directive;*
- *for the joint surveillance and assessment of the marine environment of the North Sea and the Baltic Sea;*
- *within the framework laid down by the Convention on the Protection of the Marine Environment of the Baltic Sea Area (Helsinki Convention);*
- *within the framework laid down by the Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR Convention);*
- *in the coordination of marine conservation work with the Trilateral Cooperation for the Protection of the Wadden Sea;*
- *in drawing on relevant EU directives (including the Habitats Directive (HD) and the Birds Directive (BD)), in so far as this is expedient and necessary for the transposition of the MSFD; and*
- *in deriving requirements for marine conservation in conjunction with the goals of the EU Water Framework Directive (WFD).’* (Marine Conservation Administrative Agreement, 2012)

The Federation and the Länder are working together *‘to coordinate and improve compliance with national, European and international obligations, to generate synergies, to ensure the quality of data, to coordinate and harmonise the surveillance programmes that examine the*

status of the North Sea and Baltic Sea, to document the results of studies, to carry out the assessment of the status of national coastal and marine waters jointly and, by means of mutual communication, to provide information about all findings that are significant for the environmental status of the North Sea and the Baltic Sea. The storage of data and information, and their provision for the fulfilment of national, European and international obligations are incumbent upon the Federation. The signatories guarantee the effective and timely provision of the requisite quality-assured data, information and documents for the fulfilment of the agreed purposes.' 'It is to be ensured that coherent marine strategies are developed jointly by the Federation and the Länder by means of the coordination and harmonisation of their individual functions' (Marine Conservation Administrative Agreement, 2012). Under the Administrative Agreement, the parties to the cooperation, the Federation and the Länder, have undertaken to grant each other all exemptions and reliefs on the costs incurred their legislation allows them to offer.

The Federation represents German interests under the international agreements discussed above, and seeks to promote the harmonisation and coordination of activities in marine regions in its external relations with neighbouring states. The Federation makes arrangements for the coordination of the monitoring programmes, as well as the compilation of their results, the presentation of those results and their communication to international bodies.

The data from the various surveillance programmes are gathered in various forms, including the Marine Environment Database (MUDAB – UBA, 2011f). MUDAB is operated by the Federal Institute of Hydrology (BfG) on behalf of the Federal Environment Agency.

The extensive monitoring programmes that were administered by the GMMP and are now continuing under the cooperation that has taken its place also involve testing for organic trace substances in water, sediment and biota from the North Sea and Baltic Sea. An overview of the individual legal sources (incl. the WFD) that list substances subject to monitoring is to be found in the *GMMP Monitoring Manual* ('Monitoring Specifications Pollutants', <http://www.blmp-online.de/Seiten/Monitoringhandbuch.htm>, GMMP, 2012). The *Monitoring Manual* is being revised in order to comply with the requirements of the Marine Strategy Framework Directive concerning surveillance programmes. Apart from the surveillance of the marine environment, this also demands the gathering of data on pollution and activity-related indicators.

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10 Annex

The following tables have been compiled using information from the Länder and make no claim to completeness.

Table 10 Research and monitoring projects on POPs in the Länder

Land	Research projects	POPs studied	Monitoring projects	POPs monitored
Baden-Württemberg	Electrochemical PFT decomposition in electroplating industry waste waters and development of a PFT recycling facility	http://www.um.baden-wuerttemberg.de/servlet/is/84532/Abschlussbericht.pdf?command=downloadContent&filename=Abschlussbericht.pdf	POP monitoring using migratory falcon eggs	PBDEs, PFOS, DDT, chlordane, HCHs, dieldrin, endrin, heptachlor, HCB, chlordecone, aldrin, PeCB, PCBs, mirex, toxaphene, hexabromobiphenyl, PCDD/Fs http://www.lubw.baden-wuerttemberg.de/servlet/is/56143/
			dl PCBs in soils across Baden-Württemberg	PCBs, dl PCBs, PCDD/Fs http://www.lubw.baden-wuerttemberg.de/servlet/is/71184/
			Surface monitoring programmes	PBDEs, endosulfan, HCB, HCHs, PeCB, aldrin, dieldrin, endrin, DDT
			Watercourse surveillance (2007-2010)	PBDEs, DDT, HCHs, chlordane, HCB, PeCB, heptachlor, PFOS, aldrin, dieldrin, endrin
			Testing of suspended matter and sediment (2007-2010)	PBDEs, PCBs, DDT, HCHs, chlordane, endrin, dieldrin, aldrin, HCB, PeCB, heptachlor http://jdkfg.lubw.baden-wuerttemberg.de/servlet/is/300/
			Groundwater monitoring programmes	2003: DDT, HCHs, dieldrin, endrin, heptachlor, HCB, aldrin 2006, 2007, 2010: PFOS, PFOA http://www.lubw.baden-wuerttemberg.de/servlet/is/9162
			Long-term soil monitoring	Chlordane, DDT, HCB, HCHs, PCBs, dl PCBs, PCDD/Fs http://www.lubw.baden-wuerttemberg.de/servlet/is/9162/

