European Commission, Brussels

"Identification, assessment and prioritisation of EU measures to reduce releases of unintentionally produced/released Persistent Organic Pollutants"

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FINAL REPORT

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BiPRO

Beratungsgesellschaft für integrierte Problemlösungen

in cooperation with Müller-BBM

Table of Content

Abbreviations

AOX	Halogenated Organic Compounds
APC	Air pollution control
BARCOM	Barcelona Commission
BAT	Best available technology
BCD	Base catalysed decomposition
BEP	Best environmental practice
BREF	Best available technology reference document
CAFE	Clean Air For Europe
C&D	Construction and demolition
CEMBUREAU	Association Europeenne du Ciment
CEN	European Committee for Standardization
CLRTAP	Convention on Long-Range Transboundary Air Pollution
COP	Conference of Parties
CORINAIR	CO-oRdinated INformation on the Environment in the European Community
DG SANCO	Directorate general health and consumer protection of the European Commission
EAF	Electric arc furnaces
EEA	European environment agency
EEE	Electrical and electronic equipment
EF	Emission Factor (s)
EIA	Environmental Impact Assessment
EIONET	European Environment Information and Observation Network
ELV Directive	End-of-life vehicles Directive 2000/53/EC
EMEP	European monitoring and evaluation programme under CLRTAP
EPER	European Pollutant Emission Register
E-PRTR	European Pollutant Release and Transfer Register

EUROFER	European Confederation of Iron and Steel Industries
EUROMETAUX	European Association of Metals
EWC	European waste catalogues
FGT	Flue-gas treatment
HARP-HAZ	Harmonized Quantification and Reporting Procedures for Hazardous Substances
HCB	Hexachlorobenzene
HELCOM	Helsinki Commission
HWI	Hazardous waste incineration
IMO	International Maritime Organisation
IPPC	Integrated Pollution Prevention and Control
ISO	International Organization for Standardization
LIFE	The Financial Instrument for the Environment
ELV	Emission Limit Value
MAC-EQS	Maximum allowable concentration environmental quality standard
MARPOL	International Convention for the Prevention of Marine Pollution from Ships
MS	Member State
Mt	Mega tons
MW	Megawatt
MW th	Megawatt thermal
NFP	National Focal Point
NGO	Non governmental Organisations
NIP	National Implementation Plan
OECD	Organisation for economic co-operation and development
OSPARCOM	Oslo and Paris Commission
PAH	Polycyclic Aromatic Hydrocarbons
PBB	Polybrominated Biphenyls
PBDE	Polybrominated Diphenyl Ether

PCB	Polychlorinated Biphenyls
PCDD	Polychlorinated Dibenzodioxins
PCDF	Polychlorinated Dibenzofurans
PCP	Pentachlorophenol
PCT	Polychlorinated terphenyl
PHARE	Poland and Hungary: Aid for Restructuring of the Economies
POPs	Persistent Organic Pollutants
ROHS	Restriction of hazardous substances in electrical and electronic equipment
SME	Small and medium sized enterprises
T+	Very toxic
TBT	Tributyltin
TCDD	Tetrachlorodibenzodioxin
TEQ	Toxic Equivalent
TOC	Total organic carbon
TWG	Technical working group
UNECE	United Nations Economic Commission for Europe
UNEP	United Nations Environment Programme
WEEE	Waste electrical and electronic equipment
WFD	Water Framework Directive 2000/60/EC
WHO	World Health Organization
WWT	Waste water treatment

Executive Summary

Following the obligations of the Stockholm Convention and the European POP Regulation, Member States and the Commission are drawing up plans for implementation of appropriate measures to minimise releases of unintentionally produced/released POPs (PCDD/PCDF, PCB, HCB, PAH).

For the elaboration of a Community Implementation Plan and for a future oriented POPs reduction strategy it is necessary to investigate the status of already applied measures and to check if any additional measures can be usefully taken at EU level to reduce unintentional releases of these substances.

Against this background the major objectives of the study have been to

- identify
- assess
- prioritise

possible measures to be taken at EU level to reduce the releases of unintentionally produced/released POPs.

Bases for the study have been

- already existing legislation, strategies and measures on EU und Member States level
- the National Implementation Plans under development by the Member States
- other relevant sources of knowledge and ideas for new and innovative, creative approaches for feasible Commission activities.

In order to fulfil the objectives of the study work packages did include an inventory of major sources and a compilation of mass flows for unintentionally produced POPs (PCDD/PCDF, PCB, HCB and PAH), an inventory of measures relating to POP releases existing or planned at Community or Member State level. Results from these investigations have than been used as basic elements for identification of gaps and deficits and derivation of proposals for additional measures that could be considered for future action at Community level.

Source inventory

The investigation for the source inventory was based on potential sources identified under the Stockholm Convention and under OSPAR and included all transport sectors, open burning, residential combustion, as well as the industrial sectors waste incineration , metallurgical production, power production, mineral industry, cremation, chemical industry (including surface treatment, solvent use), refinery, pulp and paper, wood preservation, asphalt processing and shredder industry (vehicles and white goods and cable stripping).

The investigation showed that in general the dominant pathway for releases of POPs are the releases to waste which outweigh releases to air by a factor of two or more. However it has to be taken into consideration that waste is subject to a number of specific provisions in the POP Regulation and in general waste legislation and that there is a lower degree of concern regarding releases to waste since they have less potential to enter the environment if managed properly.

Based on available data overall roughly 20 kg of PCDD/PCDF-TEQ are emitted unintentionally with about ¾ being discharged to waste and only ¼ emitted to air. Air emissions are dominated by residential combustion in small combustion installations and open burning of waste.

Wood preservation tends to be another important source for releases to air, which however already has been addressed by means of a legal ban for use of the relevant wood preservatives, so that this issue should fade out over time. Major industrial sources in the field of air emissions are iron and steel and power production, with sinter plants and biomass power plants as major contributors.

Releases to waste are dominated by municipal solid waste which accounts for ½ of the total releases. About 30% are due to industrial sources such as waste incineration, power production and metallurgical processes. As a rough estimation about 2/3 of the releases to waste are disposed off in landfills or recycled in secondary thermal processes. The rest is either recovered in construction material or discarded to land. Due to low water solubility of PCDD/PCDF releases to water are low.

Unlike PCDD/PCDF releases of PCB to environment are absolutely dominated by stocks from historic production, which cause releases in a dimension of more than 6,000 tons per year with estimated air emissions of 600 t/y and and a discharge into waste of the remaining amount. This issue however is already addressed by existing legislation and has been evaluated in previous studies.

The investigation of sources for unintentional production showed that - based on available data - overall roughly 5,000 kg of total PCB are emitted unintentionally with about 4,000 kg being emitted to air. In the evaluation of this result it has to be taken into account that poor information is available on PCB concentrations in solid residues and in water, so that the real releases might be higher. Air emissions seem to be dominated by power generation, road transport and iron and steel production; however, data uncertainty is high for road transport. Due to low water solubility of PCB releases to water are expected to be low.

Also releases of HCB to environment are dominated by stocks of historic production which have not been taken into consideration in this report. Based on available data releases from unintentional production account for about 4,000 kg/year with roughly 3,500 kg being released to air and thus are in the same dimension as releases of PCB. As for PCB information on releases to waste and water is incomplete.

Air emissions seem to be dominated by pesticide use and metal industry (predominantly non-ferrous metal production); other sources are chemical industry and residential combustion. Releases to water are due to chemical production but are low in comparison.

Releases of PAHs are in another dimension than releases of other POP. Based on available data overall roughly 3000 tons of UNECE PAHs (Sum 4) are emitted unintentionally per year with about 2000 tons being emitted to air and roughly 900 tons being discharged to water.

Air emissions seem to be dominated by residential combustion, road transport and wood preservation, however all other sources also contribute with almost one third of the total. Except of refinery and anode production industrial sectors are no major sources for PAH releases. Releases to water are related to marine activities mainly.

Detailed results on the source inventory are provided in chapter 5. Information on major data sources is given in chapter 4.

Inventory of measures related to POPs

The inventory of measures has been based on Member State answers to a questionnaire, evaluation of available NIPs and draft NIPs, literature search and an investigation of European legislation.

To differentiate and evaluate the results the investigation has been performed in the 9 categories: existing legislation, review of legislation, planned new legislation, implementation and enforcement of existing legislation (administrative, technical), new approaches (economic incentives, eco-labelling, taxes, subsidies, etc), funding, communication/education, monitoring/inventory and research.

Based on the investigated sources it can be stated that with respect to legislation a range of efficient instruments is in place for all releases pathways targeting on general release reduction or specific reduction of POP releases.

The major instruments for release control from industrial sources and for reporting on POP releases are the IPPC Directive, the EPER Decision and the E-PRTR regulation.

Other legal instruments are the LCP directive 2001/80/EC, the Waste Incineration Directive 2000/76/EC, the ambient air Directive 96/62/EC and its 4th daughter directive (2004/107/EC), the Emission Ceiling Directive (2001/81/EC) and the Energy Efficiency Directive 2002/91/EC addressing releases to air. Directive 76/464/EEC and the Water Framework Directive 2000/60/EC are the major instruments for monitoring and release control to the aquatic environment. The PCB Directive 96/59/EC, Directive 76/769/EEC and Directive 98/70/EC have addressed the issue from the input side by restricting (banning) production and use of POPs or substances releasing POP during their lifetime or during disposal/recovery operations. With respect to releases from waste Directive 75/442/EEC and the Landfill directive (1999/31/EC) with all related legislation as well as the EU POP regulation constitute an effective legal framework.

Planning for review of existing legislation mostly addresses releases to air. Namely in the framework of the “Thematic Strategy on Air pollution” (2005) involving the CAFE (Clean Air For Europe) programme proposals for measures have been developed.

In addition a large number of measures have been reported in the fields of implementation and enforcement, communication and research or inventory. The focus of measures is laid on institutional strengthening, capacity building, training, effective permitting and control, improved coordination within national administration, development of technical standards, the adaptation to technical standards, coordination, knowledge exchange and awareness raising, process technology, detoxification, risk assessment and verification of emission estimates. Little activities have been identified for new approaches such as economic incentives, certification etc., funding and new legislation.

Generally it can be stated that the focus of NIPs is on further investigation of sources and knowledge gain, management of POP containing wastes and on elimination of intentionally produced POPs. Release reduction from unintentional production is less addressed.

Identification of gaps and deficits

Based on an allocation of the identified measures with the source sectors and an evaluation of number, type and effectiveness of related existing measures and mass flow relevance (see chapter 7) gaps and deficits have been identified and need of action categories from low to high could be attributed as basis for the generation of proposals for measures to be taken by the Commission for further release reduction or information purpose.

In this evaluation industrial sources mostly have been attributed low need of action due to existing regulatory framework and BAT concept.

Burning of agricultural waste, the construction and demolition sector, marine activities, surface treatment and solvent use and wood preservation have been attributed medium need for action and residential combustion as well as road transport has been identified as priority sectors.

Detailed results on the inventory of existing measures are provided in chapter 6. Information on their assessment and resulting gaps and deficits is compiled in chapter 7.

Proposals for additional measures

Based on the identification of gaps and deficits a broad list of about 160 measures has been suggested in order to compensate existing gaps and deficits concerning 22 source sectors. They are targeted to release reduction of POPs, to improve knowledge or to raise awareness.

Proposed measures have been grouped in the categories: overall measures (applicable to all source categories), general industrial measures (with relevance for all IPPC installations) and specific measures for each source category.

This broad list of measures does not provide priorities and does not take into account aspects of mass flow relevance and need for action.

From the 160 measures about 100 address all POPs, about 40 focus mainly on PAH and 20 on PCDD/PCDF. Only 7 measures address PCB and no measures have been specifically proposed for HCB. About 2/3 of the measures are designed for release reduction the rest focuses on knowledge gain. Corresponding to the importance of the air as release pathway the majority of measures focuses on this compartment. With 33 the overall measures have been the largest group followed by general mesures for industry with 15 proposals.

All measures have been screened for effectiveness, feasibility, cost and socio-economic impacts as basis for ranking and prioritisation.

Effectiveness has been assessed related to reduction of releases or improvement of knowledge. Costs have been assessed concerning the institution that is performing the measure to be discussed.

Socio-economic impacts have been assessed concerning the consequences of measures at actors. They consider jobs and economic consequences. As socio-economic issues often happen to have "winners" and "losers" or positive and negative impacts at the same time, in many cases it would be inadequate to judge the impacts to be “positive” or “negative”. Consequently, in this field the assessment of socio-economic impacts is restricted to the strength of the impacts. The balance of positive/negative direction of impacts will be explained in the justification of the impacts under the corresponding chapters of the report

As a detailed impact assessment was not possible in the scope of the study; all criteria have been evaluated with a point system by a procedure based on individual expert assessments.

Medium effectiveness and medium to high feasibility could be attributed for more than half of the measures. Chapter 8 presents the detailed information on suggested possible additional measures and their assessment.

Ranking and prioritisation of measures

Following this assessment a categorisation of the proposed measures as a function of effectiveness and feasibility into 6 priority categories has been performed in chapter 9.1.

18 measures could be categorised in category 1 (high effectiveness and feasibility), 28 measures pertained to category 2 (medium effectiveness and high feasibility), 9 measures could be listed in category 3 (high effectiveness and medium feasibility), 19 measures were sorted into category 4 (medium effectiveness and feasibility), 35 measures were allocated to category 5 (either effectiveness or feasibility high with the corresponding parameter low). 55 measures were sorted in category 6 (low effectiveness and feasibility). These measures were not further taken into account in the prioritisation and ranking procedure.

After ranking according to need for action with exclusion of measures for “low need” sources and exclusion of measures favourably addressed at Member State level almost 70 measures

remained that could be taken into consideration by Commission Services as additional measures to address POP in the future.

30 of these measures address releases reduction. Highly ranked measures mainly address process optimisation and improved release management as basis for release reduction with focus on high release areas such as small combustion installations, open burning and marine source sectors. In addition a focus is on further improvement of enforcement of existing legal framework.

In addition 15 measures that focus on guidance, communication, research and information transfer could be used to generate a release reduction effect in the middle or long term perspective. These measures mainly address thorough implementation of existing legal framework and research in process optimisation as basis for release reduction.

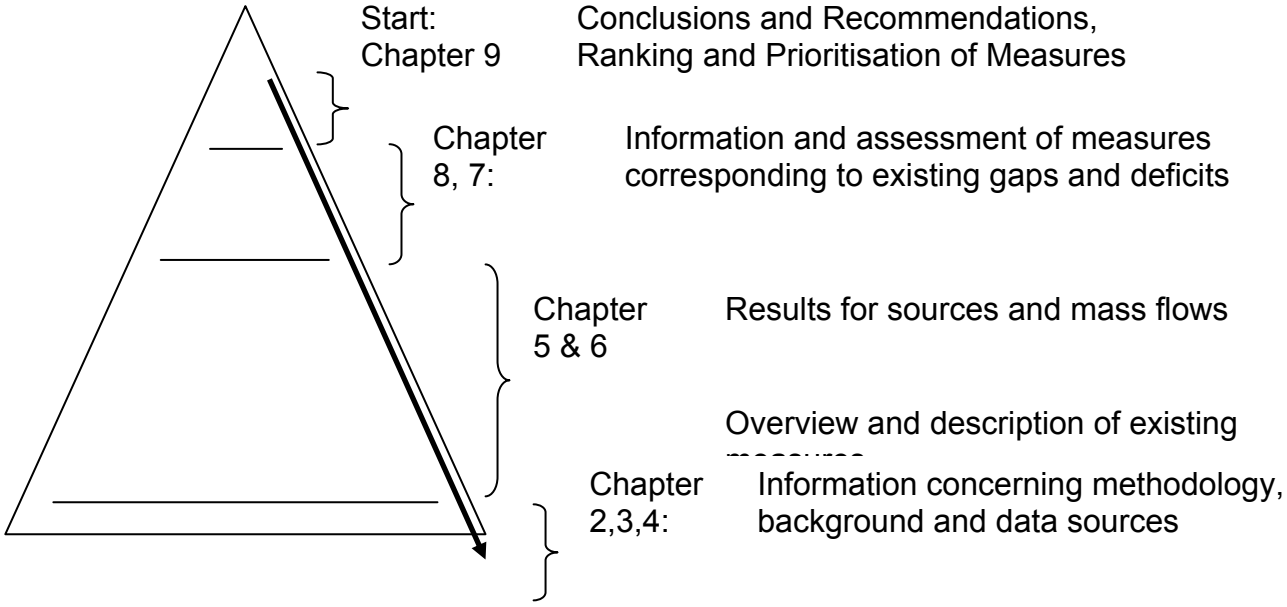
22 Measures have been short-listed for possible action in the field of knowledge gain and improved communication. Measures relate to generation of sound knowledge on actual releases and risks hereof in source sectors where knowledge currently is highly limited as well as to improved presentation and communication of POP issues as such.

1 How to use the report and realise benefits from this document

The intention of the project is to provide the European Commission with an information and decision basis to facilitate the implementation of appropriate measures in order to further reduce unintentional releases of POPs. For details see chapter 2 (background and objectives)

Two ways seem to be recommendable to read the report:

Top Down Approach



The hasty reader gets the important messages first when using this approach and starting with chapter 9. He can then – if he needs further evidence – go to chapter 8 where he finds an overview on the assessment results in 8.1 and 8.2. Information and justification for suggested measures is available in chapter 8.3. He should then further proceed to chapter 7 where the gaps and deficits of the current situation in Member States and on European level concerning the objective of minimising POP releases are summarised (7.1, details in 7.2)

Chapter 8 and 7 contain matrices with a similar structure.

For all relevant POP sources the following information is provided:

- Material flow information
- Assessment of importance of material flows
- Measure information
- Assessment of appropriateness of measures
- Overall assessment results

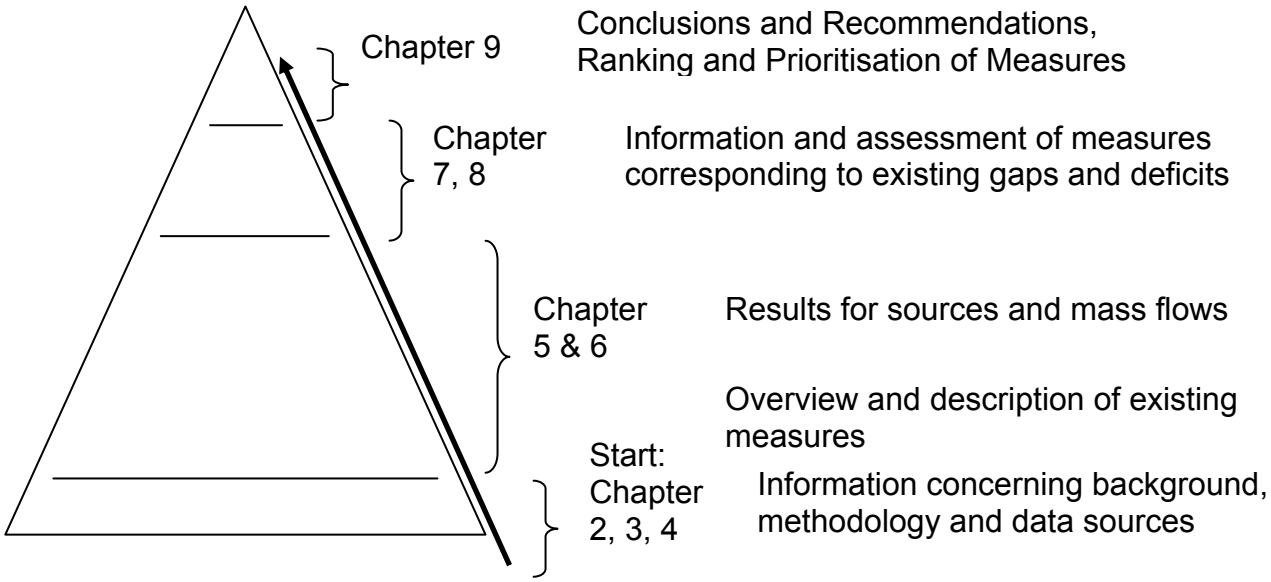
This type of matrix can be followed down within the approach to basic data, calculations and information on material flows for POPs (chapter 5) and on measures in Member States and on Community level (chapter 6).

In order to avoid the need to read these big chapters completely they are prepared in a way that relevant information can be easily found following the search criteria:

- Source for material flow
- Types of measures
- Measures applied at Member States / European level / stakeholder contribution

Chapters 2, 3 and 4 provide information concerning background and objectives, developed and applied methodology and data sources.

Bottom up approach



The bottom up approach enables a systematic and logical access to the results of the project.

It is recommendable for the reader who intends to fully understand existing problems and the way the decision basis for measures has been elaborated.

The bottom up approach foresees that the chapters are read in the order of their numbering.

Chapter 2 starts with backgrounds and the objectives of the project, chapter 3 explains which methodology was used to achieve the objectives and chapter 3 provides information on the used data sources.

Basic results can be found in chapter 5 for material flows and in chapter 6 for an inventory of measures. Combining these results leads to chapter 7, where gaps and deficits are identified.

On the basis of the identified gaps additional measures are suggested and assessed in chapter 8, while chapter 9 summarises the results and presents a ranking. The conclusions and recommendations for the Commission are the logical endpoint of the investigation.

2 Background and Objectives

An important background of the project is formed by legally binding instruments:

- Stockholm Convention
- UNECE Convention on long-range transboundary air pollution (CLRTAP) with Aarhus Protocol
- European POP regulation (2004/850/EC)

Common objectives are the reduction and elimination of the production, use and releases of persistent organic pollutants (POPs) in all participating parties.

Stockholm Convention

The major objective of the Stockholm Convention is the protection of human health and the environment from persistent organic pollutants by means of elimination from use or restriction to use for all POPs and the minimisation of unintentional production. The obligations include measures to reduce releases from stockpiles and wastes.

The Stockholm Convention differentiates between two categories of POPs:

- intentionally produced POPs where production and use are to be eliminated or restricted and
- unintentionally produced POPs where parties are required to take measures to reduce total releases from anthropogenic sources.

The contracting parties shall take all necessary legal and administrative measures to ensure the implementation of the obligations under the convention. To this purpose national implementation plans (NIPs) will have to be established defining a programme for POP management including inventory, monitoring and control as well as collection, storage and final disposal of the substances in question.

According to article 5 of the Stockholm Convention

> Each Party shall [take]... the following measures to reduce the total releases ... from anthropogenic sources of each of the chemicals listed in Annex C, ...:
>
> (a) Develop an action plan ... within two years of the date of entry into force of this Convention ... designed to identify, characterize and address the release of the chemicals listed in Annex C ... .
>
> (b) The action plan shall include the following elements:
>
> (i) An evaluation of current and projected releases, including the development and maintenance of source inventories and release estimates, taking into consideration the source categories identified in Annex C;
>
> (ii) An evaluation of the efficacy of the laws and policies of the Party relating to the management of such releases;
>
> (iii) Strategies to meet the obligations of this paragraph, taking into account the evaluations in (i) and (ii);

Aarhus Protocol

The Aarhus Protocol to the UNECE Convention on Long-range transboundary Air Pollution is focussed on control, reduction of discharges, emissions and losses of persistent organic pollutants by elimination or restriction of substances from use. Besides the 12 Stockholm POPs the Protocol covers Chlordecone, HCH, HxBB and PAH which are not subject to the Stockholm Convention.

The Aarhus Protocol under the UNECE Convention obliges Member States in its article 3 (5 (a)) to reduce its total annual emissions of each of the substances listed in annex III in accordance with that annex by taking effective measures, appropriate in its particular circumstances.

Regulation 850/2004/EC

In order to ensure coherent and effective implementation of the Community's obligations under the Protocol and the Convention, a common legal framework has been established at EU level by the Regulation (EC) 850/2004 of the European Parliament and of the Council.

In the Regulation the provisions of the above mentioned Conventions and the Protocol have been implemented for the scope of the European Community.

The main objectives of the Regulation are the following:

- Stockpiles of prohibited substances should be treated as waste. In particular this shall apply for stockpiles which consist of or are contaminated with persistent organic pollutants as soon as possible.
- For waste limit values with respect to its POP content shall be defined above which the irreversible destruction or transformation of the POP content is mandatory
- Releases of unintentional by-products of industrial processes should be identified and reduced as soon as possible with the ultimate aim of elimination. Appropriate national implementation should be drawn up and implemented.
- Programmes and mechanisms shall be established to provide adequate monitoring data on the presence of PCDD/PCDF and PCB in the environment under economically and technically viable conditions

In introductory 13 the Regulation requires that

- In line with the Communication from the Commission on the Community Strategy for Dioxins, Furans and Polychlorinated Biphenyls (PCBs), and with the Protocol and the Convention, releases of persistent organic pollutants which are unintentional by-products of industrial processes should be identified and reduced as soon as possible with the ultimate aim of elimination, where feasible.
- Appropriate national action plans, covering all sources and measures, including those provided for under existing Community legislation, should be drawn up and implemented to reduce the releases continuously and cost-effectively as soon as possible.

In article 6 of the Regulation it is specified that

> 1. Within two years of the date of entry into force of this Regulation, Member States shall draw up and maintain release inventories for the substances listed in Annex III* into air, water and land in accordance with their obligations under the Convention and the Protocol.
>
> 2. A Member State shall communicate its action plan on measures to identify, characterise and minimise with a view to eliminating where feasible as soon as possible the total releases developed in accordance with its obligations under the Convention, to both the Commission and the other Member States as part of its national implementation plan, pursuant to Article 8.

Implementation Plans and Objectives of the Project

Thus following the obligations of the Stockholm Convention and the European POP Regulation, Member States and the Commission are drawing up plans for implementation of appropriate measures. These contain actions to minimise releases of the unintentionally produced/released PCDD/PCDF, PCB, HCB and to varying extents PAH.

Member State implementation plans will of course take into account the specific local situation. Hence, these implementation plans may differ considerable from each other.

For the elaboration of a Community Implementation Plan under the Stockholm Convention it is therefore necessary to investigate if any additional measures can be usefully taken at EU level to reduce unintentional releases of these substances.

Against this background the major objectives of the study are to

- identify
- assess
- prioritise

possible measures to be taken at EU level to reduce the releases of unintentionally produced/released POPs.

Bases for the study are

- already existing legislation, strategies and measures on EU und Member States level
- the National Implementation Plans under development by the Member States
- Other relevant sources of knowledge and new and innovative, creative approaches for feasible release reduction of unintentionally produced/released POPs.

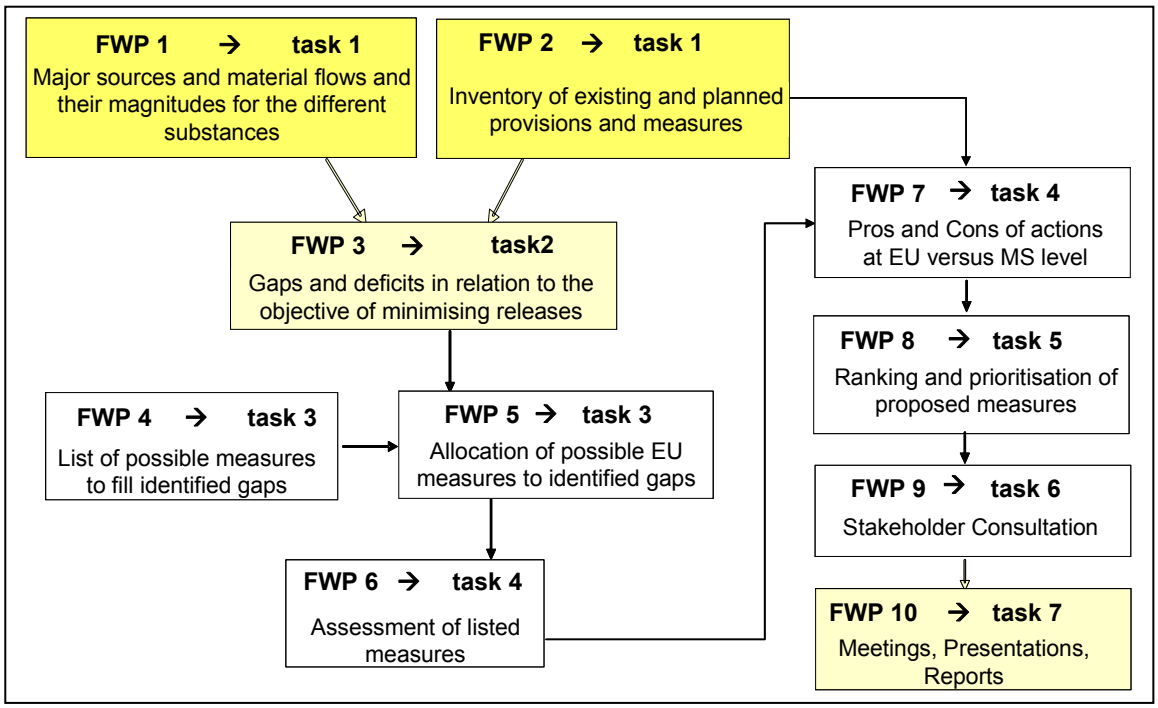
The study will be a decision basis for the European Commission for further steps concerning release reductions of the substances concerned. It therefore has to form a scientifically sound and solid basis.

It should bring forward new, innovative ideas, based on well justified sources and material flow analysis, technical information and justification. A well reasoned list of possible measures has to be checked by an assessment of the appropriateness and feasibility of possible measures and has to be seen against the background of already existing or currently developed activities.

3 Structure and Methodology

The following chapter shortly describes the methodological approach that has been developed.

In order to achieve the overall project objectives to identify, assess and prioritise possible measures to be taken at EU level to reduce the releases of unintentionally produced/released POPs the project work is structured into 10 focal working points (FWP). The following figure shows how the project structure is designed.



FWP: Focal working point referring to the tender
Task: Referring to the Technical Annex

The allocation of FWPs/ tasks to the chapters of this report is as follows:

FWP 1/task 1 (source inventory) – chapter 5

FWP 2/task 1 (inveotry of measures) – chapter 6

FWP 3/task 2 (identification of gaps and deficits) – chapter 7

FWP 4/task 3 (list of possible measures)

FWP 5/task 3 (allocation of measures to identified gaps) } Chapter 8

FWP 6/task 4 (assessment of listed measures)

FWP 7/task 4 (pros and cons) – chapter 9.2

FWP 8/task 5 (raking and prioritisation) – chapter 9

FWP 9/task 6 (Stakeholder consultation) – chapter 4, chapter 6

FWP 10/task 7 (Meetings, presentations, reports (see chapter 4)

A description of the methodology used for the different working steps is specified separately for each of the major tasksin the chapters below. For results of the working steps see the corresponding chapters listed above.

3.1 Methodology for source inventory and mass flows

In this report a "source inventory" is seen as a compilation and evaluation of all known potential sources for unintentional production and releases of POPs.

The identification of potential sources is based on scientific publications and the state of the knowledge as well as on recommendations and compilations listed in official documents related to POPs or the Stockholm Convention. The following sources (liste in alphabetical order) have been investigated and influence the structure of various chapters of this report:

1. Air transport
2. Asphalt processing
3. Burning of agricultural waste
4. Chemical industry
5. Construction and Demolition
6. Crematoria / Animal carcass burning
7. Dredging / Offshore / Dock works
8. Iron and Steel Industry
9. Land filling
10. Marine transport
11. Mineral industry (Cement, Ceramics, Glass, Lime)
12. Non-ferrous metal industry
13. Open burning of waste
14. Power production

15. Paper and pulp
16. Refinery
17. Residential combustion
18. Road transport
19. Shredder industry
20. Surface treatment / solvent use
21. Waste incineration and co-incineration
22. Wood preservation

Identified sources are investigated by means of a mass flow approach performed separately for the 4 POPs (PCDD/PCDF, PCB, HCB, PAH) emitted within the scope of unintentional production. As illustrated in the scheme below, the mass flows follow the pathways from generation (source) to the environment and provide quantification of each source identified, including differentiation of releases to air, water and waste/land as far as data are available.

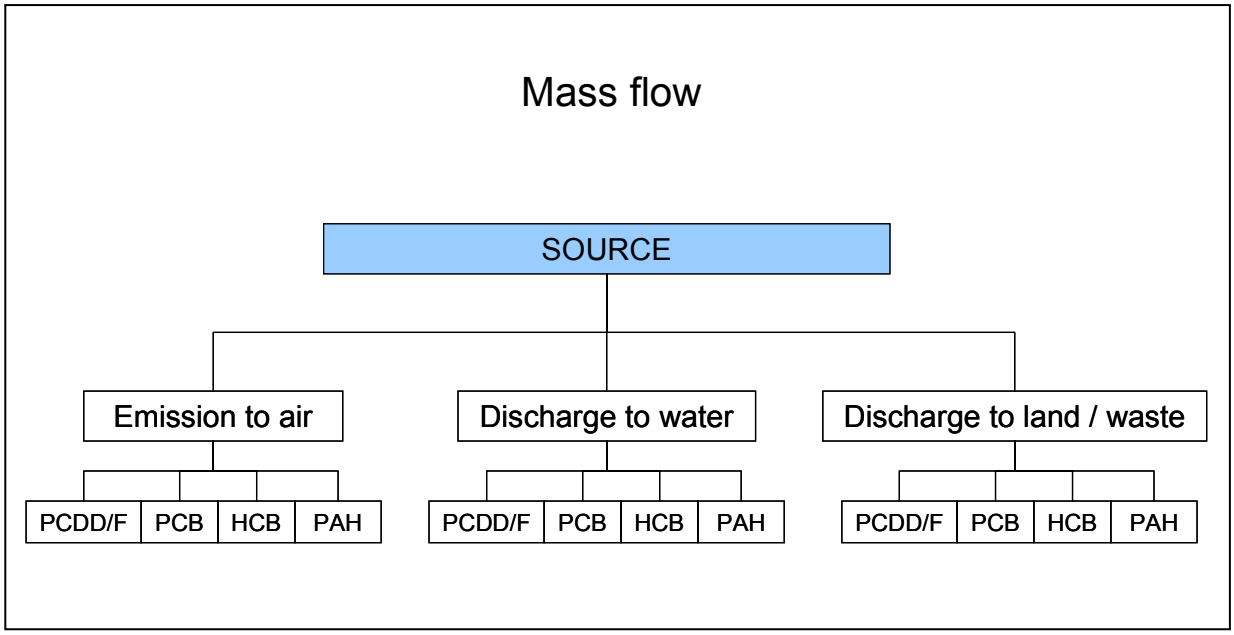


Figure 3-1: Scheme of the mass flow

The results of the source analysis and mass flows shall be used to draw a number of conclusions:

- Identification of the main sources
- Comparison of emission/discharge pathways
- Comparison of the importance of the relevant POPs (PCDD/PCDF, PCB, HCB, PAH)
- Comparison of the importance of various source sectors (industrial, public and domestic)

Following these different purposes the mass flows have been calculated by means of a computer based system. As input parameters the project team used activity data, waste generation factors, emission factors and specific contamination data for emissions and solid residues in the 25 EU Member States. This information was retrieved - as far as accessible - from international data bases (Eurostat, IEA, EEA, EMEP, national statistics) and literature (BREF documents, UNEP documents on BAT/BEP with respect to POPs) plus unpublished data directly communicated by industry associations, scientific experts or NGOs.

Based on these data the annual generation of a broad range of residues and annual discharges of specific POPs from important sectors have been calculated on EU 25 level.

Releases from intentionally produced PCB and HCB and related sources are not in the focus of the assessment, but may be used for comparison in some cases.

In the assessment of the overall relevance of a source sector (see chapter 7) the relevance to the eco-cycle and thus the difference in impacts on humans and environment depending on whether releases are to air, water or waste have to be taken into consideration. Therfore a qualitative estimation of environment and health impacts is provided for each source in the assessment tables in chapter 7:

Exposure relevance	Oral/digestive		Dermal		Inhalative	
Food chain relevance	vegetables		dairies/meat		fish/seafood	

Exposure and food chain relevance is classified into the categories low/ medium/ high and can be further specified by the attribute local. All estimations are related to general polulation sitings.

Oral/digestive exposure as major pathway to human body burden is defiend as exposure related to food chain relevance and is assumed when food chain relevance is given.

Dermal exposure is indicated in cases of risk for contact to contaminated material or when air emission is near ground level. Similarily inhalative exposure is assumed when sources emit to air at or near ground level.

Also the attribute local is related to at or near ground air emissions and releases to land.

As regards impacts on the eco-cycle releases to air are of highest priority followed by releases to the aquatic system because they have a high probability of entering the food chain. Releases to wastes and residues often have a far lower potential to enter the environment, if managed properly. Consequently emphasis will be put on the investigation of releases to air, followed by water and waste.

It has to be highlighted that the source inventory and mass flow analysis is not a central objective of this project and that it is not possible to provide an in depth analysis for all sources in the given timeframe and project scope.

The calculation of the POP releases has been performed by various methods, depending on data availability. Basically however it always followed the method described below, using activity data and emission factor or calculating one of the two by dividing the other with reported annual emissions.

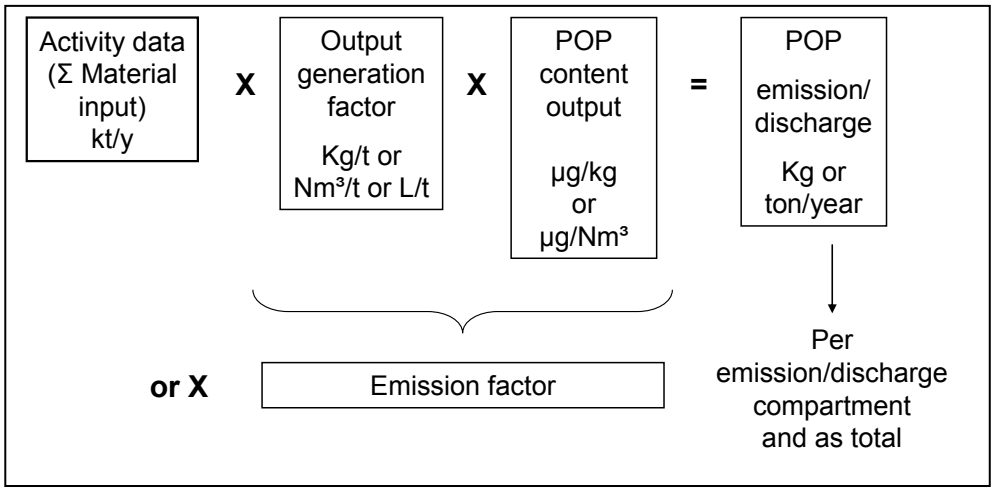


Figure 3-2: Approaches to calculate POP releases

The realisation and variability of this methodology shall be illustrated in the following with a number of examples.

Example 1:

The annual production of steel in the European Union can be derived from statistics; an average POP specific emission factor for air can be calculated from a range of reported data (e.g. BREF etc.). Thus the annual release of this POP can be easily calculated following the equation

Annual production (kt/y) x EF (µg/t) = Annual release/year (mg/y)

Example 2:

The annual waste incineration in the European Union can be derived from statistics; the average specific exhaust gas flow and the average POP concentration in the clean gas can be calculated from a range of reported data derived from literature. Thus the annual release of this POP can be easily calculated following the equation

Annual production (kt/y) x specific exhaust gas flow (Nm^3/t) x POP Concentration (ng/Nm^3) = Annual release/year (µg/y)

Example 3:

The annual transport and road traffic in the European Member States can be derived from statistics; annual releases have been reported by a number of Member States; thus “country-related“ emission factor can be derived and used for the calculation of an average emission factor following the equation:

$EF_{country}$ (mg/km) = annual emissions (mg/y) **:** Annual traffic (km/y)

As far as possible all mass flows contributing with more than 5% of the overall releases to a specific compartment have been validated and controlled for plausibility via cross-checks as far as possible. These cross checks use different data sources or different ways of calculation and show the possible range or results. They are summarised in a semi-quantitative uncertainty analysis.

The results of the mass flow calculations are presented separately for each of the POPs investigated by means of a flow scheme.

In this scheme all contributing sources are grouped as “roots” into three “categories of mass flow relevance” quantifying the dimension of overall releases. The total annual releases are presented as “trunk” and the releases into the different environmental compartments form the “branches” of the mass flow scheme.

Subsequently major sources (contributing ≥ 5% of the total) are compiled as columns separately for each release pathway in order to highlight and focus on the major results.

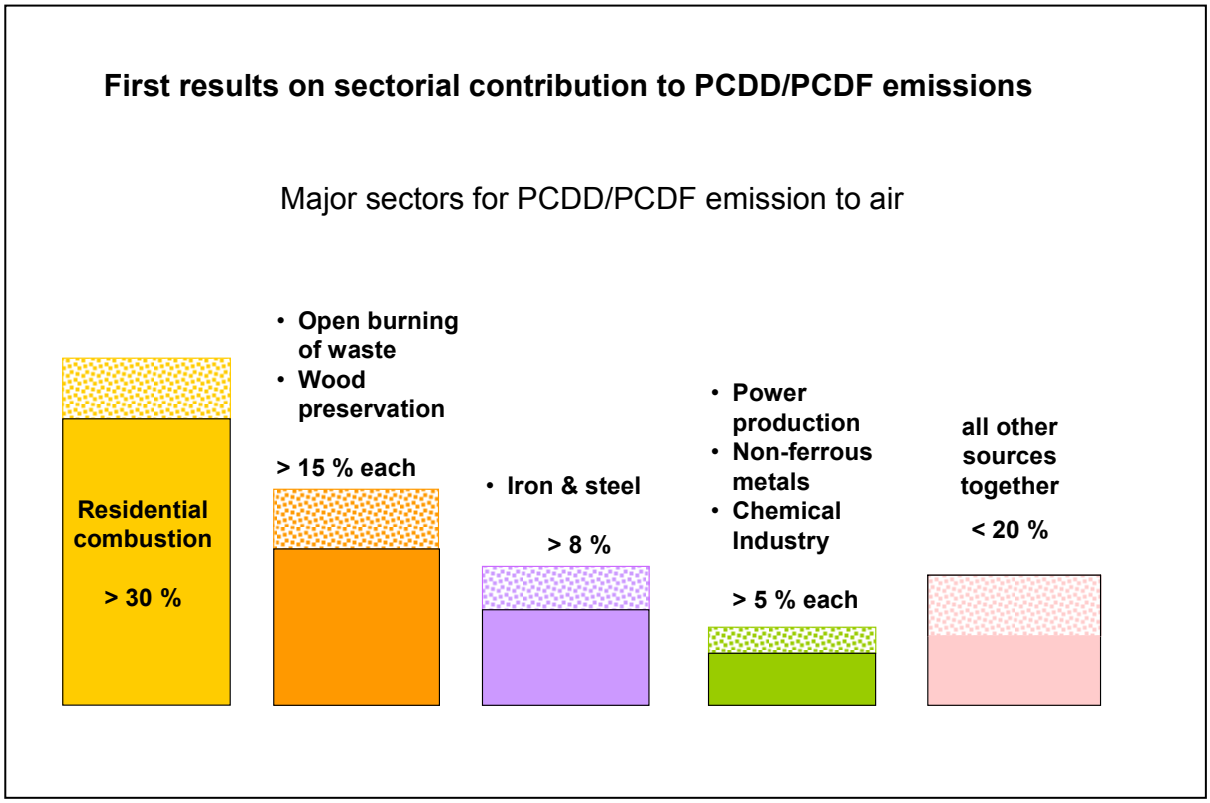


Figure 3-3: Identification of major source sectors contributing to air emissions - example PCDD/F emissions

This approach has been chosen in accordance with the project objectives and allows a fast overview and quick orientation on specific points of interest in the field of reduction measures for unintentional POP releases. In addition this approach helps to focus the investigation of measures and the identification of gaps and deficits as well as the identification of priority areas for action.

All figures are calculated based on available information and represent best estimates. Were data have not been available mass flows could not be calculated. Due to limited data the uncertainty in part can be significant and the relative contribution of sectors has to be read with reservation. In order to take this fact into consideration and to reduce bias in the assessment and recommendations the uncertainty assessment has been performed.

3.2 Methodology for inventory of measures

In this report an "inventory of measures" is developed as a compilation of measures established or envisaged on the territory of the European Union. This includes measures taken or planned by the European Commission, International Conventions relevant for European Member States and Member States themselves and covers all aspects related to POP, emissions reduction and knowledge gain. The inventory further includes information and recommendation provided by Stakeholders (e.g. Industry, NGOs).

The inventory of measures provides information on the level of intervention and engagement in relation to source sectors and pollutants and thus forms in conjunction with the results of the source inventory a basic prerequisite for the identification of gaps and deficits in relation to the overall objective of continuous release reduction of POPs in the Stockholm Convention.

For the purpose of this study the project team has developed an Inventory Matrix composed of two parts:

- An Overview Matrix which contains existing or planned measures to reduce the releases of unintentionally produced POPs taken at EU and at Member States level as well as relevant stakeholder propositions,
- A Detailed Matrix which contains a characterising analysis of these measures as far as data are available.

The matrix approach has the advantage to provide a condensed and structured overview on all identified measures. In addition it provides an allocation of measures to a number of categories and to the executing or proposing institutions. Thus it allows a quick overview on the current state and focus of measures. Moreover horizontal (related to a specific measure) and vertical (related to a specific country) evaluation can be performed.

The basic overview matrix structure is illustrated in Figure 3-4 below.

Structure of the inventory matrix

Actor / Measures	AT	BE	CY	CZ	...	European Commission	Other Stakeholders	International Organisations
Category 1								
measure 1.1								
measure 1.2								
measure 1.3								
...								
Category 2								
measure 2.1								
...								

Figure 3-4: Structure of the inventory matrix

A "1" in a matrix field indicates that the measure has been mentioned by the authority/institution, a “nym” (= **n**ot **y**et **m**entioned) indicates that the measure has not been reported. Measures at EU level that have to be implemented by the Member States are marked with a “1” for the EU and with a “*” for each Member State.

According to common practise all identified measures are allocated to nine categories:

- Category 1: Existing legislation
- Category 2: Review of legislation
- Category 3: Planned new legislation
- Category 4: Implementation and enforcement of existing legislation (administrative, technical)
- Category 5: New approaches (economic incentives, eco-labelling, taxes, subsidies, etc)
- Category 6: Funding
- Category 7: Communication/Education
- Category 8: Monitoring/Inventory
- Category 9: Research activities.

All measures described under a category get numbers like 1.1. 1.2 etc..

The columns are differentiated for:

- European Commission
- Member States
- International organisations (like HELCOM and OSPARCOM)
- Other stakeholders.

This allows to identify the state of play of political action and to recognise policy approaches which are commonly used to address the issue of POP releases and policy instruments used less frequently (horizontal comparison).

In addition the categorisation can help Member States to evaluate the focus of national status and planning, identify approaches not intensively used and benefit from experience made by and expertise developed in other Member States (vertical comparison).

At Community level the compilation of measures does not only include provisions directly concerning POPs (such as the recent ban of the PAH content in extender oils and tyres) but also measures which intend to reduce releases from other pollutants (e.g. the provisions of the LCP Directive) or which applies to other policy areas but may have an impact on POPs emissions (e.g. provisions of the Ecodesign Directive). Planned measures at EU level are included to the matrix when they are mentioned in an official document of one of the institutions, namely in the „Thematic Strategies“.

At Member States level, the compilation of measures is largely based on the Member States´ responses to a questionnaire developed for information collection (see chapter 3).

The questionnaire was restricted to a small number (7-9) of questions on central issues. Questions focussed on inventory data for unintentionally produced POPs, POP related legislation, other environmental legislation for release reduction, state of the NIP, measures in place or planned and national priorities. Stakeholder were asked to provide their specific point of view and invited to comment on the state of legislation and measures in the field of POP release reduction.

The questionnaire is documented in the annex to this report

NIPs and draft NIPs have been used as another important information source.

A systematic investigation of national legislation on POPs was not intended and would not have been possible in the scope this study.

In particular it should be mentioned that the inventory matrixes can form a basis or support for

- the Community Implementation Plan
- MS in the elaboration / optimisation of their NIPs
- information exchange on completeness and effectiveness of measures
- identification of gaps
- the assessment of already established/planned measures
- the elaboration of potential additional measures.

For the assessment of identified measures and the ranking and prioritisation of measures additional information is required. This relates to the state of realisation, the reduction potential or knowledge gain achieved, administrative and socio-economic impacts and timeframe.

Consequently in a second step, the identified measures are completed by information on

- Status/Way of implementation,
- Intended effect,
- Concerned sectors/Material flow,
- Control,
- Experiences/ results,
- Costs,
- Time frame.

as far as data are available.

The principal methodology for the development of detailed matrices is illustrated in Figure 3-5 below.

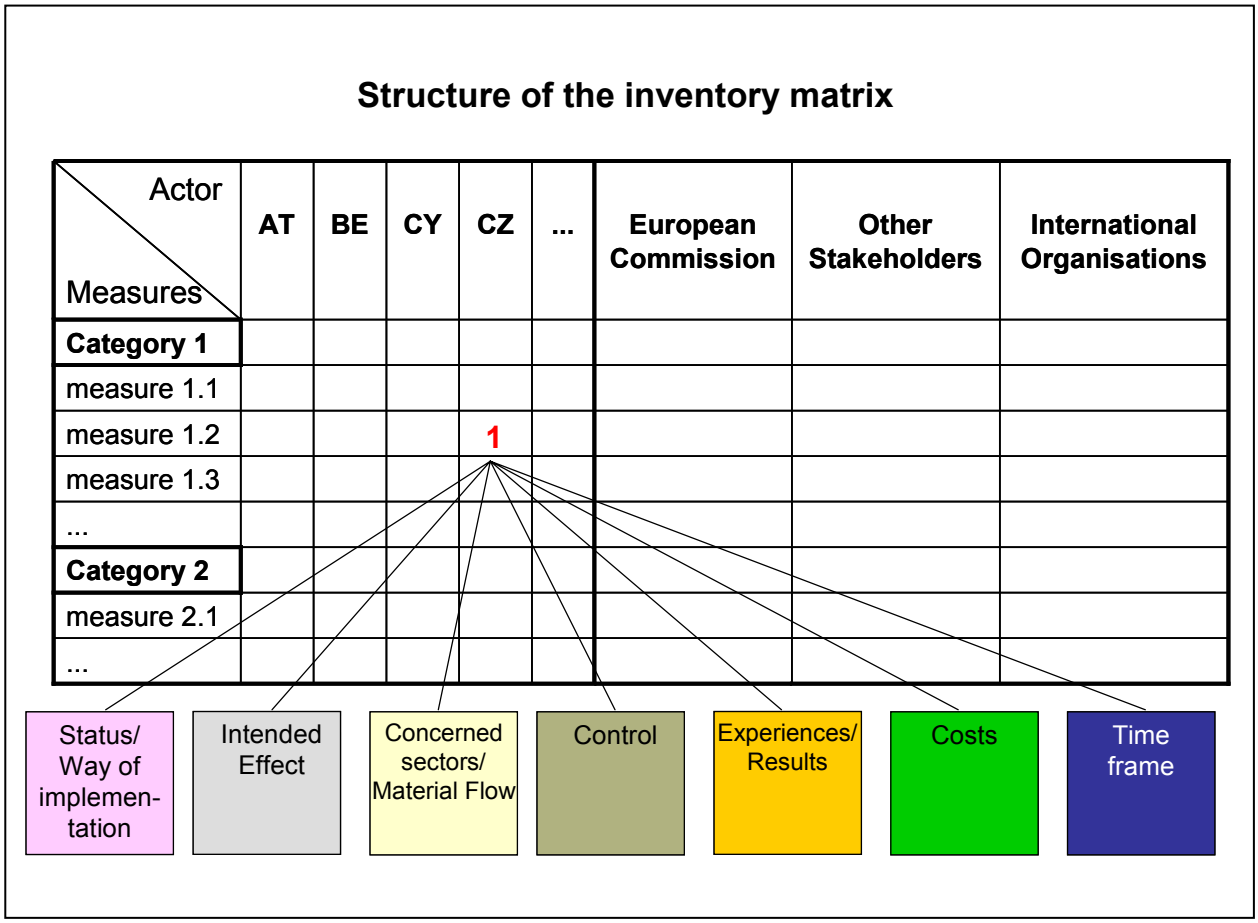


Figure 3-5: Principal methodology for the development of detailed matrices

The information for the detailed matrices has been collected in a dialogue with MS and by checking available information. Data and information is summarised in the following format:

	Measures Details	Status / Way of realisation	Intended effect	Concerned sectors / sources	Control	Experiences / Results	Costs	Time frame
1	Existing legislation							
	EU level							
1.1	…							
	MS level							
	…							

Table 3-1: Format of the detailed measure matrix

3.3 Methodology for identification of gaps and deficits

The identification of gaps and deficits in relation to the objective of minimising releases is important to identify sectors where a potential for emission reduction has not yet been addressed. This information is essential for the correct allocation of possible additional EU measures.

For the identification of gaps and deficits results from the mass flow analysis and from the source inventory have been merged according to the methodology described below.