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Land	Research projects	POPs studied	Monitoring projects	POPs monitored
				berg.de/servlet/is/50596/20_jahre_bodendauerbeobachtung.pdf?command=downloadContent&filename=20_jahre_bodendauerbeobachtung.pdf

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Land	Research projects	POPs studied	Monitoring projects	POPs monitored
			Industrial waste water, 2007-2010: Testing of effluent and sewage sludge at selected waste water treatment plants	Various PFTs
			Sentinel Health Departments project, 2005/06: Testing of 15 pooled blood specimens (from 411 9/10-year-olds)	PBDEs
			Sentinel Health Departments project, 2008/09: Blood tests on 803 9/10-year-olds	DDE, HCB, PCBs, PCDD/Fs, dl PCBs, PBDEs
			Adult Contamination and Effect Monitoring Project 2010/2011: Tests on blood of approximately 1,400 adults	PBDEs
Bavaria	Survey of POPs in the Alpine region	PCDD/Fs, dl PCBs, PCBs, PBDEs (tri- to heptaBDE and decaBDE)	Surface water monitoring as part of technical water supervision	WFD priority substances and PCBs, PFOS, dl PCBs
	Testing and assessment of samples from various environmental compartments for PCDD/Fs and PCBs in the light of the new WHO Toxicity Equivalence Factors	PCDD/Fs, dl PCBs, PCB6 http://www.lfu.bayern.de/analytik_stoffe/untersuchung_bewertung_proben/doc/pcb_abschluss_bericht_100807.pdf	Biomonitoring (perennial ryegrass, curly kale) at 6 locations	Chlorobenzenes, PCDD/Fs, PCBs
	Accumulation of various POPs in terrestrial wild animals	Including: PFCs, PBDEs, HBCD, HBB, PCBs, dl PCBs, PCDD/Fs	Sewage sludge testing	
	Organic trace substances in sewage sludge	PCDD/Fs, dl PCBs, PCBs, PBDEs, PFOS	AbfklärV	PCBs and PCDD/Fs
	Detection of persistent, bioaccumulating perfluoroalkyl compounds in various matrices	PFTs http://www.bestellen.bayern.de/shoplink/lfu_all_00085.htm	Mandatory testing for PFCs in sewage intended for use in landscaping	11 individual PFCs (including PFOS) http://www.lfu.bayern.de/analytik_stoffe/analytik_org_stoffe_perfluorierte_chemikalien/pfc_belastung_abwasser_klaerschlam/index.htm
	Cross-media environmental analysis methods for persistent	PFTs in surface waters, waste water, air, technical products	Sewage sludge testing programme	PCBs, PCDD/Fs, PBDEs, PFOS

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Land	Research projects	POPs studied	Monitoring projects	POPs monitored
	PFTs and detection of (semi)volatile precursor compounds	and consumer goods		

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Land	Research projects	POPs studied	Monitoring projects	POPs monitored
	Impacts of PFOS on rainbow trout	PFOS www.bestellen.bayern.de/application/applstarter?APPL=STMUG&DIR=stmug&ACTIONxSETVAL(index.htm,APGxNODENR:200594,USERxBODY-URL:artdtl.htm,AARTxNR:lfu_all_00094)=X	Monitoring of biogenic wastes	PFOS, PCDD/Fs, dl PCBs, PCBs, PBDEs, HCB http://www.bestellen.bayern.de/application/stmug_app000003?SID=500753603&ACTIONxSETVAL%28artdtl.htm,APGxNODENR:29,AARTxNODENR:195448,USERxARTICLE:artlist1.htm%29=Z
	Cross-media environmental analysis methods for various polybrominated flame retardants	Including PBDEs, hexabromocyclododecane, hexabromobenzene	Immission-ecological long-term observation	PCDD/Fs, dl PCBs, PCBs
	Perfluorinated compounds in household dust from Bavarian homes	Perfluorinated substances, in particular PFOS and PFOA	Fish pollutant monitoring as part of technical water supervision	PCBs, HCB, PeCB, PCDD/Fs, dl PCBs
	Contamination of asylum seekers with chloroorganic pesticides	PCBs, lindane, DDT	Suspended matter monitoring as part of technical water supervision	PCBs, HCB, PeCB
	Occurrence of perfluorinated substances in blood from the Bavarian population	Perfluorinated substances, including PFOS and PFOA	Long-term soil monitoring	PCBs, DDT, HCB, α -HCH, β -HCH, -HCH, aldrin
	Prenatal and postnatal exposure to perfluorinated substances	Perfluorinated compounds, e.g. PFOS and PFOA	Planned	
	Integrated Exposure Assessment Survey 1 (INES 1): Projects for multipathway surveying and health assessment of exposure to endocrine-active and persistent substances	PBDEs, dl PCBs, PCBs, PCDD/Fs and PFC	Trend monitoring as part of technical water supervision	PCDD/Fs, dl PCBs, PCBs, PBDEs, HCB, PeCB
	Chlorinated paraffins in food-stuffs, breast milk and environ-	Short and medium-chain chlorinated paraffins	a) Trend monitoring: biota/WFD b) Surveillance of environmental quality standards (EQSs)	Potentially PBDEs, HCB

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Land	Research projects	POPs studied	Monitoring projects	POPs monitored
	mental media			

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Land	Research projects	POPs studied	Monitoring projects	POPs monitored
	Detection of PBDEs and new brominated flame retardants in various media	PBDEs, cycloaliphatic hexabromocyclododecane, tetrabromobisphenol A, 2,4,6-tribromophenol, 2,2-Bis(bromomethyl)propane-1,3-diol	Drinking water monitoring, 2006, 2007 and 2011	Including PFOS, PFOA
			Testing of drinking water in immediate vicinity of an industrial emitter	PFT, perfluoropentanoic acid, polyfluorinated PFOA replacement
			Testing of municipal drinking water	PFT
			Perfluorinated chemicals (PFCs) in breast milk	PFCs
			Reorientation of breast milk testing as targeted contamination monitoring and an opportunity for preventive health care	Chloroorganic pesticides, standard PCBs, dl PCBs, PCDD/Fs, PBDEs
			BAMBI 2007/2008: Bavarian Monitoring of Breast Milk	Chloroorganic pesticides, standard-PCBs, dl PCBs, PCDD/Fs, PBDEs, PFT and phthalates
Berlin	Planned 2013: Testing of mineral construction wastes			
Bremen			1993 and 1995: Soil protection monitoring programmes	PCDD/Fs
			Surface water measurements	Chlordane, heptachlor, PCB, PBDEs, endosulfan, HCB, HCHs, PeCB, aldrin, dieldrin, endrin, DDT
			Groundwater surveillance	
Hamburg			Testing of topsoil samples, report will be published mid-2012	PCBs
Hesse	Perfluorinated chemicals (PFCs)	PFOS, PFOA and other PFCs	Measurements in River Main under Interna-	Aldrin, endrin, dieldrin, HCB, HCHs, PCBs, PCDD/Fs, DDT,

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Land	Research projects	POPs studied	Monitoring projects	POPs monitored
	in Hesse	http://www.hlug.de/fileadmin/dokumente/boden/pfc-bericht_web.pdf	tional Commission for the Protection of the Rhine (ICPR) surveillance and monitoring programmes	PFOS, PeCB, PBDEs

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Land	Research projects	POPs studied	Monitoring projects	POPs monitored
			Hesse-wide groundwater quality monitoring programme	Plant protection product active substances and metabolites, selected pharmaceutical active substances (carbamazepine, diclofenac, clofibric acid → <i>Arzneimittelbericht Südhessen</i> http://www.hlug.de/fileadmin/dokumente/wasser/grundwasser/artikel/arzneimittelbericht.pdf), tetrachloroethene, trichloorethene, PFCs
			Long-term soil monitoring Aldrin, α -HCH, β -HCH, γ -HCH, dieldrin, heptachlor, HCB, DDT, PCBs, PCDD/Fs	http://www.hlug.de/start/boden/bodendauerbeobachtung.html
			Airborne dioxin monitoring programme	http://atlas.umwelt.hessen.de/atlas/
			Hesse Breast milk testing programme	
Lower Saxony	Measurements of PCDD/Fs and PCBs in outdoor air and depositions in Lower Saxony	PCDD/Fs, PCBs, dl PCBs Period: Dec. 2008-Dec. 2009 http://www.mu.niedersachsen.de/download/51604	Air quality surveillance	http://www.mu.niedersachsen.de/live/live.php?navigation_id=2165&article_id=9123&psmand=10 http://www.mu.niedersachsen.de/live/live.php?navigation_id=2655&article_id=9127&psmand=10 http://www.mu.niedersachsen.de/live/live.php?navigation_id=2656&article_id=8888&psmand=10
	Research project on the detection of substances with oestrogenic effects in drinking, mineral and table waters, as well as associated well waters	PCDD/Fs, PCBs, dl PCBs http://www.laves.niedersachsen.de/live/live.php?navigation_id=20039&article_id=73684&psmand=23	Surface water testing under the OGewV	Aldrin, dieldrin, endrin, HCB, DDT, chlordane, heptachlor, PCBs, PBDEs, endosulfan, HCHs, PeCB Results at: www.nlwkn.niedersachsen.de Example: http://www.nlwkn.niedersachsen.de/live/live.php?navigation_id=8007&article_id=39452&psamd=26
	Special report on groundwater in East Frisia – plant protection products, pharmaceutical active	Publication to follow	Testing of sediments/suspended matter from the Ems for PCDD/Fs and dl PCBs	PCDD/Fs, dl PCBs http://www.umwelt.niedersachsen.de/live/live.php?navigation_id=2457&article_id=8865&psmand=10