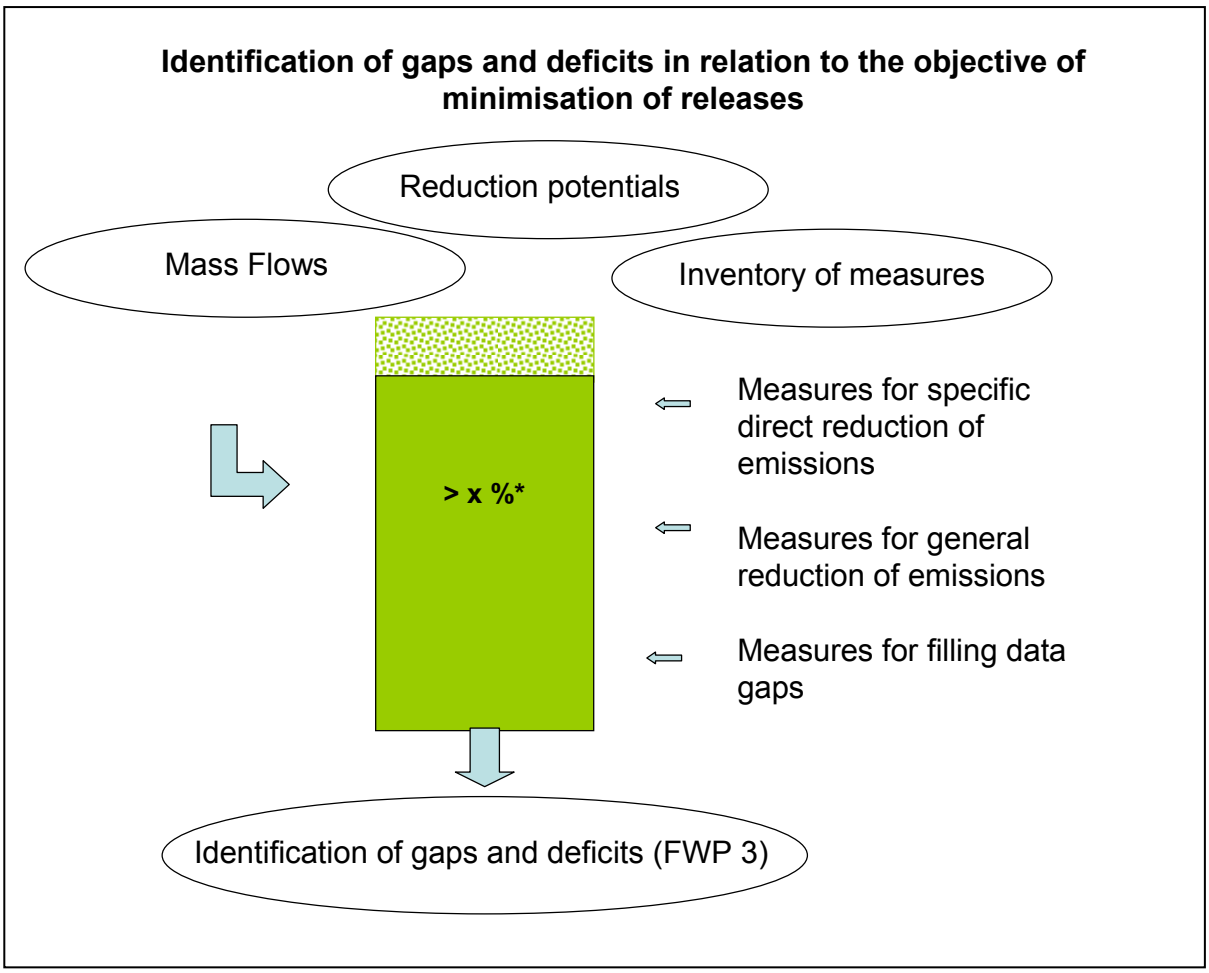


Figure 3-6: Schematic overview on the methodology to identify gaps and deficits

Results of the mass flow analysis and the measures inventory are combined in a table which provides condensed information:

Source												
Overall assessment										**Need for action**		
Deficits in measures												
Mass flow	PCDD/PCDF			PCB			HCB			PAH		
Total releases												
Compartment	Air	Water	Land	Air	Water	Land	Air	Water	Land	Air	Water	Land
Rating												
Exposure relevance	Oral/digestive				Dermal				Inhalative			
Food chain relevance	vegetables				dairies/meat				fish/seafood			

Measures	**Measure**	**Status**	**Effect**	**Compartment addressed**	**Pollutant addressed**	**Assessment**		
						Effective-ness	Costs	Socio-economic impacts
Specific measures for reduction of POP releases								
General measures for release reduction								
Measures for filling knowledge gaps								

Table 3-2: Combination matrix for identification of gaps and deficits

Such matrices - filled in for all analysed sources - are presented in chapter 7.2.

Assessment of measures

As shown in Figure 3-6 the measures are differentiated into

- specific measures (that enable POP release reduction for this source)
- general measures (that enable emission reduction with possible effects on POPs)
- measures to improve knowledge

Measures	Measure	Status	Effect	Compartment addressed	Pollutant addressed	Assessment		
						Effective-ness	Costs	Socio-economic impacts
Specific measures for reduction of POP releases								
General measures for release reduction								
Measures for filling knowledge gaps								

Table 3-3: Format for the assessment of identified measures

The assessment of measures has been done for three criteria:

→ effectiveness

→ costs

→ socio-economic impacts

In this context the terms effectiveness, costs and socio-economic impacts are defined as follows:

- Effectiveness: Ability to either reduce releases or to improve knowledge or awareness
- Costs: Expenses to be expected for involved authorities or the legal body developing or implementing a measure
- Socio-economic impacts: Additional expenses or turnover for involved industry or citizens resulting from implementation of the measure, also including consequences for jobs.

As a detailed impact assessment was not possible in the scope of the study all three criteria have been evaluated with a point system

0 points	=	no
1 point	=	low
2 points	=	medium
3 points	=	high

The assessment has been based on expert knowledge and experience within the project team, interviews and a market analysis which provides data for the three key figures:

- revenues per sector
- revenues per jobs
- jobs per sector

With these key figures the following socio-economic impacts could be roughly estimated:

- Generation of revenues and added value
- Number of concerned jobs

The sources of information for the market analysis were public available statistic data bases, maily Eurostat.

The principle approach was that in a first step 6 experts of the project team did the assessment individually and independent from the other team members. All team members had the same information available. In a second step the individual assessments have been discussed together and an agreement for a common assessment result had to be achieved.

In a third step the results of the assessment have been communicated to Member States and stakeholders giving them the opportunity for comments and different opinions towards the assessment results. The feed back received so far has been incorporated in the assessment results as they are presented in this report.

However, it should be highlighted that the results do not necessarily have a fix character. With additional information and further different points of view a re-adjustment will be possible in the future.

A detailed justification for the assessments is given directly after the results in the corresponding chapters. In the following some general principles are mentioned:

Generally it has been assumed that measures with higher binding elements or research character can be attributed higher effectiveness.

With respect to costs it has been assumed that costs for review of existing legislation, establishment of database or development of information material are low in comparison to funding of research, monitoring activities, and establishment of infrastructure, regular control or granting subsidies.

Socio-economic impacts have been assumed high for measures requiring major technical investments (such as installation of abatement technology, regular measurements or development of new technology) in comparison to communication, education and research which generally do not entrain the need of significant investments from industry or citizen.

Rating of deficits in coverage by measures

Based on an assessment of the coverage of each specific source sector by existing or planned measures the project team classified the situation for every source with one of the following rating categories:

- adequately covered
- partially addressed
- not adequately addressed.

The assessment compiles the results of the evaluation of number, type and status of measures as well as compartment and pollutant addressed and the estimated effectivenss.

The summary evaluation includes a short textual justification and is given in the following line of the combination matrix:

Deficits in measures	Textual justification	
		partially addressed

Assessment of mass flows

The second criterion for the identification of gaps is the importance of the corresponding material flows and possible knowledge gaps concerning releases. For this purpose the main conclusions of the material flow analysis have been summarised in the table and enable conclusion on mass flow relevance and exposure relevance.

Mass flow	PCDD/PCDF			PCB			HCB			PAH		
Total releases												
Compartment	Air	Water	Land	Air	Water	Land	Air	Water	Land	Air	Water	Land
Rating												
Exposure relevance	Oral/digestive			Dermal					Inhalative			
Food chain relevance	vegetables			dairies/meat					fish/seafood			

Table 3-4: Format for the mass flows assessment

As shown in the table above information on mass flow relevance and knowledge deficits and is specified for

- PCDD/F
- PCB
- HCB
- PAH

The information is differentiated for releases to air, water and land. Additionally estimation for exposure relevance and food chain relevance are provided.

Human exposure in this context refers to risk of exposure for the general population not for professional exposure settings. Oral /digestive relevance is defined as result from dietary intake not accidential intake of contaminated soil or other material. Thus relevance is closely related to food chain contamination as predominant pathway of overall human exposure.

In conjunction with the results from the source inventory and the data compiled in the tables of chapter 5 (e.g. range of EFs) the assessment of the material flows takes into consideration the importance concerning various POPs, reduction potential and the existence of knowledge deficits.

Conclusion for identification of gaps

The conclusion on gaps and deficits for a source sector concerning measures (adequately, partially, not adequately addressed) and mass flow/exposure relevance, uncertainty, reduction potential (high, medium, low) are summarised to a "need for action category". This leads to the overall assessment of:

- low
- medium
- high

This assessment gives a suggestion of priority for possible future actions and measures. The measures to fill the identified gaps and deficits are developed in chapter 8, the corresponding methodology is described in the following chapter 3.4.

Overall assessment	Short textual justification	**Need for action**
		low

3.4 Methodology to identify and assess additional measures

As a basis to fulfil these tasks the same structural table as described in chapter 3.3 can be used:

1. Air transport												
Results from status quo										**Need for action**		
Mass flow	PCDD/PCDF			PCB			HCB			PAH		
Total releases												
Compart-ment	Air	Water	Land	Air	Water	Land	Air	Water	Land	Air	Water	Land
Rating												
Exposure relevance	Oral/digestive				Dermal				Inhalative			
Food chain relevance	vegetables			low	dairies/meat				fish/seafood			

Proposed Measures	**Measure**	**EU / MS**	**Expected Effect**	**Compart-ment addressed**	**Pollutant addressed**	**Assessment**			
						Effective-ness	Costs	Socio-economic impacts	Feasi-bility
Specific measures for reduction of POP releases									
General measures for release reduction									
Measures for filling knowledge gaps									

Table 3-5: Format for the table to identify and assess additional measures

Additional measures to fill the identified gaps have been developed by the project team by

- taking up already existing proposals and suggestions
- transferring measures from areas where they have been successfully applied to areas with deficits
- "brain storming" within the project team and with selected interview partners to generate new ideas.

The suggestions have been differentiated into

- overall measures
- general industry related measures
- specific measures for single sources.

The focus of the suggested measures could be

→ release reduction

→ improvement of knowledge

→ awareness raising

All proposed measures have been assessed for the same criteria as described for already existing measures:

- effectiveness
- costs
- socio-economic impacts.

Additionally the criterion "feasibility" has been assessed considering problems and obstacles to be expected when implementing the suggested measures.

Feasibility can be defined as the probability that the measure could be implemented Taking this definition feasibility in a first screening approach is a function of various parameters such as effectiveness, costs, socio-economic impacts and the level of coordination and cooperation needed. This level of coordination needed, increases with the number of stakeholders involved and the divergence of interests.

The assessment has been based on the same procedure as described above for the assessment of the other criteria.

Principally feasibility of a measure is dependent on the available budget to cover costs, established infrastructure or framework and the acceptance by involved stakeholders.

High costs, high adverse socio-economic impacts and a large number of involved stakeholders (e.g. cooperation between European Commission and Member States needed, international conventions or agreements concerned) as well as low expected effectiveness or mass flow relevance have been seen as hampering factors for feasibility in the assessment performed in the framework of this project. Consequently measures showing these characteristics have been classified low to medium feasibility.

However this does not mean that measures with low feasibility could not be taken into consideration. The selection of final measures is also a matter of political strategy and prioritisation.

The assessment of proposed measures with respect to effectiveness, costs, socio-economic impacts and feasibility has been done measure by measure. The detailed results and the justifications are presented in chapter 8.3

As illustrated/discussed in the chapters above, feasibility is not completely independent from other criteria used for assessment and ranking. A semi-quantitative evaluation of the relative weighing of specific assessment criteria in the ranking procedure is presented in Figure 3-7 .

The suggested measures might be relevant for the European Community, Member States or a combined activity between Member States and Commission. For every measure the best approach was discussed within the project team and marked in the overview table:

Proposed Measures	**Measure**	**EU / MS**	**Expected Effect**	**Compart-ment addressed**	**Pollutant addressed**	**Assessment**			
						Effective-ness	Costs	Socio-economic impacts	Feasi-bility
General measures for release reduction	Quality requirements for air transport fuel	EU (already established in some MS level)	release reduction	Air	PAH (mainly)	1	1	1	1-2

Table 3-6: Example of the assessment of an additional measure

A short justification for the assessments is given below each table.

It should be emphasised that the assessments are regarded as a first contribution to a future discussion with Member States and Stakeholders. They are not yet final and might be readjusted with further incoming information.

3.5 Methodology for ranking and prioritisation of measures

Basis for the ranking and the prioritisation are the “assessments of measures” and the “need for action” categories concerning gaps and deficits for single sources.

Effectiveness and feasibility are regarded to be the most important criteria for the ranking of suggested measures. Consequently they are used as ranking criteria for a basic categorisation into 5 priority categories:

Category 1: Effectiveness high or medium to high (3 or 2-3)
Feasibility high or medium to high (3 or 2-3)

Category 2: Effectiveness medium (2)
Feasibility high or medium to high (3 or 2-3)

Category 3: Effectiveness high or medium to high (3 or 2-3)
Feasibility medium (2)

Category 4: Effectiveness medium (2)
Feasibility medium (2)

Category 5: Effectiveness high or medium to high (3 or 2-3)
Feasibility low to medium (1-2)
or
Effectiveness low to medium (1-2)
Feasibility high or medium to high (3 or 2-3)

The allocation of single measures to one of the categories has been calculated following an "if-then" algorithmus in an excel spread sheet.

The relative weighing of specific assessment criteria in the ranking procedure is presented in the figure below.

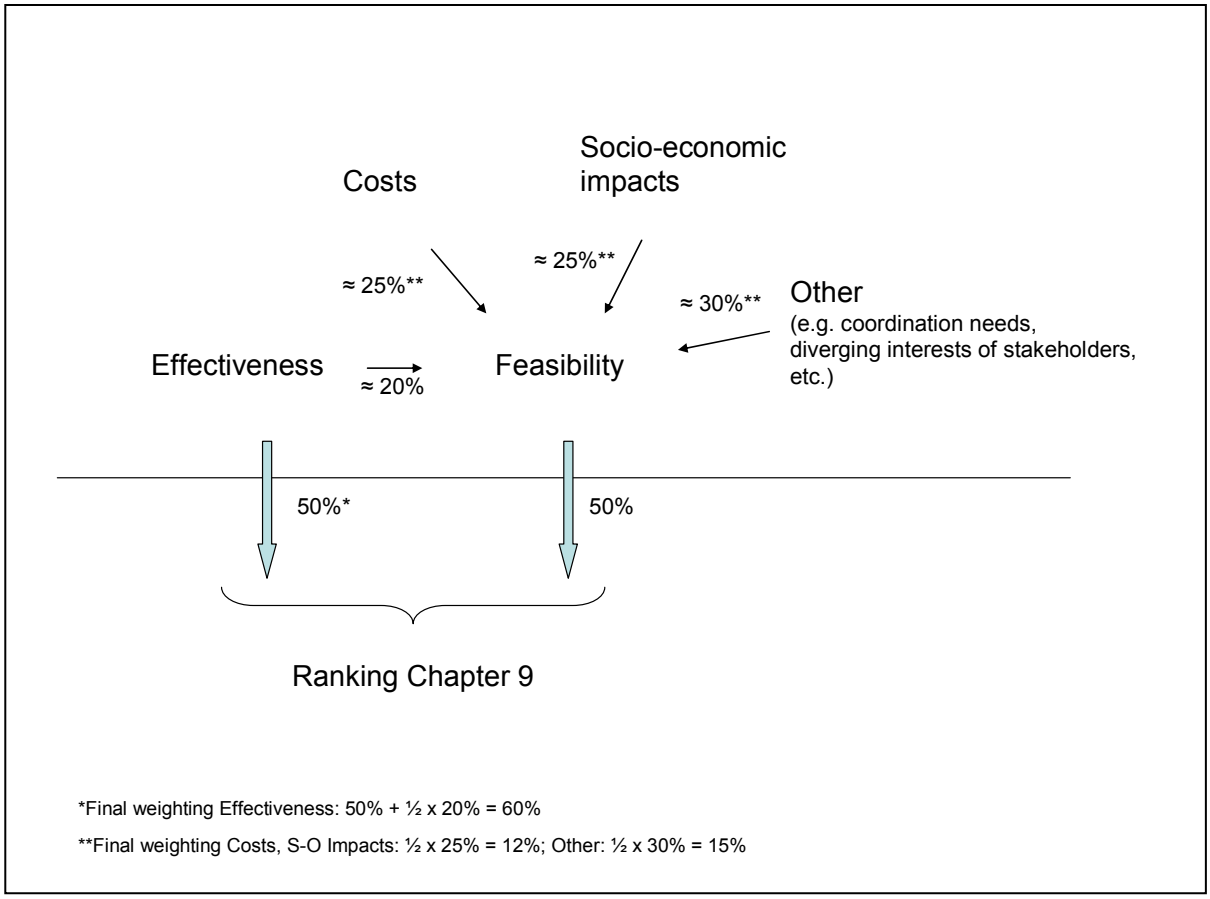


Figure 3-7: Weighting of effectiveness and feasibility in the ranking of proposed measures for reduction of unintentional releases of POPs

In a second step measures from these categories have been evaluated concerning pros and cons of action at European level versus action at Member State level. For this evaluation the subsidiarity principle has been taken into account.

In a third step a ranking within the above mentioned categories has been performed for measures assessed to be advantageously addressed at Community level as a function of "need for action".. In order to be able to further sort the proposed measures within the categories a weighing of further parameters has been included in the ranking according to the following principles:

- Overall measures and general measures are attributed higher priority than specific measures for single sources
- The specific measures for single sources are rated depending on the "Need for action" ranking as performed in chapter 8
- Measures assessed as favourable at Community level alone are attributed higher priority than measures assessed preferably followed by a combined approach between Member States and European Commission
- Measures for release reduction are attributed higher priority than measures for information or knowledge gain. Within this category measures with combined effect (knowledge/information gain and side-effect on releases) are ranked higher than pure measures for information gain or improved knowledge
- Within single source categories ranking has been performed from high need for action to low need for action. Within these categories measures addressing all POP have been weighted higher than those addressing only single POPs.
- Within category 5 measures with high effectiveness but low feasibility have been attributed higher priority than measures with high feasibility but low effectiveness

In a final categorisation measures for release reduction and measures for improved knowledge, information or communication have been sorted separately.

This step is important as the two types of measure use completely different approaches and a direct comparison would act as strong confounding factor (measures for information gain may have high effectiveness and feasibility with respect to information gain, but this does not mean that they are necessarily better for the overall purpose of release reduction than a reduction measure with medium effectiveness or feasibility in relation to release reduction).

The ranking has been performed in the categories:

- Measures for release reduction
- Measures for information/knowledge gain and release reduction
- Measures for information/knowledge gain.

Within each class of measures the ranking parameter mentioned above have been used.

3.6 Summary and Overview on step by step approach in assessment and ranking of measures

The assessment of need for action and the identification and ranking of potential measures to fill identified gaps in this project follows a step wise approach, which is summarised in the overview figure below.

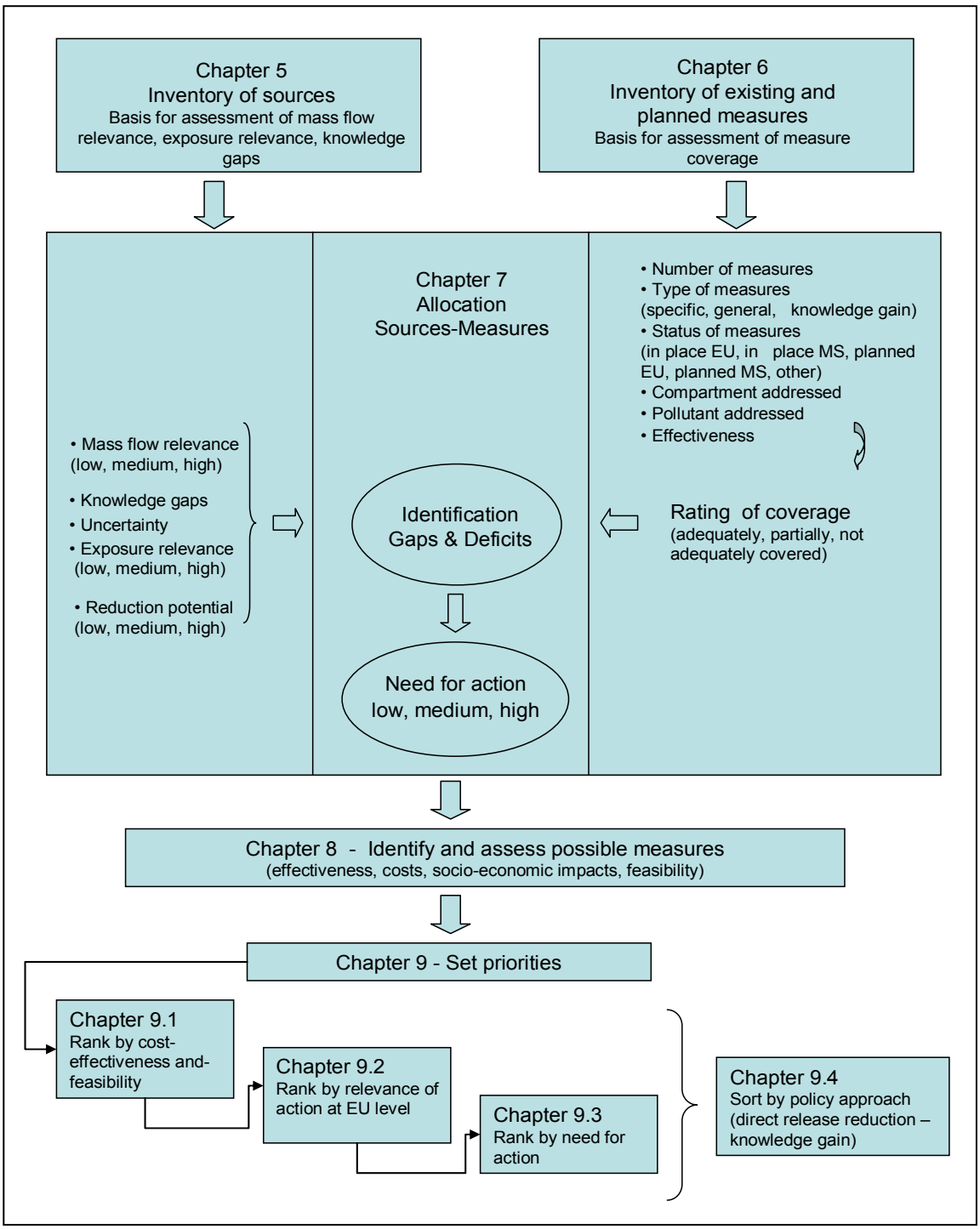


Figure 3-8: Stepwise approach in assessment of need for action and prioritisation of measures for reduction of unintentional releases of POPs

4 Data Sources

Various data sources have been used to derive the information compiled in this report.

4.1 Source inventory

The most important data sources used for the source inventory have been.

- EMEP Database
- EPER Database
- BREF Documents
- EMEP/CORINAIR Atmospheric Emission Inventory Guidebook
- UNEP Toolkit

In the EMEP data base information is compiled on annual emissions according to NFRO2 codes. For the years 2000-2003 the following information is available and could be used for the source inventory of unintentionally produced and released POPs:

- For PCDD/F data to some of the source sectors have been reported from 19 of 25 Member States;
- For PCB and HCB data for some of the source sectors in question are compiled for 12 out of 25 Member States
- For PAH 16 out of 25 Member States have reported annual release data for some of the source sectors to be investigated

In the EPER data base information for annual emissions from IPPC installations are compiled for the reporting year 2001.

- For PCDD/F the data base contains sector specific annual releases from 9 of 15 Member States
- For HCB the data base contains sector specific annual releases from 4 out of 15 Member States
- For PAH the data base contains sector specific annual releases to air from 11 out of 15 Member States; to water information is compiled for 9 Member States

Information is restricted to industrial point source releases to air and to water (direct/indirect); there is no information on releases of PCB.

EPER data have to be interpreted carefully as they include confounding factors such as the fact that emissions have to be reported under main annex I activities but may include

emissions from other sub-activities such as emissions from a company waste incinerator reported as basic organic chemical production etc.

BREF documents contain sector specific data on annual emissions, contamination levels, emission factors, etc as far as data have been available.

The EMEP/CORINAIR Atmospheric Emission Inventory Guidebook provides valuable information on emission factors for releases to air.

In addition publications from OSPAR and HELCOM as well as scientific publications have been screened for additional information.

4.2 Inventory of measures

For the inventory of measures the following information sources have provided major input to the results

- Questionnaires
- NIPs and draft NIPs
- Personal discussions and electronic communication
- Commission documents
- Existing studies

Questionnaire

For information collection on measures and identification of responsible experts a questionnaire has been developed and was sent out to Member States and other stakeholders in January 2006.

The questionnaire was restricted to a small number (7-9) of questions on central issues. Questions focussed on inventory data for unintentionally produced POPs, POP related legislation, other environmental legislation for release reduction, state of the NIP, measures in place or planned and national priorities. Stakeholder were asked to provide their specific point of view and invited to comment on the state of legislation and measures in the field of POP release reduction.

The questionnaires (authorities, industry/NGO/Marine Conventions) are provided in Annex 1 to this report.

NIPs and Draft NIPs

For the purpose of this study a number of NIPs and Draft NIPs could be used, which have in part been provided as answer to the questionnaire send to the Member State authorities.

By the end of the project time final NIPs submitted to the Stockholm Convention have been available for Latvia, Germany, Denmark, Sweden, Finland and the Netherlands. Draft NIPs have been used for the Czech Republic, Poland and Hungary.

Commisison Documents and Existing Studies

In addition to the feed back from Member States and other Stakeholders the proposal of measures has been based on a number of strategic documents and studies concerning releases from specific source sectors. A compilation of used documents is provided in the reference section of this report.

4.3 Feed back from Stakeholder Consultation

For information collection on measures and feed back on the proposed measures a number of consulation processes at concerned Stakeholders have been performed. A list of the consulted stakeholders is attached as Annex 2 to this report.

As a first step for information collection and identification of responsible experts a questionnaire has been developed and was sent out to Member States and other stakeholders in January 2006.

By 6 February BiPRO received answers from 10 Member States:

- Belgium (Flemish Region),
- Cyprus,
- Czech Republic,
- Germany,
- Spain,
- Finland,
- Greece,
- Sweden,
- Slovakia,
- and the United Kingdom.

Further, feedback was provided by the following industrial stakeholders:

- EUROFER,
- CEMBUREAU,
- EUROMETAUX, and
- Shredder industry companies.

And by Marine Conventions

- OSPAR
- HELCOM
- MEDPOL

For further inforamtion first results of this study were presented in Brussels on the 2nd Meeting of the Competent Authorities for the Implementation of the EU POP Regulation Nr 850/2004 on 21 February 2006.

At the meeting it was agreed that the interim report and the overview matrix of measures should be sent out to Member States so that they would have an opportunity to review the results and add measures envisaged or installed in their country. The documents were sent out mid of March, the Member States were asked to reply until 10 April.

By the end of the project time answers have been provided from the following Member States:

- Belgium (Flemish region),
- Czech Republic,
- Denmark,
- The Netherlands,
- Sweden,
- Slovenia,
- Slovakia
- and Ireland.

The answers from National authorities and Marine Conventions contained information on existing and planned measures and priorities, which has been used for the compilation of the inventory matrixes in chapter 6 (for summary and specific information see there).

All information concerning planned or porposed measures has in addition been taken into consideration in the evaluation of need for action in chapter 7 (Gaps and deficits in relation ot the objective of minimizing releases) and in the proposal of potential additional measures to be taken at Community level in chapter 8 (Measures to fill identified gaps).

The feed back from industrial Stakeholders and NGOs was poor.

The proposals from industry and Marine Conventions have been compiled in a specific overview matrix in chapter 6.3. All provided proposals have been used and evaluated in chapters 7 and 8.

After the elaboration of the draft final report (executive summary, source inventory results and the broad list of proposed measures has been send out again to Stakeholders for final comments.

A summary compilation of received comments is provided in Table 4-1 below.

Stakeholder	Type of Comment	Area of concern
EUROFER	Mass flow, measures	Highlight correlation between reduction in air emissions and increased concentrations on waste; Number of already exisiting research and monitoring activities deemed significant
BIR (Shredder Industry)	Mass flow	Hightlight that shredder industry is not a source of unintentional production but only of unintentional release in case polluted feed material is used in the process
Cembureau	Mass flow	Correct EF used for calculation of PCDD/PCDF and PCB mass flow*; co-incineration in cement kilms attributed high destruction efficiency
FEAD	oral	Stress the specific situation of the waste incineration sector with ELV for PCDD/PCDF; in contrast to other IPPC sectors this factor should be highlighted (need for action in other sectors e.g. metal industry is seen as somewhat higher
CEPI (Pulp and Paper)	oral	As the paper industry is classified low need of action it should be stated that no action are needed; concerns as regards proportionality of proposed measures; high costs if regular measurements of POPs required

Slovak republic	overall	No need for comments
Czech republic	overall	Decisions of COP 2 should be taken into account
The Netherlands	Measures	As PAH is not listed under the Stokholm Convention it should not be addressed in the CIP; number of proposed measures; tracebility of the cost-effectiveness assessment; outcome of the assessment of need for action sufficiently reflected in measures

* the correction did not lead to another classification

Table 4-1: Overview on feedback to final Stakeholder Consultation

5 Source inventory and mass flows for unintentionally produced/ released POPs

In this chapter background information on POPs and results of the source inventory and analysis of mass flows are presented.

5.1 Health and environmental background of POPs

Persistent organic pollutants (further referred to in this report as POPs) are a set of carbon containing chemical substances that consists of pesticides, industrial chemicals and unintentional by-products of industrial and non-industrial combustion processes.

Some of their chemical characteristics include low water solubility, high lipid solubility, high molecular masses and low volatility. Due to their chemical properties, many POPs are both non-volatile and insoluble. These compounds therefore are not transported directly through the environment. Indirect routes include attachment to particulate matter, and transport through the food chain.

POPs give rise to concern as according to their definition they are

- persistent in the environment and in human tissues,
- bio accumulate in the food chain due to their lipophilic properties,
- have the potential for long-range environmental transport

and

- show adverse effects ranging from acute to chronic toxicity.

POPs have been linked to adverse effects such as cancer, damage to the nervous system, reproductive disorders, and disruption of the immune system.

Because they circulate globally via atmosphere, oceans and other pathways persistent organic pollutants pose a threat to the environment and to human health all over the globe.

Although substantial progress has been achieved in limiting the use and application of these substances and reduce their emissions to environment, there are ongoing releases to the environment as well as a constant cycling of substances released in former times so that they still pose a threat to human health and further action has to be taken.

In May 1995, the UNEP Governing Council (GC) decided to begin investigating POPs. In the Stockholm Convention a first set of 12 POPs (aldrin, chlordane, DDT, dieldrin, endrin, heptachlor, hexachlorobenzene, mirex, polychlorinated biphenyls, polychlorinated dibenzo-p-dioxins, polychlorinated dibenzofurans and toxaphene) has been defined as high priority substances. However, the option to include further substance either existing or newly developed is one of the important provisions in order to dispose of a flexible tool for the control of potentially dangerous substances and preparations.

Since then this list has generally been accepted to be extended by such substances as carcinogenic PAHs, and certain brominated flame-retardants, as well as some organometallic compounds such as tributyltin (TBT).

16 POP substances are listed in the UNECE –POP-Protocol (Aarhus Protocol).

A compilation of the substances is given in Table 5-1:

POP substance (CAS-N)	classification	use	ban /restrictions according to directives 79/117/EC or 76/769/EC	Hazardous properties
Aldrin (309-00-2)	enviro- and humanotoxic (T, N), Carc. Cat. 3	1950 -1990 manufactured commercially since 1950 for control of soil pests, grasshoppers and wood protection against termites	use banned without exception since 1990	H5, H6, H7, H11, H14
Dieldrin (60-57-1)	enviro- and humanotoxic (T, N), Carc. Cat. 3	1948 -1979 manufactured commercially since 1948 for control of soil pests, wood and textile protection; metabolite of Aldrin	ban on use since 1979	H5, H6, H7, H11, H14
Endrin (72-20-8)	highly toxic to humans and environment (T+, N), Carc.Cat. 3	1950 -1985; restricted up to 1990 widely used since 1950 for control of soil pests and rodents,	use restricted since 1985; banned since 1990; European production already had ceased in 1982	H6, H14
Chlordane (57-74-9)	enviro- and humanotoxic (Xn, N), Carc. Cat. 3	1945 - 1997 used since 1945 for control of cockroaches, ants, termites and household pests	ban on use since 1997	H5, H7 H14
DDT (1,1,1-trichloro-2,2-bis(4-chlorophenyl)ehane) (50-29-3)	enviro- and humanotoxic (T, N), Carc. Cat. 3	1940 – 1983; restricted 1983 – 1990; widely used since 1940 for malaria control and crop protection	use restricted in 1983 and 1985; all uses prohibited in 1990; The use as intermediate for the production of dicofol is allowed until 2014; production ongoing in IT and ES	H6, H7, H11, H14
Heptachlor (76-44-8)	enviro- and humanotoxic (T, N), Carc. Cat. 3	? - 1985 used against soil insects, termites grasshoppers and in malaria prevention	use banned without exception since 1985	H6, H7, H11, H14
Chlordecone (143-50-0)	enviro- and humanotoxic (T, N), Carc. Cat. 3	used as insecticide	all uses prohibited	H6, H7, H11, H14

POP substance (CAS-N)	classification	use	ban /restrictions according to directives 79/117/EC or 76/769/EC	Hazardous properties
Mirex (2385-85-5)	harmful to environment and health (Xn, N) Carc. Cat. 3	1950 - 1990 Used since mid 1950s for ant control (mainly in US) and as fire retardant in plastics, paint and paper	all uses prohibited	H5, H7, H10, H11, H14
Toxaphene (Camphechlor)	enviro- and humanotoxic (T, N), Carc. Cat. 3	1949 - 1983 Used since 1949 for control of ectoparasites and as insecticide	use banned without exceptions in 1983	H4, H5, H6, H7, H11, H14
HCH including (Hexachloro-cyclohexanes) (608-73-1) Lindane (58-81-9)	enviro- and humanotoxic (T, N), Carc.Cat. 3	1940 – 1990; Lindane as topical insecticide through 2006 Widely used since early 1940s as insecticide in agriculture, household, wood and textile protection	use as pesticide banned in 1990; until 2007 Technical HCH allowed as intermediate, Lindane restricted to use in public health and veterinary as topical insecticide; until 2006 HCH allowed as professional remedial and industrial treatment of lumber, timber and logs and for indoor applications production in France, Italy and Germany	H5, H6, H14
HCB (Hexachloro-benzene) (118-74-1)	enviro- and humanotoxic (T, N), Carc. Cat. 2	1945 - 1979 used since 1945 as fungicide and for fireworks and synthetic rubber; unintentional formation in combustion processes and chemical production	banned as pesticide since 1979;	H5, H6, H7, H 14
PCB (polychlorinate d biphenyls) (1336-36-3) Group of chlorinated aromatic hydrocarbons with general structure general structure of C12H10-xClx	harmful to environment (N); low acute toxicity; endocrine disrupting effects Carc. Cat 2 (possible carcinogen to humans)	Around 1930 – 1980 used from 1930 as dielectric fluids in transformers, capacitors heat exchanger sand hydraulic machinery as well as in lubricating and cutting oils and as plasticiser in sealants, adhesives, lacquers and paints. unintentional formation in combustion and	production and use stopped in the mid eighties; articles in use may be further used and maintained according to the provisions of directive 1996/59/EC; phase out of all equipment >500 ppm until 2010; equipment 50-500 at end of lifetime	H14, H10

POP substance (CAS-N)	classification	use	ban /restrictions according to directives 79/117/EC or 76/769/EC	Hazardous properties
		incineration processes in the temperature range of 250-450°C)		
HxBB (Hexabromo-biphenyl) (36355-01-8)	harmful to environment; moderate toxicity; endocrine disrupting effects Carc. Cat 2 (possible carcinogen to humans),	1970 - 1974 Produced in the USA only; used since 1970 as fire retardant in thermoplastics for various products, in coatings, lacquers and polyurethane foam	use stopped end of the seventies	
PCDD/PCDF (polychlorinated dibenzo-p-dioxins and dibenzo-furans) Group of chlorinated aromatic hydrocarbons with two molecular rings as basic structure	harmful to environment; moderate toxicity; IARC classification as possible carcinogen to humans, endocrine disrupting effects	possible by-products from the production of certain chemicals and new formation in combustion and incineration processes (250-450°C)	no intentional production or use	[H7, but not applicable to all PCDD/PCDF]
PAH (polycyclic aromatic hydrocarbons) Group of compounds consisting of two or more fused aromatic benzene rings	harmful to environment; moderate to high toxicity IARC classification as probable carcinogen to humans for benz[a] anthracene, benz[a] pyrene, dibenzo[ah] anthracene; classification as possible carcinogen for benzo[b]fluoranthene and indeno[123-cd]pyrene,	Mostly formed during incomplete combustion of organic material (thought to account for over 90%); emission from production and use of creosote and coal-tar (poorly quantified) trace compound in mineral oil derived fuels	no intentional production or use for Benzo[a]pyrene, Benzo[b]fluoranthene, Benzo[k]fluoranthene and Indenopyrene	H7, H 10, H 11, H 14

Table 5-1: POP substances covered by the European POP regulation (2004/850/EC), their classification, use, bans, restrictions and hazardous properties

PCDD/PCDF are a class of structurally and chemically related compounds known as halogenated aromatic hydrocarbons. They include poly-chlorinated dibenzo-p-dioxins (PCDD) and polychlorinated dibenzofurans (PCDF) and can include dioxin-like PCB (see below). The definition of the term "Dioxin" varies with publications and organisations, which can lead to confusion when defining maximum tolerable levels. In general, however, it only includes PCDD and PCDF.

The basic chemical structure consists of two molecular rings of carbon atoms. Substitution of chlorine atoms for hydrogen atoms on the rings produces one of many chlorinated congeners. There are 75 PCDD, 135 PCDF and 209 PCB congeners (see below) of which, ~30 (7 PCDD, 10 PCDF, and 12 PCB) are considered to give dioxin-like toxicity. The term dioxin-like refers to compounds having basic similarities in molecular structure, chemical properties, environmental persistence, bioaccumulation potential and mechanisms of toxic actions. The most toxic PCDD and PCDFs are those chlorinated at the 2, 3, 7 and 8 positions.

In addition there are polybrominated dibenzo-p-dioxins, dibenzofurans (and polybrominated biphenyls) but these are believed to be relatively insignificant in the overall picture (Fries, 1995).

In the environment “dioxins” occur as complex mixtures of isomers and congeners. Therefore quantification of dioxin-like toxicity is based on a system of toxic equivalent factors (TEQ) related to the most potent dioxin 2,3,7,8–tetrachloro p–dibenzodioxin (TCDD). Sum exposure or release is expressed in TEQ-PCDD/PCDF.

Polychlorinated biphenyls (PCBs) are a group of organic, chlorinated, aromatic hydrocarbons that contain 209 individual compounds (known as congeners) with 1 to 10 chlorine atoms attached to biphenyl and a general structure of $C_{12}H_{10-x}Cl_x$. The most toxic PCBs are those with 4 or more chlorines with just 1 or no substitution in the ortho position. The latter are sometimes referred to as coplanar i.e. a flat configuration with rings in the same plane. In the environment they exist as complex mixtures of isomers and congeners.

Hexachlorobenzene (HCB) is a chlorinated hydocarbon with the molecular formula C6Cl6.

HCB has been produced as pesticide from 1945 to the eighties and has been extensively used for seed treatment, especially on wheat.

In addition HCB has been used as intermediate in the production of other substances (e.g. rubbers, dyestuff, PCP and aromatic fluorocarbons), occurs as by-product in the manufacture of certain chlorinated solvents (mainly perchloroethylene, trichloroethylene and carbon tetrachloride) and can occur as impurity in a small number of pesticides (PCP, Chlorothalonil, Picloram)1. In addition HCB is generated in small amounts in the same combustion processes as PCDD/PCDFs. The electrolytic production of aluminium and magnesium and the extraction of magnesium are suggested to be potential high release sources if certain processes are used.

HCB is an animal carcinogen and is considered to be a probable human carcinogen. HCB is very toxic to aquatic organisms and may cause long term adverse effects in the aquatic environment.

[1] See http://reports.eea.europa.eu/EMEPCORINAIR4/en/sources_of_HCB.pdf , Technical Guidelines on ESM of pesticides wastes (first draft) www.basel.int/techmatter

Polycyclic aromatic hydrocarbons (PAH) are a group of ubiquitous environmental contaminants that are formed by the incomplete combustion of organic materials, such as wood or fossil fuels. PAH molecules are made up of three or more benzene rings, at least two of which are fused with two neighbouring rings sharing two adjacent carbon atoms. In addition to PAH that are composed of carbon and hydrogen atoms only, some PAH contain heteroatoms such as nitrogen and sulphur.

PAH form a large and heterogeneous group, but the most toxic members of this family known to-date are PAH molecules that have four to seven rings. In this report, the discussion therefore focuses on the properties of this four- to seven-ring subset of the PAH family of compounds.

Benzo[a]pyrene (B[a]P) is the most studied of the PAH family of compounds. It is a relatively large non-substituted five-ring compound. Because of its relatively high environmental levels and high level of toxicity resulting in larger health impact than any other PAH identified in the environment, it is often selected as an indicator for other PAH compounds.

Due to their specific properties POP substances have been disseminated to the environment all over the world and entered the food chain, via transfer to plants from atmospheric deposition and soil and contamination of food from animal origin, which is especially high for fish and other sea food and is caused by the natural bioaccumulation in the food chain.

Human exposure to POPs is mainly due to ingestion of contaminated foods. It is therefore important to reduce the contamination level in food by addressing ongoing emissions and historical environmental contamination.

5.2 Source inventory

The identification of potential source sectors to investigate has been mainly based on the following sources:

- Stockholm Convention Annex II, part 2 and part 3
- OSPAR (HARP-HAZ)

According to these documents major and potential sources for PCDD/PCDF, PCB and HCB are (no ranking):

- Waste incinerators (municipal, hazardous, medical, sewage sludge)
- Cement kilns firing hazardous waste
- Production of pulp and paper (chlorine);
- Thermal metallurgical processes
- Open burning of waste, including burning of landfill sites
- Residential combustion
- Fossil fuel-fired utility and industrial boilers

- Power production biomass
- Specific chemical production processes
- Crematoria; Destruction of animal carcasses
- Motor vehicles, particularly those burning leaded gasoline
- Textile and leather dyeing and finishing
- Shredder plants

For PAH OSPAR lists in its compilation the following processes as potential sources for releases (no ranking):

- On field burning of stubble/straw; open burning of agricultural waste
- Road transport
- Inland waterways
- Marine Activities, (plus dock works)
- Air traffic
- Construction and Demolition (Creosote treated timber)
- Domestic combustion
- Power generation
- Pulp and paper, print (wood combustion)
- Chemical industry
- Wood preservation
- Metal industry (coke oven, aluminium, basic metals, ferro alloys, iron smelting)
- Anode production
- Extraction and distribution of fossil fuels
- WWT
- Waste incineration and pyrolysis
- Cremation

Due to the focus of requirements in the Stockholm Convention and the objectives of the Community Implementation plan investigation has been focused on unintentional production processes and does not include stocks of intentionally produced POPs.

5.3 Results of mass flow evaluations

It has to be highlighted that the source inventory and mass flow calculation has not been a focus of this project, which is more oriented to the identification if appropriate measures and that the scope of this project did not allow an in-depth investigation. Nevertheless, the source inventory presents a basic prerequisite. It was the intention and has been possible to identify

and illustrate the dimension of releases from different sectors and classify them in different categories.

The calculation method used in the mass flow is discussed in chapter 3. The resulting emission factors are presented as far as possible and an uncertainty assessment is added to each mass flow in order to allow cross checks and an adaptation of the ranking results with incoming knowledge. All results are calculated at the EU 25 scale. Emission factors and relative activity and consequently the ranking may be different in individual Member States.

For the material flows source sectors are attributed to three release categories representing their relative importance:

	PCDD/PCDF	PCB	HCB	PAH
very important	> 1 kg/y	> 500 kg/y	> 500 kg/y	> 300 t/y
Important	0.2 – 1 kg/y	50 – 500 kg/y	50 – 500 kg/y	30 – 300 t/y
less important	< 0.2 kg/y	< 50 kg/y	< 50 kg/y	< 30 t/y

Table 5-2: Definition of release categories according to their relative importance

All material flows contain a differentiation as regards releases into the following compartments:

- emission to air
- discharge to waste
- discharge to water

Releases to land are not specifically mentioned as they are closely related to releases to waste. As a rough estimation in average about 2/3 of the amounts listed under waste are directed to landfill disposal operations.

For the source inventory important release flows are characterised by a ranking of sources giving their relative importance.

Mass flow and ranking are followed by figures with background information and a characterisation concerning uncertainty/ data gaps.

Figures in the mass flows represent conservative estimations as “best estimates” from available data.

To reflect this fact and the inherent uncertainty in estimations all data in the mass flow illustrations have been marked with either > or < signalling a limited variability either to higher or lower values than the ones presented.

In each of the following sections, first an overview is presented on the total flow of the considered POP. Specific flows to the environmental compartments air, waste and water are presented thereafter, providing information on the activity rates, the emission factors and the database used. Additional figures show the relative importance and further details to the calculations, cross checks and an uncertainty assessment.

5.4 PCDD/PCDF

In EU 25 more than 21 kg/y of PCDD/PCDF-TEQ are released to the environment, thereof more than 5 kg/y are air emissions and more than 16 kg/y are assignable to waste.

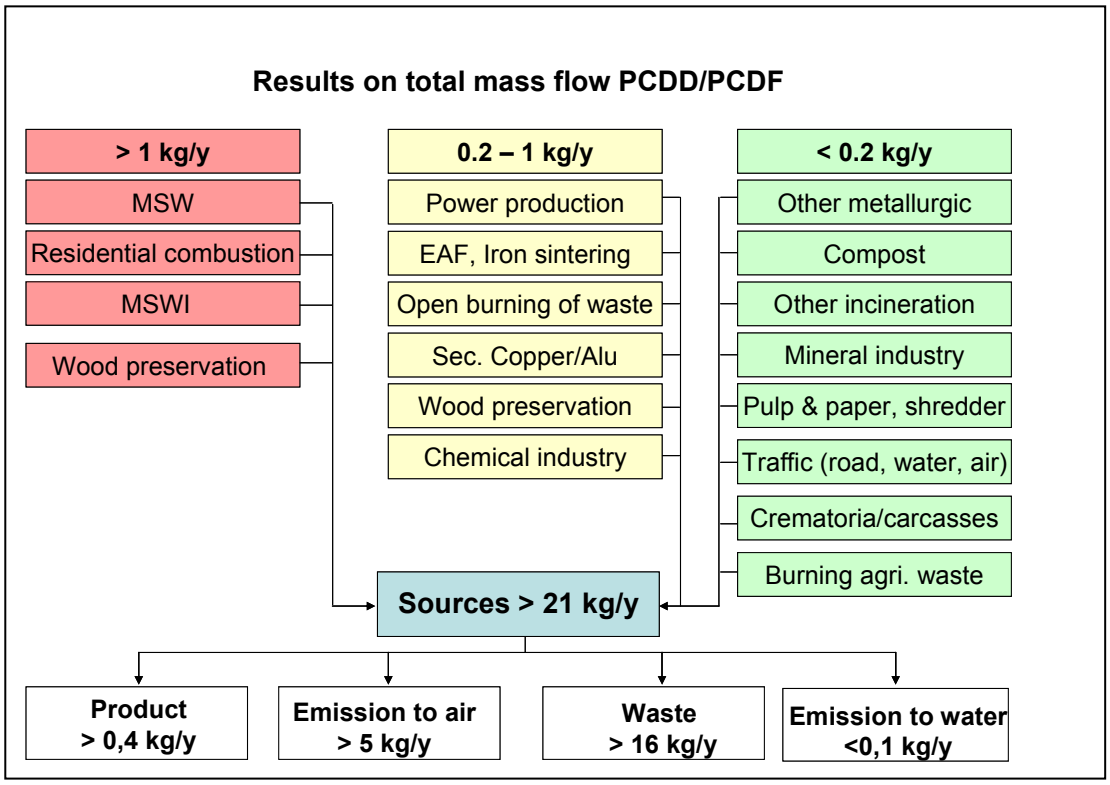


Figure 5-1: Results on total mass flow PCDD/PCDF

Air emissions are dominated by residential combustion in small combustion installations and open burning of waste. Wood preservation tends to be another important source for releases to air. Major industrial sources in the field of air emissions are iron and steel and power production, with sinter plants and biomass power plants as major contributors.

Releases to waste are dominated by municipal solid waste which accounts for ½ of the total releases. About 30% are due to industrial sources such as waste incineration, power production and metallurgical processes. 300 g/y are contributed via sewage sludge.

As a rough estimation about 2/3 of the releases to waste are disposed off in landfills or recycled in secondary thermal processes. The rest is either recovered in construction material or discarded to land. Due to low water solubility of PCDD/PCDF releases to water are low.

5.4.1 Releases to Air

The following table gives an overview on releases to air from all source sectors where data have been available. The information in the column database and the dimension of the range of reported emission factors – respectively the absence of alternative data for comparison – give an indication on the uncertainty of the mass flow data.

Sector	Estimated emission of PCDD and PCDF to Air (g TEQ/y)	Data base	Emission factor (µg TEQ/t)	Range EF
Total waste incineration	270	Based on country reporting to EMEP	~ 5	Not available
MSWI	20	Calculation based on concentrations and toolkit emission factor (good FGT)	0.5	0.5 – 1.3
Total metal	400	Based on EPER 2001 (EU 15)	1.9	Not available
Iron & steel	207	Extrapolation from UK EMEP reporting	1.07	0.1 - 10
Sinter	500	Based on POP waste study	2.5	0.3 – 20
EAF	170	Based on POP waste study	2.4	
Coke production	20	UNEP toolkit	0.3	0.3 - 3
Primary copper	0.03	UNEP toolkit	0.01	
Secondary copper	80	POP waste	80	5 - 800
Secondary aluminium	60	POP waste	28.9	Toolkit 0.5 - 150
Secondary zinc	2.5	POP waste	2.6	0.3 - 100
Lead	1	Country reporting	0.5	0.5 - 80
Cement	11	Country reporting	0.05	0.05 - 5
Lime	2	Toolkit (good dust abatement)	0.07	0.02 - 10
Pulp and Paper	7	Country reporting	0.1	0.06 – 4.5
Chemical Industry	~ 160	Extrapolated from EMEP data	0.1	0.0003 – 0.95
Refinery	6	Country reporting	0.1	0.06 – 1.3
Fertilizers	1	EPER		
Pharmaceuticals	10	EPER		
Power production fossil fuels	350	Based on country reporting to EMEP	0.24	–0.01-1
Power production biomass	1.7	POP waste	0.3	0.06 - 13
Residential combustion	1.300	Based on country reporting to EMEP	50	0.002 - 225
Road transport	60	Country reporting	0.2	0.00 – 3.5
Marine transport	1.7	Based on country reporting	0.25	0.1 - 4
Air transport	1	Country reports EMEP	0.1	
Railroad transport	10	Based on country reporting to EMEP	2.9	
Open burning	800	Based on UNEP Toolkit	300	60 - 1000
Agricultural waste	52	Country reporting	5	0.5 - 30
Crematoria	7	Based on country reporting to OSPAR	5	0.4 - 90
Animal carcasses	130	Extrapolated from BE data		0.3- 500
Wood preservation	1000	Country reporting on creosote/PCP		
Shredder	2		0.1	0.02 – 3.3

Table 5-3: Overview on PCDD/F releases to air in EU 25

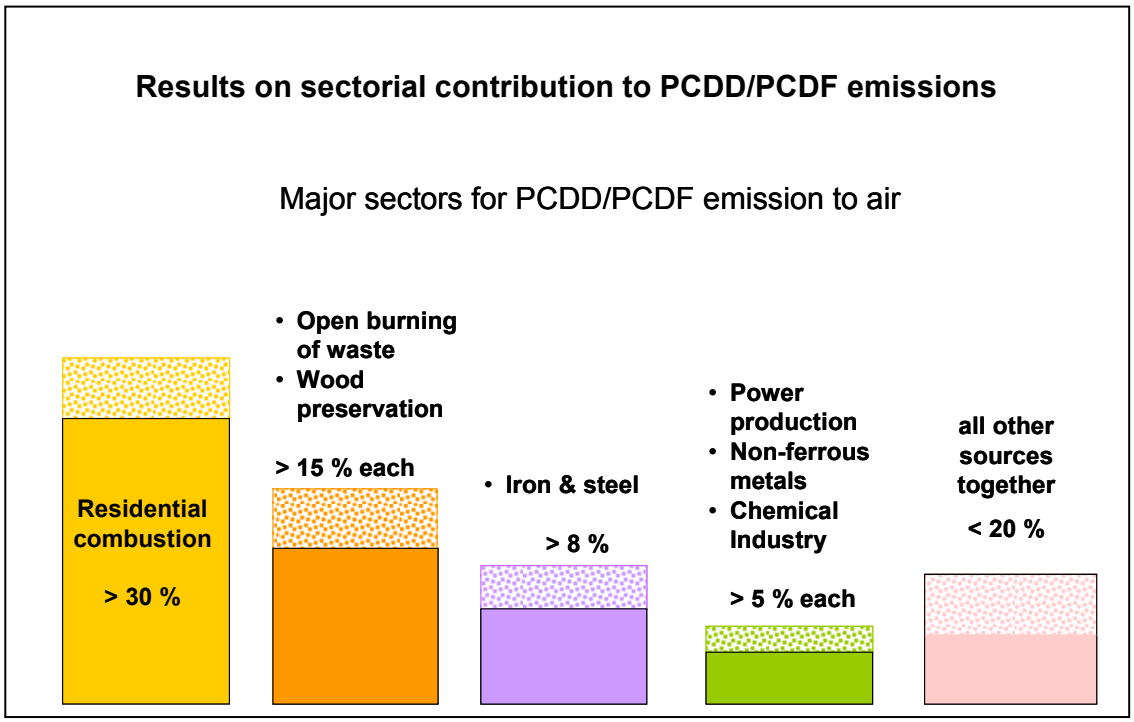


Figure 5-2: Results on sectorial contribution to PCDD/PCDF emissions

Further information on uncertainty of data can be derived from the cross checks for major source sectors performed in the following figures.

Data basis and uncertainty assessment for PCDD/PCDF Emissions to air (TEQ)

Sector/source	Calculation	Cross check
Residential combustion	MS reporting to EMEP 2003 (13 MS) Extrapolation on per capita basis ➔ ~ 1500 g/y	With EF Toolkit ~ 200g/y With concentration data from literature 100-7000g/y due to large range in output data for coal
Open burning of waste	Calculation with emission factor UNECE toolkit and activity data (300 µg TEQ/t) ➔ ~ 800 g/y	No cross checks available

Figure 5-3: Calculations and cross check for residential combustion and open burning of waste

Data basis and uncertainty assessment for PCDD/PCDF Emissions to air (TEQ)

Sector/source	Calculation	Cross check
Wood preservation	Emission calculation for PCP treated wood DK; Extrapolation on per capita basis → 50-2000 g/y MS reporting to OSPAR for creosote treated wood (3 MS) Extrapolation on per capita basis → 4.5-680 g/y ➔ best estimate ~1000 g/y	No cross checks available

Figure 5-4: Calculations and cross check for wood preservation

Data basis and uncertainty assessment for PCDD/PCDF Emissions to air (TEQ)

Sector/source	Calculation	Cross check
Iron and steel	Calculation from reported concentration data x exhaust air flow ~ 700 g/y; corresponding to EF 2.6 µg/t ➔ best estimate ~400 g/y	Country reporting to EMEP (1 MS) extrapolated ~210 g/y Toolkit EF for good - high process control (5-0.3) EPER reporting 2001 extrapolated ~400 g/y

Figure 5-5: Calculations and cross check for iron and steel

Data basis and uncertainty assessment for PCDD/PCDF Emissions to air (TEQ)

Sector/source	Calculation	Cross check
Public power production	MS reporting to EMEP and EPER (20 MS) ~350 g/y Extrapolation based on activity data; corresponds to EF 0.24 µg/t ➔ best estimate 250 g/y	EF UNECE Toolkit 0.1-0.3 µg/t Calculation based on concentration data provided by industry ~40 g/y

Figure 5-6: Calculations and cross check for public power production

Data basis and uncertainty assessment for PCDD/PCDF Emissions to air (TEQ)

Sector/source	Calculation	Cross check
Non ferrous metal industry	MS reporting to EMEP (20 MS) ~220 g/y ➔ best estimate 200 g/y	Concentration data literature/industry; EFs UNECE toolkit ~ 20 – 400 µg/t
Chemical industry	MS reporting to EPER (10 MS) ~150 g/y ➔ best estimate 200 g/y	No cross checks available

Figure 5-7: Calculations and cross check for non ferrous metal industry and chemical industry

5.4.2 Releases to Waste

The following table gives an overview on releases to waste from all source sectors where data have been available. The information in the column database and the dimension of the range of reported emission factors – respectively the absence of alternative data for comparison – give an indication on the uncertainty of the mass flow data.

Sector	Estimated emission of PCDD and PCDF to Waste (g TEQ/y)	data base	Emission factor (µg TEQ/t)	Range
Municipal solid waste	6700	POP waste	35	
Waste incineration	1900		43	Toolkit 4-100
Sinter plants	70	POP waste	0.55	Toolkit 0.003
EAF	650	based on mean emission factor from UNEP toolkit and POP waste study	9	Toolkit 1.5 - 15
Secondary copper	50	POP waste	50	Toolkit 300 - 600
Secondary Alu	450	POP waste	200	Toolkit 100 - 400
Secondary Zinc	90	POP waste	90	Toolkit 5-1000
Pulp and Paper	< 30	based on SE emission inventory	0.6	Toolkit 10 for sludges
Power production (coal)	500	Based on UNEP toolkit		POP waste study EF 1.3
Power production biomass	150	Based on best estimate EF calculated from UNEP toolkit and POP waste study	20	Toolkit 0.8 POP waste 100
Residential combustion coal	240	POP waste	8.9	Toolkit 500 t
Residential combustion wood	160	POP waste	3	No default EF
Open burning	1600	Based on toolkit	600	
Agricultural waste	100	Based on toolkit	10	Toolkit 4-10

Table 5-4: Overview on PCDD/F releases to waste in EU 25

Further information on uncertainty of data can be derived from the cross checks for major source sectors performed in the following figures.

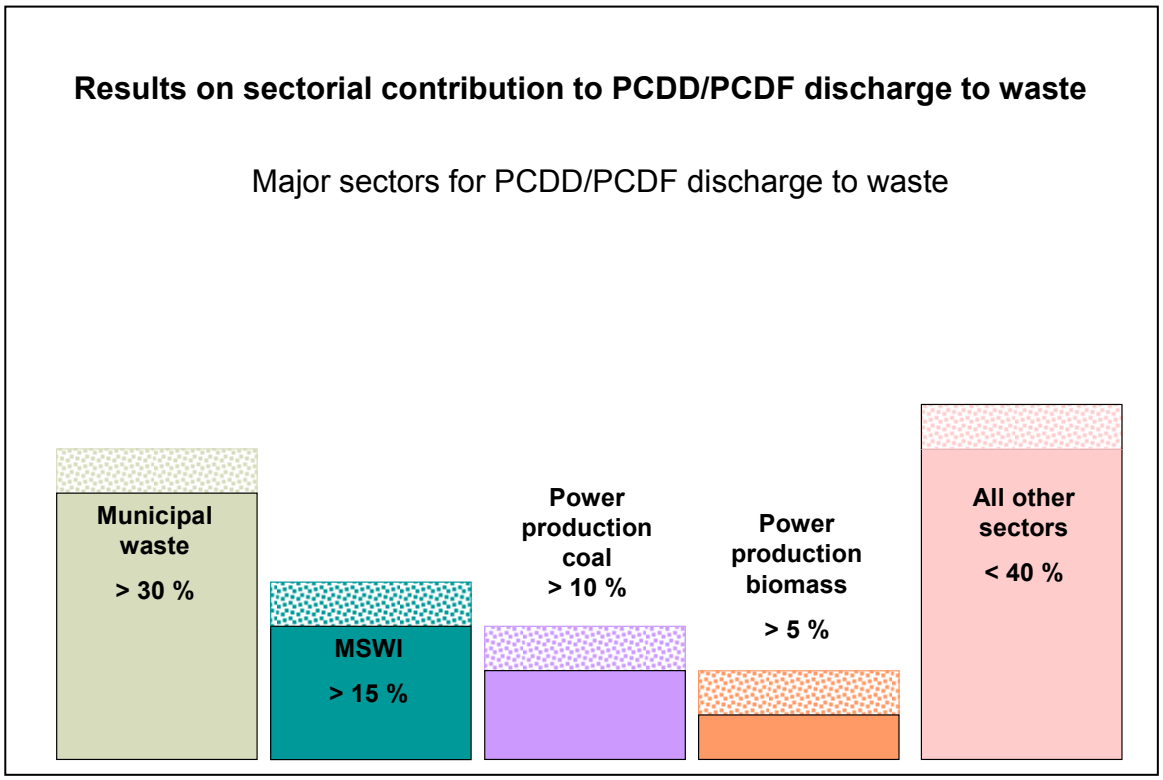


Figure 5-8: Results on sectorial contribution of PCDD/PCDF discharge to waste

Data basis and uncertainty assessment for PCDD/PCDF discharge to waste (TEQ)

Sector/source	Calculation	Cross check
Municipal solid waste	Calculation from reported concentration data ~ 8000 g/y; 37 µg/t (2-250) ➔ ~ 8000 g/y	Study „Dioxin emissions in Candidate Countries“; „European Dioxin Inventory“ EF 6.3-73
Waste incineration	Calculation from reported concentration data ~ 2000 g/y; 45 µg/t ➔ ~ 2000 g/y	EF UNECE toolkit 15-200 µg/t for good to highly sophisticated installations

Figure 5-9: Calculations and cross check for municipal solid waste and waste incineration

Data basis and uncertainty assessment for PCDD/PCDF discharge to waste (TEQ)

Sector/source	Calculation	Cross check
Public power production coal	Calculation from reported concentration data ~ 1600 g/y; corresponding to EF of 1.37 µg/t (0.04-4.8) ➔ ~ 1600 g/y	EF UNECE Toolkit 0.4 µg/t (~50 g/y) Study „Dioxin emissions in Candidate Countries“ 0.004 -0.7 µg/t
PP biomass	Calculation from reported concentration data ~ 600 g/y; output conc. 0.01 -16.2 µg/kg; output generation factor 100 kg/t corresponding to EF of 113 µg/t (0.1-1600) ➔ ~ 600 g/y	Study Dioxin Emissions in CCs EF for wood 2-22 µg/t; EF UNECE Toolkit 0.3 µg/t wood fired power boiler (~ 2 g/y) Country reporting SE extrapolated by activity data 110 g/y; output conc. 0.02 µg/kg; CH: output conc. 0.7- 7.6 µg/kg

Figure 5-10: Calculations and cross check for public power production coal and PP biomass

5.4.3 Releases to Water

The following table gives an overview on releases to water from all source sectors where data have been available. The information in the column database and the dimension of the range of reported emission factors – respectively the absence of alternative data for comparison – give an indication on the uncertainty of the mass flow data.

Sector	Estimated emission of PCDD and PCDF to Water (g TEQ/y)	data base	Emission factor (µg TEQ/t)	Range
Coke production	4	UNEP toolkit	0.06	0.01 – 0.06
Pulp and Paper	< 0.6		0.0002	0.0001 – 0.0003
Chemical Industry			0.01-0.03	

Table 5-5: Overview on PCDD/F releases to water in EU 25

5.5 Unintentionally produced PCB

The following figure provides an overview source inventory for unintentional PCB emission/ discharge. Investigation is focused on unintentional production processes and does not include releases from stocks of intentionally produced PCBs.

For unintentionally produced PCBs more than 5,000 kg/y are released in EU 25. Air emissions account for > 4,000 kg/y; releases to waste account for at least 650 kg/y.

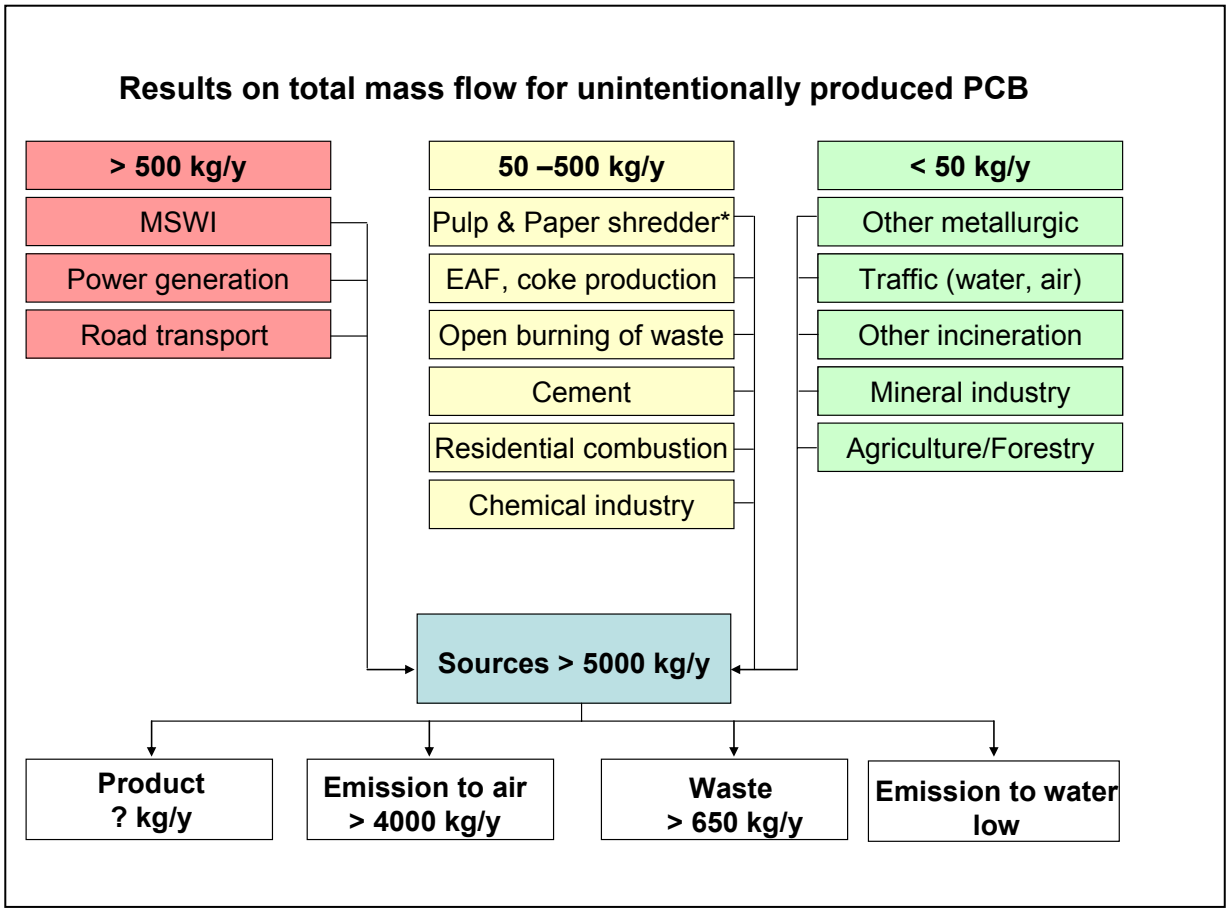


Figure 5-11: Results on total mass flow PCB

In the evaluation of this result it has to be taken into account that poor information is available on PCB concentrations in solid residues and in water, so that the real releases might be higher.

Air emissions seem to be dominated by power generation, road transport and iron and steel production; however, data uncertainty is high for road transport. Due to low water solubility of PCB releases to water are expected to be low.

Unlike PCDD/PCDF overall releases of PCB to environment are absolutely dominated by stocks from historic production, which cause releases in a dimension of more than 6,000 tons per year with estimated air emissions of 600 t/y and and a discharge into waste of the

remaining amount. This issue however is already addressed by existing legislation and has been evaluated in previous studies.

5.5.1 Releases to Air

The following table gives an overview on releases to air from all source sectors where data have been available. The information in the column database and the dimension of the range of reported emission factors – respectively the absence of alternative data for comparison – give an indication on the uncertainty of the mass flow data.

Sector	Estimated emission of PCBs to Air (kg/y)	Data base	Emission factor (mg/t)	Range
MSWI	50	Based on EMEP/CORINAIR Guidebook	1	0.1 - 6
HWI	0.03	Based on concentration data BREF	10	0.4 - 30
Iron & steel	500	Country reporting to EMEP	2.7	
Sinter	50	Based on measurement data PL	0.5	0.06 - 13
EAF	350	Based on country reporting to EMEP	5	0.9 - 45
Iron foundries	6	Country reporting PL/CZ	0.5	0.14 -
Coke production	200	Data from PL	3.6	0 – 3-6
Primary copper	5	Data from JP	0.1	
Secondary copper	2.6	Data from Poland	2.6	
Secondary aluminium	7	Based on data from PL, IT, JP	3.4	0.001 - 100
Secondary zinc	1	Data based on concentration data from Poland, waste from cathode production	1	0 - 85
Lead	6	Based on data from Italy	7.25	7 - 90
Brass		Based on data from Italy	4.4	
Precious metals		Based on MoE Japan	160	
Cement	200	Based on data from IT, PL and JP	1	0.007 - 5
Lime	3	Based on data from JP	0.15	
Pulp and Paper	90	Based on data from JP	0.7	
Petrol Refinery	65	Based on country reporting to EMEP	1	
Chemical Industry	200	estimation		0.009 – 0.4
Power production	1500	Based on country reporting to EMEP	1	
Power production biomass	3		0.6	
Small combustion sources		Based on data from PL	1.4	
Residential combustion coal	40	Based on Austrian study	2	0.1 - 16

Sector	Estimated emission of PCBs to Air (kg/y)	Data base	Emission factor (mg/t)	Range
Residential combustion wood	50	Based on Austrian study	1	0.1 – 3.5
Road transport	1400	Based on data from CZ, PL	5	0.02 - 10
Marine transport	3.9	Based on data from SE	0.6	
Open burning of waste	95	Based on data from SE (estimation from TEQ)	35	4 - 72
Agricultural/Forestry	35	Country reporting to EMEP (FR, NL)		0.7
Crematories	< 60	Based on data from JP	0.4	
Shredder	100	Based on data from IT, DK	5.2	

Table 5-6: Overview on PCB releases to air in EU 25

The following figure presents the relative contribution of different source sectors to the overall emission of PCB to air. The figures are calculated based on available information on emission factors, concentration data or annual emission reporting and represent best estimates. Uncertainty in part can be significant. In addition it has to be stated clearly that – while data for air emission had been available for the majority of sources, data for discharge to waste and water have been available only for a very limited number of source sectors. Results for these sectors consequently may significantly be underestimated.

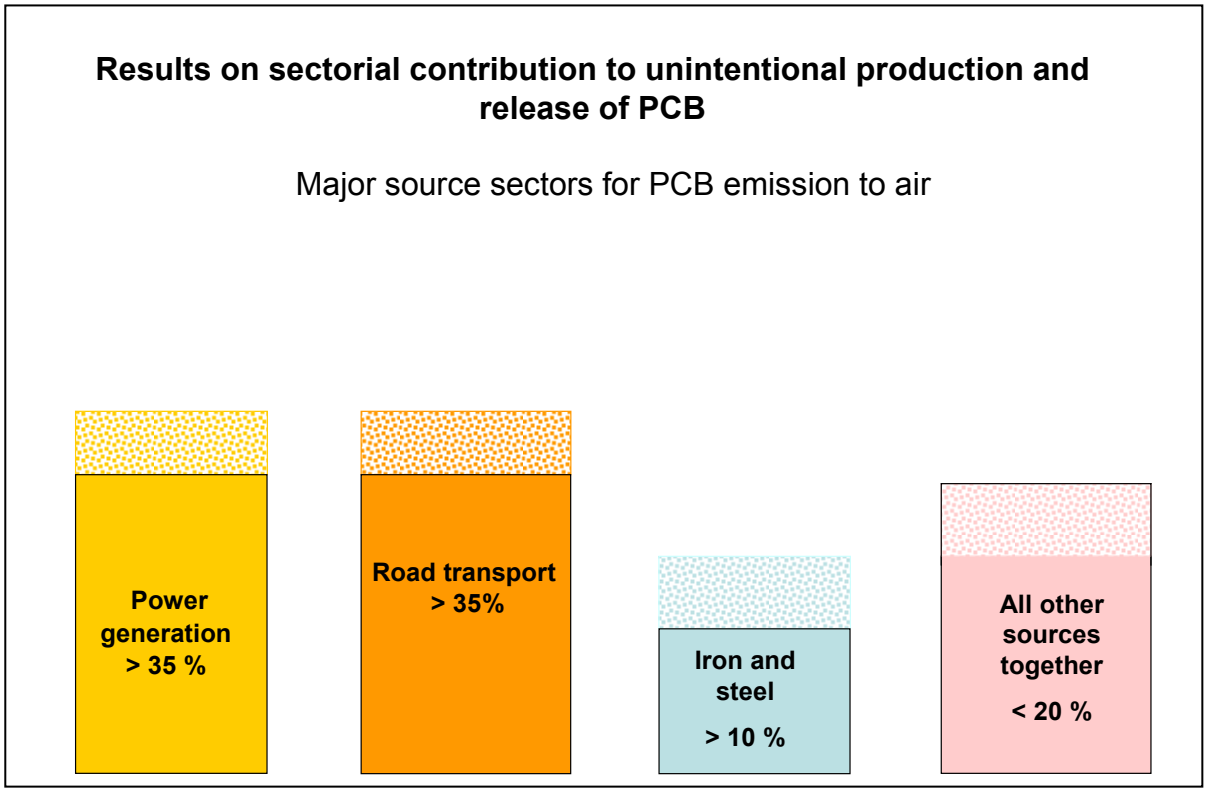


Figure 5-12: Results on sectorial contribution to PCB emissions

Further information on uncertainty of data can be derived from the cross checks for major source sectors performed in the following figures.

Data basis and uncertainty assessment for PCB Emissions to air

Sector/source	Calculation	Cross check
Public power generation	MS reporting to EMEP 2003 (8 MS) Extrapolation via activity data; corresponding to EF 1 mg/t ➔ ~1500 kg/y	Based on concentration data BREF➔ ~ 210 t/y (still to be clarified) No official EF available in UNECE Guidebook
Road transport	Calculation with emission factors for diesel and gasoline used in CZ and PL Draft-NIPs (0.02 -10 mg/t) ➔ ~1400 kg/y	No cross checks available

Figure 5-13: Calculations and cross checks for public power generation and road transport

Data basis and uncertainty assessment for PCB Emissions to air

Sector/source	Calculation	Cross check
Iron and steel	MS reporting to EMEP 2003 (6 MS) calculation via activity data (corresponding to EF 2.7 mg/t) ➔ ~ 500 kg/y	Default EF in UNECE Guidebook 0.2 mg/t (Sinter) - 3.6 mg/t (EAF); EF in BREF steel 1-13 mg/t

Figure 5-14: Calculations and cross check for iron and steel

5.5.2 Releases to Waste

The following table gives an overview on releases to waste from all source sectors where data have been available. The information in the column database and the dimension of the range of reported emission factors – respectively the absence of alternative data for comparison – give an indication on the uncertainty of the mass flow data.

Sector	Estimated emission of PCBs to Waste (kg/y)	Data base	Emission factor (mg/t)	Range
MSWI	200	Based on concentration data BREF	4	Not available
HWI	30	Based on industry SE inventory	2.8	Not available
EAF	260	Based on data from PL	3.7	Not available
Lead	6.7	Based on data from Italy	4.8	Not available
Brass		Based on ENEA Italy	9.6	Not available
Residential combustion coal	0.6	Based on Austrian study	0.02	0.03 – 0.2
Residential combustion wood	3	Based on Austrian study	0.05	0.01 – 0.07
Shredder	17,000*	Based on industry data	0.3	0.001 - 50

* not included in mass flow, as no unintentional production

Table 5-7: Overview on PCB releases to waste in EU 25

5.5.3 Releases to Water

The following table gives an overview on releases to water from all source sectors where data have been available. The information in the column database and the dimension of the range of reported emission factors – respectively the absence of alternative data for comparison – give an indication on the uncertainty of the mass flow data.

Sector	Estimated emission of PCBs to Water (g/y)	Data base	Emission factor (mg/t)	Range
Pulp and Paper	0.	Based on reporting to OSPAR (NL)	0.005 µg/t	Not available
Chemical Industry	< 10	Based on data from SE		Not available

Table 5-8: Overview on PCB releases to water in EU 25

5.6 Unintentionally produced HCB

The HCB material flow is characterised by more than 4,000 kg/y releases from unintentional production, mainly to air (> 3,500 kg/y) and to waste (> 500 kg/y), thus are in the same dimension as releases of PCB. As for PCB information on releases to waste and water is incomplete.

The following figure provides an overview source inventory for unintentional HCB emission/ discharge. Investigation is focused on unintentional production processes and does not include releases from stocks of intentionally produced HCBs.

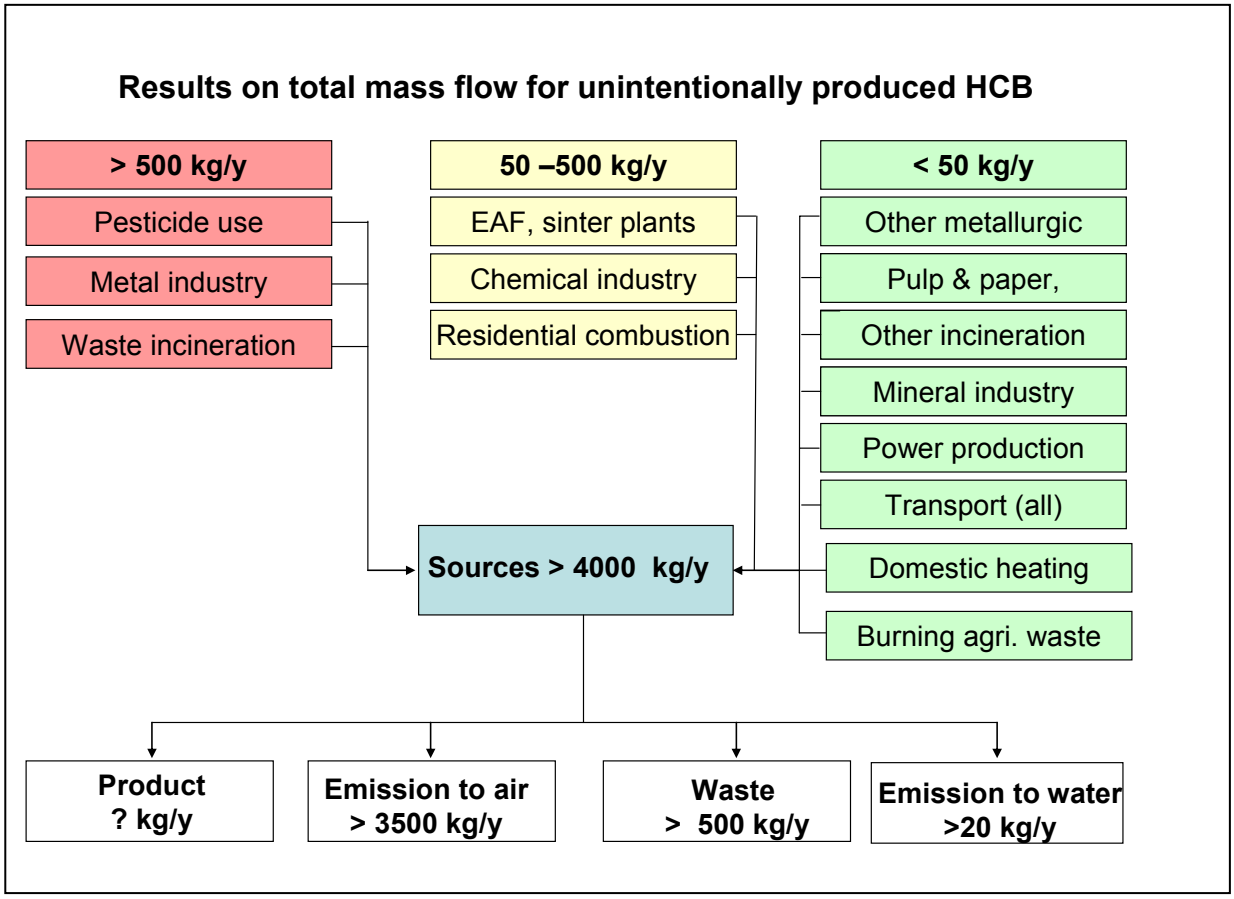


Figure 5-15: Results on total mass flow HCB

Air emissions seem to be dominated by pesticide use and metal industry (predominantly non-ferrous metal production); other sources are chemical industry and residential combustion. Releases to water are due to chemical production but are low in comparison.

According to an EEA report[2] and other documents HCB occurs as impurity in a number of pesticides suchas PCNB, chlorothalonil, picloram, PCP and DCPA.. According to the

[2] http://reports.eea.europea.eu/EMEPCORINAIR4/en/sources_of_HCB.pdf

European Chemical Substances Inforamtion System ECB-ESIS only Chlorothalonil is currently produced in Europe in significant quantities while picloram is a low volume product. PCP is banned in most of the Member States; however exemptions are granted through 2008. Based on these data the cross check for reported release data is based on production figures for chlorothalonil (see Figure 5-17).

5.6.1 Releases to Air

The following table gives an overview on releases to air from all source sectors where data have been available. The information in the column database and the dimension of the range of reported emission factors – respectively the absence of alternative data for comparison – give an indication on the uncertainty of the mass flow data.

Sector	Estimated emission of HCB to Air (kg/y)	Data base	Emission factor (mg/t)	Range
MSWI	50 kg/y	Default EF UNECE Guidebook	1	0.15 – 1
HWI	0.7 kg/y	Industry data	0.15	0.1 – 19
Metal total	2000 kg/y	Based on country reporting to EMEP	9.8	
Sinter	300 kg/y	Based on concentration data from PL, Korea	2.3	0.003 – 10
EAF	150 kg/y	Based on data JP	2	0.7 – 2.3
Iron foundries	0.4 kg/y	Based on concentration data from PL	0.04	
Non-ferrous metal foundries	1600 kg/y	Based on default EF from UNECE Guidebook	500	
Primary copper	15 kg/y	Based on concentration measurements from PL	11	
Secondary copper	20 kg/y	Based on data PL, Japan	20	17 – 39
Secondary aluminium	40 kg/y	Based on data PL, Japan	~20	0.01 – 38
Secondary zinc	10 kg/y	Based on data from PL, JP	~10	0.01 – 36
Magnesium		Based on UNECE default	300	90 – 3000
Lead		Based on data from Italy	0.3	
Brass		Based on data from Italy	15	
Precious metals		Based on data from JP	204	
Cement	2 kg/y	UNECE default factor	0.01	0.01 – 0.2
Lime	0.2 kg/y	Based on data from JP	0.008	
Pulp and Paper	1.2 kg/y	Based on data from JP	0.009	
Chemical Industry	200 kg/y	Extrapolation of UK data		0.07 – 10,000
Power production	20 kg/y	EMEP reporting 6 MS	0.01	
Residential combustion	200 kg/y	EMEP reporting 6 MS	0.5	0.06 – 0.1
Open burning of agricultural waste	10 kg/y	Data based on reporting AT and PL	1	
Road transport	17 kg/y	EMEP reporting FR, AT, PL	0.06	0.0 – 0.3

Table 5-9: Overview on HCB releases to air in EU 25

The following figure presents the relative contribution of different source sectors to the overall emission of HCB to air. The figures are calculated based on available information on emission factors, concentration data or annual emission reporting and represent best estimates. Uncertainty in part can be significant. In addition it has to be stated clearly that – while data for air emission had been available for the majority of sources, data for discharge to waste and water have been available only for a very limited number of source sectors. Results for these sectors consequently may significantly be underestimated.

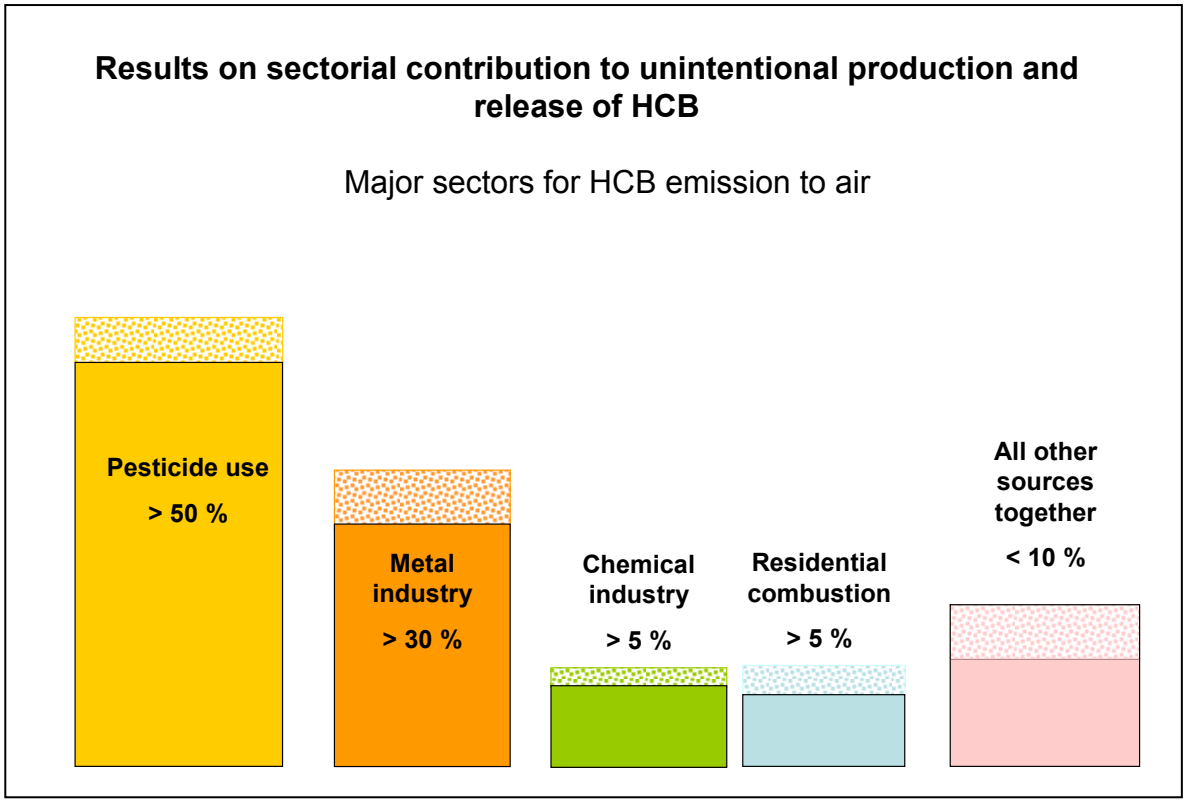


Figure 5-16: Results on sectorial contribution to HCB emissions

Further information on uncertainty of data can be derived from the cross checks for major source sectors performed in the following figures.

Data basis and uncertainty assessment for HCB Emissions to air

Sector/source	Calculation	Cross check
Pesticide use	MS reporting to EMEP 2003 (2 MS); calculation via per capita approach ~ 2000 – 64000 kg/y ➔ Best estimate 2000 kg/y	UNECE Guidebook default EF 500 kg/t HCB Guideline; impurities in current pesticides max. 0.5 kg/t Pesticide use EU 25 300 kt/y; ~1400 kt/y if 1% of pesticides contaminated Production of Chlorothalonil 5-10 kt/y (data IUCLID); maximum impurity content of HCB 0.5 kg/t (draft technical guideline HCB); maximum overall release 5 t/y

Figure 5-17: Calculations and cross checks for pesticide use

Data basis and uncertainty assessment for HCB Emissions to air

Sector/source	Calculation	Cross check
Metal industry	MS reporting to EMEP 2003 (3 MS) calculation via activity data ~2000 kg/y corresponds to EF 10 mg/t ➔ best estimate 1300 kg/y	Default EF in UNECE Guidebook 0.03 mg/t (Sinter) - 5000 mg/t (Secondary Alu); reported recent EFs (PL, IT, JP) 0.04 - 40 mg/t Recent investigations for iron and steel (PL, IT, JP) ~450 kg/y corresponds to EF 2.3 mg/t Recent investigations non ferrous metals (PL, IT, JP) ~150 kg/y corresponds to EF 10 -40 mg/t

Figure 5-18: Calculations and cross checks for metal industry

Data basis and uncertainty assessment for HCB Emissions to air

Sector/source	Calculation	Cross check
Residential combustion	MS reporting to EMEP 2003 (6 MS); calculation via activity data ~ 360 kg/y; corresponding to EF of 0.8 mg/t ➔ best estimate 200 kg/y	UNECE Guidebook default EF 0.01 -0.06 mg/t (without specification of process)
Chemical industry	MS reporting to EMEP 2003 (2 MS) calculation on per capita basis ~200 -2000 kg/y ➔ best estimate 200 kg/y	Default EF in UNECE Guidebook 4000 – 10000 mg/t (Tri- Tetra- and Solvent Production); reported recent EFs JP 0.07 – 1.8 mg/t (Vinylchloride, PCE)

Figure 5-19: Calculations and cross checks for residential combustion and chemical industry

5.6.2 Releases to Waste

The following table gives an overview on releases to waste from all source sectors where data have been available. The information in the column database and the dimension of the range of reported emission factors – respectively the absence of alternative data for comparison – give an indication on the uncertainty of the mass flow data.

Sector	Estimated emission of HCB to Waste (kg/y)	Data base	Emission factor (mg/t)	Range
MSWI	500	Based on concentration data BREF and SE data	0.05	Not available
HWI	7.9	Based on concentration data EURITS	1.6	Not available
Lead		Based on concentration measurements from Italy	0.2	Not available
Magnesium	1.5	Based on BREF data	60-120	Not available

Table 5-10: Overview on HCB releases to waste in EU 25

5.6.3 Releases to Water

The following table gives an overview on releases to water from all source sectors where data have been available. The information in the column database and the dimension of the range of reported emission factors – respectively the absence of alternative data for comparison – give an indication on the uncertainty of the mass flow data.

Sector	Estimated emission	Data base	Emission factor (mg/t)	Range
Magnesium		Based on BREF data	2.4	Not available
Chemical Industry	2	Based on EPER EU 15		Not available

Table 5-11: Overview on HCB releases to water in EU 25

5.7 Unintentionally produced PAH

Releases of PAHs are in another dimension than releases of other POP. Based on available data overall roughly 3000 tons of UNECE PAHs (Sum 4) are emitted unintentionally per year with about 2000 tons being emitted to air and roughly 900 tons being discharged to water.

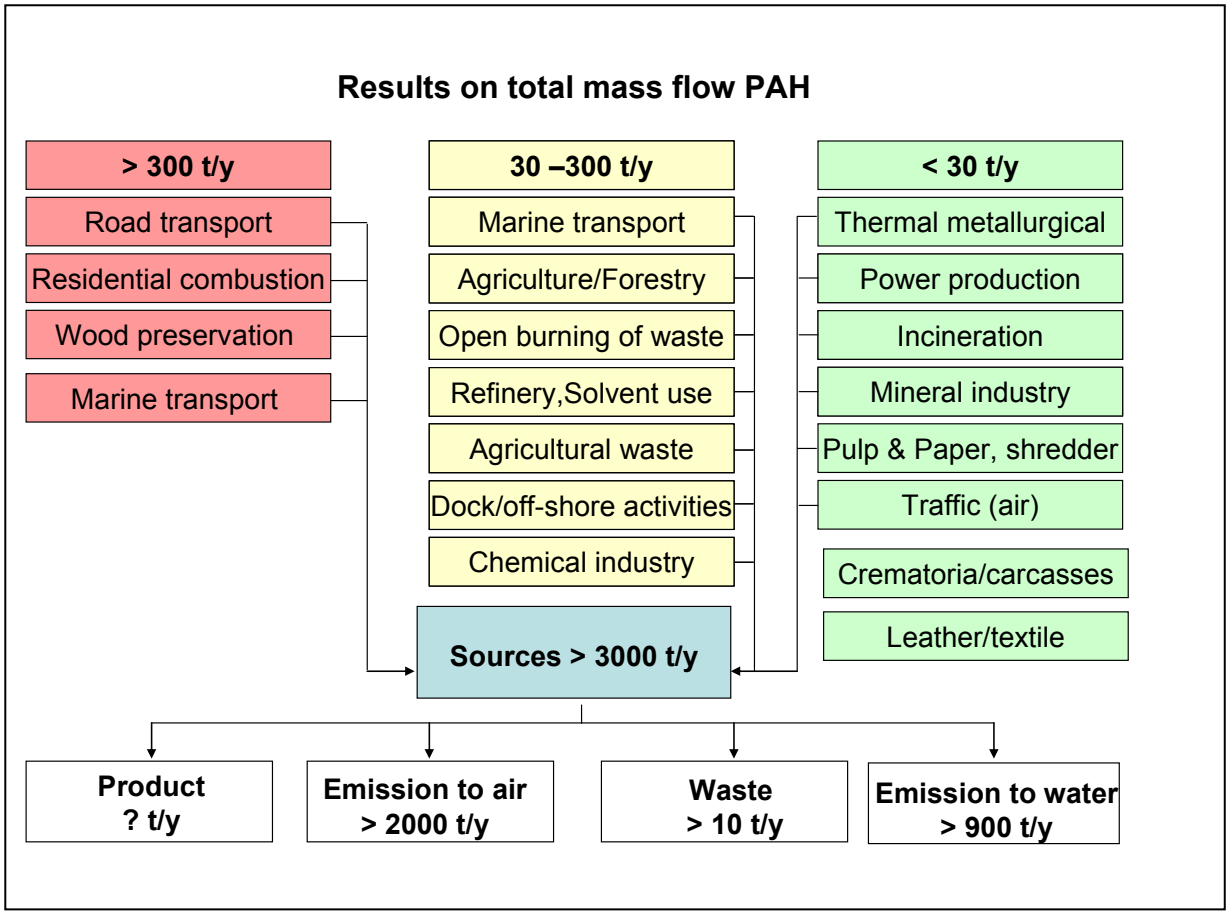


Figure 5-20: Results on total mass flow PAH

Air emissions seem to be dominated by residential combustion, road transport and wood preservation, however all other sources also contribute with almost one third of the total. Except of refinery and anode production industrial sectors are no major sources for PAH releases. Releases to water are related to marine activities mainly.

5.7.1 Releases to Air

The following table gives an overview on releases to air from all source sectors where data have been available. The information in the column database and the dimension of the range of reported emission factors – respectively the absence of alternative data for comparison – give an indication on the uncertainty of the mass flow data.

Sector	Estimated emission of PAHs to Air (t/y)	data base	Emission factor (mg/t)	Range
MSWI	2.5	Based on BREF Waste incineration	60	
HWI	0.3	Based on BREF Waste incineration	60	
Sewage sludge incineration	2	Based on reporting FR (UNEP regional report Mediterranean 2001)	800	130 – 1400
Metal industry	55	Based on EPER reporting	260	
Iron and steel	31	Based on country reporting to EMEP	160	3 – 170
Sinter	15	Based on BREF steel	150	0.2 – 900
EAF	0.2	Based on BREF steel	3	3 – 110
Iron foundries	0.04	Based on draft NIP CZ	3.4	
Coke production	6.7	Based on BREF steel	170	50 – 500
Non-ferrous metals	0.45	Based on country reporting EMEP		
Non-ferrous metal foundries	0.007	Based on BREF	2.3	1.5 – 3
Primary aluminium	2.3	Based on UNECE Guidebook	1000	30 – 9000
Secondary aluminium	0.4	Based on UNECE Guidebook and recent data IT	190	
Lead	0.005	Based on UNECE Guidebook and recent data IT	6	
Brass		Based on UNECE Guidebook and recent data IT	8	
Anode production	180	Based on EPER reporting		3 – 500
Cement/Lime	10	Based on EPER reporting		
Pulp and Paper	6	Based on EPER reporting 2001		
Chemical Industry	35	Based on EPER reporting 2001		19 – 33
Solvent use	100	Based on EPER reporting 2001		
Petrol refining	100	Based on country reporting to EMEP		
Power production	30	Based on country reporting to EMEP		0.1 – 700
Power production biomass	7	Based on EF UNECE Guidebook	1300	2 – 1200
Residential combustion	670	Based on country reporting to EMEP and OSPAR		200 – 8000
Road transport	~500	Based on country reporting to EMEP; UNECE Guidebook		6000 – 7000
Marine transport	~ 50	Based on country reporting to EMEP		0.004 – 2
Air transport	5	Based on country reporting to EMEP		850
Wood preservation	300	Based on country reporting OSPAR;		
Asphalt roofing	0.05	Based on EMEP reporting FR/UK		
Agriculture/Forestry	70	Based on MS reporting to EMEP		

Sector	Estimated emission of PAHs to Air (t/y)	data base	Emission factor (mg/t)	Range
Open burning agricultural waste	50	Based on EF from USA		200 – 14,000
Shredder	0.007	Based on IT data	0.45	

Table 5-12: Overview on PAH releases to air in EU 25

The following figure presents the relative contribution of different source sectors to the overall emission of PAH to air. The figures are calculated based on available information on emission factors, concentration data or annual emission reporting and represent best estimates. Uncertainty in part can be significant. In addition it has to be stated clearly that – while data for air emission had been available for the majority of sources, data for discharge to waste and water have been available only for a very limited number of source sectors. Results for these sectors consequently may significantly be underestimated.

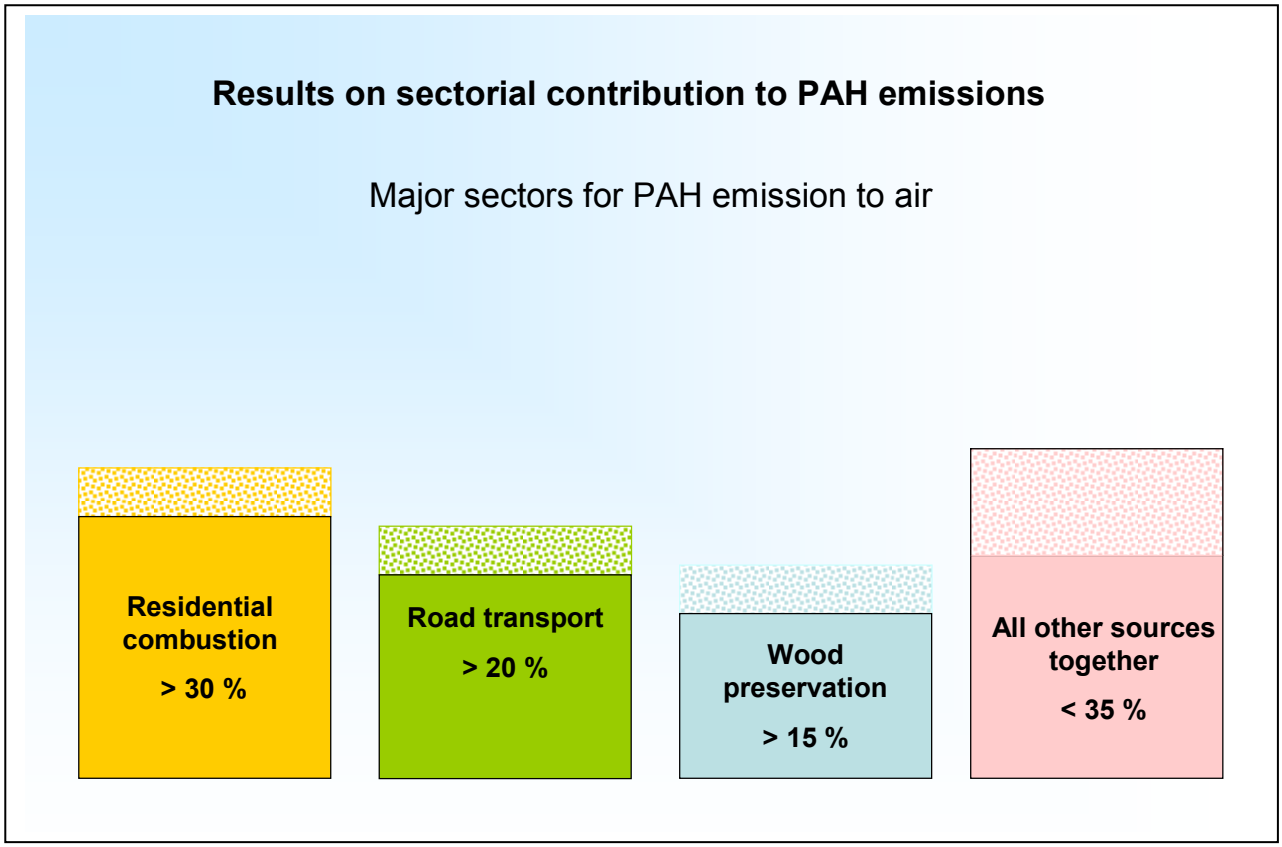


Figure 5-21: Results on sectorial contribution to PAH emissions

Further information on uncertainty of data can be derived from the cross checks for major source sectors performed in the following figures.

Data basis and uncertainty assessment for PAH Emissions to air

Sector/source	Calculation	Cross check
Road transport	MS reporting to EMEP 2003 (11 MS); calculation via per capita approach ~ 900 t/y ➔ best estimate 500 t/y	UNECE Guidebook EF /km ~ 500 (100-960) t/y TNO emission projections 2010 ~200 t/y
Residential combustion	MS reporting to EMEP 2003 (17 MS) calculation with per capita approach ~700 kg/y ➔ best estimate 600 t/y	TNO emission projections 2010 small combustion sources ~650 t/y UNECE Guidebook EF ~500 t/y Country reporting to OSPAR

Figure 5-22: Calculations and cross checks for road transport and residential combustion

5.7.2 Releases to Waste

The following table gives an overview on releases to waste from all source sectors where data have been available. The information in the column database and the dimension of the range of reported emission factors – respectively the absence of alternative data for comparison – give an indication on the uncertainty of the mass flow data.

Sector	Estimated emission of PAHs to Waste (t/y)	data base	Emission factor (mg/t)	Range
MSWI	4.4	Based on BREF	100	10 - 1000
EAF	2.9	Based on data IT	42	15 - 70
Iron foundries	0.2		21	
Primary aluminium	0.24	Based on BREF		
Secondary aluminium	0.4	Based on UNECE and recent data IT	191	14 - 370
Lead	0.02	Based on UNECE and recent data IT	22	
Brass		Based on UNECE and recent data IT	300	0 - 716

Table 5-13: Overview on PAH releases to waste in EU 25

5.7.3 Releases to Water

The following table gives an overview on releases to water from all source sectors where data have been available. The information in the column database and the dimension of the range of reported emission factors – respectively the absence of alternative data for comparison – give an indication on the uncertainty of the mass flow data.

Sector	Estimated emission of PAHs to Water (t/y)	Data base	Emission factor (mg/t)	Range
Dredging	~150	Based on country reporting to OSPAR		Not available
Dock works	~100	Based on country reporting to OSPAR		Not available
Off-shore activities	~150	Based on country reporting to OSPAR		Not available
Marine transport	~500	Based on UNEP Mediterranean Regional report		Not available
EAF	0.14	Based on BREF	2	1 - 3
Coke production	0.02	Based on EPER		
Non-ferrous metal foundries	1.3	Based on BREF	390	50 - 1000
Primary aluminium	2	BREF (average for Söderberg & prebaked processes)	10-10000	Not available
Chemical Industry	2	Based on EPER reporting 2001		Not available

Table 5-14: Overview on PAH releases to water in EU 25

The following figure presents the relative contribution of different source sectors to the overall discharge of PAH to water. The figures are calculated based on available information on emission factors, concentration data or annual emission reporting and represent best estimates. Uncertainty in part can be significant.

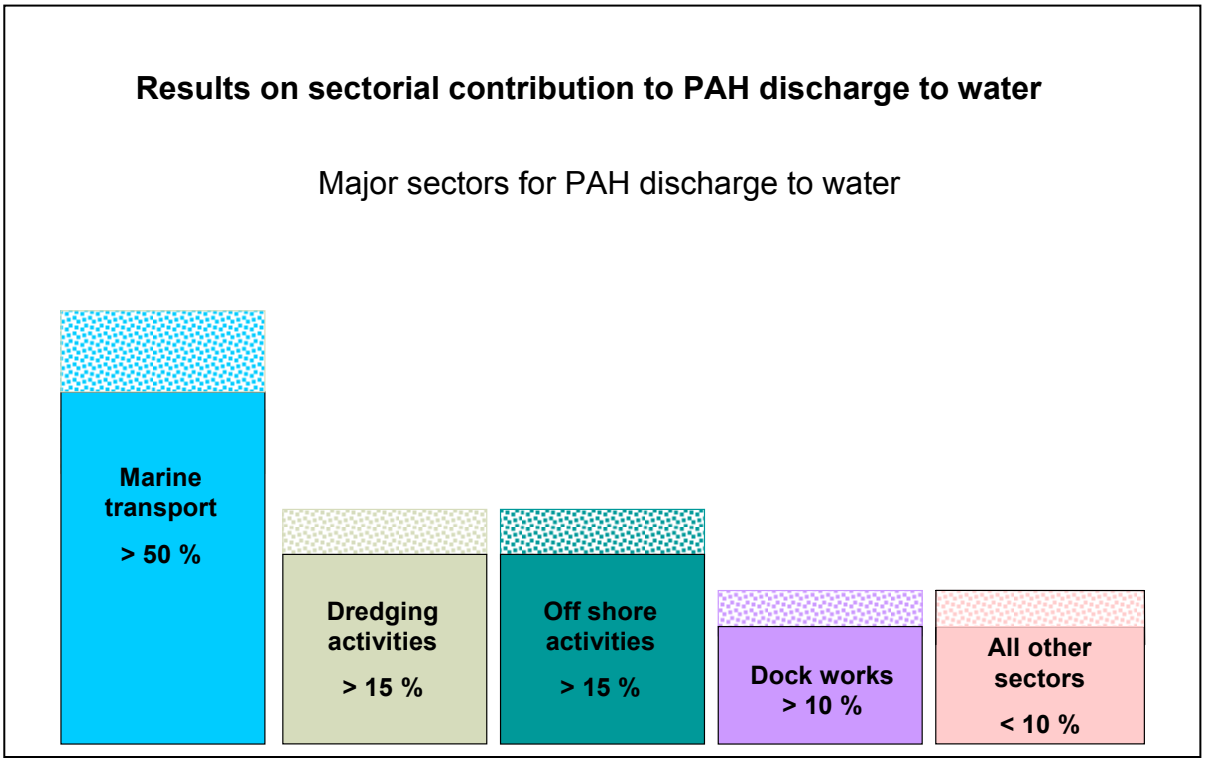


Figure 5-23: Results on sectorial contribution to PAH discharge to water

The following figures illustrate the calculation process and include a first evaluation of uncertainty.

Data basis and uncertainty assessment for PAH discharge to water

Sector/source	Calculation	Cross check
Marine transport	Reporting in UNEP Mediterranean regional report; Sum 500 t/y shipping discharge for mediterranean region ➔best estimate >500 t/y for European Union	No cross checks available
Dredging	MS reporting to OSPAR (4 MS); Sum 20-50 t/y ➔ best estimate >150 t/y	No cross checks available

Figure 5-24: Calculations and cross checks for marine transport and dredging

Data basis and uncertainty assessment for PAH discharge to water

Sector/source	Calculation	Cross check
Off-shore activities	MS reporting to OSPAR 1998 (1MS) 70 t/y ➔ best estimate >150 t/y	No cross checks available
Dock works	MS reporting to OSPAR 1993 (1MS) 25 t/y ➔ best estimate >100 t/y	No cross checks available

Figure 5-25: Calculations and cross checks for off-shore activities and dock works

Data basis and uncertainty assessment for PAH discharge to water

Sector/source	Calculation	Cross check
Leather and Textile processing	EPER reporting 2001 (11 MS); 13 t/y ➔ best estimate >15 t/y	No cross checks available
Metal industry	MS reporting to OSPAR 1993 (1 MS) 10 t/y ➔ best estimate >10 t/y	No cross checks available

Figure 5-26: Calculations and cross checks for leather and textile processing and metal industry

6 Inventory of provisions and measures

This chapter provides information on the results of the investigation for measures already installed or planned in the scope of the European Union to address POP releases or deficits in knowledge. Background information on the methodology used for the inventory is compiled in chapter 3.

An investigation for measures has been performed in the categories

- Category 1: Existing legislation
- Category 2: Review of legislation
- Category 3: Planned new legislation
- Category 4: Implementation and enforcement of existing legislation (administrative, technical)
- Category 5: New approaches (economic incentives, eco-labelling, taxes, subsidies, etc)
- Category 6: Funding
- Category 7: Communication/Education
- Category 8: Monitoring/Inventory
- Category 9: Research activities

and has been listed separately for European Union, HELCOM, OSPARCOM, Member States and Stakeholders.

The inventory is based on Member State answers to the questionnaire, evaluation of available NIPs and draft NIPs, literature search and an investigation of European legislation. A large number of measures – directly or indirectly addressing POPs – has been identified, that has been established, has been proposed or is planned at international, Community or Member State level.

6.1 Overview on identified measures (European Union, Member States, Marine Conventions)

Overview matrices provide a condensed compilation of measures identified for the above mentioned categories and provide information on the number of countries that have implemented or planned the same or a corresponding approach.

After evaluation of the collected information the following conclusions can be drawn:

6.1.1 Legislation

At Community level a number of legal instruments has been established for general release reduction or specific reduction of POP releases.

A major instrument for release control from industrial sources including provisions for POPs has been established with the IPPC Directive (1.1) and related legislation (EPER Decision, E-PRTR), which contain effective provisions both for release reduction (via obligation to apply BAT) and improved knowledge (via obligation to report on releases).

Although not directly addressing POPs, the LCP directive 2001/80/EC (1.2) and the Directive 84/360/EEC (1.3) contribute to general release control as they require permitting and enhance technical progress by setting air emission limit values for SO_2, NOx, dust or PM, heavy metals VOC, asbestos, chlorine and fluorine.

A legal instrument specifically addressing POP emissions to air is formed by the Waste Incineration Directive 2000/76/EC (1.6) setting strict limit values for PCDD/PCDF emissions including obligation to monitor in flue gas and waste water for *waste incineration* and co-incineration facilities.
With directive 96/62/EC (1.4) and its 4th daughter directive (2004/107/EC) the European Commission has established the framework for ambient air protection which – although not directly addressing emissions can lead to POP release reduction. Directive 2004/107/EC has set a target value in ambient air for benzo[a]pyrene as a marker for PAH as the first POP directly addressed.

A side effect on POP might also be expected from the Emission Ceiling Directive (2001/81/EC) (1.5) setting provisions for national total CO_2 emissions.

Some side effect on POP releases from residential sources could be expected for the Energy Efficiency Directive 2002/91/EC which contains provisions for energy performance and inspections of small combustion installation.