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Land	Research projects	POPs studied	Monitoring projects	POPs monitored
	substances, perfluorinated ten- sides, PFOS, PFOA and other PFTs			http://www.bmu.de/files/pdfs/allgemein/application/pdf/3709_72_228_pcb_bf.pdf

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Land	Research projects	POPs studied	Monitoring projects	POPs monitored
	Weser Quality Reports - Thuringian Ministry of Agriculture, Nature Conservation and the Environment	Chlorobenzenes, PCBs, organochlorine pesticides, chlorophenols, PCDD/Fs http://www.fgg-we-ser.de/quetebericht_neu.html	Long-term soil monitoring	Aldrin, α -HCH, β -HCH, γ -HCH, dieldrin, heptachlor, HCB, DDT, PCBs, PCDD/Fs
			Routine plant protection monitoring as part of the water monitoring system	Aldrin, β -HCH, chlordane and PeCB
North Rhine-Westphalia	Surveillance of surface waters in North Rhine-Westphalia	PCDD/Fs, PCBs http://www.lanuv.nrw.de/veroeffentlichungen/gEECue01/gEECue01_018.pdf	North Rhine Westphalian Specialist Information System for Chemical Contamination in Soils Organochlorine pesticides, chlorobenzenes, PCBs, PCDD/Fs	http://www.lanuv.nrw.de/boden/boschulua/fisstobo.html
			Surveillance of immissions and depositions of PCDD/Fs and PCBs in North Rhine-Westphalia	PCDD/Fs, PCBs
Rhineland-Palatinate	Background levels in soils from Rhineland-Palatinate	Organochlorine pesticides, PCBs, PCDD/Fs http://www.mwkel.rlp.de/bodenschutz/Vorsorgender_bodenschutz/Bodenzustandsberichte/	Long-term study of PCB-contaminated white-collar workers from all Länder (RWTH Aachen University)	PCBs
Saarland			Surface water monitoring programmes	PeCB, HCB, PCBs
Saxony			Surface water monitoring programmes	PBDEs, endosulfan, HCB, HCHs, PeCB http://www.umwelt.sachsen.de/umwelt/wasser/7112.htm
			Long-term soil monitoring	PCBs, HCB, HCHs, DDT, PCDD/Fs
			Testing and rehabilitation of contaminated sites under the BBodSchG	
			Groundwater testing	Aldrin, chlordane, DDT, dieldrin, endrin, heptachlor,

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Land	Research projects	POPs studied	Monitoring projects	POPs monitored
				HCb, mirex, HCHs, PeCB, PCBs, hexabromobiphenyl, PBDEs, PFOS
Saxony-Anhalt			Water surveillance programme	Aldrin, α -HCH, β -HCH, γ -HCH, dieldrin, endrin, heptachlor, HCB, PeCB, PCBs, DDT http://www.sachsen-anhalt.de/index.php?id=32562
			Long-term soil monitoring	PCDD/Fs, dl PCBs, PAHs, PCBs, DDT, HCB, HCHs
Thuringia	Identification of the state of the art for the determination of waste water surveillance benchmarks	PFOS	Long-term soil monitoring	PCBs, HCB, HCHs, DDT, PAHs
	Construction and trialling of a pilot facility for the separation of PFT from waste water	PFT	Chlorinated aromatic dioxin monitoring programme	PCDD/Fs, dl PCBs, PCBs, PAHs, HCB, HCHs, DDT

Table 11 Public information portals

Land	Description	Public information portal
Bavaria		www.lfu.bayern.de
		www.lgl.bayern.de
Thuringia		www.tlug-jena.de
Lower Saxony	Assessment of risks from pollutants attached to solids in the Elbe catchment area	http://fgg-elbe.de
Hesse	Overview maps with explanatory texts	http://atlas.umwelt.hessen.de/atlas/

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Land	Description	Public information portal
	on the environmental situation in Hesse	