Regarding releases to water, Directive 76/464/EEC had established the framework emission limit values and environmental quality standards for certain categories of dangerous substances, including dioxins and PCB. The Water Framework Directive 2000/60/EC integrated the provisions under 76/464/EEC and aims at a progressive reduction or cessation of discharges of pollutants to water. HCB and PAH are included in the list of priority substances (Decision 2455/2001/EC) to be subject to monitoring.

In the framework of chemicals management PCB Directive 96/59/EC (1.9), Directive 76/769/EEC (1.8) and Directive 98/70/EC (1.10) are examples for legal instruments limiting the production and use of POP substances or substances that release POPs and thus contributing to release reduction. These measures however do not address unintentional production of POPs.

With respect to releases from waste not directed to incineration, Directive 75/442/EEC and the Landfill directive (1999/31/EC) with all related legislation as well as the EU POP regulation constitute a effective framework for release reduction. Specific instruments concerning POP releases from waste recovery has been set with the ELV and WEEE directives.

On the Member State level the list of legislation addressing POP releases is completed by instruments addressing crematoria, residential combustion, traffic and releases to water.

6.1.2 Review of legislation

With respect to review of existing legislation a number of proposals have been made at European level. Most of these proposal address releases to air. Namely in the framework of the "Thematic Strategy on Air pollution" (2005) involving the CAFE (Clean Air For Europe) programme proposals for measures have been developed. Proposals are designed to better address releases from small industrial sources, residential combustion and traffic, which have been identified important source for releases and are less well addressed by current legislation

At Member States level reported planning with respect to review of existing legislation focuses on PRTR, technical rules for releases to waste water, and reporting from industry to authorities.

6.1.3 Planned new legislation

With respect to new legislation proposals at European level focus on introduction of standards for small combustion sources, limits for transport emissions and bans of certain fuels in specific areas. Proposals from Member States address provisions for POPs in ambient air or the aquatic environment as well as binding technical requirements for residential combustion.

6.1.4 Implementation and enforcement

With respect to implementation and enforcement of existing legislation the European Commission has established a number of instruments ranging from infringement procedures and funding to provision of guidance and support of knowledge exchange.

At MS level a large number of measures has been reported. The focus of measures is laid on institutional strengthening, capacity building, training, effective permitting and control, improved coordination within national administration, development of technical standards and the adaptation to technical standards and European legislation.

6.1.5 New approaches

In the category "*New approaches*", only a small number of measures has been reported. The proposals focus on residential combustion and include negotiated agreements with manufacturers as well as tax discount, subsidies, public modernisation programmes and support for technical development.

6.1.6 Communication and education

In the field of communication a large number of established measures and proposals have been provided. Measures in this field focus on coordination, knowledge exchange and awareness raising and range from general approaches like “Communication to General Public” to highly targeted initiatives such as a campaigns on “the proper burning of household waste”. A significant number of MS uses the web as information platform on POPs.

6.1.7 Funding

At EU level a large number of projects addressing legal framework, administrative and technical capacity building, adaptation to technical standards, installation of infrastructure, remediation of hot spots and monitoring have been and are supported via e.g. PHARE and LIFE programs which directly or indirectly address POPs. At Member State no information on funding activities has been reported.

6.1.8 Research

As regards research a large number of activities has been initiated at European level in the past years to improve knowledge and reduce releases. It is not in the scope of this report to lists all studies performed. Thus the list of measures focuses on planned priority activities. At European level the focus is currently put on risk assessment of non-dioxin-like PCB in the framework of food and feed monitoring.

Reported activities at Member State level focus on detoxification, alternative process technology and verification of emission estimates to control necessity of measures in specific sectors (e.g. importance of residential combustion sector).

6.1.9 Monitoring and inventory

With respect to inventory of POP releases a number of provisions regarding all environmental compartments have been established in European legislation. In addition a number of monitoring programmes addressing POPs are coordinated throughout Europe.

At Member State level the focus of planned activities is on expansion and verification of emission inventories and monitoring programmes with emphasis on less investigated sources and compartments as well as on emission factors. With over 20 monitoring measures reported, this category contains the largest group of reported measures.

To conclude it can be stated that the focus of identified measures to address POP is on improvement of knowledge and coordination while the legal framework is considered basically sufficient to address the issue.

The following tables provide a compilation of all the measures that have been identified.

	Measures overview	EU	HE	OS	AT	BE	CY	CZ	DE	DK	EE	ES	FI	FR	GR	HU	IE	IT	LT	LU	LV	MT	NL	PL	PT	SE	SI	SK	UK
1	**Existing legislation**																												
	EU level																												
1.1	*IPPC Directive 96/61/EC* - Permitting according to BAT	1			*	*	*	*	*	*	*	1	*	*	*	*	*	*	*	*	1	*	*	*	*	*	*	1	*
1.2	*LCP Directive 2001/80/EC* - Emission Limit Values (ELV)	1			*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
1.3	*Directive 84/360/EC* - Permit requirements / ELV	1			*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
1.4	*Ambient Air Quality Directive 96/62/EC and 4th Daughter Directive 2004/107/EC* - Target values for benzo(a)pyrene as a marker for PAH emissions into Air	1			*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
1.5	*Emission Ceiling Directive 2001/81/EC* Limit values for annual totals for NO_x, SO_2, NH_3, VOC	1			*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*

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1.6	*Waste Incineration Directive 2000/76/EC* - Permit requirements / ELV for waste incineration and co-incineration plants	1			*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
1.7	*Water Framework Directive 2000/60/EC* - ELV and environmental quality standards in water policy	1			*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
1.8	*Restrictions in Use Directive 76/769/EEC* - Restriction on PAH content in extender oil and tyres - Market restrictions on creosote as creosote treated timber - Market restriction on PCP	1			*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
1.9	*PCB Directive 96/ 95/EC* limit value and provisions for environmental sound disposal	1			*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*

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1.10	*Directive 98/70/EC* - Restriction on the PAH content in Diesel fuel	1			*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
1.11	*POP Regulation (EC) No 850/2004* - Obligation for release inventories - Limit values for POP content in waste - Specific requirements for disposal/recovery of POP waste																												
1.12	*ELV Directive 2000/53EC* - Obligation to remove PCB containing capacitors/transformer	1			*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
1.13	*WEEE Directive 2002/96/EC* - Obligation to remove PCB containing capacitors	1			*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*

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1.14	*Energy Efficiency Directive 2002/91/EC* - Minimum standards for energy performance applying to new buildings and to major refurbishments of existing large buildings	1			*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
1.15	*Energy Efficiency Directive 2002/91/EC* - Boilers above minimum sizes have to be inspected regularly to verify CO_2 emissions	1			*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
1.16	*Ecodesign Directive 2005/32/EC* - Requires producers to design products to meet specific eco-design criteria over entire life cycle for certain specific products	1			*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*

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1.17	*79/117/EEC* Ban on use or placing on the market of plant protection products	1			*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
1.18	*91/414/EEC* Establishment of a positive list of plant protection substances (2005/53/EC amendment concerning Chlorothalonil)	1			*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
1.19	*396/2005/EC* Maximum levels for pesticide residues in and on foodstuffs	1			*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
1.20	*1998/8/EC* Biocide Directive (Chlorothalonil under evaluation)	1			*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
	MS level																												
1.21	ELV for cremation plants				nym	1	nym	nym	1	nym		nym	nym				nym				nym			nym		nym	nym		

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1.22	Ban on certain chlorinated/brominated compounds as fuel additives				nym	nym	nym	nym	1	nym		nym	nym				nym				nym			nym		nym	nym		
1.23	Requirements for the fuel quality for small combustion plants				nym	nym	nym	nym	1	1		nym	nym				nym				nym			nym		nym	nym		
1.24	Special requirements for the permitting of discharge to waste water, e.g. ELV for PCDD/F / PCB				nym	nym	nym	nym	1	nym		nym	nym				nym				nym			nym		1	nym		
1.25	Ban on private burning of waste				1	nym	nym	nym	1	1		nym	nym				nym				nym			nym		nym	nym		
1.26	Requirements for fuel gas purification for mercury				nym	nym	nym	nym	nym	1		nym	nym				nym				nym			nym		nym	nym		
2	**Planned review of legislation**																												
	EU level																												
2.1	*Thematic Strategy on Air pollution* - Proposition of revised emission ceilings in the Directive 2001/81/EC	1																											
2.2	*Thematic Strategy on Air pollution* - Streamlining of	1																											

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	current legislation on air quality																												
2.3	*Thematic Strategy on Air pollution* - Expansion of the IPPC directive to cover sources < 50 MWth	1																											
2.4	*Thematic Strategy on Air pollution* - Inclusion of smaller residential and commercial buildings into an extended Energy Efficiency Directive	1																											
2.5	*Thematic Strategy on Air pollution* Common system of graded user charges for heavy vehicles similar to the Eurovignette as established by 99762/EC	1																											
2.6	*Thematic Strategy on Waste* - Simplification and modernisation of	1																											

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	existing legislation in the field of waste policy																												
	MS level																												
2.7	Updating of the PRTR legislation					nym	nym	1	nym	1		nym	nym				nym				nym			nym		nym		nym	
2.8	Updating of technical rules for discharge of waste water					1	nym	nym	1	nym		nym	nym				nym				nym			nym		nym		nym	
2.9	Modification of the current procedures of environmental impacts reporting from polluters					nym	nym	nym	nym	1		nym	nym				nym				nym			nym		1		1	
2.10	Review of Air Protection Law					nym	nym	nym	nym	1	1	nym	nym								nym			nym		1		nym	
3	**Planned new legislation**																												
	EU level																												
3.1	*Thematic Strategy on Air pollution* - European Harmonised Standards for Small combustion appliances and their fuels	1																											

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3.2	*Thematic Strategy on Air pollution* - Proposition to tighten current NOx emission standards from ships	1																											
3.3	*Thematic Strategy on Air pollution* - Proposition to tighten further the emissions from heavy duty vehicles	1																											
	HELCOM / OSPARCOM Proposals																												
3.4	Introduction of Smoke Control Zones where only smokeless fuels and smoke free appliances can be used			1																									
	MS level																												
3.5	Emission standards for thermal sources					nym	nym	nym	nym	1		nym	nym				nym				nym			1		nym		nym	
3.6	Target values for dioxin deposition					1	nym	nym	nym	nym		nym	nym				nym				nym			nym		nym		nym	
3.7	Annual PCDD/PCDF emission ceiling					nym	nym	nym	nym	nym		nym	nym				nym				1			nym		nym		nym	

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3.8	Proposition for a new Government Decree on harmful and hazardous substances in the aquatic environment					nym	nym	nym	nym	nym		nym	1				nym				nym			nym		nym		nym	
3.9	Proposition of mandatory particle filters for wood-burning stoves and fireplaces					nym	nym	nym	nym	1		nym	nym				nym				nym			nym		nym		nym	
3.10	New regulations to deal with unauthorised burning					nym	nym	nym	nym	nym		nym	nym				1				nym			nym		nym		nym	
4	**Implementation and enforcement of existing legislation**																												
	EU level																												
4.1	Infringement procedure to enforce implementation of EU environmental legislation	1																											
4.2	*5th Survey on the implementation and enforcement of Community environmental law* - Composition of	1																											

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	Guidelines and interpretive texts																												
4.3	*5th Survey on the implementation and enforcement of Community environmental law* - Multilateral discussions in technical committees, contributions to expert seminars and bilateral contacts between the Commission and the Member States	1																											
4.4	*5th Survey on the implementation and enforcement of Community environmental law* - Conformity check for the ten new Member States	1																											

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4.5	*5th Survey on the implementation and enforcement of Community environmental law* - Encouragement of information exchange between implementing authorities	1																											
4.6	*5th Survey on the implementation and enforcement of Community environmental law* - Funding of programmes / projects only if compliant with Community policies and instruments	1																											
	HELCOM / OSPARCOM Proposals																												
4.7	Capacity Building in the field of PCB		1																										
4.8	Promotion of environmentally sound practices for small combustion appliances		1																										

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4.9	Introduction of mandatory annual internal inspections and regular instructions on the proper use of technical equipment for enterprises regarding combustion appliances		1																										
	MS level																												
4.10	Improvement of coordination within national administration				1	1	nym	1	nym	1		nym	nym					nym			nym			nym		1		nym	
4.11	Enforcement of BAT & BEP for new sources and gradual implementation of BAT & BEP in existing sources				*	1	*	*	*	*	*	1	*	*	*	*	*	*	*	*	1	*	*	*	*	*	*	1	*
4.12	Assessment of the efficiency of the national legal system					nym	nym	nym	nym	1		nym	nym					nym			nym			1				nym	1
4.13	Reduction of the danger of landfill fires by ensuring compliance with legal requirements					1	nym	nym	nym	1		nym	nym					nym			1			nym		1		nym	
4.14	Development of a POPs emissions					nym	nym	nym	nym	nym		nym	nym					nym			1			nym		1		nym	

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	management handbook (BAT)																												
4.15	Introduction of BAT at POPs stationary emission sources					1	nym	nym	nym	nym		nym	nym					nym			1			nym		1		nym	
4.16	Implementation of the Stockholm Convention / POP Protocol requirements into national legislation					1	nym	1	nym	1		nym	nym					nym			nym			1		1		1	
4.17	Construction of a central high standard incineration plant and of landfills according to 1999/31/EC in order to reduce emissions from uncontrolled combustion					1	1	nym	nym	1		nym	nym					nym			nym			nym		1		nym	
4.18	Application of BAT in the context of permitting and enforcement for the energy sector					1	nym	nym	nym	1		nym	1					nym			nym			nym		1		nym	
4.19	Proposition of technical standards for small scale burning					1	nym	nym	nym	1		nym	1					nym			nym			nym		1		nym	

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4.20	Introduction of enforcement instruments such as dioxin monitoring at incineration and co-incineration facilities					1	nym	nym	nym	1		nym	nym					nym			1			nym		1		nym	
4.21	Improvement of expertise of environmental inspectors and permit authorities by training and guidelines					nym	nym	nym	nym	nym		nym	nym					nym			1			1		1		1	
4.22	Improvement of current reportings from industry					1				1								nym								1			1
5	**New approaches**																												
	EU level																												
5.1	*Thematic Strategy on Air pollution* - Introduction of voluntary standards for solid fuel residential appliances (CEN level)	1																											
	HELCOM / OSPARCOM Proposals																												
5.2	Negotiated agreements with			1																									

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	manufacturers / importers																												
5.3	Promotion of the development and use of substitute products and processes to prevent formation and release of dioxins			1																									
5.4	Subsidies on certified stoves			1																									
	MS level																												
5.5	Local programs to modernize residential combustion					nym	nym	nym	nym	nym		1	nym				nym				nym			nym		1		nym	
5.6	Tax discount to installations that apply BAT					nym	nym	nym	nym	nym	nym	1	nym				nym				nym			nym				nym	
5.7	National voluntary agreement with the solid fuel trade sector focussing on reducing air pollution emissions from the burning of domestic solid fuels					nym	nym	nym	nym	nym	nym	nym	nym				1				nym			nym				nym	
6	**Communication / Education**																												
	EU level																												

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6.1	*POP Regulation (EC) No 850/2004* Communication of Action Plans on measures to minimise total releases of PCDD/F, PCB and PAH	1																											
6.2	*IPPC Directive* - Promotion of the use of BAT and technology transfer as well as the general information exchange between MS	1																											
6.3	*IPPC Directive* - Encouragement of information exchange on PCDD/PCDF prevention and abatement techniques	1																											
6.4	Communication towards general public on POPs and activities towards POPs, e.g. via press releases / leaflets / brochures/ internet	1																											
	HELCOM / OSPARCOM Proposals																												

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6.5	User guidelines for sound domestic burning of coal, peat and wood		1																										
6.6	Public information campaigns on domestic combustion of coal, peat and wood (including purchase, operation, preparation and storage of fuel)			1																									
6.7	Awareness raising of suppliers on environmentally sound practices for combustion appliances < 50 kW; Promotion of BEP			1																									
6.8	Awareness raising regarding the importance of environmentally friendly practices in residential and small industrial furnaces			1																									
	MS level																												

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	Measures overview	EU	HE	OS	AT	BE	CY	CZ	DE	DK	EE	ES	FI	FR	GR	HU	IE	IT	LT	LU	LV	MT	NL	PL	PT	SE	SI	SK	UK
6.9	Communication towards general public on POPs and activities towards POPs, e.g. via press releases / leaflets / brochures/internet					nym	1	1	1	1		nym	nym				nym				1			1		1		nym	
6.10	Collection and regular update of all public available data and presentation on a central web portal					nym	1	nym	nym	nym		nym	nym				nym				1			nym		nym		nym	
6.11	Online PCDD/PCDF data base containing country wide data for environmental compartments as well as for food, feed and human data					nym	nym	nym	1	nym		nym	nym				nym				nym			nym		nym		nym	
6.12	Communication towards concerned industry (management, employees)					nym	nym	1	nym	nym		nym	nym				nym				1			nym		1		1	
6.13	Establishment of a central institution for the coordination of POPs related information					1	nym	1	nym	nym		nym	nym				nym				1			nym		nym		1	

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6.14	Identification of stakeholders and development of information exchange					nym	nym	1	nym	nym		nym	nym				nym				1			nym		1		nym	
6.15	Communication on PCB towards affected groups					1	nym	nym	nym	nym		nym	nym				nym				1			nym		1		1	
6.16	Development of an inventory on treatment methods for fly ash from incinerators and metallurgic processes					nym	nym	1	nym	nym		nym	nym				nym				nym			nym		nym		nym	
6.17	Awareness raising in residential and agricultural sector (proper burning of household waste/agricultural waste)					1	nym	nym	nym	1		nym	nym				nym				1			1		nym		nym	
6.18	Awareness raising / guidelines for environmentally sound practices for small combustion appliances					1	nym	nym	nym	1		nym	nym				nym				nym			nym		1		nym	
6.19	Inclusion of information on POPs in the curriculum of general education schools					nym	nym	nym	nym	1		nym	nym				nym				1			nym		nym		1	

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6.20	Training of municipal employees on polluted site management					nym	nym	nym	nym	nym		nym	nym				nym				1			nym		1		nym	
6.21	Encouragement of university courses on environmental studies including information on POPs					nym	nym	nym	nym	nym		nym	nym				nym				1			nym		nym		nym	
6.22	Ensurance of a constant information exchange with the Convention Secretariat and the EC Coordinating Centre					nym	nym	nym	nym	1		nym	nym				nym				1			nym		1		nym	
6.23	Promotion of the acquisition and use of the POPs monitoring experience from other countries					nym	nym	nym	nym	nym		nym	nym				nym				1			nym		1		nym	
6.24	Coordination of cooperation between concerned industry and universities					nym	nym	nym	nym	nym		nym	nym				nym				nym			1		nym		nym	
6.25	Improved inter-administrative coordination of POP related activities					1	nym	nym	nym	nym		nym	nym				nym				nym			nym		nym		nym	
7	**Funding**																												

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	Measures overview	EU	HE	OS	AT	BE	CY	CZ	DE	DK	EE	ES	FI	FR	GR	HU	IE	IT	LT	LU	LV	MT	NL	PL	PT	SE	SI	SK	UK
	EU level																												
7.1	Funding Programs at EC level (e.g. LIFE, PHARE)	1																											
8	**Research activities**																												
	EU level																												
8.1	*Community Strategy for Dioxins, Furans and PCB* Risk assessment of non-dioxin-like PCBs in the framework of food/feed monitoring	1																											
	MS level																												
8.2	Research programs focussed on efficient detoxification of contaminated fly ash					nym	nym	1	nym	nym		nym	nym				nym				nym			nym		nym		nym	
8.3	Research Programs on methods and technologies on POP´s origination and neutralisation					nym	nym	nym	nym	nym		nym	nym				nym				nym			1		nym		nym	
8.4	Promotion of research on alternative production technologies for products currently					nym	nym	nym	nym	nym		nym	nym				nym				nym			nym		nym		1	

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	produced with chlorine based technologies																												
8.5	Research on emissions from wood burning stoves					nym	nym	nym	nym	1		nym	nym				nym				nym			nym		nym		nym	
8.6	Research on the sources of dioxin in organic farming					nym	nym	nym	nym	1		nym	nym				nym				nym			nym		nym		nym	
9	**Monitoring / Inventory**																												
	EU level																												
9.1	*POP Regulation (EC) No 850/2004* Emission inventories (PCDD/F, PCB and PAH)	1			*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
9.2	*PRTR Regulation (EC) No 166/2006* - Pollutant Release and Transfer Register (PCDD/PCDF, PCB, HCB, PAH to air, water, land if thresholds are exceeded	1			*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*

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9.3	*IPPC Directive* - Monitoring of emissions to air (PCDD/PCDF) and water (PCDD/PCDF, PAH, HCB) above thresholds for large industrial source will be replaced by PRTR requirements	1			*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
9.4	*Water Framework Directive 2000/60/EC* Monitoring of priority substances (HCB, PAH)	1			*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
9.5	*Community Strategy for Dioxins, Furans and PCB* Reduction of knowledge gaps in the field of sources of Dioxins and PCB	1																											
	HELCOM / OSPARCOM Proposals																												
9.6	Monitoring obligations for PCDD/F, PCB and PAH emissions to water (plus HCB under HELCOM)		1	1																									

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	MS level																												
9.7	Evaluation of POPs				1	nym	nym	nym	1	1		1	1		nym		nym				nym			nym				nym	1
9.8	Expansion of emission inventories (by sources and pathways)					1	nym	1	1	1		nym	nym		1		nym				1			1		1		nym	
9.9	Updating of National Emission Factors					1	nym	nym	nym	nym		nym	nym		nym		nym				nym			nym		1		nym	1
9.10	Evaluation of the necessity to perform dioxin and PCB analyses in soil treated with sewage sludge					nym	nym	nym	nym	nym		nym	nym		nym		nym				1			nym				nym	
9.11	Participation in LRTAP-Monitoring on POP (deposition in Alpine ecosystems)					nym	nym	nym	1	nym		nym			nym		nym				nym			nym				nym	
9.12	Evaluation of LRTAP pollution by installation of monitoring network in background areas (EIONET)					nym	nym	nym	1	nym		nym	nym		nym		nym				nym			nym		1		nym	
9.13	Monitoring on human exposure to POPs (Participation in WHO milk study)					nym	nym	nym	1	nym		nym	nym		nym		nym				1			nym		1	1	nym	1
9.14	Enforcement of monitoring programs, e.g. in river basins and					1	nym	1	1	1		nym	nym		1		nym				1			1		1		1	

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	the marine environment																												
9.15	Validation studies on emissions from domestic burning of coal, wood and biomass and co-combustion of common household waste					1	nym	nym	nym	1		nym	nym		nym		1				nym			1		1		nym	
9.16	Integration of PCB analysis into the drinking water monitoring program					nym	nym	nym	nym	nym		nym	nym		nym		nym				1			nym		nym		nym	
9.17	Study on PCP treated wood					nym	nym	nym	nym	nym		nym	nym		nym		nym				nym			nym		1		nym	
9.18	Setting up a framework for monitoring and mitigation of total releases of chlorine or other halogens containing pollution					nym	nym	nym	nym	nym		nym	nym		nym		nym				nym			nym		nym		1	
9.19	Establishment of an effective system for monitoring and handling of the POP-containing hazardous					nym	nym	nym	nym	nym		nym	nym		nym		nym				nym			nym		nym		1	

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	wastes including import and export																												
9.20	Development of an assessment project on unintentional production of POPs in waste wood incineration					nym	nym	nym	nym	nym		nym	nym		nym		nym				nym			nym		nym		1	
9.21	Study on contaminated soil					1	nym	nym	nym	nym		nym	1		nym		nym				nym			nym		1		nym	
9.22	Study on PCB in building materials					nym	nym	nym	1	nym		nym	nym		nym		nym				nym			nym		nym		nym	

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6.2 Overview on target, threshold and limit values in EU legislation

For the assessment of impacts and effects of existing legal instruments on the control of the POPs (subject to investigation in this study) it is important to know which pollutants are addressed in the specific legislation and to be informed about the type and level of potential target, threshold or limit values set. Thus a compilation of pollutants covered and of related limitations as regards emission and discharge is provided in the overview table below.

Relevant legal document	Pollutants covered	Related Target / Threshold / Limit Value	See Overview Matrix
IPPC Directive (96/61/EC)	Air: PCDD/F, Water: Organohalogens, PAH	./.	1.1
EPER Decision (2000/479/EC)	PCDD/F, HCB, PAH	Threshold values for reporting per facility: PCDD/F to air: 1 g/a (TEQ), HCB to air: 10 kg/a HCB to water: 1 kg/a, PAH to air: 50 kg/a, PAH to water: 5 kg/a	
PRTR Regulation (EC) No 166/2006	PCDD/F, PCB, HCB, PAH	Threshold values for reporting per facility: PCDD/F to air: 0.1 g TEQ/a, PCB to air/water/soil: 100 g/a, HCB to air: 10 kg/a, HCB to water/soil: 1 kg/a, PAH to air: 50 kg/a, PAH to water/soil: 5 kg/a	9.2
LCP Directive (2001/80/EC)	NO_x, SO_2, Dust	ELV for NO_x, SO_2 dependant of the thermal input for solid, liquid and gaseous fuels; ELV for Dust / solid fuels > 50 MW: 50 mg/Nm^3, < 50 MW: 100 mg/Nm3 ELV for Dust / liquid fuels: 50 mg/Nm^3; ELV for Dust / gaseous fuels: 5 mg/Nm^3 as a rule, 10 mg/Nm^3 for blast furnace gas 50 mg/Nm^3 for gases produced by the steel industry which can be used elsewhere	1.2
Emission Ceiling Directive	NO_x, SO_2, NH_3, VOC	Limit values for national annual totals	1.5
Directive (84/360/EEC) Air pollution from combustion plants	Organic compounds, in particular hydrocarbons; Dust	./.	1.3
Directive on ambient air quality (96/62/EC) and PAH Daughter Directive (2004/107/EC)	PAH	Target Value for Benzo(a)pyrene for the total content in the PM_{10} fraction average level / year: 1 ng/m^3	1.4

Relevant legal document	Pollutants covered	Related Target / Threshold / Limit Value	See Overview Matrix
Waste Incineration Directive (2000/76/EC)	PCDD/F	ELV for PCDD/F to air: 0.1 ng/Nm^3 PCDD/F to water: 0.3 ng/l	1.5
Water Framework Directive (2000/60/EC)	HCB and PAH (in Priority substances Decision No 2455/2001/EC)	Obligation to monitor No limit	1.6
Fuel quality Directive (98/70/EC)	PAH	Content < 11 % w/w in Diesel fuel	1.8
POP Regulation (EC) No 850/2004	PCB (Annex I, III), PCDD/F, HCB, PAH (Annex III)	Threshold values (low and upper POP content levels) related to mandatory destruction/irreversible transformation of POP content for PCDD/PCDF, PCB, HCB; Values pending	6.1, 9.1
91/414/EEC Establishment of a positive list of plant protection substances	(2005/53/EC amendment concerning Chlorothalonil)	Authorised as Funicid ; limit value for HCB as impurity ≤ 0.01 g/kg (entry into force 1 march 2006)	1.18

6.3 Overview on measures (other stakeholder –industry)

The following matrix contains measures proposed by industrial stakeholders as derived from the answers to the questionnaire.

	Measures overview	**BIR / (shredder industry)**	**EUROFER (Iron and steel Industry)**	**EUROMETAUX (Non-ferrous metal industry)**	**CEMBUREAU (Cement industry)**
1	**Existing legislation**				
1.1	IPPC is the most suitable tool for control; there is no need for additional measures				1
1.2	The legal framework related to reduction of unintentionally produced POPs is sufficient		1		
1.3	The legal framework (IPPC & WEEE) is sufficient to control POP emissions	1			
2	**Proposed review of legislation**				
2.1	ELV for metal and steel industry analogical to German "TA Luft" at Community level		1		
3	**Proposed new legislation**				
4	**Implementation and enforcement of existing legislation**				
4.1	Enforcement of the implementation of WEEE and IPPC Directive at MS level	1			
4.2	Optimisation of process technology with maximum FGT and close loop technology	1			

	Measures overview	BIR / (shredder industry)	EUROFER (Iron and steel Industry)	EUROMETAUX (Non-ferrous metal industry)	CEMBUREAU (Cement industry)
4.3	IPPC Directive and BREF documents should regularly be reviewed and updated to reflect technical development			1	
5	**New approaches**				
5.1	Introduction of a window take-back-system financed by window pane producers	1			
5.2	Subsidies for high temperature incineration of shredder waste	1			
5.3	General application of particle filters for diesel engines		1		
6	**Communication / Education**				
7	**Funding**				
8	**Research activities**				
9	**Monitoring / Inventory**				
9.1	Identification of major emission sources		1		
9.2	Mapping of POP waste or components which release POPs when treated (recovery / destruction)	1			

6.4 Details on identified measures

In a second step, the identified measures are characterised by status or way of implementation, intended effect, concerned source sectors, possibilities for control, experiences made in countries where measures have already been realised, costs and time frame as far as possible. The assessment of control, costs, experiences and timeframe is work in progress and will be further elaborated for the final report.

	Measures Details	**Status / Way of realisation**	**Intended effect**	**Concerned sectors / sources**	**Control**	**Experiences / Results**	**Costs**	**Time frame**
1	**Existing legislation**							
	EU level							
1.1	*IPPC Directive 96/61/EC* All new installations covered by Annex I of the Directive are required to obtain a permit. Permits must be based on BAT; threshold levels for reporting to air, water (EPER) and land (E-PRTR)	Part of the legislation; Applies for new installations since 1999; Transition period for existing installations until 2007, further transition period for LV, PL (2010) and SI, SK (2011)	General Emission reduction due to application of BAT and pressure to meet thresholds	All industrial	Permit authorities; No operation without permit	significant emission reduction compared to older technologies		Short term / long term results
1.2	*LCP Directive 2001/80/EC* Applies to combustion plants with a rated thermal input equal to or greater than 50 MW. Aims to reduce the annual emissions of So_2 and NOx from existing plants; ELV for SO_2, NOx and PM for new plants	Part of the legislation; Applies for new installations since 2001; No ELV for existing plants that are subject to a national emission reduction plan or that do not run longer that until 2015; Transition period for SK, SI (2007) and EE, LT, MT, PL (2015)	Reduction of particle emission to air due to the duty to meet thresholds leads to reduction of POP emissions to air	Large combustion plants	Permit authorities; No operation without permit			Short term / long term results

	Measures Details	**Status / Way of realisation**	**Intended effect**	**Concerned sectors / sources**	**Control**	**Experiences / Results**	**Costs**	**Time frame**
1.3	*Directive 84/360/EC* Claims an authorities´ permit a. for categories of plants listed in Annex I and b. in the case of emission of dangerous pollutants as listed in Annex II (no POPs). The Council may lay down ELV	Part of the legislation	Reduction of particle emission to air due to the duty to meet thresholds leads to reduction of POP emissions to air	All industrial	Permit authorities; No operation without permit			Short term / long term results
1.4	*Ambient Air Quality Directive 96/62/EC and 4th Daughter Directive 2004/107/EC* Target values for benzo(a)pyrene as a marker for PAH emissions into Air	Part of the legislation	Reduction of PAH emission to air due to the duty to meet thresholds	All sectors / sources				Short term / long term results
1.5	*Emission Ceiling Directive 2001/81/EC* Limit values for annual totals for NO_x, SO_2, NH_3, VOC Emission trading	Part of the legislation	Release reduction of POPs as side effect of general release reduction	All sectors / sources	National authorities;			Short term / long term results
1.6	*Waste Incineration Directive 2000/76/EC* Operational conditions and permit requirements for waste incineration and co-incineration plants; ELV for PCDD/PCDF (0.1 ng TEQ/Nm²)	Part of the legislation	Direct Reduction of emission to air due to the duty to meet limit value for PCDD/PCDF	Waste incineration and co-incineration plants	Permit authorities; Loss of permit in case of non-compliance			Short term / long term results

	Measures Details	Status / Way of realisation	Intended effect	Concerned sectors / sources	Control	Experiences / Results	Costs	Time frame
1.7	*Water Framework Directive 2000/60/EC* ELV and environmental quality standards at EU level for certain substances in the field of water policy; Decision 2455/2001/EC lists HCB and PAH	Part of the legislation	Setting quality standards and measurement requirements at Community level puts on pressure to reduce discharge to water	All sectors / sources				Short term / long term results
1.8	*Restrictions in Use Directive 76/769/EEC* - Restriction on PAH content in extender oil and tyres - Market restrictions on creosote as creosote treated timber - Market restriction on PCP	Part of the legislation (exceptions for industrial uses concerning PCP); PAH restriction to be implemented until Dec. 2006	Market restriction on certain chemicals leads to direct reduction of PCDD/PCDF and PAH emission to air	Wood preservation; construction & demolition, power production biomass				
1.9	*PCB Directive 96/ 95/EC* limit value and provisions for environmental sound disposal							
1.10	*Directive 98/70/EC* - Restriction on the PAH content in Diesel fuel	Community legislation	Restriction of PAH content leads to direct PAH release reduction from diesel driven vehicles	Transport (road, rail ,marine)				
1.11	*POP Regulation (EC) No 850/2004* - Obligation for release inventories - Limit values for POP	Community legislation	provisions for POP content in waste leads to release reduction for					

	Measures Details	**Status / Way of realisation**	**Intended effect**	**Concerned sectors / sources**	**Control**	**Experiences / Results**	**Costs**	**Time frame**
	content in waste - Specific requirements for disposal/recovery of POP waste		PCDD/PCDF, PCB, HCB from wastes					
1.12	*ELV Directive 2000/53/EC* - Obligation to remove PCB containing capacitors/transformer	Community legislation	Removal of PCB containing capacitors leads to direct reduction of POP release from recovery operations	Shredder industry; co-incineration plants				
1.13	*WEEE Directive 2002/96/EC* - Removal of PCB containing capacitors (Annex II)	Community legislation	Removal of PCB containing capacitors leads to direct reduction of POP release from recovery operations	Shredder industry				
1.14	*Energy Efficiency Directive 2002/91/EC* - Minimum standards for energy performance applying to new buildings and to major refurbishments of existing large buildings	Community legislation	Reduction of CO_2 emissions to air due to minimum standards for energy performance leads to direct reduction of POP emissions to air	Energy producing sources				

	Measures Details	**Status / Way of realisation**	**Intended effect**	**Concerned sectors / sources**	**Control**	**Experiences / Results**	**Costs**	**Time frame**
1.15	*Energy Efficiency Directive 2002/91/EC* - Boilers above minimum sizes have to be inspected regularly to verify CO_2 emissions	Community legislation	Reduction of CO_2 emissions to air due to regular inspection leads to direct reduction of POP emissions to air	Residential combustion				
1.16	*Ecodesign Directive 2005/32/EC* - Requires producers to design products to meet specific eco-design criteria over entire life cycle for certain specific products	Part of the legislation; Transition period until August 2007	Reduction of CO_2 emissions to air due to eco design criteria leads to direct reduction of POP emissions to air	Residential combustion				
1.17	*79/117/EEC* Ban on use or placing on the market of plant protection products	Part of the legislation	Direct reduction of releases to all media due to ban on production and use	Pesticide use	Permit authorities			
1.18	*91/414/EEC* Establishment of a positive list of plant protection substances (2005/53/EC amendment concerning Chlorothalonil)	Part of the legislation	Direct reduction of releases to all media due to ban on production and use	Pesticide use	Permit authorities			

	Measures Details	**Status / Way of realisation**	**Intended effect**	**Concerned sectors / sources**	**Control**	**Experiences / Results**	**Costs**	**Time frame**
1.19	*396/2005/EC* Maximum levels for pesticide residues in and on foodstuffs	Part of the legislation	Reduction of dietary intake	None specific; mainly pesticide use	Control authorities			
1.20	*1998/8/EC* Biocide Directive (Chlorothalonil under evaluation)							
	MS level							
1.21	ELV for cremation plants	Part of the legislation	Direct Reduction of emission to air due to the duty to meet limit value for PCDD/PCDF	Crematoria	Permit authorities			

	Measures Details	Status / Way of realisation	Intended effect	Concerned sectors / sources	Control	Experiences / Results	Costs	Time frame
1.22	Ban on certain chlorinated/brominated compounds as fuel additives	Part of the legislation	Direct reduction of POP emission to air due to reduce chlorine content in fuel	Transport	Fine up to 50.000 € for placing on the market / trading with fuel that contains brominated /chlorinated additives			Implemented since 1992
1.23	Requirements for the fuel quality for small combustion plants	Part of the legislation	Direct reduction of emission to air	Residential combustion				
1.24	Special requirements for the permitting of discharge to waste water, e.g. ELV for PCDD/F / PCB	Part of the legislation	Direct reduction of PCDD/F and PCB emission to water	All sectors / sources				Implemented since 1992
1.25	Ban on private burning of waste	Part of the legislation	Direct reduction of emission to air	Open burning of waste				
1.26	Requirements for fuel gas purification for mercury	Part of the legislation	Side-effect on POP releases to air	All combustion processes; mainly those not yet regulated				

	Measures Details	Status / Way of realisation	Intended effect	Concerned sectors / sources	Control	Experiences / Results	Costs	Time frame
2	**Planned review of legislation**							
2.1	*Thematic Strategy on Air pollution* - Proposition of revised emission ceilings in the Directive 2001/81/EC	Proposed review of legislation	Obliges MS to intensify measures to reduce emissions to air	All; mainly industry				
2.2	*Thematic Strategy on Air pollution* - Streamlining of current legislation on air quality	Proposed review of legislation; Combine existing Daughter Directives into one directive	Strengthening of EC legislation leads to the intended emission reduction	All sectors / sources				Short term / long term results
2.3	*Thematic Strategy on Air pollution* - Expansion of the IPPC directive to cover sources < 50 MWth	Proposed review of legislation; IPPC concept (see 1.1)	IPPC concept leads to integrated emission reduction	Residential combustion; small industrial				
2.4	*Thematic Strategy on Air pollution* - Inclusion of smaller residential and commercial buildings into an extended Energy Efficiency Directive	Planned legislation; no further data	Emission reduction via inclusion of additional sources	Residential combustion; small industrial				
2.5	*Thematic Strategy on Air pollution* - Proposition of charges for the use of road infrastructure applicable to heavy vehicles (Eurovignette)	Planned legislation	Reduction of NOx and particle emissions to air by charging for the use of roads leads to POP emission reduction	Road transport				

	Measures Details	Status / Way of realisation	Intended effect	Concerned sectors / sources	Control	Experiences / Results	Costs	Time frame
2.6	*Thematic Strategy on Waste* - Simplification and modernisation of existing legislation in the field of waste policy	Planned legislation	Strengthening of EU legislation leads to the intended emission reduction	All sectors / sources				
	MS level							
2.7	Updating of the PRTR legislation	Planned legislation; no further data	Knowledge gain discharge reduction	All; mainly industrial				
2.8	Updating of the technical rules for the discharge of waste water	Planned legislation	Reduction of POP discharge to water	Waste water treatment plants; all				
2.9	Modification of the current procedures of environmental impacts reporting from polluters	Planned legislation	Knowledge gain discharge reduction	All industrial				
2.10	Review of Air Protection Law	Planned legislation; no further data	Reduction of air emission	nd				
3	**Planned new legislation**							
	EU level							
3.1	*Thematic Strategy on Air pollution* - European Harmonised Standards for Small combustion appliances and their fuels	Planned legislation	Binding technical rules lead to reduction of air emission	Residential combustion				

	Measures Details	Status / Way of realisation	Intended effect	Concerned sectors / sources	Control	Experiences / Results	Costs	Time frame
3.2	*Thematic Strategy on Air pollution* - Proposition to tighten current NOx emission standards from ships	Proposition of legislation	Reduction of NOx emission to air due to the duty to meet thresholds leads to reduction of POP emissions	Marine transport				
3.3	*Thematic Strategy on Air pollution* - Proposition to tighten further the emissions from heavy duty vehicles	Proposition of legislation	Reduction of NOx and particle emissions to air leads to POP emission reduction	Road transport				
	HELCOM / OSPARCOM Proposals							
3.4	Introduction of Smoke Control Zones where only smokeless fuels and smoke free appliances can be used	Proposition of legislation	Reduction Smoke emissions to air leads to POP emission reduction	All sectors / sources focus residential combustion				
	MS level							
3.5	Emission standards for thermal sources	Planned legislation	Reduction of emission to air due to the duty to meet thresholds	Power production Waste incineration Metal industry				
3.6	Target values for dioxin deposition	Planned legislation	Reduction of emission to air due to the duty to meet thresholds	All sectors / sources				

	Measures Details	Status / Way of realisation	Intended effect	Concerned sectors / sources	Control	Experiences / Results	Costs	Time frame
3.7	Annual PCDD/PCDF emission ceiling	Planned legislation	Maximum annual quantity obliges to intensify measures to reduce emissions to air	All sectors / sources				Long term results
3.8	Proposition for a new Government Decree on harmful and hazardous substances in the aquatic environment	Planned legislation; no further data	Discharge reduction	All sectors / sources				
3.9	Proposition of mandatory particle filters for wood-burning stoves and fireplaces	Part of the legislation	Direct reduction of air emission	Residential combustion				
3.10	New regulations to deal with unauthorised burning	Planned legislation	nd	Residential combustion, Open burning of waste				
4	**Implementation and enforcement of existing legislation**							
	EU level							
4.1	Infringement procedure to enforce implementation of EU environmental legislation	Part of the legislation	General emission reduction	All industrial				
4.2	*5th Survey on the implementation and enforcement of Community environmental law* - Composition of Guidelines and interpretive texts	Established	Knowledge gain; emission reduction	All sectors / sources				Short term / long term results

	Measures Details	**Status / Way of realisation**	**Intended effect**	**Concerned sectors / sources**	**Control**	**Experiences / Results**	**Costs**	**Time frame**
4.3	*5th Survey on the implementation and enforcement of Community environmental law* - Multilateral discussions in technical committees, contributions to expert seminars and bilateral contacts between the Commission and the Member States	Established	Knowledge gain; emission reduction	All sectors / sources				Short term / long term results
4.4	*5th Survey on the implementation and enforcement of Community environmental law* - Conformity check for the ten new Member States	Established	General emission reduction	All industrial				Short term / long term results
4.5	*5th Survey on the implementation and enforcement of Community environmental law* - Encouragement of information exchange between implementing authorities	Established	Knowledge gain; emission reduction	All sectors / sources				Short term / long term results
4.6	*5th Survey on the implementation and enforcement of Community environmental law* - Funding of programmes / projects only if compliant with Community policies and instruments	Established	General emission reduction	All sectors / sources				Short term / long term results

	Measures Details	Status / Way of realisation	Intended effect	Concerned sectors / sources	Control	Experiences / Results	Costs	Time frame
	HELCOM / OSPARCOM Proposals							
4.7	Capacity Building in the field of PCB	Proposition		All sectors / sources as regards PCB				
4.8	Promotion of environmentally sound practices for small combustion appliances	Proposition		Residential combustion; small industrial				
4.9	Introduction of mandatory annual internal inspections and regular instructions on the proper use of technical equipment for enterprises regarding combustion appliances	Proposition		Al industrial				
	MS level							
4.10	Improvement of coordination within national administration	Planned	Knowledge gain; emission reduction	All sectors / sources				Planned LV: 2005-2006 CZ: 2004-2005
4.11	Enforcement of BAT & BEP for new sources and gradual implementation of BAT & BEP in existing sources	Established / Planned	Emission reduction due to better process technology	All large industrial			SK: 0	
4.12	Assessment of the efficiency of the national legal system	No further data	General emission reduction	All; mainly industrial				
4.13	Reduction of the danger of landfill fires by ensuring compliance with legal requirements	Planned	Emission reduction due to improved technical	Open burning of waste; Landfills			Private	Planned from 2005 reg

	Measures Details	Status / Way of realisation	Intended effect	Concerned sectors / sources	Control	Experiences / Results	Costs	Time frame
			standard					
4.14	Development of a POPs emissions management handbook (BAT)	Planned	Emission reduction due to better technology; Knowledge gain	Industrial sectors (no further data)				Planned 2007-2008
4.15	Introduction of BAT at POPs stationary emission sources	No further data	Emission reduction due to better technology	Industrial sectors (no further data)			8000 LVL (ca 11500 €)	Planned 2006 -2007
4.16	Implementation of the Stockholm Convention / POP Protocol requirements into national legislation	No further data	Knowledge gain; emission reduction	All; mainly industrial				Planned 2004-2005
4.17	Construction of a central high standard incineration plant and of landfills according to 1999/31/EC in order to reduce emissions from uncontrolled combustion	Planned legislation (or enforcement, no data)	General emission reduction	Open burning of waste; Landfills				
4.18	Application of BAT in the context of permitting and enforcement for the energy sector	Planned legislation	General emission reduction	Power production				
4.19	Proposition of technical standards for small scale burning	Technical standards	General emission reduction	Residential combustion				

	Measures Details	Status / Way of realisation	Intended effect	Concerned sectors / sources	Control	Experiences / Results	Costs	Time frame
4.20	Introduction of enforcement instruments such as dioxin monitoring at incineration and co-incineration facilities	Planned	Knowledge gain; emission reduction	Waste incineration Power production, Cement industry				
4.21	Improvement of expertise of environmental inspectors and permit authorities by training and guidelines	Methodical guidelines / training	Knowledge gain; emission reduction	Mainly industrial sources			LV: 2800 LVL = ca. 3750 € SK: 240000 SK = ca. 6000 €	LV: 2006-2009 SK: 2006-2010
4.22	Improvement of current reportings from industry	nd	Knowledge gain; emission reduction	All industrial				
5	**New approaches**							
	EU level							
5.1	*Thematic Strategy on Air pollution* - Introduction of voluntary standards for solid fuel residential appliances (CEN level)	Planned	Emission reduction due to voluntary standards	Residential combustion				
	HELCOM / OSPARCOM Proposals							
5.2	Negotiated agreements with manufacturers / importers	Proposition	Emission reduction due to an increased use of environmentally sound technology	Residential combustion				

	Measures Details	Status / Way of realisation	Intended effect	Concerned sectors / sources	Control	Experiences / Results	Costs	Time frame
5.3	Promotion of the development and use of substitute products and processes to prevent formation and release of dioxins	Proposition	Direct POP reduction	All; mainly industrial sources				
5.4	Subsidies on certified stoves	Proposition	Emission reduction due to an increased use of environmentally sound technology	Residential combustion				
	MS level							
5.5	Local programs to modernize residential combustion	Planned	Emission reduction due to improved technology	Residential combustion				
5.6	Tax discount to installations that apply BAT	nd	General emission reduction	All industrial	Permit authorities			
5.7	National voluntary agreement with the solid fuel trade sector focussing on reducing air pollution emissions from the burning of domestic solid fuels	nd	Emission reduction	Residential combustion				

	Measures Details	Status / Way of realisation	Intended effect	Concerned sectors / sources	Control	Experiences / Results	Costs	Time frame
6	**Communication / Education**							
	EU level							
6.1	*POP Regulation (EC) No 850/2004* Communication of Action Plans on measures to minimise total releases of PCDD/F, PCB and PAH	Part of the legislation / Communication between MS and EU	Improvement of knowledge	All sectors / sources				
6.2	*IPPC Directive* Promotion of the use of BAT and technology transfer as well as the general information exchange between MS	Planned for 2001-2005	Improvement of knowledge	Large industrial				
6.3	*IPPC Directive* - Encouragement of information exchange on PCDD/PCDF prevention and abatement techniques	Communication between MS	Improvement of knowledge	Large industrial				
6.4	Communication towards general public on POPs and activities towards POPs, e.g. via press releases / leaflets / brochures/internet	Established	Knowledge gain; emission reduction	All sectors / sources				
	HELCOM / OSPARCOM Proposals							
6.5	User guidelines for sound domestic burning of coal, peat and wood	Proposition	Knowledge gain; emission reduction	Residential combustion				

	Measures Details	Status / Way of realisation	Intended effect	Concerned sectors / sources	Control	Experiences / Results	Costs	Time frame
6.6	Public information campaigns on domestic combustion of coal, peat and wood (including purchase, operation, preparation and storage of fuel)	Proposition	Knowledge gain; emission reduction	Residential combustion				
6.7	Awareness raising of suppliers on environmentally sound practices for combustion appliances < 50 kW; Promotion of BEP	Proposition	Knowledge gain; emission reduction	Residential combustion, small industrial facilities				
6.8	Awareness Raising regarding the importance of environmentally friendly practices in residential and small industrial furnaces	Proposition	Knowledge gain; emission reduction	Residential combustion				
	MS level							
6.9	Communication towards general public on POPs and activities towards POPs, e.g. via press releases / leaflets / brochures/internet	Planned	Knowledge gain; emission reduction	All sectors / sources			LV: 5000 LVL (ca 7.250 €) SK: 39.2 Mill. SK (total) (ca €)	Planned LV: 2006 SK: Short term / long term
6.10	Collection and regular update of all public available data on an internet site and presentation on a central web portal	Planned	Improvement of knowledge	All sectors / sources			LV: 300 LVL (ca 435 €)	Planned: 2006
6.11	Online PCDD/PCDF data base containing country wide data for environmental compartments as well as for food, feed and human data	Established	Improvement of knowledge	All sectors / sources				Regularly

	Measures Details	Status / Way of realisation	Intended effect	Concerned sectors / sources	Control	Experiences / Results	Costs	Time frame
6.12	Communication towards concerned industry (management, employees)	Planned	Knowledge gain; emission reduction	Industrial			LV: 15500 LVL (ca 22000 €) SK: see 6.1 (total)	Planned: 2007-2015
6.13	Establishment of a central institution for the coordination of POPs related information	Planned	Knowledge gain; emission reduction	All sectors / sources			CZ: nd LV: 300 LVL (ca 435 €) SK: 1.6 Mill. SK	Planned CZ: 2004 LV: 2005-2006 SK: 2004-2010
6.14	Identification of stakeholders and development of information exchange	Planned	Knowledge gain; emission reduction	All sectors / sources				
6.15	Communication on PCB towards affected groups	Planned	Knowledge gain; emission reduction	PCB related sectors			LV: 5300 LVL (ca 7700 €) SK: see 6.1 (total)	Planned LV: 2005-2007 SK: Short term
6.16	Development of an inventory on treatment methods for fly ash from incinerators and metallurgic processes	Established	Knowledge gain; emission reduction	waste incineration, metal industry				2004-2007
6.17	Awareness raising in residential/agricultural sector (proper burning of household waste/agricultural waste)	Campaign to general public	Knowledge gain; emission reduction	Residential combustion open burning of agricultural waste			LV: 2.6 Mio. LVL (integrated campaign budget) ca. 3.5 Mio. €	LV: 2006/2007

	Measures Details	Status / Way of realisation	Intended effect	Concerned sectors / sources	Control	Experiences / Results	Costs	Time frame
6.18	Awareness raising/guidelines for environmentally sound practices for small combustion appliances	nd	Knowledge gain; emission reduction	Residential combustion, small industrial facilities				
6.19	Inclusion of information on POPs in the curriculum of general education schools	Planned	Knowledge gain; emission reduction	Diffuse non-industrial sources			400 LVL (ca 580 €)	Planned: 2010
6.20	Training of municipal employees on polluted site management	Planned	Knowledge gain; emission reduction	All sectors / sources				
6.21	Encouragement of university courses of environmental studies including information on POPs	Planned	Knowledge gain; emission reduction	All sectors / sources			400 LVL (ca 580 €)	Planned: 2010
6.22	Ensuring a constant information exchange on POPs with the Convention Secretariat and the EC Coordinating Centre	Planned	Knowledge gain; emission reduction	All sectors / sources			800 LVL (ca 1150 €)	Planned: Regularly from 2006
6.23	Promotion of the acquisition and use of the POPs monitoring experience from other countries	Established	Improved information exchange leads to emission reduction	All sectors / sources			2640T SK	Planned: 2004-2010
6.24	Coordination of cooperation between concerned industry and universities	Planned	Improvement of knowledge	All industrial				
6.25	Improved Inter-administrative coordination of POP related activities	Planned	Knowledge gain; emission reduction	All sectors / sources				

	Measures Details	Status / Way of realisation	Intended effect	Concerned sectors / sources	Control	Experiences / Results	Costs	Time frame
7	**Funding**							
	EU level							
7.1	Funding Programs at EC level (e.g. LIFE and PHARE, see Handbook for Environmental Funding)	Established	Knowledge gain; emission reduction	nd				
	MS level							
8	**Research activities**							
	EU level							
8.1	*Community Strategy for Dioxins, Furans and PCB* Risk assessment of non-dioxin-like PCBs in the framework of food/feed monitoring	Planned for 2001-2005	Improvement of knowledge	All sectors / sources ?				
	MS level							
8.2	Research programs focused on efficient detoxification of contaminated fly ash	Established	Improvement of knowledge	All thermal industrial; mainly Waste incineration Metal industry				2004-2007
8.3	Research Programs on methods and technologies on POP´s origination and neutralisation	No further data	Improvement of knowledge	All sectors / sources				
8.4	Promotion of research on alternative production technologies for products which are currently produced by chlorine based technologies	Planned	Improvement of knowledge	Chemical industry				

	Measures Details	**Status / Way of realisation**	**Intended effect**	**Concerned sectors / sources**	**Control**	**Experiences / Results**	**Costs**	**Time frame**
8.5	Research on emissions from wood burning stoves	Established	Improvement of knowledge	Residential combustion, wood burning stoves				
8.6	Research on the sources of dioxin in organic farming	Established	Improvement of knowledge	All sectors / sources				
9	**Monitoring**							
	EU level							
9.1	*POP Regulation (EC) No 850/2004* Emission inventories (PCDD/F, PCB and PAH)	Part of the legislation	Improvement of knowledge in the field of POPs emissions and flows	All sectors / sources				Short term / long term results
9.2	*PRTR Regulation (EC) No 166/2006* - Pollutant Release and Transfer Register (PCDD/PCDF, PCB, HCB, PAH to air, water, land if thresholds are exceeded;	Part of the legislation	Improvement of knowledge in the field of emissions and flows	All, mainly industrial				Short term / long term results
9.3	*IPPC Directive* - Monitoring of emissions to air (PCDD/PCDF) and water (PCDD/PCDF, PAH, HCB) above thresholds for large industrial source will be replaced by PRTR requirements	Part of the legislation	Improvement of knowledge	All large industrial				Short term / long term results

	Measures Details	**Status / Way of realisation**	**Intended effect**	**Concerned sectors / sources**	**Control**	**Experiences / Results**	**Costs**	**Time frame**
9.4	*Water Framework Directive 2000/60/EC* Monitoring of priority substances (HCB, PAH)	Part of the legislation	Improvement of knowledge	All sectors / sources				Short term / long term results
9.5	*Community Strategy for Dioxins, Furans and PCB* Reduction of knowledge gaps in the field of sources of Dioxins and PCB	Planned for 2001-2005	Improvement of knowledge	All sectors / sources as regards PCDD/PCDF, PCB				
	HELCOM / OSPARCOM Proposals							
9.6	Monitoring obligations for PCDD/F, PCB and PAH emissions to water (plus HCB under HELCOM)	Existing	Improvement of knowledge	All sectors / sources				
	MS level							
9.7	Evaluation of POPs	Established / Planned	Improvement of knowledge	All POPs emitting sources				
9.8	Expansion of emission inventories (by sources and pathways)	Planned	Improvement of knowledge	All sectors / sources namely non-industrial				
9.9	Updating of National Emission Factors	Planned	Improvement of knowledge	All sectors / sources				
9.10	Evaluation of the necessity to perform dioxin and PCB analyses in soil treated with sewage sludge	Planned	Improvement of knowledge	WWT				

	Measures Details	Status / Way of realisation	Intended effect	Concerned sectors / sources	Control	Experiences / Results	Costs	Time frame
9.11	Participation in LRTAP-Monitoring on POP (deposition in Alpine ecosystems)	Established	Improvement of knowledge on POPs flow and deposition	All sectors / sources				Long term
9.12	Evaluation of LRTAP pollution by installation of monitoring network in background areas (EIONET)	Established	Improvement of knowledge	All sectors / sources				Long term
9.13	Monitoring on human exposure to POPs (participation in WHO milk study)	Established / Planned	Improvement of knowledge on human exposure to POPs	All sectors / sources			DE: nd LV: 100000 LVL (ca 145000 €)	DE: nd LV: 2006
9.14	Enforcement of monitoring programs, e.g. in river basins and the marine environment	Planned	Improvement of knowledge	All sectors / sources				DE: regularly
9.15	Validation studies on emissions from domestic burning of coal, wood and biomass and co-combustion of common household waste	Planned	Improvement of knowledge	Residential combustion				
9.16	Integration of PCB analysis into the drinking water monitoring program	Planned	Health protection; Improvement of knowledge	All sectors / sources			7300 LVL (ca 10500 €)	2005, reg from 2008
9.17	Study on PCP treated wood	Planned	Improvement of knowledge	Wood preservation, Construction & Demolition, Biomass power production				

	Measures Details	Status / Way of realisation	Intended effect	Concerned sectors / sources	Control	Experiences / Results	Costs	Time frame
9.18	Setting up a framework for monitoring and mitigation of total releases of chlorine or other halogens containing pollution	Planned	Improvement of knowledge	All sectors / sources				
9.19	Establishment of an effective system for monitoring and handling of the POP-containing hazardous wastes including import and export	Planned	Improvement of knowledge	HWI, Landfill, direct leaching/emissions			SK: 320 T SK	Planned 2004-2005
9.20	Development of an assessment project on unintentional production of POPs in waste wood incineration	Planned	Improvement of knowledge	Power production biomass, Co-incineration Waste incineration				
9.21	Study on contaminated soil	Planned	Improvement of knowledge	All sectors / sources				

7 Gaps and deficits in relation to the objective of minimising releases

7.1 Overview on identified gaps and deficits

As described in the methodology (see chapter 3.3), the identification of gaps and deficits follows a source specific and a pollutant specific approach.

Concerning the *material flow relevance* two major issues are relevant for the identification of gaps: the existing knowledge/data deficits (also including uncertainty) and the relevance of material flows / potentials for reduction. The following table gives an overview on the results, also taking into consideration the differences for PCDD/F, PCB, HCB and PAH:

N°	Sector	Mass flow relevance				Reduction potential	Knowledge deficit				Uncertainty *
		PCDD/F	PCB	HCB	PAH		PCDD/F	PCB	HCB	PAH	
1	Air transport	low			low	+		●	●		++
2	Asphalt processing				low	+	●	●	●	•	+++
3	Burning of agricultural waste	low	low	low	medium	++	•	•	•	•	+++
4	Chemical industry	medium	medium	medium	medium	+		•	•		+
5	Construction and Demolition		high			+++	•	•	•	•	+++
6	Crematoria / Animal carcass burning	low	medium			++			●	●	+++
7	Dredging / Offshore / Dock works				high	+++	●	●	●	•	+++
8	Iron and Steel Industry	medium	medium	medium	medium	+			•		+
9	Land filling	low	low			+		●	●	●	++
10	Marine transport	low	low		high	++		•	●		+++
11	Mineral industry	low	medium	low	low	+					+
12	Non-ferrous metal industry	medium	low	high	low	+		•	•		+

N°	Sector	Mass flow relevance				Reduction potential	Knowledge deficit				Uncertainty *
		PCDD/F	PCB	HCB	PAH		PCDD/F	PCB	HCB	PAH	
13	Open burning of waste	medium	medium			+++	●	●	⬤	⬤	+++
14	Pesticide Use			high		+**	⬤	⬤	●	⬤	+++
15	Power production	medium	high	low	medium	++				●	+
16	Paper and pulp	low	medium	low	low	+		●	●		+
17	Refinery	low	medium		medium	+			⬤		++
18	Residential combustion	high	medium	medium	high	+++	●	●	●	●	++
19	Road transport	medium	high	low	high	++		●	●		+
20	Shredder industry	low	medium	low	low	+			●	●	++
21	Surface treatment/ solvent use				medium	++	●	●	●	●	++
22	Waste incineration and co-incineration	high	medium	high	low	+			●		+
23	Wood preservation	medium			high	++	●	●	●	●	+++

Table 7-1: Overview on mass flow relevance, reduction potential, knowledge gaps and uncertainty concerning POPs for identified source sectors

● Data available but uncertainty high

⬤ No data available

* for more specific information on uncertainty see chapter 5.4 to 5.7.

** after implementation of Directive 2005/52/EC concnerning maximum content of HCB in Chlorothalonil

As regards gaps and deficits in relation to existing measures, a rating on coverage was allocated to the source sectors, depending on the number and characteristics of existence of measures and their assumed effectiveness.

In this context the resulting rating is defined as follows:

- "adequately addressed"
  Effective measures in place, with respect to release reduction and reduction of knowledge gaps (reporting duties)
- "partially addressed"
  A number of measures in place, but deficits either in effectiveness, characteristics or concerning reporting duties, which leads to knowledge deficits
- "not adequately addressed"
  Heavy deficits in measures (none at European level, low effectiveness) plus absence of measures to reduce knowledge gaps leading to knowledge deficits (no reporting obligation)

The following table summarises for each source sector the status with respect to coverage by measures and the resulting rating. :

N°	Sector	Specific measures for release reduction	General measures for release reduction	Measures to reduce knowledge gaps	Rating
1	Air transport	/	low	/	not adequately addressed
2	Asphalt processing	medium	/	low	partially addressed
3	Burning of agricultural waste	/	low	/	not adequately addressed
4	Chemical industry	/	high	high	adequately addressed
5	Construction and Demolition	medium	medium	/	partially addressed
6	Crematoria / Animal carcass burning	low	/	/	not adequately addressed
7	Dredging / Offshore / Dock works	/	/	low	not adequately addressed
8	Iron and Steel Industry	high	high	high	adequately addressed
9	Land filling	high	high	high	adequately addressed
10	Marine transport	/	medium	/	partially addressed
11	Mineral industry	high	high	high	adequately addressed
12	Non-ferrous metal industry	high	high	high	adequately addressed
13	Open burning of waste	medium	medium	/	partially addressed
14	Pesticide Use	high	medium	medium	adequately addressed
15	Power production	medium	medium	medium	partially addressed
16	Paper and pulp	high	high	high	adequately addressed
17	Refinery	medium	high	medium	adequately addressed
18	Residential combustion	low	low	/	not adequately addressed
19	Road transport	medium	medium	/	partially addressed

N°	Sector	Specific measures for release reduction	General measures for release reduction	Measures to reduce knowledge gaps	Rating
20	Shredder industry	high	low	/	partially addressed
21	Surface treatment/ solvent use	medium	medium	medium	partially addressed
22	Waste incineration and co-incineration	high	high	high	adequately addressed
23	Wood preservation	high	/	/	partially addressed

Table 7-2: Results of the assessment of existing measures concerning effectiveness, costs and socio-economic impacts

All existing measures have been assessed concerning effectiveness, costs and socio-economic impacts (see detailed results in chapter 7.2 where also a justification of the assessments is available).

In this context the terms effectiveness, costs and socio-economic impacts are defined as follows:

- Effectiveness: Ability to either reduce releases or to improve knowledge or awareness
- Costs: Expenses to be expected for involved authorities or the legal body developing or implementing a measure
- Socio-economic impacts: Additional expenses or turnover for involved industry or citizens resulting from implementation of the measure, also including consequences for jobs.

The assessment has been based on expert knowledge and experience within the project team; interviews and market analysis (see also description of methodology in chapter 3).

Generally it has been assumed that measures with higher binding elements or research character can be attributed higher effectiveness.

With respect to costs it has been assumed that costs for review of existing legislation, establishment of database or development of information material are low in comparison to funding of research, monitoring activities, establishing infrastructure, regular control or granting subsidies.

Socio-economic impacts have been assumed high for measures requiring major technical investments (such as installation of abatement technology, regular measurements or development of new technology) in comparison to communication, education and research which generally do not entrain the need of significant investments from industry or citizen.

The combination of mass flow relevance, knowledge deficits and status with respect to existing measures leads to the following overall classification of sources for all substances (see methodology in chapter 3):

N°	Sector	*Need for action category*
1	Air transport	low
2	Asphalt processing	low
3	Burning of agricultural waste	medium (PCDD/PCDF, PCB, HCB, PAH)
4	Chemical industry	low
5	Construction and Demolition	medium (PCB, PCDD/PCDF)
6	Crematoria / Animal carcass burning	low
7	Dredging / Offshore / Dock works	medium (PAH)
8	Iron and Steel Industry	low
9	Land filling	low
10	Marine transport	high (PAH)
11	Mineral industry	low
12	Non-ferrous metal industry	low
13	Open burning of waste	medium (PCDD/PCDF, PCB, HCB, PAH)
14	Pesticide Use	Low (HCB)
15	Power production	medium (PCDD/PCDF, PCB, HCB, PAH)
16	Paper and pulp	low
17	Refinery	low
18	Residential combustion	high (PCDD/PCDF, PCB, HCB, PAH)
19	Road transport	high (mainly PAH)
20	Shredder industry	low
21	Surface treatment/ solvent use	medium (PAH)
22	Waste incineration and co-incineration	low
23	Wood preservation	medium (PAH, PCDD/PCDF)

Table 7-3: Overall classification of sources with respect to need for action

In this context the need for action categories have been defined as follows:

Low: Low mass flow relevance with low exposure relevance and satisfying data base or medium mass flow relevance and adequate coverage by existing measures

Medium: Medium mass flow relevance but deficits in knowledge or inadequate coverage by existing measures (not adequately addressed)

Medium mass flow relevance, exposure relevance and limited coverage by existing measures (partially addressed)

High mass flow relevance for specific POPs and limited coverage by existing measures (partially addressed)

High: High mass flow relevance and deficits in knowledge or inadequate coverage by existing measures (not adequately addressed)

7.2 Detailed results and lists for gap identification

7.2.1 Air transport

Based on reported data the POP relevance of air transport seems to be low. Thus there is no justification for action from this point of view. However information on emissions from PCB and HCB is limited. Therefore there is need for action concerning knowledge gaps, especially as regards PCB and HCB. Information would be required in the field of air emissions mainly. Due to air transport characteristics important releases to water and land are not expected.

Based on the justification the overall assessment of the source sector is as follows:

- **low need for action although not adequately addressed with respect to unintentional releases of POPs**

A condensed compilation of collected information and the resulting assessment is presented in Table 7-4 below.

Air transport												
Overall assessment	Low mass flow relevance; medium data gaps; potential for release reduction for PAH and PCDD/PCDF									**Need for action**		
										low		
Deficits in measures	No measures at EU level; few general measures at MS level; limited measures for filling of data gaps									Rating:		
										not adequately addressed		
Mass flow	PCDD/PCDF			PCB			HCB			PAH		
Total releases	~1g TEQ/y			?			?			~5 t/y		
Compartment	Air	Water	Land	Air	Water	Land	Air	Water	Land	Air	Water	Land
Rating	low	?	?	?	?	?	?	?	?	low	?	?
Exposure relevance	Oral/digestive		low		Dermal		none		Inhalative		low	
Food chain relevance	vegetables		low		dairies/meat		low		fish/seafood		low	

Measures	**Measure**	**Status**	**Effect**	**Compartment addressed**	**Pollutant addressed**	**Assessment**		
						Effective-ness	Costs	Socio-economic impacts
Specific measures for reduction of POP releases	no measures identified							
General measures for release reduction	Quality requirements for air transport fuel	Established at MS level	General release reduction leads to POP release reduction	Air	PAH (mainly)	2	0	2
Measures for filling knowledge gaps	Obligation for source related country reporting to EMEP	International Convention	Information collection on sectorial releases	Air	PAH (mainly)	2	1	0

Table 7-4: Assessment of deficits and need for action for Air transport

7.2.2 Asphalt processing

Asphalt processing as defined for the purpose of this report covers road paving with asphalt and asphalt roofing but not the asphalt production process itself. Based on reported data for POP releases road paving is the major source.

The POP relevance of asphalt processing seems to be low and focused on PAH. Thus there is no justification for action from this point of view. However information on emissions of all POPs except PAH is limited. Therefore there is need for action concerning knowledge gaps. Information would be required in the field of releases to air and land mainly. Due to asphalt processing characteristics releases to water and land are expected to be lower than to air.

Based on the justification the overall assessment of the source sector is as follows:

- **low need for action although only partially addressed with respect to unintentional releases of POPs**

A condensed compilation of collected information and the resulting assessment is presented in Table 7-5 below.

Asphalt processing												
Overall assessment	Low Mass Flow relevance with high uncertainty due to poor reporting; high data gaps; potential for release reduction for PAH									**Need for action**		
										low		
Deficits in measures	Measures to fill knowledge gaps do not seem appropriate									Rating:		
										partially addressed		
Mass flow	PCDD/PCDF			PCB			HCB			PAH		
Total releases	?			?			?			0.05 t/y		
Compartment	Air	Water	Land	Air	Water	Land	Air	Water	Land	Air	Water	Land
Rating	?	?	?	?	?	?	?	?	?	low	?	?
Exposure relevance	Oral/digestive		low		Dermal		none		Inhalative		low/medium ?	
Food chain relevance	vegetables		none		dairies/meat		low		fish/seafood		none	

Measures	**Measure**	**Status**	**Effect**	**Compartment addressed**	**Pollutant addressed**	**Assessment**		
						Effective-ness	Costs	Socio-economic impacts
Specific measures for reduction of POP releases	Classification of tar containing waste asphalt as hazardous waste	Established at EU level (European waste list)	Reduction of PAH releases	Air	PAH (mainly)	1-2	1	1
	Substitution of tar by bitumen in asphalt production	Established	Reduction of PAH releases	Air	PAH (mainly)	2	2	2
General measures for release reduction	no measures identified							
Measures for filling knowledge gaps	Obligation for source related country reporting to EMEP (NFR 2A6)	International Convention	Information collection on sectorial releases	Air	PAH (mainly)	2	1	0

Table 7-5: Assessment of deficits and need for action for asphalt processing

7.2.3 Burning of agricultural waste

Based on reported data the POP relevance of agricultural waste burning seems to be low except of PAH where medium mass flow relevance has been observed. Thus there is limited justification for action from this point of view. However information on release of all POPs is highly limited and uncertainty of activity data is high. There is only limited number of emission factors indicating relatively high relative releases. Therefore there is need for action concerning knowledge gaps. Information would be required in the field of releases to air and land mainly. Due to burning characteristics releases to water are expected to be lower than to air and land.

Based on the justification the overall assessment of the source sector is as follows:

- **medium need for action and not adequately addressed with respect to unintentional releases of POPs**

A condensed compilation of collected information and the resulting assessment is presented in Table 7-6 below.

Burning of agricultural waste												
Overall assessment	Low to Medium Mass Flow relevance with high uncertainty; potential for release reduction in countries where measures not yet applied									**Need for action**		
										medium		
Deficits in measures	Limited knowledge of releases to land and water; no specific measures; no general measures at EU level;									Rating:		
										not adequately addressed		
Mass flow	PCDD/PCDF			PCB			HCB			PAH		
Total releases	~150 g TEQ/y			~35 kg/y (Agriculture/Forestry)			~10 kg/y			~50 t/y		
Compartment	Air	Water	Land	Air	Water	Land	Air	Water	Land	Air	Water	Land
Rating	low	?	low	low	?	?	low	?	?	medium	?	?
Exposure relevance	Oral/digestive		locally	Dermal			none		Inhalative		locally	
Food chain relevance	Vegetables		locally	Dairies/meat			locally		Fish/seafood		low	

Measures	**Measure**	**Status**	**Effect**	**Compartment addressed**	**Pollutant addressed**	**Assessment**		
						Effective-ness	Costs	Socio-economic impacts
Specific measures for reduction of POP releases	Broad ban of agricultural burning	Established at MS level	Reduction of POP releases	Air, Land	PCDD/PCDF, PCB, HCB, PAH	3	0	2
General measures for release reduction	Awareness raising on proper burning of household waste / dead grass	Ongoing at MS level	Environmentally sound attitude leads to reduction of POP release to air	Air	PCDD/PCDF, PCB, HCB, PAH	1-2	2	0
Measures for filling knowledge gaps	Obligation for source related country reporting to EMEP (NFR 4F)	International Convention	Information collection on sectorial releases	Air	PCDD/PCDF, PCB, HCB, PAH	2	1	0

Table 7-6: Assessment of deficits and need for action for burning of agricultural waste

7.2.4 Chemical industry

Based on reported data the POP relevance of chemical productions seems to be low to medium concerning air and water. Thus there is some justification for action from this point of view. In addition there are knowledge gaps with respect to PCB and releases to land via impurities and by-products. This could provide arguments for some need for action concerning knowledge gaps. On the other hand chemical industry is highly addressed by legal instruments as regards application of best available techniques and release reporting. Due to additional coverage of PCB and releases to waste and to land the implementation of E-PRTR will reduce the above mentioned knowledge gaps with the first reporting in 2007.

Based on the justification the overall assessment of the source sector is as follows:

- **low need for action due to the fact that the source sector is already adequately covered with respect to unintentional releases of POPs**

A condensed compilation of collected information and the resulting assessment is presented in Table 7-7 below.

Chemical Industry												
Overall assessment	Medium Mass Flow relevance especially to water with some uncertainty.									**Need for action**		
										low		
Deficits in measures	generally adequately covered; deficits in knowledge as regards releases to land via by-products									Rating:		
										adequately covered		
Mass flow	PCDD/PCDF			PCB			HCB			PAH		
Total releases	~200 g TEQ/y			~210 kg/y			~205 kg/y			~ 40t/y		
Compartment	Air	Water	Land	Air	Water	Land	Air	Water	Land	Air	Water	Land
Rating	low	low/medium	?	medium	low/medium	?	medium	medium	?	medium	medium	?
Exposure relevance	Oral/digestive		low		Dermal		none		Inhalative		none	
Food chain relevance	Vegetables		none		Dairies/meat		none		Fish/seafood		medium	

Measures	Measure	Status	Effect	Compartment addressed	Pollutant addressed	Assessment		
						Effective-ness	Costs	Socio-economic impacts
Specific measures for reduction of POP releases	Limits for HCB in waste water legislation; HCB as priority substance in water framework							
General measures for release reduction	Mandatory permitting (e.g. based on BAT concept)	Established at EU and MS level	Release reduction due to the authority's control in the permitting process and the (officially observed) duty to meet thresholds	Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH	3	1-2	2
	Emission trading	Established at EU level (Directive 2003/87/EC)	Overall release reduction	Air	PCDD/PCDF, PCB, HCB, PAH	1	2	1
	Training of environmental inspectors and permit authorities	Established at MS level	Better enforcement of legislation due to more effective control leads to general release reduction	Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH	3	1	0
Measures for filling knowledge gaps	Reporting obligation if threshold values exceeded	Established at EU and MS level	Improved knowledge	Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH (depending on permit)	2	0	0
	Obligation for MS to make release inventories for PCDD/F, PCB and PAH	Established at EU level (POP Regulation)	Improved knowledge	Air, Water, Land	PCDD/PCDF, PCB, PAH	2	1	0
	Reporting to EMEP, EPER and E-PRTR	Established at EU level	Improved knowledge	Air, Water, Land	PCDD/PCDF, PCB, HCB PAH	2	1	0

Table 7-7: Assessment of deficits and need for action for chemical industry

7.2.5 Construction and demolition

Based on reported data the POP relevance of construction and demolition activities is focused on PCB releases due to historic use of PCB in construction material. Although the sector is not related to unintentional production releases may be significant if waste material is not properly managed. Consequently there is justification for action from this point of view. In addition there is only limited information on remaining stocks and POP contamination levels. Therefore there is need for action concerning knowledge gaps.

On the other hand the construction and demolition sector is already addressed by Community waste legislation as regards classification of waste and limit values for landfill acceptance.

Based on the justification the overall assessment of the source sector is as follows:

- **medium need for action due to the fact that the sector is already partially addressed with respect to unintentional releases of POPs**

A condensed compilation of collected information and the resulting assessment is presented in Table 7-8 below.

Construction and Demolition

Overall assessment	Medium to high mass flow relevance for PCB with high uncertainty; significant potential for release reduction in countries where measures for material separation and ESM (Environmental sound management) not yet applied	**Need for action** **medium**
Deficits in measures	Important knowledge gaps with respect to releases to all media; a number of measures established at European and Member State level; however insufficient measures to address separation and ESM (Environmental sound management) of material fractions	Rating: partially addressed

Mass flow	PCDD/PCDF			PCB			HCB			PAH		
Total releases	?			~20,000 kg/y (entering landfills)			?			?		
Compartment	Air	Water	Land	Air	Water	Land	Air	Water	Land	Air	Water	Land
Rating	?	?	?	?	?	high	?	?	?	?	?	?
Exposure relevance	Oral/digestive		low		Dermal		low		Inhalative		low	
Food chain relevance	Vegetables		none		Dairies/meat		low		Fish/seafood		low	

Measures	**Measure**	**Status**	**Effect**	**Compartment addressed**	**Pollutant addressed**	**Assessment**		
						Effective-ness	Costs	Socio-economic impact
Specific measures for reduction of POP releases	Limit values in leachate as acceptance criteria for landfilling	Established at EU level (Decision 2003/33/EC)	Reduction of releases to water and land	Water, Land	PCB,	2	0-1	0-1
	Ban of PCB in products	Established at EU level (1976/769/EC)	Direct release reduction	Water, Land	PCB	3	0	1-2
	Limit values for PCB containing material in view of recovery /disposal	Established at EU level (Directive 96/59/EC)	Reduction of releases to water and land	Water, Land	PCB,	2	0	1

	Limit values for use as secondary raw material in landfill management	Established at MS level	Reduction of releases to water and land	Water, Land	PCB,	2	0	1
	Limit values for waste wood in case of use for energy recovery	Established at MS level	Reduction of releases to air	Water, Land	PCDD/PCDF (mainly)	1	0	0
General measures for release reduction	Obligation to plan and permit construction and demolition measures including thorough separation and management of material fractions	Established at MS level	Reduction of releases to all media	Air, Water, land	PCB (mainly) and pesticides	2	1	2
Measures for filling knowledge gaps	no measures identified							

Table 7-8: Assessment of deficits and need for action for construction and demolition

7.2.6 Crematoria and animal carcass burning

Based on reported data the POP relevance of cremation and animal carcass burning seems to be low, however significant knowledge gaps and uncertainty exist. Therefore there is no justification for action as regards mass flow relevance but need for action concerning knowledge gaps. Information would be required in the field of releases of HCB and PAH as well as to water and land. Currently cremation is not well addressed at Community level.

Based on the justification the overall assessment of the source sector is as follows:

- **low need for action due to mass flow relevance but not adequately addressed with respect to unintentional releases of POPs**

A condensed compilation of collected information and the resulting assessment is presented in Table 7-9 below.

Crematoria / Animal carcass burning												
Overall assessment	Low to Medium Mass Flow relevance with significant uncertainty									**Need for action**		
										low		
Deficits in measures	Poor knowledge of HCB / PAH releases to land and water; Specific measures in a few MS; No measures at EU level									Rating:		
										not adequately addressed		
Mass flow	PCDD/PCDF			PCB			HCB			PAH		
Total releases	~ 7 g TEQ/y			~50 kg/y			?			?		
Compartment	Air	Water	Land	Air	Water	Land	Air	Water	Land	Air	Water	Land
Rating	low	?	?	low	?	?	?	?	?	?	?	?
Exposure relevance	Oral/digestive		none		Dermal		none		Inhalative		low	
Food chain relevance	Vegetables		none		Dairies/meat		low		Fish/seafood		low	
Measures	**Measure**	**Status**	**Effect**		**Compartment addressed**		**Pollutant addressed**			**Assessment**		
										Effective-ness	Costs	Socio-economic impacts
Specific measures for reduction of POP releases	ELV for for PCDD/PCDF (0.1 ng/Nm³)	Established at MS level	Direct reduction of release to air due to the duty to meet thresholds		Air		PCDD/F			3	0	1
General measures for release reduction	no measures identified											
Measures for filling data gaps	Obligation for MS to make release inventories for PCDD/F, PCB and PAH	Established at EU level (POP Regulation)	Improved knowledge		Air, Water, Land		PCDD/PCDF, PCB, PAH			2	1	0

Table 7-9: Assessment of deficits and need for action for crematoria / animal carcass burning

7.2.7 Dredging, Off-shore activities and Dock works

Based on reported data the POP relevance of dredging, off-shore activities and dock works seems to be medium for PAH. Thus there is justification for action from this point of view. In addition there is need for action concerning reporting for off-shore facilities. Due to characteristics of the activities releases of other POPs are less expected.

On the other hand the sector is already addressed by legislation and reporting obligations as concerns dock works and dredging activities.

Based on the justification the overall assessment of the source sector is as follows:

- **medium need for action due to mass flow relevance and the fact that the sector is not yet adequately addressed with respect to unintentional releases of POPs**

A condensed compilation of collected information and the resulting assessment is presented in Table 7-10 below.

Dredging / Offshore / Dock works												
Overall assessment	Medium mass flow relevance for PAHs with high uncertainty; significant potential for release reduction might be achievable									**Need for action**		
										medium		
Deficits in measures	no specific measures applied; no measures to address off-shore activities identified									Rating:		
										not adequately addressed		
Mass flow	PCDD/PCDF			PCB			HCB			PAH		
Total releases	?			?			?			~400 t/y		
Compartment	Air	Water	Land	Air	Water	Land	Air	Water	Land	Air	Water	Land
Rating	?	?	?	?	?	?	?	?	?	?	medium	?
Exposure relevance	Oral/digestive		low		Dermal		none		Inhalative		none	
Food chain relevance	Vegetables		none		Dairies/meat		none		Fish/seafood		medium/high	

Measures	Measure	Status	Effect	Compartment addressed	Pollutant addressed	Assessment		
						Effective-ness	Costs	Socio-economic impacts
Specific measures for reduction of POP releases	no measures identified							
General measures for release reduction	Mandatory permitting (e.g. based on BAT concept) for dock works	Established at EU and MS level	Release reduction due to the authority's control in the permitting process and the (officially observed) duty to meet thresholds	Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH	3	1-2	2
	Classification of dredging sludges according to EWC (European Waste Catalogue)	Established at EU and MS level	Release reduction due to specific management requirements	Land	PAH (mainly)	2-3	1-2	2
Measures for filling knowledge gaps	Reporting obligation for dock works if threshold values exceeded	Established at EU and MS level	Improved knowledge	Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH (depending on permit)	2	0	0
	Reporting to EPER and E-PRTR	Established at EU level	Improved knowledge	Air, Water, Land	PCDD/PCDF, PCB, HCB PAH	2	1	0

Table 7-10: Assessment of deficits and need for action for dredging, off-shore activities and dock works

7.2.8 Iron and steel

Based on reported data the POP relevance of iron and steel production seems to be medium to air and land. Thus there is some justification for action from this point of view. In addition there are some knowledge gaps with respect to releases to water, however due to process technology releases are not expected to be high. On the other hand iron and steel industry is highly addressed by legal instruments as regards application of best available techniques and release reporting. Due to reduced threshold levels for reporting and inclusion of releases to waste and to land the implementation of E_PRTR will reduce the above mentioned knowledge gaps with the first reporting in 2007.

Based on the justification the overall assessment of the source sector is as follows:

- **provided BAT is thoroughly implemented and further developed in accordance with POP Regulation objectives there is low need for action due to the fact that the source sector is already adequately covered with respect to unintentional releases of POPs**

A condensed compilation of collected information and the resulting assessment is presented in Table 7-11 below.

Iron and Steel

Overall assessment	Medium mass flow relevance with some uncertainty. Release level highly depended on effective enforcement and application of high standard technology	Need for action: low
Deficits in measures	generally well addressed; deficits in knowledge as regards releases to water	Rating: adequately covered

Mass flow	PCDD/PCDF			PCB			HCB			PAH		
Total releases	~ 1,000 g TEQ/y			~600 -800 kg/y			~700 kg/y			~50 t/y		
Compartment	Air	Water	Land	Air	Water	Land	Air	Water	Land	Air	Water	Land
Rating	medium	low*	medium	medium	?	medium	medium	?	?	medium	?	?
Exposure relevance	Oral/digestive		low		Dermal		none		Inhalative		low	
Food chain relevance	Vegetables		low		Dairies/meat		medium		Fish/seafood		medium	

Measures	Measure	Status	Effect	Compartment addressed	Pollutant addressed	Assessment: Effective-ness	Costs	Socio-economic impacts
Specific measures for reduction of POP releases	Limit Values for POP content in production residues	Established at EU level (POP Regulation)	Specific requirements for waste treatment	Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH	2	0	1
	Emission limit for PCDD/PCDF	Established at MS Level	Reducing air pollution	Air	PCDD/F	3	1	1
General measures for release reduction	Mandatory permitting (e.g. based on BAT concept)	Established at EU and MS level	Release reduction due to the authority's control in the permitting process and the (officially observed) duty to meet thresholds	Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH	3	1-2	2
	Emission trading	Established at EU level (Directive 2003/87/EC)	Overall release reduction	Air	PCDD/PCDF, PCB, HCB, PAH	1	2	1
	Training of environmental inspectors and permit authorities	Established at MS level	Better enforcement of legislation due to more effective control leads to general release reduction	Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH	3	1	0

Measures for filling knowledge gaps	Reporting obligation if threshold values exceeded	Established at EU and MS level	Improved knowledge	Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH (depending on permit)	2	0	0
	Obligation for MS to make release inventories for PCDD/F, PCB and PAH	Established at EU level (POP Regulation)	Improved knowledge	Air, Water, Land	PCDD/PCDF, PCB, PAH	2	1	0
	Reporting to EMEP, EPER and E-PRTR	Established at EU level	Improved knowledge	Air, Water, Land	PCDD/PCDF, PCB, HCB PAH	2	1	0
	Research on efficient detoxification of contaminated fly ash	Established at MS level	Improvement of knowledge	Air	PAH (mainly)	2	1	0

Table 7-11: Assessment of deficits and need for action for iron and steel

7.2.9 Landfilling

Based on reported data the POP relevance of landfills seems to be low. Thus there is little justification for action from this point of view. However there are knowledge gaps as concerns long-term leaching behaviour and long-term releases.

On the other hand land filling is already addressed by legal instruments as regards limit values for incoming wastes, application of best available techniques and release reporting. Due to reduced threshold levels for reporting and inclusion of releases to land the implementation of E-PRTR will reduce the above mentioned knowledge gaps with the first reporting in 2007.

Based on the justification the overall assessment of the source sector is as follows:

- **low need for action due to the fact that the source sector is already adequately covered with respect to unintentional releases of POPs**

A condensed compilation of collected information and the resulting assessment is presented in Table 7-12 below.

Landfilling

Overall assessment	Low mass flow relevance with respect to releases to water; general and specific (e.g. regarding PCB) measures established at EU level; effect highly dependent on proper enforcement and control	Need for action: low
Deficits in measures	Significant knowledge gaps with respect to releases to all media	Rating: partially addressed

Mass flow	PCDD/PCDF			PCB			HCB			PAH		
Total releases	?			?			?			?		
Compartment	Air	Water	Land	Air	Water	Land	Air	Water	Land	Air	Water	Land
Rating	?	low	?	?	low	?	?	?	?	?	?	?
Exposure relevance	Oral/digestive		NO		Dermal		none		Inhalative		none	
Food chain relevance	Vegetables		none		Dairies/meat		none		Fish/seafood		low	

Measures	Measure	Status	Effect	Compartment addressed	Pollutant addressed	Assessment: Effectiv-ness	Assessment: Costs	Assessment: Socio-economic impacts
Specific measures for reduction of POP releases	Limit values in leachate as acceptance criterium for landfilling	Established at EU level (Decision 2003/33/EC)	Reduction of releases to water and land	Land, Water	PCB,	3	1	1
	Obligation to destroy POP content if low POP content limits are exceeded	Established at EU level (Regulation No 850/2004)	Reduction of releases to water and land	Land, Water	PCDD/PCDF, PCB, HCB	3	1	1

General measures for release reduction	Permitting based on BAT concept	Established at EU level (IPPC Directive)	Integrated release reduction due to the authority's control in the permitting process and the (officially observed) duty to meet thresholds	Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH	3	2	1
	Technical standards and requirements for landfill sites including ban of landfilling of untreated waste, monitoring and after care	Established at EU level (Directive 1999/31/EC)	Reduction of releases to all media (mainly water and land)	Land, Water	PCDD/PCDF, PCB, HCB, PAH	2	1	1
	Prioritisation of recycling and recovery; overall reduction targets	Established at EU level (Landfill Directive)	Reduction of releases to all media (mainly water and land)	Land, Water	PCDD/PCDF, PCB, HCB, PAH	2	0	0
	Reporting obligation if threshold values exceeded	Established at EU level (IPPC directive, E-PRTR-Regulation)	Improvement of knowledge; Pressure to reduce releases	Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH	2	1	0
	Pollutant Release and Transfer Register	Established at EU and MS level	Improvement of knowledge in the field of releases and mass flows; pressure to reduce releases	Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH	2	1	0
Measures for filling data gaps	Reporting obligation if threshold values exceeded	Established at EU level (IPPC directive, E-PRTR-Regulation)	Improvement of knowledge	Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH	2	1	0
	Pollutant Release and Transfer Register	Established at EU and MS level	Improvement of knowledge in the field of releases and mass flows	Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH	2	1	0

Table 7-12: Assessment of deficits and need for action for landfilling

7.2.10 Marine transport

Based on reported data the POP relevance of marine traffic seems to be low to air except of PAH where medium mass flow relevance has to be observed and high to water as regards PAH. Thus there is significant justification for action from this point of view. In addition there is need for action concerning knowledge gaps.

On the other hand marine traffic is already partially addressed by means of general measures set at international and European level.

Based on the justification the overall assessment of the source sector is as follows:

- **medium need for action due to significant PAH relevance and the fact that the sector is already partially addressed with respect to unintentional releases of POPs**

A condensed compilation of collected information and the resulting assessment is presented in Table 7-13 below.

Marine transport												
Overall assessment	Mass Flow relevance with high uncertainty; Potential for release reduction									**Need for action**		
										medium		
Deficits in measures	Poor knowledge of releases to water except of PAH; No specific measures established									Rating:		
										partially addressed		
Mass flow	PCDD/PCDF			PCB			HCB			PAH		
Total releases	~2 gTEQ/Y			~ 5kg/y			?			~500 t/y		
Compartment	Air	Water	Land	Air	Water	Land	Air	Water	Land	Air	Water	Land
Rating	low	?	?	low	?	?	?	?	?	medium	high	?
Exposure relevance	Oral/digestive		medium		Dermal		none		Inhalative		none	
Food chain relevance	Vegetables		none		Dairies/meat		none		Fish/seafood		high	

Measures	Measure	Status	Effect	Compartment addressed	Pollutant addressed	Assessment		
						Effective-ness	Costs	Socio-economic impacts
Specific measures for reduction of POP releases	no measures identified							
General measures for release reduction	International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto (MARPOL 73/78)	Internationally agreed	Overall limitation of crude oil releases and sea pollution by other discharges	Water	PAH	1	0	0
	Limits on the sulphur content of marine fuels	Established at EU level (Directive 99/32/EC)	Overall release reduction may have limited effect namely for PAH releases reduction	Air	PCDD/PCDF, PCB, HCB, PAH	1	0	1
	NOx and PM releases standards for non-road engines	Established at EU level (Directive 97/68/EC)	Overall release reduction may have effect namely for PAH releases reduction	Air	PCDD/PCDF, PCB, HCB, PAH	1-2	0	1
Measures for filling data gaps	Reporting to EMEP (NFR 1A 3d)	Established at EU level	Improved knowledge	Air, Water, Land	PCDD/PCDF, PCB, HCB PAH	2	1	0

Table 7-13: Assessment of deficits and need for action for marine transport

7.2.11 Mineral industry

Based on reported data the POP relevance of the mineral industry seems to be generally low to air even if waste is used for co-incineration. Thus there is no justification for action from this point of view. Cement industry seems to be the relevant source in this sector. Reported releases from ceramics, glass and lime are very low. There are some knowledge gaps with respect to releases to land (via waste or product) and to water, however due to process technology releases are not expected to be high.

In addition the mineral industry sector (namely cement kilns) is highly addressed by legal instruments as regards application of best available techniques and release reporting. Cement kilns furthermore are subject to the waste incineration directive due to their function as co-incineration facilities for wastes and thus have to respect emission limits for PCDD/PCDF. Due to reduced threshold levels for reporting and inclusion of releases to waste and to land the implementation of E_PRTR will reduce the above mentioned knowledge gaps with the first reporting in 2007.

Based on the justification the overall assessment of the source sector is as follows:

- **low need for action due to the fact that the source sector is already adequately covered with respect to unintentional releases of POPs**

A condensed compilation of collected information and the resulting assessment is presented in Table 7-14 below.

Mineral Industry (Cement, Ceramics, Glass, Lime)												
Overall assessment	Low mass flow relevance with uncertainty with respect to POPs other than PCDD/PCDF; Technical standards and process technology are crucial factors for environmental performance									**Need for action**		
										low		
Deficits in measures	generally well addressed; deficits in knowledge as regards releases to land									Rating:		
										adequately covered		
Mass flow	PCDD/PCDF			PCB			HCB			PAH		
Total releases	25 gTEQ/y			~400 kg/y (?)			~2 kg/y			~ 10 t/y		
Compartment	Air	water	land	Air	water	land	Air	water	land	Air	water	land
Rating	low	?	?	Medium (?)	?	?	low	?	?	low	?	?
Exposure relevance	Oral/digestive		low	Dermal			none		Inhalative		none	
Food chain relevance	Vegetables		none	Dairies/meat			low		Fish/seafood		low	

Measures	Measure	Status	Effect	Compartment	Pollutant	Assessment		
						Effective-ness	Costs	Socio-economic impacts
Specific measures for reduction of POP releases	Limit value for PCDD/PCDF release	Established at EU level (Waste Incineration Directive)	Reduction of PCDD/PCDF releases	Air	PCDD/PCDF	3	0	2
General measures for release reduction	Mandatory permitting (e.g. based on BAT concept)	Established at EU and MS level	Release reduction due to the authority's control in the permitting process and the (officially observed) duty to meet thresholds	Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH	3	1-2	2
	Emission trading	Established at EU level (Directive 2003/87/EC)	Overall release reduction	Air	PCDD/PCDF, PCB, HCB, PAH	1	2	1
	Training of environmental inspectors and permit authorities	Established at MS level	Better enforcement of legislation due to more effective control leads to general release reduction	Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH	3	1	0
Measures for filling knowledge gaps	Reporting obligation if threshold values exceeded	Established at EU and MS level	Improved knowledge	Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH (depending on permit)	2	0	0
	Obligation for MS to make release inventories for PCDD/F, PCB and PAH	Established at EU level (POP Regulation)	Improved knowledge	Air, Water, Land	PCDD/PCDF, PCB, PAH	2	1	0
	Reporting to EMEP, EPER and E-PRTR	Established at EU level	Improved knowledge	Air, Water, Land	PCDD/PCDF, PCB, HCB PAH	2	1	0

Table 7-14: Assessment of deficits and need for action for mineral industry

7.2.12 Non-ferrous metal industry

Based on reported data the POP relevance of non-ferrous metal production seems to be low to air except of HCB where high releases have been reported for magnesium production. Releases to land are low as most of the dusts are recovered in secondary thermal processes or have to be disposed as hazardous wastes. Releases to water have been categorised as medium for PAH based on reported data. In addition there are some knowledge gaps with respect to releases to water for the other POPs. Mass flow relevance and knowledge gaps therefore provide some justification for need of action.

On the other hand non-ferrous metal industry is highly addressed by legal instruments as regards application of best available techniques and release reporting. Due to reduced threshold levels for reporting and inclusion of releases to waste and to land the implementation of E_PRTR will reduce the above mentioned knowledge gaps with the first reporting in 2007.

Based on the justification the overall assessment of the source sector is as follows:

- **provided BAT is thoroughly implemented and further developed in accordance with POP Regulation objectives there is low need for action due to the fact that the source sector is already adequately covered with respect to unintentional releases of POPs**

A condensed compilation of collected information and the resulting assessment is presented in Table 7-15 below.

Non-ferrous metal industry												
Overall assessment	Medium mass flow relevance with some uncertainty; releases highly dependent on proper application and up-dating of BAT, enforcement and control									**Need for action**		
										low		
Deficits in measures	generally well addressed; deficits in knowledge as regards releases to waste and to land for all POPs except PCDD/PCDF									Rating:		
										adequately covered		
Mass flow	PCDD/PCDF			PCB			HCB			PAH		
Total releases	~ 800 g TEQ/y			~ 40 kg/y			~600 kg/y			~ 6 t/y		
Compartment	Air	Water	Land	Air	Water	Land	Air	Water	Land	Air	Water	Land
Rating	low	?	medium	low	?	low	high	?	low	low	medium	?
Exposure relevance	Oral/digestive		low		Dermal		none		Inhalative		low	
Food chain relevance	Vegetables		low		Dairies/meat		low		Fish/seafood		low	

Measures	Measure	Status	Effect	Compartment addressed	Pollutant addressed	Assessment		
						Effective-ness	Costs	Socio-economic impacts
Specific measures for reduction of POP releases	Limit Values for POP content in production residues	Established at EU level (POP Regulation)	reduction of releases from production residues	Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH	2	0	1
	Emission limit for PCDD/PCDF	Established at MS Level	Release reduction	Air	PCDD/F	3	1	1
General measures for release reduction	Mandatory permitting (e.g. based on BAT concept)	Established at EU and MS level	Release reduction due to the authority's control in the permitting process and the (officially observed) duty to meet thresholds	Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH	3	1-2	2
	Emission trading	Established at EU level (Directive 2003/87/EC)	Overall release reduction	Air	PCDD/PCDF, PCB, HCB, PAH	1	2	1
	Training of environmental inspectors and permit authorities	Established at MS level	Better enforcement of legislation due to more effective control leads to general release reduction	Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH	3	1	0
Measures for filling knowledge gaps	Reporting obligation if threshold values exceeded	Established at EU and MS level	Improved knowledge	Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH (depending on permit)	2	0	0
	Obligation for MS to make release inventories for PCDD/F, PCB and PAH	Established at EU level (POP Regulation)	Improved knowledge	Air, Water, Land	PCDD/PCDF, PCB, PAH	2	1	0
	Reporting to EMEP, EPER and E-PRTR	Established at EU level	Improved knowledge	Air, Water, Land	PCDD/PCDF, PCB, HCB PAH	2	1	0
	Research on efficient detoxification of contaminated fly ash	Established at MS level	Improvement of knowledge	Air	PAH (mainly)	2	1	0

Table 7-15: Assessment of deficits and need for action for non-ferrous metal industry

7.2.13 Open burning of waste

Based on reported data the POP relevance of open waste burning seems to be medium for all POPs. Thus there is justification for action from this point of view. In addition environmental and food chain relevance is significant as most of the releases are emitted to air and thus lead to deposition to soil and water. Furthermore there are significant knowledge gaps as regards activity data and some need for action concerning verification of release data.

On the other hand the sector is already addressed at Member State level and as regards reporting to EMEP. However these measures might not be enough. Consequently the overall assessment of the source sector is as follows:

- **medium need for action due to the fact that the source sector is already partially addressed with respect to unintentional releases of POPs**

A condensed compilation of collected information and the resulting assessment is presented in Table 7-16 below.

Open burning of waste												
Overall assessment	Medium Mass Flow relevance highly depending on activity data uncertainty; High potential for release reduction in countries where open burning of waste not yet banned / controlled									**Need for action**		
										medium		
Deficits in measures	Poor knowledge of releases due to limited activity data; General measures at EU level; Educational measures in a number of MS									Rating:		
										partially addressed		
Mass flow	PCDD/PCDF			PCB			HCB			PAH		
Total releases	~ 1,000 gTEQ/y			~100 kg/y			?			?		
Compartment	Air	Water	Land	Air	Water	Land	Air	Water	Land	Air	Water	Land
Rating	medium	?	medium	medium	?	?	?	?	?	?	?	?
Exposure relevance	Oral/digestive		medium	Dermal			low		Inhalative	locally		
Food chain relevance	Vegetables		low	Dairies/meat			medium		Fish/seafood	medium		

Measures	**Measure**	**Status**	**Effect**	**Compartment addressed**	**Pollutant addressed**	**Assessment**		
						Effective-ness	Costs	Socio-economic impacts
Specific measures for reduction of POP releases	Broad ban on open burning of waste	Established at MS level	Release reduction	Air	PCDD/PCDF, PAH (mainly)	3	1	2
General measures for release reduction	Awareness raising in residential and agricultural sector (proper burning of household waste/agricultural waste)	Established at MS level	Knowledge gain; release reduction	Air	PCDD/PCDF, PAH (mainly)	2	1	0
Measures for filling knowledge gaps	Reporting to EMEP (NFR 6 D)	Established at EU level	Improved knowledge	Air, Water, Land	PCDD/PCDF, PCB, HCB PAH	2	1	0

Table 7-16: Assessment of deficits and need for action for open burning of waste

7.2.14 Pesticide use

Based on reported data the POP relevance of pesticide use seems to be potentially high to air and land for HCB. Thus there is justification for action from this point of view.

On the other hand pesticide use is already addressed since a numb er of years by specific legal instruments as regards restriction in production and use (ban for use of HCB as pesticide), food monitoring and water monitoring. Via the implementation of a recent amendment of Directive 91/414/EEC regarding maximum concentration limits for HCB in Chlorothalonil (2005/52/EC) - which is reported as major source of unintentional release of HCB due to pesticide use – a further sign ificant reduction in HCB releases can b e expected. After implementation of the Directive which will enter into force in 2006, the overall releases of HCB from this source will be in the dimension of 40 kg/y. This will lead to a classification on the category of low mass flow relevance.

Based on this recent development the overall assessment of the source sector is as follows:

- **low need for action due to low mass flow relevance when Directive 2005/52/EC is implemented and the fact that the source sector is already adequately addressed with respect to unintentional releases of POPs**

A condensed compilation of collected information and the resulting assessment is presented in * as concerns current use of pesticides; contamination from historical use not taken into consideration

Table 7-17 below.

Pesticides												
Overall assessment	Potentially high mass flow relevance for HCB; specific and general reduction measures established at EU level; release reduction potential depending on impurity concentration in large volume pesticide									**Need for action**		
										low		
Deficits in measures	Effective specific and general reduction measures in place; poor knowledge with respect to releases to land and water									Rating:		
										adequately addressed		
Mass flow	PCDD/PCDF			PCB			HCB			PAH		
Total releases	?			?			~2000 kg/y			?		
Compartment	Air	Water	Land	Air	Water	Land	Air	Water	Land	Air	Water	Land
Rating	?	?	?	?	?	?	high	?	high	?	?	?
Exposure relevance*	Oral/digestive		low		Dermal		locally low		Inhalative		locally low	
Food chain relevance*	Vegetables		locally low		Dairies/meat		low		Fish/seafood		low	
Measures	**Measure**	**Status**		**Effect**		**Compartment addressed**		**Pollutant addressed**		**Assessment**		
										Effective-ness	Costs	Socio-economic impacts
Specific measures for reduction of POP releases	Ban on use or placing on the market of plant protection products containing HCB, No remaining uses are allowed	Established at EU level (79/117/EEC)		Release reduction		Air, Land, Water		HCB		2-3	1-2	2

	Establishment of a positive list of plant protection substances	Established at EU level (91/414/EEC; amended as regards Chlorothalonil 2005/52/EC))	Release reduction by reducing contamination and impurities	Air, Land, Water	HCB	3-2	1-2	2
	Provisions for marketing and use of biocides	Biocide Directive 1998/8/EC	Release reduction by reducing contamination and impurities	Air, Land, Water	HCB	3-2	1-2	2
General measures for release reduction	Maximum levels for pesticide residues in and on foodstuffs	Established at EU level (396/2005/EC)	Reduction of dietary exposure; control of proper application of instuctions and restrictions, annual monitoring	Air, Land, Water	HCB	2-3	1-2	2
	Common Agricultural Policy	Established at EU level (namely Reg. 1698/2005/EC	Sustainable use of pesticides	Air, Land, Water	HCB	1	1-2	2
	Pesticide Strategy	framework directive proposed at EU level	Sustainable use of pesticides	Air, Land, Water	HCB	1	1-2	2

Measures for filling data gaps	Food Monitoring for Pesticides	see 396/2005/EC	Control of proper application of instructions and restrictions, annual monitoring	Land	HCB	2-3	2-3	1-2
	Monitoring under Water Framework Directive	Established see list of priority substances	Control of proper application of instructions and restrictions, annual monitoring	Water	HCB, PAH	2-3	2-3	1-2

* as concerns current use of pesticides; contamination from historical use not taken into consideration

Table 7-17: Assessment of deficits and need for action for pesticide use

7.2.15 Power production

Based on reported data the POP relevance of public power production seems to be medium to air and land, whereas no significant releases to water have been reported to EPER in 2001. Thus there is justification for action from this point of view.

On the other hand large combustion plants are highly addressed by legal instruments as regards application of best available techniques and release reporting. Due to reduced threshold levels for reporting and inclusion of releases to waste and to land the implementation of E_PRTR will reduce the above mentioned knowledge gaps with the first reporting in 2007. The focus of further work should consequently be directed to installations not yet subject to BAT and strict pollution abatement. These are combustion installations with a rated thermal input < 50 MW.

Based on the justification the overall assessment of the source sector is as follows:

- **medium need for action due to the fact that the source sector is already partially addressed with respect to unintentional releases of POPs**

A condensed compilation of collected information and the resulting assessment is presented in Table 7-18 below.

Power Production												
Overall assessment	Medium mass flow relevance; general reduction measures established for larger installations at EU level; effect highly dependent on proper application of BAT, enforcement and control; significant release reduction potential for small installations not yet covered by existing legislation									**Need for action**		
										medium		
Deficits in measures	Large installations well addressed; limited knowledge with respect to releases to land and water									Rating:		
										partially addressed		
Mass flow	PCDD/PCDF			PCB			HCB			PAH		
Total releases	~1000 g TEQ/y			~1,500 kg/y			~ 20 kg/y			~30 t/y		
Compartment	Air	Water	Land	Air	Water	Land	Air	Water	Land	Air	Water	Land
Rating	medium	?	medium	high	?	?	low	?	?	low	?	?
Exposure relevance	Oral/digestive		medium		Dermal		none		Inhalative		low	
Food chain relevance	Vegetables		low		Dairies/meat		medium		Fish/seafood		medium	

Measures	Measure	Status	Effect	Compartment addressed	Pollutant addressed	Assessment		
						Effective-ness	Costs	Socio-economic impacts
Specific measures for reduction of POP releases	Limit Values for POP content in production residues	Established at EU level (POP Regulation)	Reduction of releases from production residues	Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH	2	0	1
	Emission limit for PCDD/PCDF	Established at MS Level	Release reduction	Air	PCDD/F	3	1	1
General measures for release reduction	Mandatory permitting (e.g. based on BAT concept) for large installations	Established at EU and MS level	Release reduction due to the authority's control in the permitting process and the (officially observed) duty to meet thresholds	Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH	3	1-2	2
	Emission trading	Established at EU level (Directive 2003/87/EC)	Overall release reduction	Air	PCDD/PCDF, PCB, HCB, PAH	1	2	1
	Training of environmental inspectors and permit authorities	Established at MS level	Better enforcement of legislation due to more effective control leads to general release reduction	Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH	3	1	0
Measures for filling data gaps	Reporting obligation if threshold values exceeded	Established at EU and MS level	Improved knowledge	Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH (depending on permit)	2	0	0
	Release inventories for PCDD/F, PCB and PAH	Established at EU level (POP Regulation)	Improved knowledge	Air, Water, Land	PCDD/PCDF, PCB, PAH	2	1	0
	Reporting to EMEP, EPER and E-PRTR	Established at EU level	Improved knowledge	Air, Water, Land	PCDD/PCDF, PCB, HCB PAH	2	1	0

Table 7-18: Assessment of deficits and need for action for power production

7.2.16 Pulp and paper industry

Based on reported data the POP relevance of pulp and paper production seems to be generally low to air and water. However there are some knowledge gaps with respect to current releases to water and land.

On the other hand the pulp and paper industry is highly addressed by legal instruments as regards application of best available techniques and release reporting. Due to reduced threshold levels for reporting and inclusion of releases to waste and to land the implementation of E_PRTR will reduce the above mentioned knowledge gaps with the first reporting in 2007.

Based on the justification the overall assessment of the source sector is as follows:

- **low need for action due to the fact that the source sector is already adequately covered with respect to unintentional releases of POPs**

A condensed compilation of collected information and the resulting assessment is presented in Table 7-19 below.

Pulp and Paper												
Overall assessment	Low mass flow relevance; addressed at Community level including obligation to apply BAT and report on releases to all media; effect highly dependent on proper implantation, enforcement and control									**Need for action**		
										low		
Deficits in measures	Generally well addressed; limited knowledge with respect to current releases to water and land									Rating:		
										adequately covered		
Mass flow	PCDD/PCDF			PCB			HCB			PAH		
Total releases	~40 g TEQ/y			~90 kg/y			~1.5 kg/y			~6 t/y		
Compartment	Air	Water	Land	Air	Water	Land	Air	Water	Land	Air	Water	Land
Rating	low	low	low	low/medium	low	?	low	?	?	low	?	?
Exposure relevance	Oral/digestive		NO		Dermal		NO		Inhalative		NO	
Food chain relevance	Vegetables		NO		Dairies/meat		NO		Fish/seafood		YES	

Measures	Measure	Status	Effect	Compartment addressed	Pollutant addressed	Assessment		
						Effective-ness	Costs	Socio-economic impacts
Specific measures for reduction of POP releases	Phasing out of chlorine bleaching	OSPAR decision	Direct release reduction	Water, Land	PCDD/PCDF, (mainly)	2	0	2
	Ban of PCB in products	Established at EU level (76/769/EEC)	Direct release reduction	Water, Land	PCB	3	0	2
General measures for release reduction	Mandatory permitting (e.g. based on BAT concept)	Established at EU and MS level	Release reduction due to the authority's control in the permitting process and the (officially observed) duty to meet thresholds	Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH	3	1-2	2
	Emission trading	Established at EU level (Directive 2003/87/EC)	Overall release reduction	Air	PCDD/PCDF, PCB, HCB, PAH	1	2	1
	Training of environmental inspectors and permit authorities	Established at MS level	Better enforcement of legislation due to more effective control leads to general release reduction	Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH	3	1	0
Measures for filling knowledge gaps	Reporting obligation if threshold values exceeded	Established at EU and MS level	Improved knowledge	Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH (depending on permit)	2	0	0
	Release inventories for PCDD/F, PCB and PAH	Established at EU level (POP Regulation)	Improved knowledge	Air, Water, Land	PCDD/PCDF, PCB, PAH	2	1	0
	Reporting to EMEP, EPER and E-PRTR	Established at EU level	Improved knowledge	Air, Water, Land	PCDD/PCDF, PCB, HCB PAH	2	1	0

Table 7-19: Assessment of deficits and need for action for pulp and paper industry

7.2.17 Refinery

Based on reported data the POP relevance of refineries seems to be low to medium to air and below the threshold levels of EPER for water. Thus there is some justification for action from this point of view. In addition there are deficits in knowledge with respect to exact quantities of releases to water and land.

On the other hand refineries are highly addressed by legal instruments as regards application of best available techniques and release reporting. Due to reduced threshold levels for reporting and inclusion of releases to waste and to land the implementation of E_PRTR will reduce the above mentioned knowledge gaps with the first reporting in 2007.

Based on the justification the overall assessment of the source sector is as follows:

- **low need for action due to the fact that the source sector is already adequately covered with respect to unintentional releases of POPs**

A condensed compilation of collected information and the resulting assessment is presented in Table 7-20 below.

Refinery												
Overall assessment	Low to Medium Mass Flow relevance with significant uncertainty									**Need for action**		
										low		
Deficits in measures	Generally well addressed; deficits in knowledge of releases to land and water									Rating:		
										adequately covered		
Mass flow	PCDD/PCDF			PCB			HCB			PAH		
Total releases	~ 10 g TEQ/y			~ 70 kg/y			?			~ 100 t/y		
Compartment	Air	Water	Land	Air	Water	Land	Air	Water	Land	Air	Water	Land
Rating	low	?	?	medium*	?	?	?	?	?	medium*	?	?
Exposure relevance	Oral/digestive		low		Dermal		none		Inhalative		low	
Food chain relevance	Vegetables		none		Dairies/meat		low		Fish/seafood		low	

Measures	Measure	Status	Effect	Compartment addressed	Pollutant addressed	Assessment		
						Effective-ness	Costs	Socio-economic impacts
Specific measures for reduction of POP releases	Specific requirements for tanks used for liquids containing PAH above certain threshold value	Established at MS level	Reduction of air releases	Air	PAH	1-2	1	2-3
General measures for release reduction	Mandatory permitting (e.g. based on BAT concept)	Established at EU and MS level	Release reduction due to the authority's control in the permitting process and the (officially observed) duty to meet thresholds	Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH	3	1-2	2
	Emission trading	Established at EU level (Directive 2003/87/EC)	Overall release reduction	Air	PCDD/PCDF, PCB, HCB, PAH	1	2	1
	Training of environmental inspectors and permit authorities	Established at MS level	Better enforcement of legislation due to more effective control leads to general release reduction	Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH	3	1	0
Measures for filling knowledge gaps	Reporting obligation if threshold values exceeded	Established at EU and MS level	Improved knowledge	Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH (depending on permit)	2	0	0
	Release inventories for PCDD/F, PCB and PAH	Established at EU level (POP Regulation)	Improved knowledge	Air, Water, Land	PCDD/PCDF, PCB, PAH	2	1	0
	Reporting to EMEP, EPER and E-PRTR	Established at EU level	Improved knowledge	Air, Water, Land	PCDD/PCDF, PCB, HCB PAH	2	1	0

Table 7-20: Assessment of deficits and need for action for refinery

7.2.18 Residential combustion

Based on reported data the POP relevance of residential combustion seems to be medium to high for all the investigated POPs. Due to combustion conditions and composition of fuels this applies especially for PCDD/PCDF and PAH. Thus there is strong justification for action from this point of view. In addition environmental and food chain relevance is significant as most of the releases are emitted to air (often at near ground level) and thus lead to deposition to soil and water. Furthermore there is still need for action concerning verification of release data and research in possibilities for release reduction.

Based on the justification the overall assessment of the source sector is as follows:

- **high need for action due to significant environmental and food chain relevance especially with respect to PAH and PCDD/PCDF**

A condensed compilation of collected information and the resulting assessment is presented in Table 7-21 below.

Residential Combustion												
Overall assessment	Medium to high mass flow relevance for the investigated POPs; strong initiatives to include and properly address the sector recently ongoing at EU and MS level; significant potential for release reduction									**Need for action**		
										high		
Deficits in measures	No specific measures established at EU level									Rating:		
										not adequately addressed		
Mass flow	PCDD/PCDF			PCB			HCB			PAH		
Total releases	~ 1,700 g TEQ/y			~ 100 kg/y			~ 200 kg/y			~ 600 t/y		
Compartment	Air	Water	Land	Air	Water	Land	Air	Water	Land	Air	Water	Land
Rating	high	?	low	medium*	?	low	medium	?	?	high	?	?
Exposure relevance	Oral/digestive		medium		Dermal		low		Inhalative		low	
Food chain relevance	Vegetables		low		Dairies/meat		medium		Fish/seafood		medium	

Measures	Measure	Status	Effect	Compartment addressed	Pollutant addressed	Assessment		
						Effective-ness	Costs	Socio-economic impacts
Specific measures for reduction of POP releases	Target values for PAH in ambient air	Established at EU level	General pressure to reduce overall releases	Air	PAH	1-2	1	2
	Requirements for the quality of fuel for small combustion plants	Established at MS level	Control of fuel quality has significant effect on POP releases	Air	PCDD/PCDF, PCB, HCB, PAH	3	1	2
General measures for release reduction	Minimum standards for energy performance applying to new buildings and to major refurbishments of existing large buildings	Established at EU level (Energy Efficiency Directive 2002/95/EC)	Overall reduction of fuel consumption leads to general release reduction	Air	PCDD/PCDF, PCB, HCB, PAH	2	1	1-2
	Boilers above minimum sizes have to be inspected regularly to verify CO_2 releases	Established at EU level (Energy Efficiency Directive 2002/95/EC)	Control of combustion quality leads to general release reduction	Air	PCDD/PCDF, PCB, HCB, PAH	1-2	2	1-2
Measures for filling knowledge gaps	Reporting to EMEP (NFR 1 A 4 b and as diffuse source to E-PRTR	Established at EU level	Improved knowledge	Air, Water, Land	PCDD/PCDF, PCB, HCB PAH	2	1	0

Table 7-21: Assessment of deficits and need for action for residential combustion

7.2.19 Road transport

Based on reported data the POP relevance of road transport seems to be high for PAH and PCB. Thus there is justification for action from this point of view. In addition environmental and food chain relevance is significant as most of the releases are emitted to air and thus lead to deposition to soil and water. Furthermore there is some need for action concerning verification of release data and further reduction of releases from diesel fuels.

Based on the justification the overall assessment of the source sector is as follows:

- **high need for action due to significant environmental and food chain relevance with respect to PAH and eventually PCB**

A condensed compilation of collected information and the resulting assessment is presented in Table 7-22 below.

Road Transport												
Overall assessment	Medium to High Mass Flow relevance with some uncertainty; Significant potential for release reduction by proper implementation of established legislation and realisation of proposed measures									**Need for action**		
										high		
Deficits in measures										Rating:		
										partially addressed		
Mass flow	PCDD/PCDF			PCB			HCB			PAH		
Total releases	~ 60 g TEQ/y			~ 1,400 kg/y (?)			~ 20 kg/y			~ 500 t/y		
Compartment	Air	Water	Land	Air	Water	Land	Air	Water	Land	Air	Water	Land
Rating	low	?	?	high*(?)	?	?	low	?	?	high	?	?
Exposure relevance	Oral/digestive		medium		Dermal		none		Inhalative		medium	
Food chain relevance	Vegetables		low		Dairies/meat		medium		Fish/seafood		medium	

Measures	Measure	Status	Effect	Compartment addressed	Pollutant addressed	Assessment		
						Effective-ness	Costs	Socio-economic impacts
Specific measures for reduction of POP releases	Restriction of the PAH content in diesel fuel	Established at EU level (and, further, at MS level)	Direct reduction of PAH emission due to market / trade restriction	Air	PAH	2	0	2
	Restriction of the PAH content in extender oils and tyres	Established at EU level (Dir 76/769/EEC as amended by Dir 2005/69/EC) to be implemented until December 2006	Direct reduction of PAH emission due to market / trade restriction	Air, Water	PAH	2	0	2
	ban on the marketing of leaded petrol and obligation to make sulphur-free petrol	Established at EU level (Dir. 98/70/EC)	Ban on lead leads to significant POP emission reduction	Air	PCDD/PCDF, PCB, HCB, PAH	1	0	2
General measures for release reduction	Information on the fuel consumption and CO2 emissions of new cars	Established at EU level (Dir. 99/94/EC)	General emission reduction	Air	PCDD/PCDF, PCB, HCB, PAH	1	0	2
Measures for filling knowledge gaps	Release inventories for PCDD/F, PCB and PAH	Established at EU level (POP Regulation)	Improved knowledge	Air, Water, Land	PCDD/PCDF, PCB, PAH	2	1	0
	Reporting to EMEP (NFR 1 A 3 b and as diffuse source to E-PRTR	Established at EU level	Improved knowledge	Air, Water, Land	PCDD/PCDF, PCB, HCB PAH	2	1	0

Table 7-22: Assessment of deficits and need for action for road transport

7.2.20 Shredder industry

Based on reported data the POP relevance of the shredder industry and of the cable stripping / granulation industry seems to be generally low except of PCB. Thus there is some justification for action from this point of view.

However there is no unintentional production of POPs during the shredder process and of the cable stripping / granulation process. PCB releases to waste occur depending on the contamination of feed material. In addition the shredder industry is highly addressed by specific legal instruments which should guarantee low contamination levels if properly enforced.

Based on the justification the overall assessment of the source sector is as follows:

- **low need for action due to the fact that the sector is not a source for unintentional production of POP and is already addressed with respect to unintentional releases on the input and output side**

A condensed compilation of collected information and the resulting assessment is presented in Table 7-23 below.

Shredder industry												
Overall assessment	Low to medium mass flow relevance with respect to air emissions; no unintentional production but only unintentional release of POPs due to incoming contamination; well addressed at EU level by specific regulation; release reduction effect highly dependent on proper implementation, enforcement and control of existing legislation									**Need for action**		
										low		
Deficits in measures	Poor international reporting duties									Rating:		
										partially addressed		
Mass flow	PCDD/PCDF			PCB			HCB			PAH		
Total releases	2 g TEQ/y			~100 kg/y			~14 kg/y			~ 7 kg/y		
Compartment	Air	Water	Land	Air	Water	Land	Air	Water	Land	Air	Water	Land
Rating	low	?	?	medium	?	significant	low	?	?	low	?	?
Exposure relevance	Oral/digestive		low		Dermal		none		Inhalative		low	
Food chain relevance	Vegetables		none		Dairies/meat		low		Fish/seafood		low	

Measures	Measure	Status	Effect	Compartment addressed	Pollutant addressed	Assessment		
						Effective-ness	Costs	Socio-economic impacts
Specific measures for reduction of POP releases	Ban of PCB in products	Established at EU level (1976/769/EC)	Direct release reduction	Water, Land	PCB	3	0	2
	Prohibition of the use of PBBs and PBDEs in new products from 2006	Established at EU level (ROHS Directive 2002/95/EC)	Prohibition of the use of PBBs and PBDEs in products leads to direct reduction of POPs releases to air	Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH	2	0	2
	Removal of PCB containing capacitors prior to metal recovery	Established at EU level (WEEE and ELV Directive)	Removal of PCB containing capacitors leads to direct reduction of POPs releases to air	Air, Water, Land	PCB	2	0	2
	Limit Values for POP content in production residues	Established at EU level (POP Regulation)	reduction of releases from production residues	Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH	2	0	1
General measures for release reduction	Permitting	Established at MS level	Release reduction	Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH	3	1-2	2
	Training of environmental inspectors and permit authorities	Established at MS level	Better enforcement of legislation due to more effective control leads to general release reduction	Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH	3	1	0
	Release inventories for PCDD/F, PCB and PAH	Established at EU level (POP Regulation)	Improved knowledge	Air, Water, Land	PCDD/PCDF, PCB, PAH	2	1	0

Table 7-23: Assessment of deficits and need for action for shredder industry

7.2.21 Surface treatment and solvent use

Based on reported data the POP relevance of surface treatment and solvent use seems to be medium to air for PAH. Thus there is some justification for action from this point of view. In addition there are knowledge gaps with respect to releases to water and releases of the other POPs. However due to process technology releases are not expected to occur.

Large surface treatment facilities are highly addressed by legal instruments as regards application of best available techniques and release reporting and due to reduced threshold levels for reporting and inclusion of releases to waste and to land the implementation of E_PRTR will reduce the above mentioned knowledge gaps with the first reporting in 2007. However the large amount of applications in this sector are small source below the threshold of 150 kg/h or 200 t/y set in Annex 1 (6.7) in the IPPC Directive which are less well addressed by legislation and reporting duties.

Based on the justification the overall assessment of the source sector is as follows:

- **medium need for action due to the fact that the source sector is already partially addressed with respect to unintentional releases of POPs**

A condensed compilation of collected information and the resulting assessment is presented in Table 7-24 below.

Surface treatment/solvent use												
Overall assessment	Medium mass flow relevance for PAH									**Need for action**		
										medium		
Deficits in measures	Large installations well addressed; uncertainty regarding releases to water and land									Rating:		
										partially addressed		
Mass flow	PCDD/PCDF			PCB			HCB			PAH		
Total releases	?			?			?			~100 t/y		
Compartment	Air	Water	Land	Air	Water	Land	Air	Water	Land	Air	Water	Land
Rating	?	?	?	?	?	?	?	?	?	medium	?	?
Exposure relevance	Oral/digestive		low		Dermal		none		Inhalative		low	
Food chain relevance	Vegetables		none		Dairies/meat		low		Fish/seafood		low	

Measures	Measure	Status	Effect	Compartment addressed	Pollutant addressed	Assessment		
						Effective-ness	Costs	Socio-economic impacts
Specific measures for reduction of POP releases	no measures identified							
General measures for release reduction	Mandatory permitting (e.g. based on BAT concept) for large installations	Established at EU and MS level	Release reduction due to the authority's control in the permitting process and the (officially observed) duty to meet thresholds	Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH	3	1-2	2
	Emission trading	Established at EU level (Directive 2003/87/EC)	Overall release reduction	Air	PCDD/PCDF, PCB, HCB, PAH	1	2	1
	Training of environmental inspectors and permit authorities	Established at MS level	Better enforcement of legislation due to more effective control leads to general release reduction	Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH	3	1	0
Measures for filling knowledge gaps	Reporting obligation if threshold values exceeded	Established at EU and MS level	Improved knowledge	Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH (depending on permit)	2	0	0
	Release inventories for PCDD/F, PCB and PAH	Established at EU level (POP Regulation)	Improved knowledge	Air, Water, Land	PCDD/PCDF, PCB, PAH	2	1	0
	Reporting to EMEP, EPER and E-PRTR	Established at EU level	Improved knowledge	Air, Water, Land	PCDD/PCDF, PCB, HCB PAH	2	1	0

Table 7-24: Assessment of deficits and need for action for surface treatment and solvent use

7.2.22 Waste incineration

Based on reported data the POP relevance of waste incineration is low as regards releases to air and medium to high as regards releases to waste if BAT standards according to flue gas treatment are implemented. In addition there are some knowledge gaps as concerns PCB, HCB and PAH. Thus there might be some justification for action from the point of view of mass flow relevance.

On the other hand waste incineration is the sector best addressed by legal instruments as regards emission limits, duty for application of best available techniques, waste management (classified hazardous) and release reporting. Due to reduced threshold levels for reporting and inclusion of releases to waste and to land the implementation of E_PRTR will reduce the above mentioned knowledge gaps with the first reporting in 2007. In addition the comparably low impact of waste to the environment and to the food chain has to be taken into account.

Based on the justification the overall assessment of the source sector is as follows:

- **low need for action due to the fact that the source sector is already adequately covered with respect to unintentional releases of POPs**

A condensed compilation of collected information and the resulting assessment is presented in Table 7-25 below.

Waste incineration and co-incineration

Overall assessment	Medium to high relevance for mass flow as regards releases to waste/land but low relevance for releases to air; established legal framework with strict release limit for PCDD/PCDF to air; thus focus of further action has to be laid on proper enforcement of existing legislation	**Need for action** **low**
Deficits in measures	Generally well addressed; some uncertainty regarding releases to water and land	Rating: adequately covered

Mass flow	PCDD/PCDF			PCB			HCB			PAH		
Total releases	~1900 g TEQ/y			~ 250 kg/y			~ 550 kg/y			~ 7 t/y		
Compartment	Air	Water	Land	Air	Water	Land	Air	Water	Land	Air	Water	Land
Rating	low	?	high	low	?	medium	low	?	medium/high	low	?	?
Exposure relevance	Oral/digestive		low		Dermal		none		Inhalative		none	
Food chain relevance	Vegetables		none		Dairies/meat		low		Fish/seafood		low	

Measures	**Measure**	**Status**	**Effect**	**Compartment addressed**	**Pollutant addressed**	**Assessment**		
						Effective-ness	Costs	Socio-economic impacts
Specific measures for reduction of POP releases	Limit Values for POP content in production residues	Established at EU level (POP Regulation)	Reduction of releases from production residues	Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH	2	0	1
	Emission limit for PCDD/PCDF	Established at EU Level	Release reduction	Air	PCDD/F	3	1	1

General measures for release reduction	Mandatory permitting (e.g. based on BAT concept) for large installations	Established at EU and MS level	Release reduction due to the authority's control in the permitting process and the (officially observed) duty to meet thresholds	Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH	3	1-2	2
	Emission trading	Established at EU level (Directive 2003/87/EC)	Overall release reduction	Air	PCDD/PCDF, PCB, HCB, PAH	1	2	1
	Training of environmental inspectors and permit authorities	Established at MS level	Better enforcement of legislation due to more effective control leads to general release reduction	Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH	3	1	0
Measures for filling knowledge gaps	Reporting obligation if threshold values exceeded	Established at EU and MS level	Improved knowledge	Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH (depending on permit)	2	0	0
	Release inventories for PCDD/F, PCB and PAH	Established at EU level (POP Regulation)	Improved knowledge	Air, Water, Land	PCDD/PCDF, PCB, PAH	2	1	0
	Reporting to EMEP, EPER and E-PRTR	Established at EU level	Improved knowledge	Air, Water, Land	PCDD/PCDF, PCB, HCB PAH	2	1	0
	Research on efficient detoxification of contaminated fly ash	Established at MS level	Improvement of knowledge	Air	PCDD/PCDF, PCB, HCB PAH	2	1	0

Table 7-25: Assessment of deficits and need for action for waste incineration

7.2.23 Wood preservation

POPs releases from impregnated wood occur via evaporation from the treated material as well as during combustion of treated wood. Both releases pathways are mainly directed to air. Based on reported data the POP relevance of wood preservation seems to be medium to air for PCDD/PCDF and PAH. In addition there are knowledge gaps with respect to releases to water. Releases to land and releases of PCB and HCB are less probable to occur. Thus there is some justification for action from this point of view.

On the other hand wood preservation has already been specifically addressed by legal instruments as regards new input to the mass flow and management of waste wood from demolition activities by classifying treated wood as hazardous in the European waste list (EWC 170204*) . Due to inclusion of releases from diffuse sources the implementation of E_PRTR might reduce the above mentioned knowledge gaps in the long-term. However the treatment of contaminated waste wood occurring e.g. during demolition measures is less well addressed. Consequently the overall assessment of the source sector is as follows:

- **medium need for action due to the fact that the source sector is already partially addressed with respect to unintentional releases of POPs**

A condensed compilation of collected information and the resulting assessment is presented in Table 7-26 below.

Wood preservation												
Overall assessment	Medium mass flow relevance with high uncertainty; relevant legal framework established to avoid further input into mass flow. No measures at EU level to control waste wood management									**Need for action**		
										medium		
Deficits in measures	Important knowledge gaps with respect to current releases; No measures at EU level to control waste wood management									Rating:		
										partially addressed		
Mass flow	PCDD/PCDF			PCB			HCB			PAH		
Total releases	~ 1000 g TEQ/y			?			?			~ 300 t/y		
Compartment	Air	Water	Land	Air	Water	Land	Air	Water	Land	Air	Water	Land
Rating	medium	?	?	?	?	?	?	?	?	high	?	?
Exposure relevance	Oral/digestive		low		Dermal		low		Inhalative		low	
Food chain relevance	Vegetables		none		Dairies/meat		low		Fish/seafood		medium	

Measures	**Measure**	**Status**	**Effect**	**Compartment addressed**	**Pollutant addressed**	**Assessment**		
						Effective-ness	Costs	Socio-economic impacts
Specific measures for reduction of POP releases	Ban on creosote treated timber since 2003	Established at EU level (Directive 76/769/EEC)	Market restriction on certain chemicals leads to direct reduction of PAH release to air	Air	PAH (mainly)	3	0	2
	Market restriction for PCP (with exceptions until 2008)	Established at EU level (Directive 76/769/EEC)	Market restriction on certain chemicals leads to direct reduction of PAH release to air	Air	PCDD/PCDF (mainly)	2	0	2
	Ban of PCB in products	Established at EU level (76/769/EEC)	Less PCDD/PCDF releases due to ban of PCB containing paints	Water, Land	PCB	3	0	2
General measures for release reduction	no measures identified							
Measures for filling knowledge gaps	Release inventories for PCDD/F, PCB and PAH	Established at EU level (POP Regulation)	Improved knowledge	Air, Water, Land	PCDD/PCDF, PCB, PAH	2	1	0
	Reporting under E-PRTR	Established at EU level (E-PRTR Regulation)	Improved knowledge	Air, Water, Land	PCDD/PCDF, PCB, HCB PAH	2	1	0

Table 7-26: Assessment of deficits and need for action for wood preservation

8 Measures to fill identified gaps and their assessment

8.1 Overview on suggested measures to fill identified gaps

The development of measures to fill the identified gaps and deficits follows the structure that has already been used in the measures inventory in chapter 6:

1. Existing legislation
2. Review of legislation
3. Planned new legislation
4. Implementation and enforcement of existing legislation (administrative, technical)
5. New approaches (economic incentives, eco-labelling, taxes, subsidies, etc)
6. Funding
7. Communication/Education
8. Monitoring/Inventory
9. Research activities.

In total 165 measures have been suggested. The detailed results including the assessment are available in chapter 8.3.

Some of the measures concern various POPs, some are specific. The 162 measures can be differentiated as follows:

PCDD/F focus	20
PCB focus	7
PAH focus	43
HCB focus	0
PCDD/F, PCB, HCB, PAH together	105

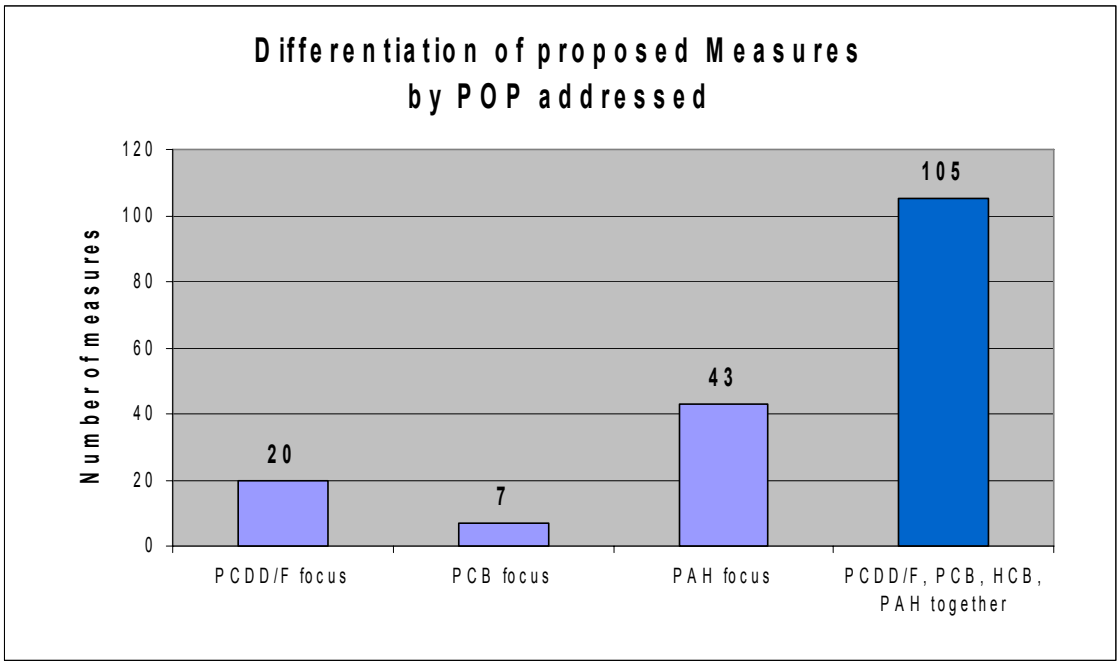

Figure 8-1: Differentiation of proposed measures with respect to POP addressed

No measures have been identified as being specific for HCB.

Most of the measures are oriented on release reduction (104), some concern awareness raising (15) and improved knowledge (71). Again some measures address several targets equally.

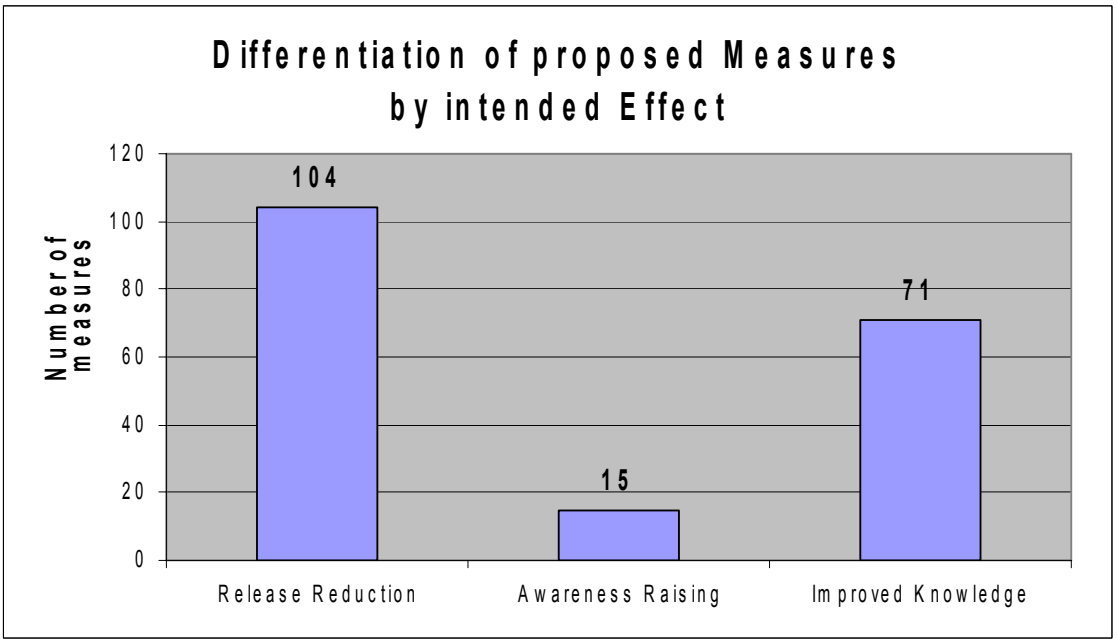

Figure 8-2: Differentiation of proposed measures in relation to the intended effect

The majority of measures is targeted on air (124 measures), water is addressed by 93 and land by 91 measures.

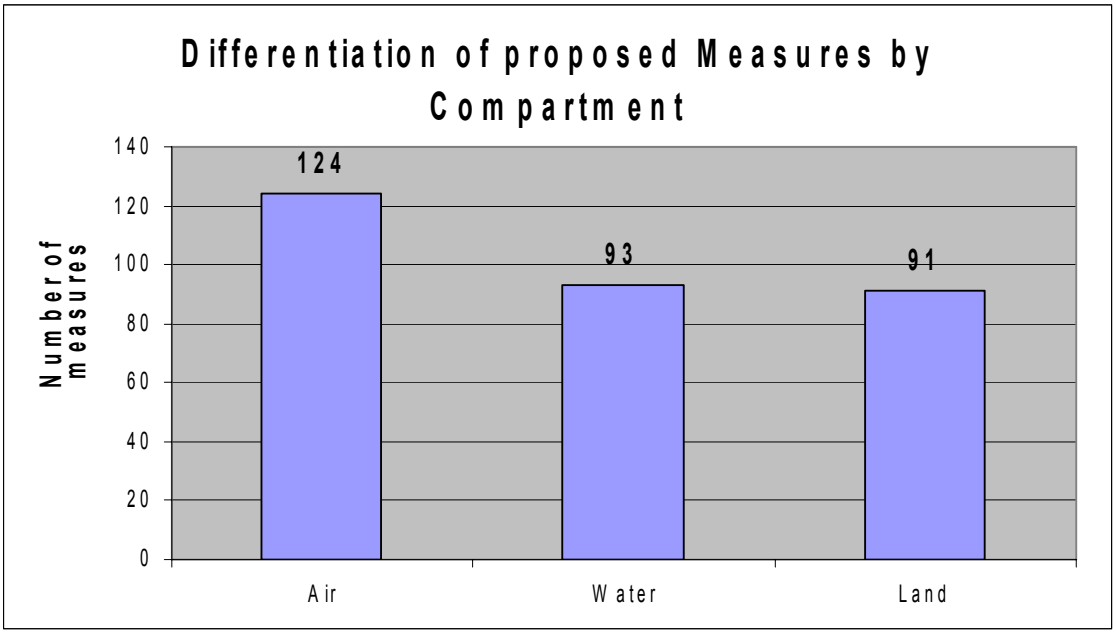

Figure 8-3: Differentiation of proposed measures by addressed compartments

Most of the measures are targeted for the European Union (100), about 20 measures seem to be better addressed at Member State level only. For about 44 measures cooperation and collaboration between EU and MS is necessary.

Information on the evaluation of pro and cons, which forms the basis for the assessment is provided in chapter 8.3.

8.2 Overview on assessment results

As explained in chapter 3.4 the assessment of proposed measures follows the same criteria as for existing measures plus an additional assessment of feasibility.

It has to be highlighted that a in depth analysis of the criteria was not possible in the scope of this project and that the assessment has been done in terms of screening analysis to enable a first selection and ranking of measures that might be taken. A further detailed investigation of specific measures might slightly change the outcome for single measures. Furthermore it has to be stated that different weighting of parameter under different points of view does also influence the outcome of the ranking procedure, so that the results of this study may not be regarded as definite.

In the context of this project the terms effectiveness, costs, socio-economic impacts and feasibility are defined as follows:

- Effectiveness: Ability to either reduce releases or to improve knowledge or awareness
- Costs: Expenses to be expected for involved authorities or the legal body developing a measure
- Socio-economic impacts: Additional expenses or turnover for involved industry or citizens resulting from implementation of the measure, also including consequences for jobs.
- Feasibility: The probability that the measure could be implemented

Feasibility is a function of various parameters such as effectiveness, costs, socio-economic impacts and the level of coordination and cooperation needed. This level of coordination needs increases with the number of stakeholders involved and the divergence of interests.

The assessment has been based on expert knowledge and experience within the project team, interviews and market analysis.

Principally feasibility of a measure is dependent on an available budget to cover costs, established infrastructure or framework and the acceptance from the side of involved stakeholders.

Thus high costs, high adverse socio-economic impacts and large number of involved stakeholders (e.g. cooperation between European Commission and Member States needed, international conventions or agreements concerned) as well as low expected effectiveness or mass flow relevance have been seen as hampering factors for feasibility in the assessment performed in the framework of this project. Consequently measures showing these characteristics have been classified low to medium feasibility.

However this does not mean that measures with low feasibility could not be taken. The selection of final measures is also a matter of political strategy and prioritisation.

The assessment of proposed measures with respect to effectiveness, costs, socio-economic impacts and feasibility has been done measure by measure. The detailed results and the justifications are presented in chapter 8.3.

Based on the above mentioned considerations the overall results concerning the criterion effectiveness show the following differentiation:

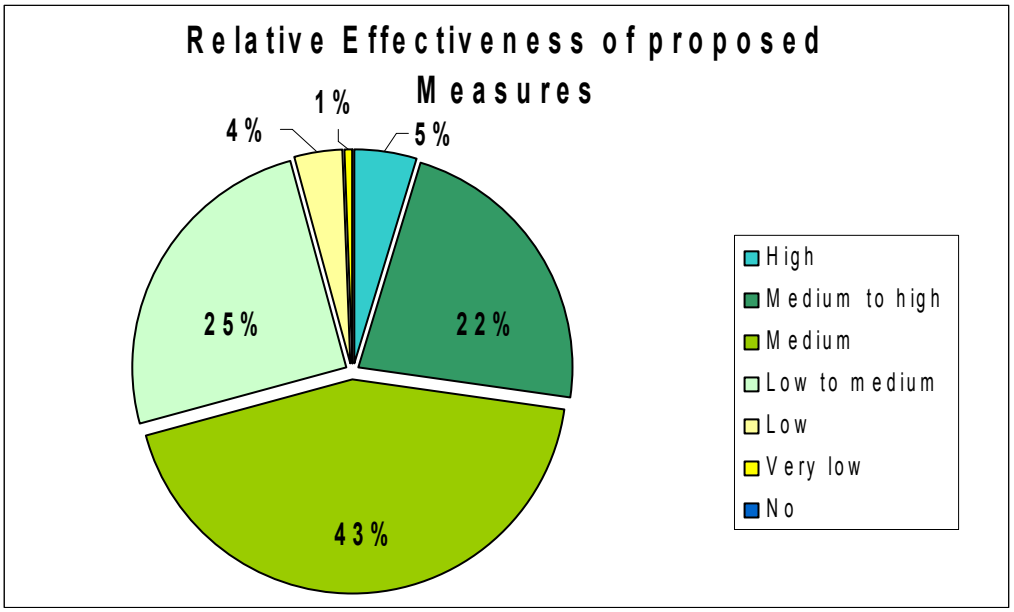

Figure 8-4: Distribution of relative effectiveness of proposed Measures

Effectiveness	All measures (absolute figures)
High (3)	8
Medium to high (2-3)	37
Medium (2)	72
Low to medium (1-2)	41
Low (1)	6
Very low (0-1)	1
Not existing (0)	0

For the criterion costs the assessment shows the following:

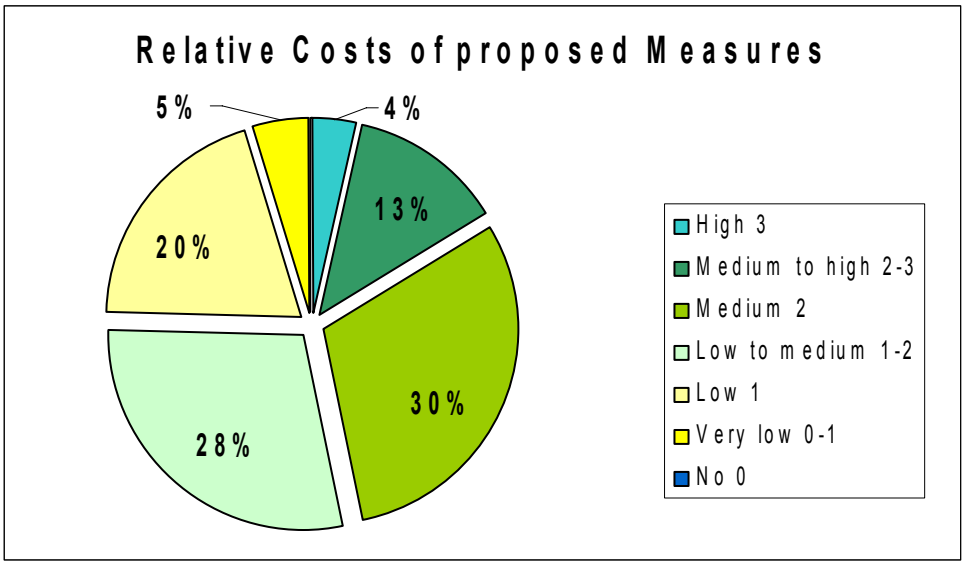

Figure 8-5: Distribution of relative costs of proposed measures

Costs	All measures (absolute figures)
High (3)	6
Medium to high (2-3)	21
Medium (2)	50
Low to medium (1-2)	47
Low (1)	33
Very low (0-1)	8
Not existing (0)	0

Based on the above mentioned premises the distribution of socio-economic impacts has been assessed as:

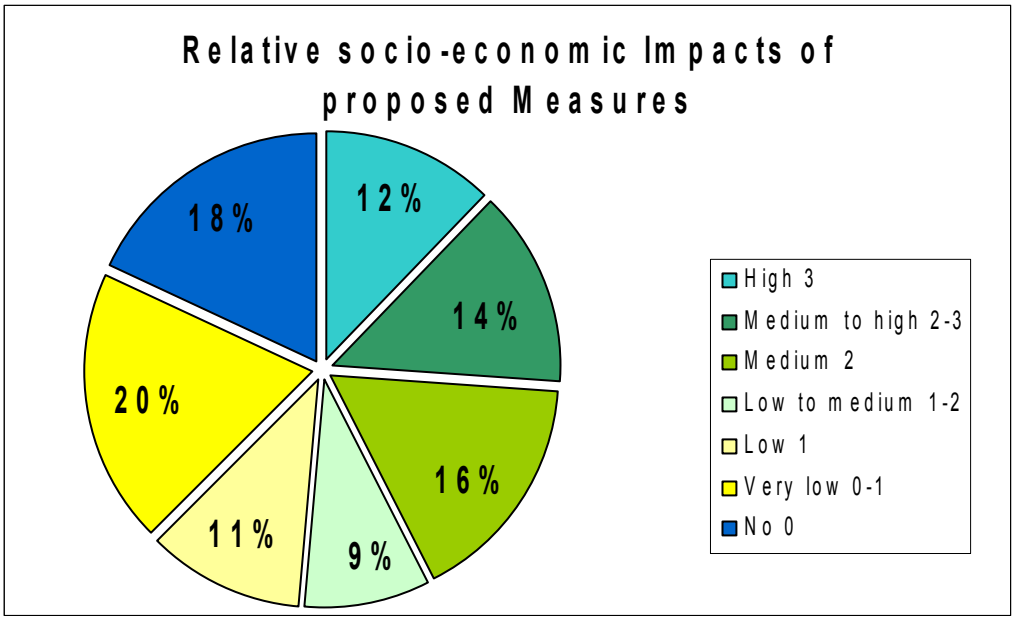

Figure 8-6: Distribution of relative impacts of proposed measures

Impacts	All measures (absolute figures)
High (3)	20
Medium to high (2-3)	23
Medium (2)	27
Low to medium (1-2)	15
Low (1)	18
Very low (0-1)	32
Not existing (0)	30

It should be emphasised that for 31 suggested measures no socio-economic impacts are expected.

For the criterion feasibility the following result has been derived from the assessment based on the premises set:

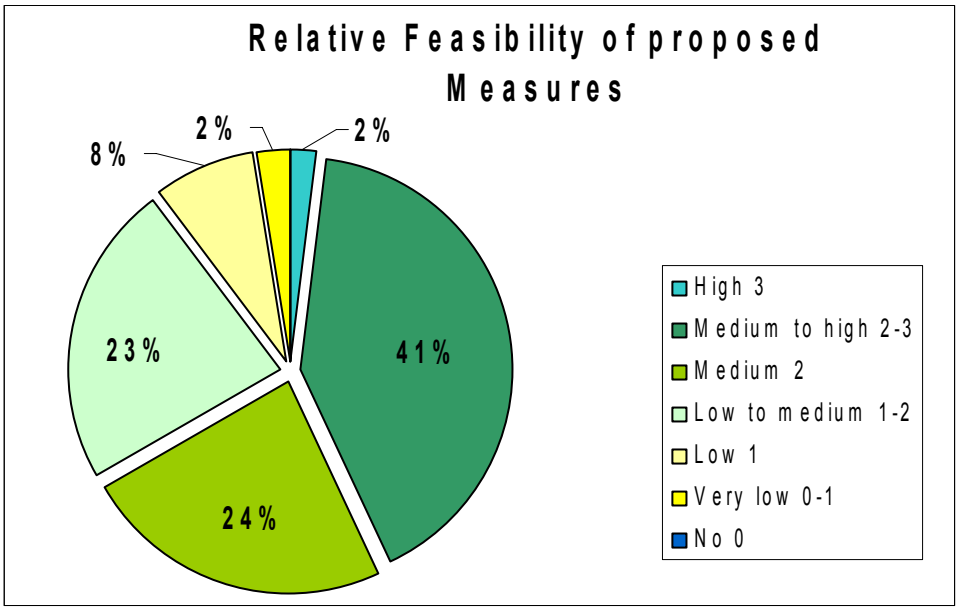

Figure 8-7: Distribution of relative Feasibility of proposed Measures

Feasibility	All measures (absolute figures)
High (3)	3
Medium to high (2-3)	68
Medium (2)	39
Low to medium (1-2)	38
Low (1)	13
Very low (0-1)	4
Not existing (0)	0

With respect to specific POPs the following results can be derived from the assessment (all figures absolute numbers):

Effectiveness	3	2-3	2	1-2	1	0-1	0
all (PCDD/F, PCB, HCB, PAH)	5	23	48	26	3	0	0
PCDD/F focus	2	5	7	4	1	1	0
PCB focus	1	2	4	3	0	0	0
PAH focus	3	8	16	12	3	1	0

Costs	3	2-3	2	1-2	1	0-1	0
all (PCDD/F, PCB, HCB, PAH)	4	15	41	28	14	3	0
PCDD/F focus	1	4	3	4	6	2	0
PCB focus	1	0	1	1	6	1	0
PAH focus	0	6	7	17	12	1	0

Socio-economic impacts	3	2-3	2	1-2	1	0-1	0
all (PCDD/F, PCB, HCB, PAH)	12	11	15	11	10	24	22
PCDD/F focus	4	1	6	1	3	0	5
PCB focus	1	3	1	1	2	2	0
PAH focus	7	8	8	2	6	5	7

Feasibility	3	2-3	2	1-2	1	0-1	0
all (PCDD/F, PCB, HCB, PAH)	2	49	20	23	8	3	0
PCDD/F focus	1	4	9	5	0	1	0
PCB focus	0	3	2	4	1	0	0
PAH focus	0	14	14	11	4	0	0

These results will be used for the ranking in chapter 9.

8.3 Detailed results and lists of measures

The following chapter provides detailed information on additional measures identified to address the POP issue including a specific assessment of effectiveness, costs, socio-economic impacts and feasibility for each measure. Measures are categorised according to identified source sectors. The relevance with respect to specific POPs is also included in the compilation.

Analogue to existing measures in chapter 7 proposed measures are compiled in the following categories

- Specific measures for reduction of POP releases: Measures designed and targeted to specifically address and reduce POP releases,
- General measures for release reduction: Measures designed and targeted to reduce releases (e.g. in the context of climate change or water protection) which are expected to have a beneficial side-effect on POP releases as well
- Measures for filling of knowledge gaps: Measures targeted on generation or collection of information (e.g. research, registers), knowledge exchange and awareness raising

Please be aware that in the following chapters on specific source sectors only targeted measures are listed and discussed.

Measures that are relevant for all source sectors or a larger group of sectors (industrial sources) are compiled separately in chapter 8.3.24 “overall measures” and chapter 8.3.25 “General industry”.

8.3.1 Air transport

The following table provides an overview of identified possible measures to address POP releases from air transport. The table is followed by a justification of the assessment concerning cost-effectiveness and feasibility provided here below.

1. Air transport												
Results from status quo	Low mass flow relevance; medium data gaps; potential for release reduction for PAH and PCDD/PCDF									**Need for action**		
										low		
Mass flow	PCDD/PCDF			PCB			HCB			PAH		
Total releases	~1g TEQ/y			?			?			~5 t/y		
Compartment	Air	Water	Land	Air	Water	Land	Air	Water	Land	Air	Water	Land
Rating	low	?	?	?	?	?	?	?	?	low	?	?
Exposure relevance	Oral/digestive		low		Dermal		none		Inhalative		low	
Food chain relevance	vegetables		low		dairies/meat		low		fish/seafood		low	
Proposed Measures	**Measure**	**EU / MS**	**Expected Effect**		**Compart-ment addressed**	**Pollutant addressed**	**Assessment**					
							Effective-ness	Costs	Socio-economic impacts	Feasibility		
General measures for release reduction	1.1 Quality requirements for air transport fuel	EU	Release reduction		Air	PAH (mainly)	1	1	1	1-2		
	1.2 Revisiting international air service agreements to introduce fuel taxes on international flights	EU	Reduced fuel consumption		Air	PAH (mainly)	2	1	3	1		
	1.3 Emission trading system for air transport	EU	Release reduction		Air	PAH (mainly)	2	1-2	2	1		
	1.4 Financial incentives (e.g. graded airport fees depending on age / type / emission level of plane)	EU	Release reduction		Air	PAH (mainly)	2	0-1	2-3	2-3		
Measures for filling knowledge gaps	1.5 Environmental monitoring in surroundings of airports	MS	Improved knowledge		Air, Water, Land	PAH (mainly)	2-3	2-3	1	1		

1. Air transport									
	1.6 Research on releases from air transport	EU	Filling of data gaps	Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH	2	2	0	2

Table 8-1: Assessment of suggested measures for air transport

Justification of the assessment

In general need for action in the field of air transport is assessed as low due to low mass flow relevance. Nevertheless additional measures for release reduction or improvement of knowledge could be taken into consideration.

Measures 1.1 to 1.4 aim at release reduction to air for PAH and PCDD/PCDF and potentials for further reduction have been identified.

Feasibility of measure 1.1 is regarded low to medium as various other parameters like requirements of engine producers, international air safety standards etc have to be considered. In addition it might be difficult to control this measure (problem of international air traffic) so effectiveness also is estimated to be low.

Feasibility of measure 1.2 seems to be low as PAH and dioxin reduction is not regarded a major driving factor for the complex negotiations concerning fuel taxes for flights. However, it is supposed that this measure would have high economic impacts for the concerned actors.

Measure 1.3 has been assessed with a medium effectiveness due to the problems of international air traffic. In principle an emission trading system for air transport might work and is already listed under the proposals of a “Communication on reducing the Climate Change Impact of aviation”. Due to additional costs and socio-economic impacts the feasibility is assessed to be low.

Measure 1.4 can be designed in a more targeted way for PAH release reduction. Costs for authorities are expected to be lower than in measure 1.3, socio-economic impacts depend on the amount air transport companies have to pay. Based on existing expertise impacts have been assessed as medium to high.

Measures 1.5 and 1.6 aim at improving knowledge on POP releases. While measure 1.5 is designed to study specific deficits of knowledge in the close neighbourhood of the emitting source and should be focussed on PAH, measure 1.6 is targeted to improve knowledge of overall effects thus investigating all POPs and compartments. Socio-economic impacts are expected to be low, effectiveness concerning improvement of knowledge might be medium to high.

8.3.2 Asphalt processing

The following table provides an overview of identified possible measures to address POP releases from asphalt processing. The table is followed by a justification of the assessment concerning cost-effectiveness and feasibility provided here below.

2. Asphalt processing												
Results from status quo	Low Mass Flow relevance with high uncertainty due to poor reporting; high data gaps; potential for release reduction for PAH									**Need for action**		
										medium		
Mass flow	PCDD/PCDF			PCB			HCB			PAH		
Total releases	?			?			?			0.05 t/y		
Compartment	Air	Water	Land	Air	Water	Land	Air	Water	Land	Air	Water	Land
Rating	?	?	?	?	?	?	?	?	?	low	?	?
Exposure relevance	Oral/digestive		low		Dermal		none		Inhalative		low/medium	
Food chain relevance	vegetables		none		dairies/meat		low		fish/seafood		none	

Proposed Measures	**Measure**	**EU / MS**	**Expected Effect**	**Compart-ment addressed**	**Pollutant addressed**	**Assessment**			**Feasibility**
						Effective-ness	Costs	Socio-econo-mic impacts	
General measures for release reduction	2.1 Guidance document on asphalt production and processing	EU	Release reduction, Improved knowledge	Air, Water, Land	PAH (mainly)	1-2	1	1	2-3
Measures for filling knowledge gaps	2.2 Specification as diffuse source in PRTR	EU	Improved knowledge on mass flow relevance	Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH	1-2	2	1	2-3
	2.3 ommunication of already existing EF used for reporting	MS	Improved knowledge	Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH	2	0-1	0	3
	2.4 Extended reporting to EMEP	MS	Improved knowledge	Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH	2	2	1	2
	2.5 Research on releases from asphalt processing	EU	Improved knowledge	Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH	2-3	2	0	2-3

Table 8-2: Assessment of suggested measures for asphalt processing

Justification of the assessment

In general need for action in the field of asphalt processing is seen as low due to limited mass flow relevance and existing measures. Nevertheless additional measures for release reduction or improvement of knowledge could be taken into consideration.

Measure 2.1 aims at release reduction for PAH and potentials for further reduction have been identified.

Feasibility of measure 2.1 is regarded medium to high as knowledge on process technology and major sources for diffuse releases is available at the concerned industry and scientific community. On the other hand there is no binding effect of a guidance document and associated costs for realisation of proposed measures might be high. So acceptance of the guidance is judged as limited and effectiveness is also seen to be low to medium.

Measures 2.2 to 2.5 aim at improving knowledge on POP releases.

Measure 2.2 is designed to make use of Europe wide collection and communication of information under E-PRTR and is closely related to measure 2.4 which consists of improved implementation of existing reporting requirements under international conventions and measure 2.3 which intends to better communicate existing knowledge on emission factors, calculation methods or release models that can be used for estimation of releases.

All three measures would contribute significantly to knowledge gain, so that the associated effectiveness has been assessed to be at least medium. Feasibility of all the measures is expected to be medium to high as the basic binding requirements already are set and no stakeholders have to be convinced to participate. The realisation of the measures however defines efforts and costs for the Member States which would have to provide the data and are probably hampered by deficits in knowledge as regards emission factors, emission models or calculation methods.

This deficit can be overcome by measure 2.5. Targeted research on POP release from asphalt processing would highly contribute to improvement of knowledge and would help to define emission factors that can later be used for release reporting. Thus effectiveness has been assessed as medium to high. In addition feasibility can be classified as high as corresponding projects could be realised in the framework of European Commission research programmes (e.g. FP 8 etc). Related costs however will not be negligible and have to be weighted against the mass flow relevance.

8.3.3 Burning of agricultural waste

The following table provides an overview of identified possible measures to address POP releases from burning of agricultural waste. The table is followed by a justification of the assessment concerning cost-effectiveness and feasibility provided here below.

3. Burning of agricultural waste												
Results from status quo	Low to Medium Mass Flow relevance with high uncertainty; potential for release reduction in countries where measures not yet applied									**Need for action**		
										medium		
Mass flow	PCDD/PCDF			PCB			HCB			PAH		
Total releases	~150 g TEQ/y			~35 kg/y (Agriculture/Forestry)			~10 kg/y			~50 t/y		
Compartment	Air	Water	Land	Air	Water	Land	Air	Water	Land	Air	Water	Land
Rating	low	?	low	low	?	?	low	?	?	medium	?	?
Exposure relevance	Oral/digestive		locally		Dermal		none		Inhalative		locally	
Food chain relevance	Vegetables		locally		Dairies/meat		locally		Fish/seafood		low	
Proposed Measures	**Measure**	**EU / MS**	**Expected Effect**		**Compart-ment addressed**	**Pollutant addressed**	**Assessment**			**Feasibility**		
							Effective-ness	Costs	Socio-economic impacts			
Specific measures for reduction of POP releases	3.1 General ban of agricultural burning	EU	Release reduction		Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH	3	1	1-2	2		
	3.2 Targeted information / education campaigns (workshops, media, etc.)	MS	Awareness raising; release reduction		Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH	1-2	2	1	2-3		
General measures for release reduction	3.3 Financial incentives for composting of agricultural residues	MS	Release reduction		Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH	1-2	2-3	1-2	1		

3. Burning of agricultural waste									
	3.4 Development of collection system for agricultural waste	MS	Release reduction	Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH	2-3	2-3	2	2-3
Measures for filling knowledge gaps	3.5 Research on releases and impacts	EU / MS	Improved knowledge	Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH	2	2	0-1	2-3

Table 8-3: Assessment of suggested measures for burning of agricultural waste

Justification of the assessment

In general need for action in the field of burning of agricultural waste is assessed as medium.

Measures 3.1 and 3.4 aim at release reduction for all POPs. Potentials for further reduction have been identified.

Highest effects on release reduction are expected from measure 3.1 as it would virtually eliminate the source of releases. However problems with enforcement can be assumed due to the scattered character of this source and to problems to otherwise eliminate agricultural residues or “old” vegetation. This would particularly be the case for arid Mediterranean soils which can not be worked with the plough but have to be cleaned to allow new vegetation to grow to feed livestock. Thus problems with acceptance and compliance will have to be considered so that the expected effectiveness has been assessed as medium. Significant socio-economic impacts for concerned actors (farmers) have to be expected so that the overall feasibility of the measures has been considered as medium only.

Information campaigns are much easier to realise so that feasibility of measure 3.2 has been assessed as medium to high. On the other hand the consequences of information may not be overestimated as other factors (namely economic impacts and tradition) will strongly influence the actions of the farmers concerned. Consequently effectiveness of this measure tends to be low. This has to be weighted against the related costs for involved Member State authorities which cannot be neglected. Expected costs are even higher for measure 3.3 with uncertain acceptance and problems in enforcement. So this measure has been considered low to medium effectiveness and low feasibility.

Measure 3.4 aims in the same direction but is more directed to providing appropriate infrastructure for collection and further use of agricultural waste. As this is an objective and issue in European and national waste management the effectiveness and feasibility of this measure is seen as medium to high.

Measure 3.5 aims at knowledge gain. As knowledge on the mass flow relevance of agricultural waste burning is far from exhaustive the effectiveness of research in this field can be expected to be at least medium. In addition feasibility can be classified as high as corresponding projects could be realised in the framework of European Commission research programmes (e.g. FP 8 etc). Related costs however will not be negligible and have to be weighted against the mass flow relevance.

8.3.4 Chemical industry

The following table provides an overview of identified possible measures to address POP releases from chemical industry. The table is followed by a justification of the assessment concerning cost-effectiveness and feasibility provided here below.

4. Chemical Industry												
Results from status quo	Medium Mass Flow relevance especially to water with some uncertainty									**Need for action**		
										low		
Mass flow	PCDD/PCDF			PCB			HCB			PAH		
Total releases	~200 g TEQ/y			~210 kg/y			~205 kg/y			~ 40t/y		
Compartment	Air	Water	Land	Air	Water	Land	Air	Water	Land	Air	Water	Land
Rating	low	low/medium	?	medium	low/medium	?	medium	medium	?	medium	medium	?
Exposure relevance	Oral/digestive		low		Dermal		none		Inhalative		none	
Food chain relevance	Vegetables		none		Dairies/meat		none		Fish/seafood		medium	

Proposed Measures	**Measure**	**EU /MS**	**Expected Effect**	**Compart-ment addressed**	**Pollutant addressed**	**Assessment**			**Feasibility**
						Effective-ness	Costs	Socio-economic impacts	
Specific measures for reduction of POP releases	4.1 Mandatory catalytic filter for flue gas treatment	EU	Release reduction	Air	PCDD/PCDF, PCB, HCB, PAH	2	1-2	2-3	1-2
	4.2 Financial incentives for POP release reduction technologies	EU / MS	Release reduction	Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH	2	3	2	1

4. Chemical Industry									
Measures for filling knowledge gaps	4.3 EU-Standards for POP waste water monitoring	EU	Improved knowledge	Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH	1-2	2	0-1	2-3
	4.4 Review of "main activity approach" in EPER, PRTR reporting to reduce bias /confounding	EU	Improved knowledge	Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH	2	2	0	1-2

Table 8-4: Assessment of suggested measures for chemical industry

Justification of the assessment

In general need for action in the field of chemical industry is low.

Measures 4.1 and 4.2 aim at release reduction for all POP and potentials for further reduction have been identified. Measure 4.1 concerns a binding requirement for catalytic filter to specifically address POP (namely dioxin releases to air). As catalytic filters are already included as recommendation in the BREF documents for chemical industry the expected effect may not be overestimated; socio-economic impacts and costs for revision of issued permits however have to be considered at least as medium. Consequently feasibility of the measure has been assessed as low to medium only. Measure 4.2 will be better accepted by industry and will promote technology development, however is associated with significant costs for Member States. Due to the high technical standard achieved in chemical industry the effectiveness of this measure can as a maximum be considered as medium. In view of high costs the feasibility must be seen as low.

Measures 4.3 and 4.4 are designed to reduce knowledge gaps on POP releases from Chemical industry. They have to be seen in the light of reporting obligations already in place.

Measure 4.3 concerns development of standards for POP sampling analysis in waste water. As a number of methods are already available (also if not harmonised) the effectiveness of this measure in view of knowledge gain is considered as low to medium only. As standardisation will be done in the framework of CEN socio-economic impacts for involved actors tend to be low. As administrative structures are in place at European level and standarisation processes are ongoing already feasibility of this measure can be seen as medium to high.

Measure 4.4 concerns the reduction of bias and confounding factors in data reported from chemical industry. More precise specification, where reported releases are generated would certainly improve knowledge, so that effectiveness of the measure is considered medium. Taking into consideration the complex negotiation process for EPER and E-PRTR improved knowledge on release details will certainly not be seen as a driving force for a review process. Thus feasibility of this measure is assessed as relatively low.

8.3.5 Construction and Demolition

The following table provides an overview of identified possible measures to address POP releases from construction and demolition. The table is followed by a justification of the assessment concerning cost-effectiveness and feasibility provided here below.

5. Construction and Demolition												
Results from status quo	Medium to high mass flow relevance for PCB with high uncertainty; significant potential for release reduction in countries where measures for material separation and ESM (Environmental sound management) not yet applied									**Need for action**		
										medium		
Mass flow	PCDD/PCDF			PCB			HCB			PAH		
Total releases	?			~ 20,000 kg/y (entering landfills)			?			?		
Compartment	Air	Water	Land	Air	Water	Land	Air	Water	Land	Air	Water	Land
Rating	?	?	?	?	?	?	?	?	?	?	?	?
Exposure relevance	Oral/digestive		low		Dermal		low		Inhalative		low	
Food chain relevance	Vegetables		none		Dairies/meat		low		Fish/seafood		low	
Proposed Measures	**Measure**	**EU / MS**	**Expected Effect**		**Compart-ment addressed**	**Pollutant addressed**	**Assessment**			**Feasibility**		
							Effective-ness	Costs	Socio-economic impact			
Specific measures for reduction of POP releases	5.1 Differentiated limit values for use as secondary raw material in landfills	EU	Reduction of releases to water and land		Water, Land	PCB	2	1	1	2-3		
	5.2 Limit values for contaminated waste wood in case of use for energy recovery	EU	Reduction of releases		Air	PCDD/PCDF (mainly)	2	1	1	2		

5. Construction and Demolition									
	5.3 Obligation for separation of C & D waste fraction	EU	Reduction of releases	Air, Water, Land	PCDD/PCDF, PCB	2	1	2	1-2
General measures for release reduction	5.4 Permitting for C & D measures	EU	Improved control, reduction of releases	Water, Land	PCB	2	2	2-3	1-2
	5.5 Provisions/Establishment for collection / recovery system for C & D waste	EU / MS	Reduction of releases	Water, Land	PCB	2-3	1	2-3	2-3
Measures for filling knowledge gaps	5.6 Development of screening standards for sampling and analysis at landfill	EU	Improved knowledge	Water, Land	PCB	1-2	1	0-1	2-3
	5.7 Improved reporting on quantity and composition of waste fractions	MS	Improved knowledge	Water, Land	PCB	2	2-3	0-1	2
	5.8 Research on POP leaching properties / behaviour from inert landfill	EU / MS	Improved knowledge	Water, Land	PCDD/PCDF, PCB, HCB, PAH	2	2-3	0-1	2

Table 8-5: Assessment of suggested measures for construction and demolition

Justification of the assessment

In general need for action in the field of construction and demolition industry is seen as medium.

Measures 5.1 to 5.5 aim at release reduction for PCB. Potentials for further reduction have been identified.

Proposals are based on measures already implemented at Member State level and intend to use and transpose existing experience. While classification of C&D waste and requirements of landfilling is already addressed in European legislation, provisions concerning the thorough onsite separation during demolition or reconstruction activities could be further developed. Due to existing provisions the effectiveness of all measures is assessed as medium whereas feasibility is seen as medium or low to medium due to associated costs and socio-economic impacts (application for permit and separation obligation induces higher costs and lowers acceptability). On the other hand the issue is commonly addressed in national waste management plans so that measure 5.5 is considered medium to high effectiveness and feasibility.

Measures 5.6 to 5.8 aim at improving knowledge on POP releases or help to facilitate the identification of POP concentrations in residues. Measure 5.7 concerns documentation and communication on POP concentrations in different waste fraction and the related annual

generation to better base estimations on remaining stocks and releases. In the light of knowledge gain at least a medium effect can be expected. The legal basis requiring differentiated reporting on waste quantities is set with the requirements of the European waste catalogue; concentration measurements should be expected in the framework of the landfill acceptance criteria directive and the EU POP regulation. Problems however will have to be expected in compilation of basic data to national totals and average contamination levels. Taking into account the related efforts and costs needed the feasibility of the measure is assessed as medium. Measures 5.6 and 5.8 do not investigate the C&D sector itself but focus on the risks from disposal of C&D waste.

Measure 5.6 is designed to improve the reliability and reduce the costs of POP monitoring prior to landfill. With respect to knowledge gain the effectiveness of this measures is low to medium but feasibility is high as it can be realised in the framework of CEN. Measure 5.8 is designed to gain knowledge on long-term risks concerning releases to land and water. The effectiveness concerning knowledge gain will be high as current knowledge is poor. Associated costs and time needed to generate results however are high. As however, corresponding projects could be realised in the framework of European Commission research programmes (e.g. FP 8 etc) feasibility is still assessed as medium.

8.3.6 Crematoria and Animal carcass burning

The following table provides an overview of identified possible measures to address POP releases from cremation and animal carcass burning. The table is followed by a justification of the assessment concerning cost-effectiveness and feasibility provided here below.

6. Crematoria / Animal carcass burning												
Results from status quo	Low to Medium Mass Flow relevance with significant uncertainty									**Need for action**		
										low		
Mass flow	PCDD/PCDF			PCB			HCB			PAH		
Total releases	~ 7 gTEQ/y			~50 kg/y			?			?		
Compartment	Air	Water	Land	Air	Water	Land	Air	Water	Land	Air	Water	Land
Rating	low	?	?	low	?	?	?	?	?	?	?	?
Exposure relevance	Oral/digestive		low		Dermal		none		Inhalative		none	
Food chain relevance	Vegetables		none		Dairies/meat		low		Fish/seafood		low	

Proposed Measures	Measure	EU / MS	Expected Effect	Compart-ment addressed	Pollutant addressed	Assessment			Feasibility
						Effective-ness	Costs	Socio-economic impacts	
Specific measures for reduction of POP releases	6.1 ELV for cremation plants (0.1 ng/Nm³)	EU	Direct reduction of release to air due to the duty to meet thresholds	Air	PCDD/PCDF, PCB, HCB, PAH	3	1	2-3	1-2
General measures for release reduction	6.2 Review of IPPC Annex I to cover Crematoria	EU	Reduction of releases by applying BAT	Air, Land	PCDD/PCDF, PCB, HCB, PAH	2-3	2	2	2
	6.3 Guidelines for BAT and BEP for Crematoria	EU	Reduction of releases by applying BAT	Air, Land	PCDD/PCDF, PCB, HCB, PAH	1-2	1-2	1-2	1-2
	6.4 Mandatory air pollution control requirements for crematoria	EU	Release reduction	Air	PCDD/PCDF, PCB, HCB, PAH	3	1	2-3	2
Measures for filling data gaps	6.5 Research in EFs for crematoria	EU	Improved knowledge	Air, Land	PCDD/PCDF, PCB, HCB, PAH	2-3	2	0-1	2-3

Table 8-6: Assessment of suggested measures for crematoria / animal carcass burning

Justification of the assessment

In general need for action in the field of cremation and animal carcass burning seems to be low under standard conditions. However, the number of cremations can be expected to increase in Europe in future in the framework of the demographic development and the social structure of society. Therefore some deliberations on measures for crematoria are included in this report.

Measures 6.1 to 6.4 aim at release reduction for all POP; in this context potentials for further reduction have been identified.

All measures address flue gas cleaning and the necessity to apply advanced technology in the process to minimise releases. Measures 6.1 and 6.4 would be the most binding / invasive of all assuring high effectiveness but entraining highest socio-economic impacts due to the need to equip all installations with the effective APC devices. A similar approach is taken by measure 6.2. Obligation of Europe wide permitting based on BAT including reporting obligations if threshold levels are exceeded will cause significant release reduction, so that effectiveness can be assessed at least as medium. Taking into consideration the associated socio-economic impacts and the estimated mass flow relevance severe difficulties with implementation can be expected so that feasibility is considered as maximum medium. It might even be low.

Measure 6.3 is associated with significantly lower effectiveness as there is no binding element it might be far easier to implement as it is not associated with significant costs nor socio-economic impacts. Thus effectiveness has been assessed low to medium while feasibility is medium to high.

Measure 6.5 shall serve for improvement of knowledge. Research in European average releases from cremations would help to assess the overall importance of this sector as currently data are limited to a small number of countries and refer to high technical standards. Consequently effectiveness is set as medium to high. Associated costs can not be neglected. As however, corresponding projects could be realised in the framework of targeted studies or European Commission research programmes (e.g. FP 8 etc) feasibility is assessed as medium to high.

8.3.7 Dredging, Off-shore installations and dock works

The following table provides an overview of identified possible measures to address POP releases from dredging, off-shore activities and dock works. The table is followed by a justification of the assessment concerning cost-effectiveness and feasibility provided here below.

7. Dredging / Offshore / Dock works												
Results from status quo	Medium to high mass flow relevance for PAHs with high uncertainty; significant potential for release reduction might be achievable									**Need for action**		
										medium		
Mass flow	PCDD/PCDF			PCB			HCB			PAH		
Total releases	?			?			?			~400 t/y		
Compartment	Air	Water	Land	Air	Water	Land	Air	Water	Land	Air	Water	Land
Rating	?	?	?	?	?	?	?	?	?	?	medium	?
Exposure relevance	Oral/digestive		low		Dermal		none		Inhalative		none	
Food chain relevance	Vegetables		none		Dairies/meat		none		Fish/seafood		medium/high	

7. Dredging / Offshore / Dock works									
Proposed Measures	**Measure**	**EU /MS**	**Expected Effect**	**Compart-ment addressed**	**Pollutant addressed**	**Assessment**			
						Effective-ness	Costs	Socio-economic impacts	**Feasibility**
Specific measures for reduction of POP releases	7.1 Review of sewage sludge directive to include limits for all POPs and address dredging sludges	EU	Release reduction	Land	PAH (mainly)	2-3	1	2	2-3
General measures for release reduction	7.2 Mandatory filter technology for all tank/ship cleaning activities	EU	Release reduction	Water	PAH (mainly)	2	1-2	2-3	1-2
	7.3 Cycling systems for off-shore installations	EU	Release reduction	Water	PAH (mainly)	2	1-2	2-3	1-2
	7.4 Guidelines for handling oily wastes	EU	Release reduction	Water	PAH (mainly)	1-2	1	1-2	2-3
	7.5 Mandatory instrument providing globally-applicable ship recycling regulations for international shipping and for recycling activities	EU	Safe and environmentally sound recycling of ships, covering requirements for ships, requirements for ship recycling facilities and reporting requirements	Water	PAH (mainly)	2	1-2	2	2
	7.6 Include offshore platforms to IPPC	EU	Release reduction improved knowledge	Air, Water	PAH (mainly)	2	2	2	2
	7.7 Cycling and oil-collection systems at dock installations	MS	Release reduction; awareness raising	Water	PAH	2	1	2-3	1-2
	7.8 ELV for unintended oil release from offshore platforms	EU	Release reduction	Water	PAH	2-3	1-2	2-3	1-2
	7.9 Specific requirements for products used for dock works	EU	Release reduction	Water	PAH	1-2	1-2	2	2

7. Dredging / Offshore / Dock works									
	7.10 Guidelines concerning best practice of dock works	EU	Release reduction, awareness raising	Water	PAH	1-2	1-2	1-2	2-3
Measures for filling knowledge gaps	7.11 EIA for dredging of contaminated sludges	EU / MS	Improved knowledge regarding the food chain impacts	Land	PAH	2-3	2	0-1	2-3
	7.12 Research on POP releases from dock works and off-shore activities	EU	Improved knowledge	Water	PAH	2-3	2	0-1	2-3
	7.13 Environmental monitoring for POPs in harbour areas and in surroundings of off-shore installation	EU / MS	Improved knowledge	Water	PCDD/PCDF, PCB, HCB, PAH	2-3	2	0-1	1-2
	7.14 Information/education on impacts of oil spillage	EU / MS	Awareness raising	Water	PAH	1-2	1-2	1	2

Table 8-7: Assessment of suggested measures for dredging / offshore / dock works

Justification of the assessment

In general need for action in the field of Dredging, Off-shore installations and dock works is assessed as medium.

Measures 7.1 to 7.10 aim at release reduction for PAH. Potentials for further reduction have been identified.

Measure 7.1 would define limit values and requirements for dredging sludges not classified hazardous and thus could control releases to land. Consequently effectiveness is considered medium to high provided limits for POPs will be set in legislation. The inclusion of limit values and dredging sludge into the Directive could be performed in the framework of a standard review process so that feasibility is seen as relatively high.

Measures 7.2, 7.3 and 7.7 contain technical measures to address and reduce oil spillage to water. All technical measures are probably associated with significant reduction effect and thus are assessed medium or even medium to high effectiveness. However all measures are associated with intense efforts to develop appropriate technology. In addition other aspects such as control and competitiveness have to be

taken into account at least for dock works (problem of international marine traffic). So feasibility of the measures is seen to be medium to low.

Measures 7.4 and 7.10 are less drastic and can be realised at low costs by an expert committee so that feasibility is considered high. On the other hand effectiveness of non binding recommendations has proven to be relative low even more as the marine sector is subject to high economic pressures and environmentally sound behaviour is associated with significant costs. Consequently effectiveness is assessed low to medium.

Measure 7.5 refers to ongoing negotiations under the International Maritim Organisation. POP releases are expected to be reduced if internationally binding standards could be established for recycling and recovery operations. The effect will depend on operations and pollutants included. Thus a medium effectiveness has been attributed. Socio-economic impacts can be expected significant but lower than in case of a specific European approach. Consequently a medium feasibility has been assessed.

Measures 7.6 and 7.8 focus on off-shore platforms which are not yet subject to the IPPC Directive. Inclusion into the IPPC regime can be seen as effective instrument for release reduction and knowledge gain. However it is associated with significant costs and socio-economic impacts. In the light of limited knowledge, POP releases might not be seen as well founded argument for induction of necessary changes so that feasibility is seen as medium. This applies even more to measure 7.8 which would be associated with high effectiveness but also high impacts so that resulting feasibility is low to medium.

Measures 7.11 to 7.13 are designed to provide additional knowledge on releases. All measures can be considered medium to high effectiveness with respect to improvement of knowledge. Measures 7.11 and 7.12 can in addition be attributed medium to high feasibility as they can be realised in the framework of targeted studies or European Commission research programmes (e.g. FP 8 etc). Measure 7.13 is designed as comprehensive monitoring activity. It could be performed in combination with experimental studies or modelling and should cover a number of important harbours in different regions of the European Community. This approach has the opportunity to reflect real field conditions, so that effectiveness is considered even slightly higher as for the other two approaches. Associated costs however are significant for involved Member States, so that feasibility of this measure is seen as medium to low.

8.3.8 Iron and Steel Industry

The following table provides an overview of identified possible measures to address POP releases from iron and steel industry. The table is followed by a justification of the assessment concerning cost-effectiveness and feasibility provided here below.

8. Iron and Steel												
Results from status quo	Medium mass flow relevance with some uncertainty. Release level highly depended on effective enforcement and application of high standard technology									**Need for action**		
										low		
Mass flow	PCDD/PCDF			PCB			HCB			PAH		
Total releases	~ 1,000 gTEQ/y			~600 -800 kg/y			~700 kg/y			~50 t/y		
Compartment	Air	Water	Land	Air	Water	Land	Air	Water	Land	Air	Water	Land
Rating	medium	low*	medium	medium	?	medium	medium	?	?	medium	?	?
Exposure relevance	Oral/digestive		low		Dermal		none		Inhalative		low	
Food chain relevance	Vegetables		low		Dairies/meat		medium		Fish/seafood		medium	
Proposed Measures	**Measure**	**EU /MS**	**Expected Effect**		**Compart-ment addressed**	**Pollutant addressed**	**Assessment**					
							Effective-ness	Costs	Socio-economic impacts	**Feasibility**		
Specific measures for reduction of POP releases	8.1 General emission limits for all POPs	EU	Reducing air pollution		Air	PCDD/F, PCB, HCB, PAH	2-3	1	3	1-2		
General measures for release reduction	8.2 Inventory of treatment methods for fly ash from incinerators and dust from metallurgic processes	EU	Raising awareness improving environmentally sound attitude leads to reduction of air release		Air, Water, Land	PCDD/F, PCB, HCB, PAH	1-2	1	0	2-3		

8. Iron and Steel									
Measures for filling knowledge gaps	8.3 Research programs on efficient detoxification of contaminated fly ash and metal dust	EU	Improvement of knowledge	land	PCDD/F, PCB, HCB, PAH	2	2-3	0-1	2-3
	8.4 Mandatory POP emission monitoring	EU	Improvement of knowledge	Air, Water, Land	PCDD/F, PCB, HCB, PAH	2-3	2	3	1

Table 8-8: Assessment of suggested measures for iron and steel

Justification of the assessment

In general need for action in the field of iron and steel production is assessed as low due to extensive measures already in place. This applies under the premise that BAT is thoroughly implemented and further elaborated in accordance with POP Regulation objectives. Thus measure I.2 is an important activity for the iron and steel sector. In addition some specific measures can be taken into consideration.

Measures 8.1 and 8.2 aim at release reduction for all POPs (namely PCDD/PCDF). Potentials for further release reduction have been identified.

Measure 8.1 would sharpen the recommendation and requirements contained in the related BREF document. Depending on the value and pollutants chosen effectiveness can be considered medium to high. Emission values could be included into the BREF in the course of the outstanding review process. Mandatory limit values however, would be associated with high socio-economic impacts due to the need to adapt and complete flue gas cleaning by appropriate APC devices. Consequently feasibility is seen as low to medium only.

Measure 8.2 is focused on releases from POP containing process residues and shall provide support to selection of appropriate treatment methods. In this context the measure could also be seen as measure for knowledge gain. Due to consulting character effectiveness on release is limited (assessed low to medium) whereas feasibility is high as neither relevant socio-economic impacts nor costs will impede realisation.

Measures 8.4 and 8.5 are intended to improve knowledge on releases.

Measure 8.3 is a classical research measure that could be realised in the framework of European Commission programmes so feasibility is assessed medium to high. As important share of the total releases from Iron and Steel production is to dusts research in detoxification can contribute to release reduction. However effectiveness is limited by the fact that significant parts of metallurgical dusts are either recycled or recovered in secondary thermal processes where contained POPs are destroyed. Consequently effectiveness is assessed as medium only.

Measure 8.4 would lead to considerably improved knowledge on emission levels from the sector and thus provide important information to direct measures more specifically. However, costs for actors and in turn socio-economic impacts will be high. Hence, the feasibility is assessed to be low.

8.3.9 Landfilling

The following table provides an overview of identified possible measures to address POP releases from landfilling. The table is followed by a justification of the assessment concerning cost-effectiveness and feasibility provided here below.

9. Landfilling												
Results from status quo	Low mass flow relevance with respect to releases to water; general and specific (e.g. regarding PCB) measures established at EU level; effect highly dependent on proper enforcement and control									**Need for action**		
										low		
Mass flow	PCDD/PCDF			PCB			HCB			PAH		
Total releases	?			?			?			?		
Compartment	Air	Water	Land	Air	Water	Land	Air	Water	Land	Air	Water	Land
Rating	?	low	?	?	low	?	?	?	?	?	?	?
Exposure relevance	Oral/digestive		NO		Dermal		none		Inhalative		none	
Food chain relevance	Vegetables		none		Dairies/meat		none		Fish/seafood		low	
Proposed Measures	**Measure**	**EU /MS**	**Expected Effect**		**Compart-ment addressed**	**Pollutant addressed**	**Assessment**					
							Effectiv-ness	Costs	Socio-economic impacts	**Feasibility**		
Specific measures for reduction of POP releases	9.1 Separate collection / disposal of residues from domestic solid fuel appliances	MS	Release reduction		Waste, Land	PCDD/F (mainly)	2	3	3	0-1		

9. Landfilling									
Measures for filling data gaps	9.2 Guidance for an effective system for monitoring and handling of POP containing waste	EU	Improved knowledge	Waste, Land	PCDD/F, PCB, HCB, PAH	1-2	2	1-2	2-3
	9.3 Research in POP releases from landfill	EU / MS	Improved knowledge	Waste, Land	PCDD/F, PCB, HCB, PAH	2-3	2	0-1	2-3
	9.4 Development of EU standards for POP analysis in waste	EU	Better comparability	Waste, Land	PCDD/PCDF, PCB, HCB, PAH	2	1-2	1-2	2-3
	9.5 Review of 1999/31/EC to stipulate mandatory waste water monitoring for all 4 POPs	EU	Improved knowledge	Waste, Land	PCDD/PCDF, PCB, HCB, PAH	2-3	1-2	3	1
	9.6 Public awareness raising campaigns on wastes with problematic POP concentration	MS	Awareness raising, release reduction	Waste, Land	PCDD/PCDF, PCB, HCB, PAH	0-1	1-2	0	2-3

Table 8-9: Assessment of suggested measures for landfilling

Justification of the assessment

In general the need for action in the field of Landfilling is rated to be low due to low mass flow relevance and the fact that an extensive legal framework is already in place. Nevertheless a number of additional measures can be taken into consideration.

Measure 9.1 aims at release reduction of POPs. Separate collection and disposal of ashes and soot form domestic appliances burning solid fuel would lower the input to landfill with domestic waste in an estimated dimension of 300 g TEQ/y for PCDD/PCDF. However, installation of a separate collection and disposal system would determine remarkable costs as well as remarkable socio-economic impacts and would be difficult to control. In addition 300 g is not much compared to about 6 kg TEQ/y that is assumed as total PCDD/PCDF input to landfill from municipal solid waste. Consequently effectiveness and feasibility of this measure is estimated to be low.

Measure 9.2 is designed for general information on best practice on POP waste management and monitoring for local authorities and public

and thus can reduce the input of POPs to landfill sites. As separation of POP containing waste fraction influences the overall content of wastes the effectiveness is assessed as medium due to the large amounts of waste landfilled. The feasibility for production of information material is also seen as medium to high as no significant socio-economic impacts have to be expected.

Measures 9.3 to 9.5 are intended to improve knowledge on POP releases from landfill sites. This issue needs special attention as the analysis of the status quo shows a significant uncertainty.

Measures 9.4 and 9.5 cover basic research such as EU standards for POP analysis and research on long-term releases. Both measures will improve knowledge significantly and are feasible as the do not entrain significant socio-economic impacts. Measure 9.5 will also contribute to improved knowledge on POP releases from landfills, so that effectiveness is considered medium to high. However the measure would require a complex review process and entrains additional costs for stakeholders so that feasibility of this measure is seen as low.

8.3.10 Marine Transport

The following table provides an overview of identified possible measures to address POP releases from marine transport. The table is followed by a justification of the assessment concerning cost-effectiveness and feasibility provided here below.

10. Marine transport												
Results from status quo	Mass Flow relevance with high uncertainty; Potential for release reduction									**Need for action**		
										medium		
Mass flow	PCDD/PCDF			PCB			HCB			PAH		
Total releases	~2 gTEQ/Y			~ 5kg/y			?			~500 t/y		
Compartment	Air	Water	Land	Air	Water	Land	Air	Water	Land	Air	Water	Land
Rating	low	?	?	low	?	?	?	?	?	medium	high	?
Exposure relevance	Oral/digestive		medium		Dermal		none		Inhalative		none	
Food chain relevance	Vegetables		none		Dairies/meat		none		Fish/seafood		high	

10. Marine transport									
Proposed Measures	**Measure**	**EU /MS**	**Expected Effect**	**Compart-ment addressed**	**Pollutant addressed**	**Assessment**			
						Effective-ness	Costs	Socio-economic impacts	**Feasibility**
General measures for release reduction	10.1 Launching a charging regime on the basis of ships' environmental performance to benefit the least damaging	EU / MS	Release reduction	Air	PAH (mainly)	2	1-2	2-3	2
	10.2 Increased harbour fees for transport companies violating rules or using inappropriately equipped ships (blacklist)	EU / MS	Release reduction, awareness raising	Air	PAH (mainly)	2	1-2	2-3	2
	10.3 High penalty for off-shore tank cleaning	MS	Release reduction	Water	PAH (mainly)	2	1	2-3	2
	10.4 Personal responsibility of Marine master for violation of environmental requirements; mandatory element in Master License	EU / MS	Release reduction	Water	PAH (mainly)	2	1	0	2
	10.5 Guidelines for handling oily waste	EU	Release reduction	Water	PAH	1-2	1-2	0-1	2-3
	10.6 Mandatory particle filter for diesel / heavy oil engines	EU	Release reduction	Air	PCDD/PCDF, PCB, HCB, PAH	2	1-2	3	1

10. Marine transport									
Measures for filling data gaps	10.7 Funding research into low-release ship technologies	EU	Improved knowledge	Air	PCDD/PCDF, PCB, HCB, PAH	2	2	1	2-3
	10.8 Systematic monitoring of POPs in harbour areas	MS	Improved knowledge	Water	PAH	2	2-3	0-1	1-2
	10.9 Guidelines for awareness raising campaigns in harbour areas	EU / MS	Improved knowledge	Water	PAH	1-2	1-2	0	2

Table 8-10: Assessment of suggested measures for marine transport

Justification of the assessment

In general need for action in the field of Marine Transport is assessed as medium.

In accordance with mass flow relevance the measures generally address PAH. Potential for further reduction have been identified.

Measures 10.1 to 10.6 address release reduction for PAH.

Measures 10.1 to 10.4 contain provisions to better implement environmental legislation. The effectiveness to reduce spillage and misuse is expected to be at least medium due to strong legal or economic pressure. As the measures 10.1 to 10.3 all act with financial mechanisms judging the environmental performance of ships and measure 10.4 states a personal responsibility of the Marine master which may have financial (or even penal) consequences as well, opposition by concerned stakeholders may be expected. Due to high pressure from mass flow relevance for PAH the political will to take action however might be high. Therefore, feasibility is ranked as medium.

Measure 10.5 is based on an IMO proposal. As there is no binding effect of a guidance document, the effectiveness is assessed low to medium. Due to absence of socio-economic impacts feasibility is ranked medium to high.

Measure 10.6 aims at binding standards for diesel / heavy oil driven engines. This would lead to a significant reduction of POP releases from seagoing ships. On the other hand, the socio-economic impacts would be significant and problems with competitiveness would have to be taken into consideration. Therefore, feasibility is assessed to be low.

Measures 10.7 and 10.8 aim to close knowledge gaps by funding research and monitoring activities. Both measures will certainly contribute to knowledge so that effectiveness can be considered medium. However, measure 10.8 will be more time consuming and requires more efforts than an experimental study (e.g. participation of various Member States and harbour authorities etc) so that feasibility tends to be low, whereas feasibility of measure 10.7 is assessed medium to high.

Measure 10.9 aims at information and awareness raising of workers and marine personnel to promote environmentally sound behaviour. As there is no binding character the effectiveness is seen as low to medium only whereas feasibility is at least medium.

8.3.11 Mineral Industry

11. Mineral Industry (Cement, Ceramics, Glass, Lime)												
Results from status quo	Low mass flow relevance with uncertainty with respect to POPs other than PCDD/PCDF; Technical standards and process technology are crucial factors for environmental performance									**Need for action** **low**		
Mass flow	PCDD/PCDF			PCB			HCB			PAH		
Total releases	25 gTEQ/y			~400 kg/y (?)			~2 kg/y			~ 10 t/y		
Compartment	Air	water	land	Air	water	land	Air	water	Land	Air	water	land
Rating	low	?	?	medium (?)*	?	?	low	?	?	low	?	?
Exposure relevance	Oral/digestive		low		Dermal		none		Inhalative		none	
Food chain relevance	Vegetables		none		Dairies/meat		low		Fish/seafood		low	

Table 8-11: Assessment of suggested measures for mineral industry (cement, ceramics, glass, lime)

*(?) emissions to be verified

Justification of the assessment

In general need for action in the field of the mineral industry is assessed as low due to extensive measures already in place. Nevertheless a number of additional measures could be taken into consideration.

Some overall measures as well as some general measures applicable for all industrial sources (see chapters 8.3.24 and 8.3.25) might be used to further reduce releases or improve knowledge. Specific measures have not been identified.

8.3.12 Non-ferrous metal industry

The following table provides an overview of identified possible measures to address POP releases from non-ferrous metal industry. The table is followed by a justification of the assessment concerning cost-effectiveness and feasibility provided here below.

12. Non-ferrous metal industry												
Results from status quo	Medium mass flow relevance with some uncertainty; releases highly dependent on proper application and up-dating of BAT, enforcement and control									**Need for action**		
										low		
Mass flow	PCDD/PCDF			PCB			HCB			PAH		
Total releases	~ 800 g TEQ/y			~ 40 kg/y			~600 kg/y			~ 6 t/y		
Compartment	Air	Water	Land	Air	Water	Land	Air	Water	Land	Air	Water	Land
Rating	low	?	medium	low	?	low	high	?	low	low	medium	?
Exposure relevance	Oral/digestive		low	Dermal			none		Inhalative		low	
Food chain relevance	Vegetables		low	Dairies/meat			low		Fish/seafood		low	
Proposed Measures	**Measure**	**EU / MS**	**Expected Effect**	**Compart-ment addressed**	**Pollutant addressed**		**Assessment**					
							Effective-ness	Costs	Socio-economic impacts	**Feasibility**		
Specific measures for reduction of POP releases	12.1 ELV for POP releases	EU	Release reduction	Air	PCDD/PCDF, PAH		3	1	3	1-2		

Table 8-12: Assessment of suggested measures for non-ferrous metal industry

Justification of the assessment

In general need for action in the non-ferrous metal industry is assessed as low due to extensive measures already in place. This applies under the premise that BAT is thoroughly implemented and further elaborated in accordance with POP Regulation objectives. Thus measure I.2 is an important activity for the non-ferrous metal sector. In addition some specific measures can be taken into consideration.

Measure (12.1) would directly act on POPs releases and further sharpen the provisions set in the corresponding BREF documents, so effectiveness is considered high. The socio-economic impacts of this measure however would be significant and has to be weighted against

a limited mass flow relevance to air. As the non-ferrous metal industry is generally covered by the IPPC regime and waste legislation as concerns residue management, the feasibility of this measure is assessed as low to medium.

8.3.13 Open burning of waste

The following table provides an overview of identified possible measures to address POP releases from open burning of waste. The table is followed by a justification of the assessment concerning cost-effectiveness and feasibility provided here below.

13. Open burning of waste												
Results from status quo	Medium Mass Flow relevance highly depending on activity data uncertainty; High potential for release reduction in countries where open burning of waste not yet banned / controlled									**Need for action**		
										medium		
Mass flow	PCDD/PCDF			PCB			HCB			PAH		
Total releases	~ 1,000 gTEQ/y			~100 kg/y			?			?		
Compartment	Air	Water	Land	Air	Water	Land	Air	Water	Land	Air	Water	Land
Rating	medium	?	medium	medium	?	?	?	?	?	?	?	?
Exposure relevance	Oral/digestive		medium		Dermal		low		Inhalative		locally	
Food chain relevance	Vegetables		low		Dairies/meat		medium		Fish/seafood		medium	

Proposed Measures	**Measure**	**EU / MS**	**Expected Effect**	**Compart-ment addressed**	**Pollutant addressed**	**Assessment**			
						Effective-ness	Costs	Socio-economic impacts	**Feasibility**
Specific measures for reduction of POP releases	13.1 Ban on open burning of waste	EU	Release reduction	Air	PCDD/PCDF, PAH (mainly)	0-1	1	0	2-3
	13.2 Information about impacts from open burning, particularly with regard to bonfires	EU / MS	Release reduction, Improved knowledge	Air	PCDD/PCDF, PAH (mainly)	1-2	2-3	0	2-3
	13.3 Penalties for violation	MS	Release reduction	Air	PCDD/PCDF, PAH (mainly)	1	2	0	1-2

13. Open burning of waste									
General measures for release reduction	13.4 Awareness raising in residential and agricultural sector (proper burning of household waste/agricultural waste)	EU / MS	Release reduction, improved knowledge	Air	PCDD/PCDF, PAH (mainly)	1-2	2	0	2
	13.5 Support for efficient and consumer-friendly waste collection systems	EU / MS	Release reduction	Air	PCDD/PCDF, PAH (mainly)	2	2-3	2	2
	13.6 Subsidies for municipalities with excellent waste management	MS	Release reduction	Air	PCDD/PCDF, PAH (mainly)	2	2-3	2	2
	13.7 "Concourse" for label "our clean community" at local and regional level	MS	Release reduction	Air	PCDD/PCDF, PAH (mainly)	2	2-3	2	2

Table 8-13: Assessment of suggested measures for open burning of waste

Justification of the assessment

The overall ranking for need of action in this field is “medium”.

The measures 13.1 to 13.3 aim at reducing POP releases. Potentials for further reduction have been identified.

An effect on POP releases could be expected for measure 13.1. However, as problems with efficient control have to be envisaged, effectiveness is as medium to low only. The feasibility for this measure is ranked medium to high as there are stakeholder interests that have to be taken into consideration. Problems with control and enforcement also have to be taken into consideration for measure 13.3. This will reduce effectiveness so that it is considered low only. As the measure would be associated with significant costs for national and local authorities, feasibility is seen as medium to low also.

Measures 13.2 and 13.4 aim to reduce releases by means of information and awareness raising. As open burning of waste is highly associated with lack of awareness and tradition the effectiveness of these measures might be higher as for a ban and is assessed as low to medium. Feasibility is medium to high as complex negotiations or high costs have not to be taken into consideration.

Measures 13.5 to 13.7 aim for release reduction by financial incentives. As there is a real driving force the effectiveness of these measures is considered at least as medium. As this causes significant costs and the socio-economic impacts may be remarkable, the feasibility is ranked medium.

8.3.14 Pesticide Use

The following table provides an overview of identified possible measures to address POP releases from pesticide use. The table is followed by a justification of the assessment concerning cost-effectiveness and feasibility provided here below.

14. Pesticide Use												
Results from status quo	Potentially high mass flow relevance for HCB; specific and general reduction measures established at EU level; release reduction potential depending on impurity concentration in large volume pesticide									**Need for action**		
										low		
Mass flow	PCDD/PCDF			PCB			HCB			PAH		
Total releases	?			?			~2000 kg/y			?		
Compartment	Air	Water	Land	Air	Water	Land	Air	Water	Land	Air	Water	Land
Rating	?	?	?	?	?	?	high	?	high	?	?	?
Exposure relevance*	Oral/digestive		low	Dermal		locally low	Inhalative		locally low			
Food chain relevance*	Vegetables		locally low	Dairies/meat		low	Fish/seafood		low			

Proposed Measures	Measure	EU / MS	Expected Effect	Compart-ment addressed	Pollutant addressed	Assessment			
						Effective-ness	Costs	Socio-economic impacts	Feasibility
General measures for release reduction	14.1 Framework Directive for sustainable use of pesticides	EU	Release reduction , knowledge gain	Air, Water, Land	All (namely HCB)	2	1-2	2	2
Measures for filling data gaps	14.2 Screening of POP concentration in market pesticides	EU	Improved knowledge on mass flow relevance	Air, Water, Land	All (namely HCB)	1-2	2	0-1	2-3
	14.3 Research studies modelling transport and fate of POPs from pesticide use	EU	Improved knowledge on environmental impacts and health relevance	Air, Water, Land	All (namely HCB)	1-2	2	0-1	2-3

Table 8-14: Assessment of suggested measures for pesticide use

Justification of the assessment

In general need for action in the field of pesticide use is assessed as low, as the sector is already well addressed although mass flow relevance currently is potentially still high for HCB.

To further reduce releases and improve knowledge in this sector, some general measures are relevant for pesticide use as well (see chapters 8.3.24).

In addition few specific measures has been identified that can help to reduce releases or improve knowledge.

Measure 14.1 aims at release reduction. The Framework Directive has been proposed recently by the Commission in the context of recent developments in the pesticide strategy. As the proposed framework strategy shall include all aspects of sustainable use including provisions for improved permitting, monitoring, control and risk assessment the effectiveness of this measure is assessed as medium. In the light of already low mass flow relevance provided implementation of Directive 2005/53/EC the effectiveness is not estimated to be higher. Costs are

estimated in the same range as for other regulatory activities or even lower as the process has bee nstarted already. As concerned sectors will experience significant administrative costs socio-economic impacts may not be underestimated. This leads to an overall assessment for the feasibility of this measure of medium form the point of view of reduction in POP releases.

Measures 14.2 and 14.3 are designed to improve knowledge on POP concentrations in market pesticides and on their transport and environmental fate including food chain risks. Measure 14.2 shall focus on substances not yet covered by permitting under Directive 91/414/EEC. Measure 14.3 could in part use results from food and water monitoring. As provisions under Directive 91/414/EEC are often already highly precise and data on pesticide use and contamination levels in food are already known the additional gain in knowledge might not be important, so that the effectiveness is not seen as more than low to medium. Costs can not be neglected; direct socio-economic impacts are low. As the screening could be realised in the framework of Commission research activities (e.g. FP 7) the feasibility is assessed as medium to high.

8.3.15 Power Production

The following table provides an overview of identified possible measures to address POP releases from power production. The table is followed by a justification of the assessment concerning cost-effectiveness and feasibility provided here below.

15. Power Production												
Results from status quo	Medium mass flow relevance; general reduction measures established for larger installations at EU level; effect highly dependent on proper application of BAT, enforcement and control; significant release reduction potential for installations below the threshold of 50 MW not yet covered by existing legislation									**Need for action**		
										medium		
Mass flow	PCDD/PCDF			PCB			HCB			PAH		
Total releases	~1000 g TEQ/y			~1,500 kg/y			~ 20 kg/y			~30 t/y		
Compartment	Air	Water	Land	Air	Water	Land	Air	Water	Land	Air	Water	Land
Rating	medium	?	medium	high	?	?	low	?	?	low	?	?
Exposure relevance	Oral/digestive		medium		Dermal		none		Inhalative		low	
Food chain relevance	Vegetables		low		Dairies/meat		medium		Fish/seafood		medium	

15. Power Production									
Proposed Measures	**Measure**	**EU / MS**	**Expected Effect**	**Compart-ment addressed**	**Pollutant addressed**	**Assessment**			
						Effective-ness	Costs	Socio-economic impacts	**Feasibility**
Specific measures for reduction of POP releases	15.1 ELV for POP releases	EU	Reduction of air releases	Air	PCDD/PCDF, PAH	3	1	3	1-2
Measures for filling data gaps	15.2 Guidance for selection of biomass; guidance on BEP and optimised process technology for biomass plant not subject to IPPC	EU	Release reduction	Air	PCDD/PCDF, PAH (mainly)	1-2	1-2	1	2-3
	15.3 Mandatory flue gas treatment for biomass power plants not subject to IPPC	EU	Release reduction	Air	PCDD/PCDF, PAH (mainly)	2-3	1-2	3	2

Table 8-15: Assessment of suggested measures for power production

Justification of the assessment

In general need for action in the field of public power production is assessed as medium, as a number of smaller installations are not completely covered by measures already in place.

To reduce releases and improve knowledge in this sector, some general measures, as well as some measures applicable for all industrial sources are relevant for power production as well (see chapters 8.3.24 and 8.3.25). Of the proposed measures for all industrial sectors, the expansion of the IPPC Directive to cover sources below 50 MW (see 8.3.25, measure I.4) would be particularly relevant to reduce releases from Power Production plants.

In addition a number of specific measures has been identified that can help to reduce releases or improve knowledge.

Measure 15.1 aims at release reduction. The introduction of binding ELV can be expected to significantly reduce releases depending on the level chosen. Consequently effectiveness is assessed high. On the other hand the socio-economic impacts are remarkable, so that the

feasibility of this measure is assessed as to be low to medium.

Measures 15.2 and 15.3 address Biomass plants not subject to the IPPC regime.

While the effectiveness and socio-economic impacts of Measure 15.2 tend to be low due to the absence of binding requirements, the medium to high efficient measure 15.3 has significant socio-economic impacts for the concerned industry. Consequently, the feasibility of measure 15.2 is rated medium to high whereas the feasibility of measure 15.3 is rated medium only.

8.3.16 Pulp and Paper

The following table provides an overview of identified possible measures to address POP releases from pulp and paper industry. The table is followed by a justification of the assessment concerning cost-effectiveness and feasibility provided here below.

16. Pulp and Paper												
Results from status quo	Low mass flow relevance; addressed at Community level including obligation to apply BAT and report on releases to all media; effect highly dependent on proper implementation, enforcement and control									**Need for action**		
										low		
Mass flow	PCDD/PCDF			PCB			HCB			PAH		
Total releases	~40 g TEQ/y			~90 kg/y			~1.5 kg/y			~6 t/y		
Compartment	Air	Water	Land	Air	Water	Land	Air	Water	Land	Air	Water	Land
Rating	low	low	low	low/medium	low	?	low	?	?	low	?	?
Exposure relevance	Oral/digestive		NO		Dermal		NO		Inhalative		NO	
Food chain relevance	Vegetables		NO		Dairies/meat		NO		Fish/seafood		YES	

Proposed Measures	**Measure**	**EU / MS**	**Expected Effect**	**Compart-ment addressed**	**Pollutant addressed**	**Assessment**			
						Effective-ness	Costs	Socio-economic impacts	**Feasibility**
Specific measures for reduction of POP releases	16.1 Legal ban on chlorine bleaching	EU	Release reduction	Water, Land	PCDD/PCDF, (mainly)	2	0-1	2	2
	16.2 Review of sewage sludge Directive	EU	Release reduction	Water, Land	PCDD/PCDF, (mainly)	2-3	1	2	2

16. Pulp and Paper									
	16.3 Extension of Information on POP releases in ongoing review of BAT	EU	Release reduction	Water	PCDD/PCDF, (mainly)	2	0-1	1-2	3
	16. 4 ELV and mandatory monitoring of releases to water	EU	Release reduction	Water	PCDD/PCDF, (mainly)	2-3	1-2	2-3	1-2
Measures for filling knowledge gaps	16.5 Research on POP releases from pulp and paper industry	EU	Improved knowledge	Water	PCDD/PCDF, (mainly)	2-3	2	0	2-3

Table 8-16: Assessment of suggested measures for pulp and paper

Justification of the assessment

In general need for action for the Pulp and Paper Industry is assessed as low due to extensive measures already in place. Nevertheless a number of additional measures could be taken into consideration.

To reduce releases and improve knowledge in this sector, some overall measures, as well as some general measures applicable for all industrial sources are relevant for pulp and paper production as well (see chapters 8.3.24 and 8.3.25). In addition a number of specific measures has been identified that can help to reduce releases or improve knowledge.

Measure 16.1 to 16.4 aim at reducing POP releases. They vary in level of binding character including mandatory requirements for emission levels (16.1) and monitoring (16.4) Effectiveness of the measures is considered at least medium. In the light of requirements already contained in the related BREF and in view of mass flow relevance the feasibility is however considered maximum medium with lower feasibility for the more binding elements.

Measure 16.1 would fill a gap in legislation, as currently no specific legal provisions are set concerning use of chlorine bleaching in existing Community legislation. It has however to be taken into consideration that the environmental control authorities in many countries have set severe restrictions on the discharges of chlorinated organics measured as AOX into the aquatic environment. Consequently, a drastic decrease in the use of molecular chlorine as a bleaching chemical could be observed achieved by a combination of several measures: The

use of molecular chlorine has been largely replaced by chlorine dioxide and introduction of other oxygen-containing chemicals such as molecular oxygen, peroxide and ozone, so that the effectiveness of the measure may not be overestimated. Due to the fact that the use of chlorine bleaching has virtually ceased at least in “old” Member States the effectiveness is assessed as maximum medium. As the legal framework for restriction in use legislation is already in place costs will be not important. Socio-economic consequences can be seen as up to medium, if the ban would include the use of chlorine dioxide which is currently used in the process. In considering the measure the progress achieved without explicit ban and the mass flow relevance of this ssource sector have to be taken into account. This hampers feasibility which therefore is assessed not more than medium.

Measure 16.2 targets on releases from pulp and paper sludges directed to application on agricultural soils in terms of a recovery action. Currently there is no regulation at Community level to control and limit the POP content in these sludges. Therefore it is recommended to subject sludges from pulp and paper industry to the sewage sludge directive and to promote the inclusion of limit values for POP content therein. The feasibility of this measure is seen as at least medium as the legal framework is in place and a proposal for POP limit values has already been made. Socio-economic impacts are not deemed high as the majority of sludges are expected to remain below potential limits.

Measure 16.3 concerns the BREF document for pulp and paper industry. It is intended to up-date and to extend the information on POP (all 4) in the document and to set standards for BAT release levels. This will help to improve knowledge and promote low release technologies.

The BREF should also include further information on potential sources for input of POPs or precursor substances into the process to enable to optimise primary reduction measures. Further information on secondary measures for release reduction (internal cycling of process water, effective water treatment) could be included into the BREF during the current review process. Due to the achieved level of release reduction effectiveness might not be overestimated, and socio-economic consequences have to be taken into consideration; but due to the high environmental pressure especially in the Baltic Sea area and due to the fact that the BREF document is currently under review the feasibility of this mesure is seen as high.

Mesaure 16.4 addresses the monitoring in waste water. Here a better specification of POP releases (no only as AOX) and related limits might help to improve reporting and could be used to further relduce releases.

Measure 16.5 aims at improving knowledge. Based on limited knowledge on releases at European level, effectiveness as regards knowledge gain is assessed medium to high. As corresponding projects could be realised in the framework of targeted studies or European Commission research programmes (e.g. FP 8 etc) feasibility is assessed as medium to high.

8.3.17 Refinery

The following table provides an overview of identified possible measures to address POP releases from refineries. The table is followed by a justification of the assessment concerning cost-effectiveness and feasibility provided here below.

17. Refinery												
Results from status quo	Low to Medium Mass Flow relevance with significant uncertainty									**Need for action**		
										low		
Mass flow	PCDD/PCDF			PCB			HCB			PAH		
Total releases	~ 10 g TEQ/y			~ 70 kg/y			?			~ 100 t/y		
Compartment	Air	Water	Land	Air	Water	Land	Air	Water	Land	Air	Water	Land
Rating	low	?	?	medium*	?	?	?	?	?	medium*	?	?
Exposure relevance	Oral/digestive		low		Dermal		none		Inhalative		low	
Food chain relevance	Vegetables		none		Dairies/meat		low		Fish/seafood		low	
Proposed Measures	**Measure**	**EU / MS**	**Expected Effect**		**Compart-ment addressed**	**Pollutant addressed**	**Assessment**					
							Effective-ness	Costs	Socio-economic impacts	**Feasibility**		
Specific measures for reduction of POP releases	17.1 ELV for POP releases	EU	Release reduction		Air, Water	PAH, PCB	3	1-2	3	1-2		

Table 8-17: Assessment of suggested measures for refinery

Justification of the assessment

In general need for action in the field of refineries is low. However, some overall measures as well as some general measures applicable for all industrial sources could be taken into consideration (see chapters 8.3.24 and 8.3.25).

Additionally, emission limit values for POP releases could be taken into consideration (Measure 17.1).

This measure would directly act on POPs releases and therefore can be expected to be effective. The measure would require the installation of ELV in the framework of the IPPC Directive or a new regulation. Related costs are therefore assessed up to medium. However depending on the level of the limit value the measure would be associated with high the socio-economic impacts due to the need to install additional abatement technology. This fact will hamper realisation of the measure so that feasibility is assessed as medium to low.

8.3.18 Residential combustion

The following table provides an overview of identified possible measures to address POP releases from residential combustion. The table is followed by a justification of the assessment concerning cost-effectiveness and feasibility provided here below.

18. Residential Combustion												
Results from status quo	Medium to high mass flow relevance for the investigated POPs; strong initiatives to include and properly address the sector recently ongoing at EU and MS level; significant potential for release reduction									**Need for action** **high**		
Mass flow	PCDD/PCDF			PCB			HCB			PAH		
Total releases	~ 1,700 g TEQ/y			~ 100 kg/y			~ 200 kg/y			~ 600 t/y		
Compartment	Air	Water	Land	Air	Water	Land	Air	Water	Land	Air	Water	Land
Rating	high	?	low	medium*	?	low	medium	?	?	high	?	?
Exposure relevance	Oral/digestive		medium		Dermal		low		Inhalative		low	
Food chain relevance	Vegetables		low		Dairies/meat		medium		Fish/seafood		medium	

Proposed Measures	**Measure**	**EU / MS**	**Expected Effect**	**Compart-ment addressed**	**Pollutant addressed**	**Assessment**			
						Effective-ness	Costs	Socio-economic impacts	**Feasibility**
Specific measures for reduction of POP releases	18.1 Negotiated agreements with manufacturers / importers to reduce PAH releases from stoves	EU	Release reduction	Air	PCDD/PCDF, PCB, HCB, PAH	2	0	2	2-3
	18.2 Financial incentives for certified stoves	MS	Release reduction	Air	PCDD/PCDF, PCB, HCB, PAH	2-3	2	1-2	2

18. Residential Combustion									
	18.3 Users guidelines for sound burning of domestic coal, peat and wood	EU	Awareness raising, release reduction	Air	PCDD/PCDF, PCB, HCB, PAH	1-2	1	0-1	2-3
General measures for release reduction	18.4 Mandatory or voluntary quality standards for small combustion appliances and their fuels	EU	Market standards lead to general release reduction	Air	PCDD/PCDF, PCB, HCB, PAH	2-3	1-2	2	2
	18.5 Inclusion of smaller residential and commercial buildings in an extended directive on energy efficiency	EU	Improved combustion quality and reduction of fuel consumption leads to overall release reduction	Air	PCDD/PCDF, PCB, HCB, PAH	2	1	2-3	1-2
	18.6 Awareness raising / guidelines for environmentally sound practices for small combustion appliances	EU / MS	Raising awareness improving environmentally sound attitude leads to general release reduction	Air	PCDD/F, PCB, HCB, PAH	1-2	2	0	2
	18.7 Local programs to modernize residential combustion	MS	Release reduction due to modern combustion technique	Air	PCDD/PCDF, PCB, HCB, PAH	2	3	2	1-2
	18.8 Mandatory particle filters for wood-burning stoves and fireplaces	EU	Control of particle release leads to the reduction of POP release	Air	PCDD/PCDF, PCB, HCB, PAH	3	1	3	1-2

18. Residential Combustion									
	18.9 Introduction of Smoke Control Zones where only smokeless fuels and smoke free appliances can be used	EU	General pressure to reduce overall releases	Air	PAH	2	2	3	1-2
	18.10 Mandatory annual internal inspections and regular instructions on the proper use of technical equipment for enterprises regarding combustion appliances	EU	Release reduction	Air	PCDD/PCDF, PCB, HCB, PAH	1-2	2	2	0-1
	18.11 Mandatory separation of ashes from solid fuel applications and establishment of a collection system	EU / MS	Release reduction	Land	PCDD/PCDF, PCB, HCB, PAH	1-2	3	3	0-1
	18.12 Graded costs for chimney cleaning according to burning system and fuel type used	EU / MS	Release reduction	Air, Land	PCDD/PCDF, PCB, HCB, PAH	2	1	2-3	2-3
	18.13 Financial incentives for installation of catalytic flue gas cleaning	EU / MS	Release reduction	Air	PCDD/PCDF, PCB, HCB, PAH	2-3	2	2	2
Measures for filling knowledge gaps	18.14 Research in releases from domestic burning	EU / MS	Improved knowledge	Air	PCDD/PCDF, PCB, HCB, PAH	2-3	1-2	0	2-3

18. Residential Combustion									
	18.15 Research in cheap indicator methods for POP releases in chimney soot	EU / MS	Improved knowledge	Air, Land	PCDD/PCDF, PCB, HCB, PAH	2	1-2	0	2-3
	18.16 Research in catalytic flue gas cleaning (PCDD/F, PAH)	EU / MS	Improved knowledge	Air	PCDD/PCDF, PCB, HCB, PAH	2	2	0	2-3

Table 8-18: Assessment of suggested measures for residential combustion

Justification of the assessment

In general need for action in the field of releases from Residential combustion is assessed as high due to high mass flow relevance and the fact that the residential sector currently is not well addressed by existing measures.

Measures 18.1 to 18.13 aim at release reduction.

Feasibility of measure 18.1 is regarded medium as relatively low costs correspond to medium effectiveness with medium socio-economic impacts. However, implementation would need to establish a “POP” emission classification scheme (similar e.g. to the energy consumption classification for household refrigerators. Such system further requires standardised test procedures which are to develop.

Measures 18.3 and 18.6 aim at awareness raising and education of users. Due to the absence of binding elements and influence of tradition or economic deliberations the effectiveness of these measures is seen as low to medium only. On the other hand the measures are relatively cheap and do not entrain socio-economic impacts, so that feasibility can be classified medium to high.

Measures 18.5, 18.8, 18.9 and 18.12 contain binding elements concerning releases, which are associated with higher effectiveness. On the other hand this entrains significant costs for involved actors so that feasibility is hampered. Consequently it has to be assessed generally not higher than medium.

Measures containing financial incentives (18.2, 18.7 and 18.13) can be expected to be associated with relatively high effectiveness as there is a driving force for involved actors to cooperate. Consequently the measures are assessed to have a medium to high effectiveness. Due to associated costs significant problems with realisation are expected so that feasibility is ranked low to medium.

Effectiveness and feasibility of measure 18.4 depend on the binding character (voluntary, mandatory) they will get. Overall the measure is expected to have a medium to high effectiveness has fuel quality is an essential factor for releases from residential appliances. Feasibility is considered medium due to associated socio-economic impacts which will hamper the willingness to comply.

Measures 18.14 to 18.16 aim at closing knowledge gaps by funding research activities in the field of domestic burning, chimney soot and catalytic flue gas cleaning. The feasibility of these measures which highlight different targets can be ranked medium to high across the board as projects can be realised in the framework of Commission research programmes. Research will contribute to knowledge and requires significant financial effort. So both effectiveness and costs are assessed medium.

8.3.19 Road transport

The following table provides an overview of identified possible measures to address POP releases from road transport. The table is followed by a justification of the assessment concerning cost-effectiveness and feasibility provided here below.

19. Road transport		
Results from status quo	Medium to High Mass Flow relevance with some uncertainty; Significant potential for release reduction by proper implementation of established legislation and realisation of proposed measures	**Need for action**
		high

Mass flow	PCDD/PCDF			PCB			HCB			PAH		
Total releases	~ 60 g TEQ/y			~ 1,400 kg/y (?)			~ 20 kg/y			~ 500 t/y		
Compartment	Air	Water	Land	Air	Water	Land	Air	Water	Land	Air	Water	Land
Rating	low	?	?	high*(?)	?	?	low	?	?	high	?	?
Exposure relevance	Oral/digestive		medium	Dermal		none	Inhalative		medium			
Food chain relevance	Vegetables		low	Dairies/meat		medium	Fish/seafood		medium			

19. Road transport									
Proposed Measures	**Measure**	**EU / MS**	**Expected Effect**	**Compart-ment addressed**	**Pollutant addressed**	**Assessment**			**Feasibility**
						Effective-ness	Costs	Socio-economic impacts	
General measures for release reduction	19.1 Ban on certain chlorinated/brominated compounds as fuel additive	EU	Emission reduction	Air	PCDD/PCDF, PCB, HCB, PAH	2-3	0-1	2-3	1-2
	19.2 Establishment of a common system of graded user charges for heavy goods vehicles above 12 tonnes depending on technical standards similar to the „Eurovignette“ as established by Directive 99/62/EC) "	EU	General emission reduction	Air	PCDD/PCDF, PCB, HCB, PAH	2	1	2-3	1-2
	19.3 Financial incentives related to fuel and motor type	EU / MS	General emission reduction	Air	PCDD/PCDF, PCB, HCB, PAH	2	2	2	2
	19.4 Mandatory particle filters for diesel engines	EU	General emission reduction	Air	PCDD/PCDF, PCB, HCB, PAH	2	1-2	3	1-2
	19.5 Further reduction of tolerated emission limits for heavy duty vehicles	EU	General emission reduction	Air	PCDD/PCDF, PCB, HCB, PAH	2	0-1	2	1-2
	19.6 Mandatory requirements and harmonised annual emission measurements for all vehicles	MS	General emission reduction	Air	PCDD/PCDF, PCB, HCB, PAH	2	1-2	3	1
Measures for filling knowledge gaps	19.7 Research in specific EF for fuels and motor types	EU	Improved knowledge	Air	PCDD/PCDF, PCB, HCB, PAH	2-3	2-3	0	2-3
	19.8 Research in EF for tyre and brake wear	EU	Improved knowledge	Air	PAH (mainly)	2-3	2	0	2-3

Table 8-19: Assessment of suggested measures for road transport

Justification of the assessment

In general need for action in the field of Road Transport is assessed as high due to mass flow relevance for PAH.

Measures 19.1 to 19.6 aim at release reduction. Potentials for further reduction have been identified.

Effectiveness of measure 19.1 is expected to be medium to high as chlorinated compounds are important factors to increase generation of POPs in the combustion process. However, other parameters such as requirements of engine producers have to be considered entraining considerable socio-economic impacts. Consequently feasibility of this measure is ranked medium to low.

The “Eurovignette” is a system of graded user charges for heavy transport above 12 tonnes depending on technical standard and mission levels. The effectiveness of measures 19.2 is considered medium only, due to other factors such as flexibility that push transport to the road. This appraisement is supported by the modest success of the “Eurovignette” system as established by Directive 99/62/EC. Socio-economic impacts are estimated to be high. In the light of the overall burden already imposed to heavy transport, the feasibility of the measures is seen as medium to low only.

Measure 19.4 and 19.5 aim in the same direction but are expected to have a higher and more targeted reduction effect. So effectiveness is considered at least medium. Feasibility is seen higher as costs are reduced to a onetime investment and do not occur continuously. Therefore, feasibility is assessed tending to medium.

As measure 19.5 measure 19.6 aims to require emission threshold for operation permits. As it aims at harmonisation of national practice the feasibility of this measure however is seen relatively low.

Measures 19.7 and 19.8 are research measures that could be realised in the framework of European Commission programmes so feasibility is assessed medium to high even though the costs for its evaluation may be range medium to high.

8.3.20 Shredder industry

The following table provides an overview of identified possible measures to address POP releases from shredder industry (including cable stripping processes). The table is followed by a justification of the assessment concerning cost-effectiveness and feasibility provided here below.

20. Shredder industry												
Results from status quo	Low to medium mass flow relevance with respect to air emissions; no unintentional production but only unintentional release of POPs due to incoming contamination; well addressed at EU level by specific regulation; release reduction effect highly dependent on proper implementation, enforcement and control of existing legislation									**Need for action**		
										low		
Mass flow	PCDD/PCDF			PCB			HCB			PAH		
Total releases	2 g TEQ/y			~100 kg/y			~14 kg/y			~ 7 kg/y		
Compartment	Air	Water	Land	Air	Water	Land	Air	Water	Land	Air	Water	Land
Rating	low	?	?	medium	?	significant	low	?	?	low	?	?
Exposure relevance	Oral/digestive		none		Dermal		none		Inhalative		none	
Food chain relevance	Vegetables		none		Dairies/meat		low		Fish/seafood		low	

Proposed Measures	**Measure**	**EU / MS**	**Expected Effect**	**Compart-ment addressed**	**Pollutant addressed**	**Assessment**			**Feasibility**
						Effective-ness	Costs	Socio-economic impacts	
General measures for release reduction	20.1 Improved enforcement of implementation of WEEE and ELV Directive at MS level	EU / MS	Release reduction due to effective implementation of Community law	Land	PCB	1-2	0-1	1-2	2
	20.2 Introduction of a window take-back-system financed by window pane producers	EU / MS	Release reduction	Land	PCB	2	1-2	2-3	1-2
	20.3 Incentives for high temperature incineration of shredder wastes	EU / MS	Incentive for applying environmentally sound technology leads to release reduction	Land	PCB	1-2	3	1	1

20. Shredder industry									
Measures for filling knowledge gaps	20.4 Compilation and communication of info on what wastes contain POPs, and how decontamination before processing may reduce emissions	EU / MS	Awareness raising	Land	PCDD/PCDF, PCB, PAH	2	1-2	0	2

Table 8-20: Assessment of suggested measures for shredder industry

Justification of the assessment

In general need for action in the field of Shredder industry is assessed as low due to the measures already in place.

Measures 20.1 to 20.3 aim at release reduction for. Due to associated costs or socio-economic impacts the feasibility of the measures however is not seen high.

Measure 20.4 will contribute to information on POPs and is not associated with high costs. So both effectiveness and feasibility are considered medium.

8.3.21 Solvent use and surface treatment

The following table provides an overview of identified possible measures to address POP releases from surface treatment / solvent use. The table is followed by a justification of the assessment concerning cost-effectiveness and feasibility provided here below.

21. Surface treatment/solvent use												
Results from status quo	Medium mass flow relevance for PAH									**Need for action**		
										medium		
Mass flow	PCDD/PCDF			PCB			HCB			PAH		
Total releases	?			?			?			~100 t/y		
Compartment	Air	Water	Land	Air	Water	Land	Air	Water	Land	Air	Water	Land
Rating	?	?	?	?	?	?	?	?	?	medium	?	?
Exposure relevance	Oral/digestive		low		Dermal		none		Inhalative		low	
Food chain relevance	Vegetables		none		Dairies/meat		low		Fish/seafood		low	
Proposed Measures	**Measure**	**EU / MS**	**Expected Effect**		**Compart-ment addressed**	**Pollutant addressed**	**Assessment**					
							Effective-ness	Costs	Socio-economic impacts	**Feasibility**		
General measures for release reduction	21.1 Expansion of IPPC Directive (Annex 1(6.7)) to include installations with capacity <150 kg/h or <200 t/y	EU / MS	Release reduction; improved knowledge		Air	PAH	1-2	1-2	3	1		
Measures for filling knowledge gaps	21.2 Research on releases from solvent use and surface treatment	EU / MS	Improved knowledge		Air	PAH	2	2-3	0-1	2-3		

Table 8-21: Assessment of suggested measures for surface treatment/solvent use

Justification of the assessment

In general need for action in the field of solvent use and surface treatment is assessed as medium due to mass flow relevance for PAHs and the fact that for large plants measures are already in place.

Measure 21.1 aims at release reduction for PAH. Effectiveness of Measure 21.1 is rated low as the solvent use sector is dominated by large numbers of small and smallest applications which partially gives this sector the character of a diffuse source. On the other hand socio-economic impacts of an expansion of Annex 1 would be high for a large amount of installation operators and complex negotiations would be required. Thus feasibility is considered low.

Measure 21.2 is a research measure with at least medium effectiveness as regards knowledge gain. As this measure could be realised in the framework of European Commission research programmes (e.g. FP 8) feasibility is assessed medium to high. Costs however are not negligible and have to be weighted against mass flow relevance.

8.3.22 Waste incineration and co-incineration

The following table provides an overview of identified possible measures to address POP releases from waste incineration and co-incineration. The table is followed by a justification of the assessment concerning cost-effectiveness and feasibility provided here below.

22. Waste incineration and co-incineration												
Results from status quo	Medium to high relevance for mass flow as regards releases to waste/land but low relevance for releases to air; established legal framework with strict release limit for PCDD/PCDF to air; thus focus of further action has to be laid on proper enforcement of existing legislation									**Need for action**		
										low		
Mass flow	PCDD/PCDF			PCB			HCB			PAH		
Total releases	~1900 g TEQ/y			~ 250 kg/y			~ 550 kg/y			~ 7 t/y		
Compartment	Air	Water	Land	Air	Water	Land	Air	Water	Land	Air	Water	Land
Rating	low	?	high	low	?	medium	low	?	medium/high	low	?	?
Exposure relevance	Oral/digestive		low		Dermal		none		Inhalative		none	
Food chain relevance	Vegetables		none		Dairies/meat		low		Fish/seafood		low	

Proposed Measures	Measure	EU / MS	Expected Effect	Compart-ment addressed	Pollutant addressed	Assessment			Feasibility
						Effective-ness	Costs	Socio-economic impacts	
Measures for filling knowledge gaps	22.1 Research on efficient detoxification of contaminated fly ash	EU / MS	Improvement of knowledge	Ongoing at MS level	PCDD/PCDF, PCB, HCB, PAH	2	2	0	2-3

Table 8-22: Assessment of suggested measures for waste incineration and co-incineration

Justification of the assessment

In general need for action in the field of waste incineration is assessed as low due to extensive measures already in place for air and water as well as for residues. Nevertheless additional measures for release reduction or improvement of knowledge could be taken into consideration.

In addition measure 22.1 could be taken into consideration to reduce impacts from process residues. As it is a research measure which could be realised in the framework of the environmental programs of European Commission feasibility is assessed medium to high while its effectiveness and costs can be ranked as “medium”.

8.3.23 Wood preservation

The following table provides an overview of identified possible measures to address POP releases from wood preservation. The table is followed by a justification of the assessment concerning cost-effectiveness and feasibility provided here below.

23. Wood preservation												
Results from status quo	Medium mass flow relevance with high uncertainty; relevant legal framework established to avoid further input into mass flow. No measures at EU level to control waste wood management									**Need for action**		
										medium		
Mass flow	PCDD/PCDF			PCB			HCB			PAH		
Total releases	~ 1000 g TEQ/y			?			?			~ 300 t/y		
Compartment	Air	Water	Land	Air	Water	Land	Air	Water	Land	Air	Water	Land
Rating	medium	?	?	?	?	?	?	?	?	high	?	?

23. Wood preservation									
Exposure relevance	Oral/digestive	low	Dermal	low	Inhalative	low			
Food chain relevance	Vegetables	none	Dairies/meat	low	Fish/seafood	medium			
Proposed Measures	**Measure**	**EU / MS**	**Expected Effect**	**Compart-ment addressed**	**Pollutant addressed**	**Assessment**			
						Effective-ness	Costs	Socio-economic impacts	**Feasibility**
General measures for release reduction	23.1 Support for enforcement (guidelines, training for inspectors)	EU / MS	Release reduction	Air	PCDD/PCDF, PAH	1-2	1-2	1	2

Table 8-23: Assessment of suggested measures for wood preservation

Justification of the assessment

In general need for action in the field of wood preservation is estimated to be medium due to mass flow relevance and uncertainty.

To reduce releases and improve knowledge in this sector, some overall measures can be taken into consideration. For the assessment see the corresponding chapters.

In addition measure 23.1 has been identified that aims at knowledge gain and release reduction for PCDD/PCDF and PAH. As it has only training character effectiveness is seen as medium. On the other hand associated costs and efforts needed and activities already taken at national level have to be taken into consideration. Moreover, the fact that further input of contaminated wood is already regulated and control of private combustion can not be addressed by this measure. Hence a strong driving force cannot be expected so that feasibility of this measure is seen as medium to low only.

8.3.24 Overall measures

The following table provides an overview of identified possible measures to address POP releases and provide knowledge for all identified sources. The table is followed by a justification of the assessment concerning cost-effectiveness and feasibility provided here below.

Overall Measures									
Proposed Measures	**Measure**	**EU/MS**	**Expected Effect**	**Compart-ment addressed**	**Pollutant addressed**	**Assessment**			
						Effective-ness	Costs	Socio-economic impacts	**Feasibility**
Specific measures for reduction of POP releases	O.1 Quality standards for ambient air POP concentration and POP deposition rates	EU	Release reduction	Air	PCDD/PCDF, PCB, HCB, PAH	1	1-2	1-2	2-3
General measures for release reduction	O.2 Training of environmental inspectors and permit authorities	EU / MS	Release reduction	Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH	1-2	1-2	1	2
	O.3 Review of emission ceilings in the Directive 2001/81/EC	EU	Release reduction	Air	PCDD/PCDF, PCB, HCB, PAH	2	1-2	2-3	1-2
	O.4 Promotion of environmentally sound practices for small combustion appliances	EU	Release reduction	Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH	2-3	2	2	2-3
Measures for filling knowledge gaps	O.5 Enforcement of Stockholm Convention requirements regarding improved coordination within/ in between national administration (NFP approach)	EU and MS	Better enforcement of legislation Release reduction Improved knowledge	Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH	2	2	1	2-3

Overall Measures									
	O.6 Information request on efficiency of the national legal system	EU	Improved knowledge, release reduction (as indirect consequence)	Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH	2	1-2	0-1	2-3
	O.7 Guidance for assessment of the efficiency of the national legal system	EU	Improved knowledge, release reduction	Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH	2	1-2	0-1	2-3
	O.8 Development and promotion of a POPs release management handbook (BAT)	EU	Improved knowledge	Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH	2-3	2	0-1	2-3
	O.9 Research for substitute products and process technology to prevent formation and release of POPs	EU	Improved knowledge, release reduction	Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH	2	2-3	0-1	2-3
	O.10 Communication on substitute products and process technology to prevent formation and release of dioxins	EU	Improved knowledge, release reduction (as indirect consequence)	Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH	1-2	2	0-1	2-3
	O.11 POP website	EU	Improved communication and knowledge	Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH	1-2	1-2	0	3
	O.12 EU-POP database	EU	Improved knowledge	Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH	2	2-3	0	2
	O.13 Review and extension of CEN standards for POP sampling and analysis	EU	Better comparability of data	Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH	2	2	0	2-3
	O.14 Capacity building on POP monitoring and analysis	EU	Improved knowledge, better comparability and reliability of data	Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH	2	2	0-1	2-3

Overall Measures									
	O.15 Platform for information exchange between Stakeholders (e.g. Consultative Forum)	EU / MS)	Improved knowledge, release reduction, cost-effective policy	Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH	2	1-2	0	2-3
	O.16 Establishment of a central institution for POP related issues("POP coordination centre" within Commission Services)	EU / MS	Improved knowledge and communication	Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH	2-3	2	0	2
	O.17 Communication on food related POP risks towards affected groups	EU / MS	Improved knowledge and communication	Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH	1-2	2	1	2
	O.18 Inclusion of information on POPs in general education (e.g. schools)	MS	Improved knowledge and communication, better awareness	Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH	2	1-2	0-1	1-2
	O.19 Guidance for curriculum for courses on environmental studies	EU / MS	Improved knowledge and communication, better awareness	Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH	1-2	1-2	0-1	2-3
	O.20 Financial support for university courses on environmental studies including information on POPs	EU / MS	Improved knowledge and communication, better awareness	Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH	1-2	2	0-1	1-2
	O.21 Research on POP identification and detoxification techniques	EU / MS	Improved knowledge, release reduction	Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH	2	2-3	0-1	2-3
	O.22 Expansion of emission inventories in the scope of further E_PRTR development	EU	Improved knowledge	Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH	2	1-2	1-2	2

Overall Measures									
	O.23 Updating of and information exchange on Emission Factors	EU / MS	Improved knowledge	Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH	2-3	2	0	2
	O.24 Support and coordination of LRTAP- Monitoring and modelling on POP in cooperation with EMEP	EU	Improved knowledge	Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH	1-2	2	0-1	2-3
	O.25 Coordination of human POP exposure monitoring (via EU-Biomonitoring)	EU	Improved knowledge	Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH	2	2-3	0	1-2
	O.26 Promotion of source related POP monitoring and reporting in the aquatic environment, e.g. in river basins and the marine environment	EU / MS	Improved knowledge	Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH	2	2-3	0	1-2
	O.27 Mandatory PCB analysis in drinking water	EU	Improved knowledge, release reduction (as indirect consequence)	Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH	2-3	2-3	3	1-2
	O. 28 Setting up a framework and guidance for monitoring and identification of POP releases	MS	Improved knowledge	Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH	1-2	1-2	0	2
	O.29 Support of documentation on EF achievable with specific process technology	EU	Improved knowledge	Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH	2	1-2	0	2-3
	O.30 Research on analysis and sampling methods for POPs	EU	Lower costs, better comparability	Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH	2-3	2	1-2	2-3

Overall Measures									
	O.31 Research on relations between health effects and exposure to POPs	EU	Improved knowledge	Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH	2	2-3	0-1	2-3
	O.32 Information campaign concerning POPs and possibilities for release reduction	EU / MS	Improved knowledge	Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH	1-2	2	1-2	2

Table 8-24: Assessment of suggested measures

Justification of the assessment

Measure O.1 aims at specific POP release reduction whereas measures O.2 to O.4 generally concern release reduction.

The feasibility of measure O.1 is assessed medium to high as related legislation is already in place with Directives 96/62/EC (ambient air quality) and 204/107/EC (PAH target values in ambient air) and inclusion of additional substances and targets for deposition rates could be achieved via a review process. Moreover, in some EU countries such standards (i.e. for PCDD/PCDF) have already been proposed and are already applied in assessments of current and future impacts of industrial releases. Costs for the involved authorities thus are seen as low in comparison to research, monitoring or control activities. As there is no targeted approach to specific source sectors and a low binding level also socio-economic impacts are expected to remain low to medium. Due to missing source relation and limited binding elements the effectiveness of this measure concerning release reduction however, is limited and is expected to be low only.

Measure O.2 is expected to show high effectiveness regarding release reduction, as thorough implementation and enforcement of existing legal instruments are crucial factors in achieving low release levels as calculated according to BAT. The costs to develop training programmes as well as socio-economic impacts are limited in comparison to other measures, as developed material can be used for various occasions and no direct consequences have to be expected for economy and society. The measure however, requires significant contribution and involvement of MS authorities and a national decision whether an administration or legislation has to be supported in this way (and how much costs this may cause). Consequently the feasibility of measure O.2 has been assessed as "medium" only.

Measure O.3 can be expected to remarkably improve Member States´ efforts to generally reduce air emissions, but as there is no direct relation to POPs the effect concerning POP is only indirect and limited, so that the effectiveness of the measure regarding reduction of POP releases cannot be rated more than medium. Costs would be related to the negotiation and review process and thus assumed to be limited,

but socio-economic impacts would be high and would affect numerous economic sectors if the emission ceiling is further tightened. In the light of a limited effect on POP releases the cost-efficiency of this measure appears bad, so that the feasibility of this measure is regarded low to medium.

Measure O.4 is expected to show at least medium effectiveness concerning release reduction, as technical standards and process conditions as well as use of appropriate fuel are crucial factors for POP releases from an important source sector. Costs are expected to arise from development and distribution of related information (including documents, web platform, information) and from support of environmentally sound technologies including financial incentives. Thus costs can not be neglected and are assessed as medium. Socio-economic impacts both positive and negative can be expected to occur, depending on the type of action taken to promote technical progress and new technologies. As there are no mandatory elements and incentive aspects could be integrated, a strong opposition is not expected to occur. Taking furthermore in consideration the importance of the addressed source sector and the significant reduction potential achievable there might be a strong driving force to take action, so that feasibility is regarded as medium to high.

Measures O.5 to O.32 aim at improvement of knowledge on POP releases, related risks and possibilities to further reduce impacts.

Measures O.5 to O.8 and O.10 to O.17 largely focus on better coordination and communication of available knowledge to promote know-how transfer. All these measures are seen as effective in the view of improvement of knowledge and are associated with medium costs and low socio-economic impacts. As the measures are all supportive and do not impose limits or threshold levels significant opposition is not expected. Consequently the feasibility of all these measures is seen as medium to high.

POP websites are partially already installed at MS and international level; however, 0.11 would be a good instrument for illustration of the European dimension on combating POPs. As some information is already compiled and presented at the Commission homepage the effectiveness of this measure is assessed medium only. Due to established structures costs are seen as low to medium and the feasibility is assessed to be high.

Also, POP databases are already partially in place at MS level; however, a specific European compilation of POP data is currently missing. Measure O.12 could therefore lead to significant knowledge gain so that effectiveness is assessed at least to be medium. As MS have to submit data to the European Commission under E-PRTR and under other Conventions, this project would be easy to realise e.g. under EEA. However, costs for installation and regular up-date of the database may be significant. Therefore, the feasibility of this measure is assessed to be medium.

Measures O.9 (substitutes), O.10 (communication hereof), O.21 (detoxification) and O.30 (sampling-analysis) focus on research for substitutes, identification and detoxification, sampling and analysis and the related communication. Thus these measures contribute to the

explicit aim of the POP Regulation to promote measures with a focus to prevent formation and release of POPs (e.g. so called primary measures).

All measures can be expected to contribute to knowledge, so that effectiveness is assessed medium, with the pure communicative measure expected to show slightly lower effect. Measures O.30 targets the area of POP sampling and analysis procedures and their improvement and harmonisation within the EU. Comparability of monitoring results is an important precondition to properly address further actions. Costs of research are always significant, socio-economic impacts are generally low during the research phase. Therefore, no significant impediments should be expected and feasibility can be assessed to be medium to high.

Measure O.13 and O.14 concentrate on better comparability and reliability of data. Although they do not specifically contribute new knowledge they will contribute to the overall picture and knowledge on POP issues at European scale. Currently CEN standards exist for a part of the POPs in question (mainly PCDD/PCDF) and a part of the release compartment (mainly air) but sampling and analysis standards for PCB, HCB and PAH are still highly limited. The same applies for capacity building where much has been achieved already during the past years, but where problems with sophisticated analysis methods and data comparability still exist. Thus effectiveness of both measures is still assessed medium. Standardisation and capacity building activities demand significant resources and require cooperation of Member States. However the institutional framework is already in place and standardisation for a number of POPs as well as capacity building is already ongoing. So feasibility of these measures is assessed medium to high notwithstanding related costs.

The feasibility of measure O.15 (Platform for information exchange between stakeholders) is rated medium to high as this task can be realised in the Commission Premises and thus does not need complex negotiation and contracting. The effectiveness for this measure as regards knowledge exchange and knowledge gain is expected to be significant as it could extensively coordinate and distribute POP related information and thus is rated at least “medium”.

Measure O.16 takes a related approach and is expected to show even slightly higher effectiveness as it would develop into an expert institution. On the other hand, the costs for a central institution are distinctively higher than for an information exchange platform. Consequently the feasibility of this measure is slightly lower than for O.15.

Measure O.17 addresses both, producers and consumers of food. Information on possible pathways for contamination could help to reduce population exposure to POPs. The efficiency is assessed medium to high since an increase of the awareness is likely to drive the affected groups to change their usual behaviour. Due to the need for basic information originating from food and feed controls costs may not be negligible. The socio-economic effects originate from changes in consumption behaviour may have significant impact on specific food processing sectors in case warnings against consumption of certain food are released. Feasibility of the measure is assessed at least

medium since administrative structures already exist in many EU Member States as well as on the EU level (EU Food Safety Authority)

Measures O.18 to O.20 address the educational sector.

Inclusion of environmental issues into school and university curricula is already established at Member State level especially in the Nordic States. Consequently experiences could be used. It can be expected that measures in this field improve knowledge but whether this effect is important can not be assessed in the scope of this project, so that effectiveness is assumed to be only medium. The realisation of the measures will be hampered by national autonomy in educational policy. As it is assumed to be questionable whether Member States see the inclusion of POP issues in environmental education a priority area in basic school education, feasibility of measure 0.18 is expected to be low to medium only. In addition costs will have to be taken into consideration and weighted against the expected effect; These will be important especially in the case of financial support of curricula etc.. The highest feasibility is seen for measure 0.19 as this is a voluntary tool and can be developed in the Commission services themselves.

Measures O.22 to O.29 intend to generate new knowledge on POP releases, transport and fate and cover different aspects of inventory.

Measure O.22 and O.26 focus on the newly established E-PRTR, which will collect information on point and diffuse sources concerning releases to air, water, land and waste. The reporting however is limited especially as regards releases from diffuse sources, where the European Commission can only use information already collected at Member State level. Provisions to improve the completeness of Member State reporting on source categories already established and foreseen under UNFCCC reporting, provisions to expand source related reporting on POPs in the water sector to diffuse sources (measure 0.26) and a lowering of reporting thresholds for HCB and PAH, could significantly increase the knowledge on amounts, transport and fate of POPs in the environment. In the light of the fact that data in part are already available the effectiveness of this measure is assessed medium. Costs are low for setting of provisions as the legal background is already laid down in the E-PRTR regulation however development of release models or execution of monitoring will entrain significant efforts. Due to the strong involvement and efforts needed from the side of Member States the measure is not easy to realise so that feasibility is rated medium only.

Measure O.23 addresses the issue of emission factors which are a basic tool in release calculation and release reporting. Currently two international documents are available that can be used for release estimation. This is the UNEP toolkit for PCDD/PCDF and the UNECE Guidebook for PCB, HCB and PAH. However, information in these instruments is limited especially for PCB, HCB and PAH and for the compartments water, waste and land. Hence, an up-date and expansion would significantly contribute to a more precise release estimation and could contribute to direct reduction policy by providing better information on specific sources and factors influencing the EFs. Thus

effectiveness of this measure is rated medium to high. The issue could be addressed via contribution of Member State authorities and industry or via research projects based on EMEP and E-PRTR reporting. Based on this background the feasibility of this measures is seen to be at least medium.

Documentation of EFs used by Member States or industry (O.29) lacks the aspects to generate new EFs, so this measure is expected somewhat less effective; however it has the advantage to be less costive.

Both measures can be seen as a support action to inventory activities as well as to the review of BREF documents. Administrative structures to initiate related projects or to include the activity into existing framework (e.g. EEA) are existing. Both measures could be realised via contribution of Member State authorities and industry or via evaluation projects based on EMEP and E-PRTR reporting. Based on this background the feasibility of the measures is seen to be at least medium.

Measure O.24 concentrates on evaluation of long-range transboundary transport. A support of the ongoing EMEP activities might help to generate a denser network or more extensive monitoring and thus could contribute to knowledge gain. In the light of ongoing activities the effect however can not be expected to be dramatic, so that effectiveness is medium. Costs can be expected to be significant but feasibility is medium as it is a Commission decision only.

O.25 and O.27 are measures to improve knowledge on human exposure. A coordination of monitoring activities (0.25) could contribute significantly to knowledge via data comparability and larger study population. Mandatory water analysis on PCB would give additional insight in water quality. So both measures can be classified effective in terms of knowledge gain but they are also associated with high costs and require strong Member State participation. This has to be weighted against the expected effect, so that the feasibility is expected to be low to medium only.

Setting up a framework and guidance for monitoring of POPs (measure O.28) is expected to be less effective due to lack of binding elements, however it is associated with lower costs and can be seen as a good tool to increase the quality of Member State activities. So serious opposition is not expected and feasibility of this measure can be rated at least medium.

Measure O.31 is a research measure such as measures O.9 and O.21. The difference is that this measure is targeted on identification and quantification of pathways for human exposure in order to close the gap between emission data and intake recommendations. Research in this field is already ongoing since long. As however, knowledge is still limited the measure can be expected to contribute significantly to knowledge gain and understanding so that effectiveness is rated as medium. As for all research activities costs will be high. Socio-economic

impacts can be seen as low as there is not direct impact on consumption behaviour etc. during research phase. As infrastructure is established at Community level feasibility is seen as high.

O.32 is a communicative measure intended to improve environmental practice due to better knowledge on the individual level. As individual behaviour is always strongly influenced by tradition and convenience and difficult to change, the effectiveness of this measure is expected to be low to medium only. Costs are not negligible as information has to be translated and distributed via different media and pathways including information events etc. to reach a maximum of citizens. Socio-economic impacts are related to changes in consumption habits concerning food as well as technical equipment e.g. combustion installations. Some effects (positive and negative) can be expected so that impacts are assessed to be up to medium. As related structures are established at European and national level feasibility is seen as medium.

8.3.25 General Industry

The following table provides an overview of identified possible measures to address POP releases generally applicable for all industrial sources. The table is followed by a justification of the assessment concerning cost-effectiveness and feasibility provided here below.

General Industry									
Proposed Measures	**Measure**	**EU / MS**	**Expected Effect**	**Compart-ment addressed**	**Pollutant addressed**	**Assessment**			
						Effective-ness	Costs	Socio-economic impacts	**Feasibility**
Specific measures for reduction of POP releases	I.1 Mandatory EVL and measurements for all 4 POPs in all IPPC facilities	EU	Release reduction	Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH	2	1-2	3	1-2
	I.2 Further elaboration and adaptation of BREFs in accordance with POP Regulation objectives	EU	Improved enforcement and release reduction via Improved knowledge	Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH	2	1	2-3	2-3
	I.3 Inclusion of POPs in emission trading	EU	Release reduction	Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH	3	1-2	3	0-1

General Industry									
General measures for release reduction	I.4 Expansion of IPPC Directive to cover sources < 50 MW	EU	Release reduction	Air	PCDD/PCDF, PCB, HCB, PAH	3	1-2	3	1
	I.5 Mandatory annual inspections and regular instructions on proper use of combustion appliances	MS	Release reduction	Air	PCDD/PCDF, PCB, HCB, PAH	2-3	2-3	2-3	1
	I. 6 Guidance for training of environmental inspectors	EU / MS	Improved enforcement Release reduction	Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH	1-2	1-2	1	2-3
	I.7 Funding of training for environmental inspectors	EU	Improved enforcement Release reduction	Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH	2	2	0-1	2-3
	I.8 Financial incentives for installations that apply BAT (non IPPC installations)	EU / MS	Incentive for applying BAT leads to release reduction	Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH	2-3	3	2	2
Measures for filling knowledge gaps	I.9 IPPC Directive: Obligation to carry out dispersion modelling for POPs	EU	Pressure to improve processes / install abatement measures	Air, Water	PCDD/PCDF, PCB, HCB, PAH	1	1	2-3	1-2
	I.10 Environmental certification related to POPs; closed-loop / analysis; recovery rate	EU	Release reduction	Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH	2	1	2	2-3
	I.11 Dialogue with industry associations to promote new technologies	EU / MS	Improved knowledge, release reduction	Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH	1-2	1	0-1	2-3
	I.12 Information of Management and workers on BAT and BEP	EU / MS	Improved knowledge, Release reduction	Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH	1-2	2	0-1	1-2

General Industry									
	I.13 Research in process technology concerning release reduction	EU	Release reduction	Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH	1-2	2-3	1-2	2-3
	I.14 Coordination of cooperation between concerned industry and universities	EU	Improved knowledge, targeted research, enhanced applicability of existing know-how	Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH	2	1-2	1-2	2-3
	I.15 Lowering of threshold limits for reporting on HCB in E-PRTR regulation	EU	Improved knowledge	Air, Water, Land	PCDD/PCDF, PCB, HCB, PAH	2	1-2	2	2

Table 8-25: Assessment of general measures proposed for industrial sources

Justification of the assessment

Generally large industrial sources are well covered by existing legislation so that need for action is mostly regarded as low.

Nevertheless additional measures for release reduction or improvement of knowledge could be taken into consideration to reduce releases and improve knowledge in these sectors.

Measures I.1 to I.8 aim at reducing releases.

Measure I.1 concerns the establishment of binding ELV for POPs according to the waste incineration Directive. Depending on the type and level of the ELV (single POP –all POPs; single compartment – all compartments, strict – less strict) an effect on POP releases could be expected; however, it will not be overwhelming due to the principle of BAT already applied in IPPC installation. Consequently effectiveness has been rated medium. On the other hand the socio-economic impacts for the concerned industry might be high. Furthermore factors such as the existing instrument of BAT standard, overall relevance of IPPC installations in comparison to non IPPC sources or the fact that reduction in air emission is at least in part correlated with increase in concentrations in solid residues or waste water have to be taken into consideration, as well as the efforts needed to establish a new regulation. In addition the problem of effective implementation and control may occur as it may occur with respect to IPPC. For these reasons the introduction of binding limit values may not have large advantages in comparison to the established BAT system so that there might not be a strong driving force for this measure. So feasibility is assessed as low.

Measure I.2 is a crucial activity to address and control releases of POPs and other pollutants from industrial source sectors without specific emission limit values but subject to IPPC such as metal industry and power production. Measure I.2 concerns further elaboration and adaptation of BREFs to the technical progress with special emphasis on the POP Regulation objective to prevent formation and release. In addition the measure should cover inclusion of additional information on EFs and concentration levels in related BREFs and references to "Monitoring BREF". Feasibility of measure I.2 is assessed as high because review processes for related BREF documents are regularly foreseen. Inclusion of information on POPs which is not yet covered e.g. concentration levels in exhaust gas, waste water and solid residues for PCB, HCB and PAH or EFs achievable with BAT for the before mentioned POPs can be expected to contribute significantly to knowledge gain whereas the direct effect on release reduction is limited and seen as not more than medium. Socio-economic impacts for the concerned industry might be medium to high depending on requirements set as BAT.

Feasibility of measure I.3 has been assessed very low due to relatively low mass flow relevance of air releases from industrial sources and high socio-economic impacts for the concerned industry sectors – those that are covered by the IPPC – which contradicts the high effectiveness of an inclusion of POPs in emission trading.

Measure I.4 addresses the topic of smaller combustion sources not yet covered by existing legislation as regards obligation to apply BAT. These installations with a rated thermal input under 50 MW installations are currently neither addressed by the IPPC Directive nor by the LCP Directive 2001/80/EC. However, the number of this type of installations is high and emission factors for POP are high, so that a better coverage of these installations in terms of provisions for technical standards including flue gas treatment can be expected highly effective depending on the capacity threshold and the legal approach chosen.

An integration of these plants into the IPPC Directive– as proposed by the Commission in the Thematic Strategy on Air Pollution – would have the benefit of an integrated consideration of release issues including the obligation to apply BAT. In addition provisions for reporting on POPs are already set in IPPC. In order to benefit from reduced threshold levels and extended reporting obligations in the E-PRTR regulation the issue should also be addressed there. In contrast, a possible amendment of the LCP Directive would only lead to an indirect impact on POPs releases as this Directive aims to reduce releases from the climate relevant pollutants SO_2, NOx, and dust.

As concerns the capacity threshold it seems to be reasonable to orientate at the threshold of the Emission Trade Directive 2003/87/EC of 20 MW. Based on investigation of Member State information is can be considered that at a minimum 50 % of all combustion installations have a capacity below 50 MW; taking into consideration a difference in the estimated current emission factors of about 100 for PCDD/PCDF and 10^4 for PAH a significant reduction of releases seem to be possible to achieve with reduction measures targeted to this sector. Currently the information on distribution and number of installations below 20 MW is not sufficient to draw conclusions on additional effects of lower threshold limits.

However, realisation of the measure will be strongly hampered by the effort needed to enforce permitting for a huge number of installations and socio-economic impacts are expected to be extremely high. This leads to a low rated feasibility of this measure.

Measure I.5 focuses on optimised process conditions and awareness raising to reduce the large variability of POP releases which are due to bad process conditions and inappropriate fuel. Due to the large influence of above mentioned factors on the release rate especially from smaller combustion appliances a medium to high effectiveness can be expected. The measures would however be associated with high costs for the executing authorities and significant impacts for the concerned industry. So opposition against the measure will be strong and feasibility can be expected to be low.

Measures I.6 and I.7 both concern the information of environmental inspectors to improve enforcement and control. Both measures can be expected to lead to up to medium release reduction due to more effective control. As socio-economic impacts and costs are limited feasibility can be considered relatively high.

Financial incentives for installations that voluntarily apply BAT (I.8) will certainly promote application of high standards and thus can be assessed medium to highly effective. On the other hand costs of this measure are estimated to be high for the involved authorities, so that feasibility is assumed to be limited.

Consequently a related approach is proposed with measure I.10. With this measure costs for involved authorities will be low as certification and control can be mandated to the private sector. The driving factor for industry could be the benefit from positive publicity which can be further supported from authorities by means of information campaigns. Experiences from existing certification models show that effectiveness will be lower than in a subsidy model. On the other hand lower costs will result in higher feasibility.

Measure I.9 proposes the obligation to support any application for an IPPC permit by carrying out an assessment of the air emission related impacts using dispersion modelling using the expected and/or maximum allowed POPs mass flows. A considerable gain of information and increase of awareness is expected particularly regarding existing facilities which are to be upgraded to BAT. On the other hand, without binding regulation (ELVs) the effectiveness might be limited. Costs for related authorities would be low, but socio-economic impacts could be considerable particularly for SMEs. Hence opposition may arise and feasibility thus is rated low to medium.

Measure I.11 is designed as voluntary approach to promote new technologies in the view of POP release reduction. Due to the voluntary character of this measure effectiveness can not be expected to be high and has been assumed to be low to medium. On the other hand the measure does not entrain large costs and can be expected to be highly feasible.

Measure I.12 focuses on information of company's management and workers on BAT and BEP. This measure intends to promote good practice and will be effective in installations with deficits in IPPC implementation or in installations not subject to IPPC only. In correlation with the lack of binding elements the overall effectiveness of this measure can be seen as low to medium only. Costs arise from preparation of information material and expenses for experts and can not be neglected. Weighing effectiveness and related costs the feasibility of this measure is seen as low.

Research in process technology (measure I.13) will contribute to knowledge; however it has to be taken into consideration that a lot of activities have already been performed or are ongoing in this field. This fact is taken in account in the assessment of effectiveness which is seen as low to medium only. Costs for research are generally high, certain socio-economic consequences in terms of market chances for new products could however be expected. As research projects could be integrated in Commission research programmes e.g. FP 8 the feasibility of the measure is assessed high.

Measure I.14 aims at better coordination between scientific knowledge (available at university level) and industrial needs, as regards process optimisation or release reduction. As information transfer between the two sectors is often not highly developed activity in this field could be expected to contribute to knowledge and release reduction. Consequently effectiveness is rated at least as medium. Coordination and information exchange could use established structures or be performed in the framework of an information platform or central expert institution and therefore would entrain comparably low costs. Some socio-economic impacts in terms of market chances for new products as well as in terms of investment needs could be expected. Due to limited costs and established structures that could be used the overall feasibility of the measure is seen as medium to high.

Measure I.15 is related to E-PRTR and the compilation of release data for POPs. In this context it is important to take into consideration that knowledge on releases is a function of the ratio real releases are covered by existing reporting obligations. It is the intention of the EPER and E-PRTR register to cover 90% of the total releases of the pollutants addressed in the regulation. As doubts have been articulated whether this was possible with existing thresholds in the EPER reporting thresholds for PCB and PCDD/PCDF have been lowered by a factor of 10 in the E-PRTR regulation this has however not be done for PAH and HCB so far. If one compares the mass flow results and the threshold levels it becomes obvious that the relation between threshold and estimated releases is far stricter for PCDD/PCDF, PCB and PAH than for HCB. Thus it can be expected that a significant share of HCB releases are currently not covered by E-PRTR. Consequently the effectiveness of the measure can be assessed at least as medium.

Costs are related to an amendment of existing legislation and are comparatively low. Socio-economic impacts however, will not be negligible as a significant number of installations will exceed a new threshold. This will lead to remarkable opposition. Due to this and the fact that the negotiated agreement on E_PRTR has only recently lead to the current result will hamper feasibility of the measure so that it can no be rated more than medium.

9 Ranking and prioritisation of measures, recommendations and conclusions

From the broad list of potential measures that could be taken to address POP issues in the future, as compiled and assessed in chapter 8, a selection of measures has to be made that could be further investigated and evaluated in the light of concrete action to be taken from the European Commission in this field.

For this purpose in a first step identified measures are classified based on the screening of cost-effectiveness and feasibility and ranked in five categories from highest to lower priority. In this step the aspect of mass flow and exposure relevance is not yet taken into account for prioritisation.

In a second step pros and cons of action at European level versus action at Member State level are elaborated to select those actions, which are of special interest for realisation on Community level.

In a third step an allocation of mass flow relevance is performed for this short list of measures to take into consideration the different importance of the various source sectors.

9.1 Ranking and Prioritisation based on assessment of cost-effectiveness and feasibility

As discussed in the methodology (chapter 3) 6 categories of priorities have been developed:

Category 1: Effectiveness high or medium to high (3 or 2-3)
Feasibility high or medium to high (3 or 2-3)

By applying an algorithm to identify measures for category 1, 16 measures could be allocated as first priority:

Nr	Measure	Effectiveness	Costs	Socio-economic impacts	Feasibility
Overall measures					
O.4	Promotion of environmentally sound practices for small combustion appliances	2-3	2	2	2-3
O.8	Development and promotion of a POPs release management handbook (BAT)	2-3	2	0-1	2-3
O.16	Establishment of a central institution for POP related issues ("POP coordination centre" within Commission Services)	2-3	2	0	2-3
O.30	Research on analysis and sampling methods for POPs	2-3	2	1-2	2-3
Asphalt processing					
2.5	Research on releases from asphalt processing	2-3	2	0	2-3

Nr	Measure	Effectiveness	Costs	Socio-economic impacts	Feasibility
Burning of agricultural waste					
3.4	Development of collection system for agricultural waste	2-3	2-3	2	2-3
Construction & Demolition					
5.5	Provisions/Establishment for collection / recovery system for C & D waste	2-3	1	2-3	2-3
Crematoria / Animal carcass burning					
6.5	Research in EFs for Crematoria	2-3	2	0-1	2-3
Dredging / Offshore / Dock works					
7.1	Review of sewage sludge directive to include limits for all POPs and address dredging sludges	2-3	1	2	2-3
7.11	EIA for dredging of contaminated sludges	2-3	2	0-1	2-3
7.12	Research on POP releases from dock works and off-shore activities	2-3	2	0-1	2-3
Land filling					
9.3	Research in POP releases from landfill	2-3	1-2	0-1	2-3
Paper and Pulp					
16.5	Research on POP releases from pulp and paper industry	2-3	2	0	2-3
Residential combustion					
18.14	Research in releases from residential combustion	2-3	2	0	2-3
Road transport					
19.7	Research in specific EF for fuels and motor types	2-3	2-3	0	2-3
19.8	Research in EFs for tyre and brake wear	2-3	2	0	2-3

Table 9-1: Overview on category 1 measures

Category 2: Effectiveness medium (2)
Feasibility medium to high (3 or 2-3)

28 measures are in this category and can be seen as second priority for implementation.

Nr	Measure	Effectiveness	Costs	Socio-economic impacts	Feasibility
Overall measures					
O.5	Enforcement of Stockholm Convention requirements regarding improved coordination within/ in between national administration (NFP approach)	2	2	1	2-3
O.6	Information request on efficiency of the national legal system	2	1-2	0-1	2-3

Nr	Measure	Effectiveness	Costs	Socio-economic impacts	Feasibility
O.7	Guidance for assessment of the efficiency of the national legal system	2	1-2	0-1	2-3
O.9	Research for substitute products and process technology to prevent formation and release of POPs	2	2-3	0-1	2-3
O.13	Review and extension of EU standards for POP sampling and analysis	2	2	0	2-3
O.14	Capacity building on POP monitoring and analysis	2	2	0-1	2-3
O.15	Platform for information exchange between Stakeholders (e.g. Consultative Forum)	2	1-2	0	2-3
O.21	Research on POP identification and detoxification techniques	2	2-3	0-1	2-3
O.29	Support of documentation on EF achievable with specific process technology	2	1-2	1	2-3
O.31	Research on relations between health effects and exposure to POPs	2	2-3	0-1	2-3
General Industry					
I.2	Further elaboration and adaptation of BREFs in accordance with POP Regulation objectives	2	1	2-3	2-3
I.7	Funding of training for environmental inspectors	2	2	0-1	2-3
I.10	Environmental certification related to POPs; closed-loop / analysis; recovery rate	2	1	2	2-3
I.14	Coordination of cooperation between concerned industry and universities	2	1-2	1-2	2-3
Air transport					
1.4	Financial incentives (e.g. graded airport fees depending on age / type / emission level of plane)	2	0-1	2-3	2-3
Asphalt processing					
2.3	Communication of already existing EF used for reporting	2	0-1	0	3
Burning of agricultural waste					
3.5	Research on releases and impacts	2	2	0-1	2-3
Construction and demolition					
5.1	Differentiated limit values for use as secondary raw material in landfills	2	1	1	2-3
Iron and steel industry					
8.3	Research programs on efficient detoxification of contaminated dust	2	2-3	0-1	2-3

Nr	Measure	Effectiveness	Costs	Socio-economic impacts	Feasibility
Land filling					
9.4	Development of EU standards for POP analysis in waste	2	1-2	1-2	2-3
Marine transport					
10.7	Funding research into low-release ship technologies	2	2	1	2-3
Paper and pulp					
16.3	In depth consideration of POP issues in ongoing review of BAT	2	0-1	1-2	3
Residential combustion					
18.1	Negotiated agreements with manufacturers / importers to reduce PAH releases from stoves	2	0-1	2	2-3
18.12	Graded costs for chimney cleaning according to burning system and fuel type used	2	1	2-3	2-3
18.15	Research in cheap indicator methods for POP releases in chimney soot	2	2	0	2-3
18.16	Research in catalytic flue gas cleaning (PCDD/F, PAH)	2	2	0	2-3
Surface treatment / solvent use					
21.2	Research on releases from solvent use and surface treatment	2	2-3	0-1	2-3
Waste incineration and co-incineration					
22.1	Research on efficient detoxification of contaminated fly ash	2	2	0	2-3

Table 9-2: Overview on category 2 measures

Category 3: Effectiveness high or medium to high (3 or 2-3)
Feasibility medium (2)

9 measures result for this category and can be seen as third priority for implementation:

Nr	Measure	Effectiveness	Costs	Socio-economic impacts	Feasibility
Overall measures					
O.23	Updating of and information exchange on Emission Factors	2-3	2	0	2
General Industry					
I.8	Financial incentives for installations that apply BAT (non IPPC installations)	2-3	3	2	2
Construction and demolition					
5.7	Improved reporting on quantity and composition of waste fractions	2-3	1	0-1	2

Nr	Measure	Effectiveness	Costs	Socio-economic impacts	Feasibility
Marine transport					
10.3	High penalty for off-shore tank cleaning	2-3	1	2-3	2
Power production					
15.3	Mandatory flue gas treatment for biomass power plants not subject to IPPC	2-3	1-2	3	2
Paper and pulp					
16.2	Review of sewage sludge	2-3	1	2	2
Residential combustion					
18.2	Financial incentives for certified stoves	2-3	2	1-2	2
18.4	Mandatory or voluntary quality standards for small combustion appliances and their fuels	2-3	1-2	2	2
18.13	Financial incentives for installation of catalytic flue gas cleaning	2-3	2	2	2

Table 9-3: Overview on category 3 measures

Category 4: Effectiveness medium (2)
Feasibility medium (2)

19 measures are attributed to this category and can be seen as priority 4 for implementation:

Nr	Measure	Effectiveness	Costs	Socio-economic impacts	Feasibility
Overall measures					
O.12	EU-POP database	2	2-3	0	2
O.22	Expansion of emission inventories in the scope of further E_PRTR development	2	1-2	1-2	2
General Industry					
I.15	Lowering of threshold levels for reporting on HCB in E-PRTR Regulation	2	1-2	2	2
Air transport					
1.6	Research on releases from air transport	2	2	0	2
Asphalt processing					
2.4	Extended reporting to EMEP	2	2	1	2
Burning of agricultural waste					
3.1	General ban of agricultural burning	2	1	2	2
Construction and demolition					
5.2	Limit values for contaminated waste wood in case of use for energy recovery	2	1	1	2
5.8	Research on POP leaching properties / behaviour from inert landfill	2	2-3	0-1	2

Nr	Measure	Effectiveness	Costs	Socio-economic impacts	Feasibility
Dredging / Offshore / Dock works					
7.5	Mandatory Instrument providing globally-applicable ship recycling regulations for international shipping and for recycling activities	2	1-2	2	2
7.6	Include offshore platforms to IPPC	2	2	2	2
Marine transport					
10.1	Launching a charging regime on the basis of ships' environmental performance to benefit the least damaging	2	1-2	2-3	2
10.2	Increased harbour fees for transport companies violating rules or using inappropriately equipped ships (blacklist)	2	1-2	2-3	2
10.4	Personal responsibility of Marine master for violation of environmental requirements; mandatory element in Mater License	2	1	0	2
Open burning of waste					
13.5	Support for efficient and consumer-friendly waste collection systems	2	2-3	2	2
13.6	Subsidies for municipalities with excellent waste management	2	2-3	2	2
13.7	"Concourse" for label "our clean community" at local and regional level	2	2-3	2	2
Pesticide Use					
14.1	Framework Directive for sustainable use of pesticides	2	1-2	2	2
Paper and pulp					
16.1	Legal ban on chlorine bleaching	2	0-1	2	2
Road transport					
19.3	Financial incentives related to fuel and motor type	2	2	2	2
Shredder industry					
20.4	Compilation and communication of info on what wastes contain POPs, and how decontamination before processing may reduce emissions	2	1-2	0	2

Table 9-4: Overview on category 4 measures

Category 5: Effectiveness high or medium to high (3 or 2-3)
Feasibility low to medium (1-2)

or

Effectiveness low to medium (1-2)
Feasibility high or medium to high (3 or 2-3)

37 measures result for this category:

Nr	Measure	Effectiveness	Costs	Socio-economic impacts	Feasibility
Overall measures					
O.10	Communication on substitute products and process technology to prevent formation and release of dioxins	1-2	2	0-1	2-3
O.11	POP website	1-2	1-2	0	3
O.19	Guidance for curriculum for courses on environmental studies	1-2	1-2	0-1	2-3
O.24	Support and coordination of LRTAP- Monitoring and modelling on POP in cooperation with EMEP	2	2	0-1	2-3
O.27	Mandatory PCB analysis in drinking water	2-3	2-3	3	1-2
General Industry					
I.6	Guidance for training of environmental inspectors	1-2	1-2	1	2-3
I.11	Dialogue with industry associations to promote new technologies	1-2	1	0-1	2-3
I.13	Research in process technology concerning release reduction	1-2	2-3	1-2	2-3
Asphalt processing					
2.1	Guidance document on asphalt production and processing	1-2	1	1	2-3
2.2	Specification as diffuse source in PRTR	1-2	2	1	2-3
Burning of agricultural waste					
3.2	Targeted information / education campaigns (workshops, media, etc.)	1-2	2	1	2-3
Chemical industry					
4.3	EU-Standards for POP waste water monitoring	1-2	2	1-2	2-3
Construction and demolition					
5.6	Development of screening standards for sampling and analysis at landfill	1-2	1	0-1	2-3
Crematoria / Animal carcass burning					
6.1	ELV for cremation plants (0.1 ng/Nm³)	3	1	2-3	1-2

Nr	Measure	Effectiveness	Costs	Socio-economic impacts	Feasibility
6.2	Review of IPPC Annex I to cover Crematoria	2-3	2	2	1-2
6.3	Guidelines for BAT and BEP for Crematoria	1-2	1-2	1-2	2-3
6.4	Mandatory APC for Crematoria	3	1	2-3	1-2
Dredging / Offshore / Dock works					
7.4	Guidelines for handling oily wastes	1-2	1	1-2	2-3
7.8	ELV for unintended oil release from offshore platforms	2-3	1-2	2-3	1-2
7.10	Guidelines concerning best practice of dock works	1-2	1-2	1-2	2-3
7.13	Environmental monitoring for POPs in harbour areas and in surroundings of off-shore installation	2-3	2	0-1	1-2
Iron and steel industry					
8.1	General emission limits for all POPs	2-3	1	3	1-2
8.2	Inventory of treatment methods for fly ash from incinerators and dusts from metallurgic processes	1-2	1	0	2-3
Landfilling					
9.2	Guidance for an effective system for monitoring and handling of POP containing waste	1-2	2	1-2	2-3
Marine transport					
10.5	Guidelines for handling oily waste	1-2	1-2	0-1	2-3
10.9	Guidelines for awareness raising campaigns in harbour areas	1-2	1-2	0	2-3
Non-ferrous metal industry					
12.1	ELV for POP releases	3	1	3	1-2
Open burning of waste					
13.2	Information about impacts from open burning, particularly with regard to bonfires	1-2	2-3	0	2-3
Power production					
15.1	ELV for POP releases	3	1	3	1-2
15.2	Guidance for selection of Biomass; guidance on BEP and optimised process technology for biomass plant not subject to IPPC	1-2	1-2	1	2-3
Pesticide Use					
14.2	Screening of POP concentrations in market pesticides	1-2	2	0-1	2-3
14.3	Research studies modelling transport and fate of POPs from pesticide use	1-2	2	0-1	2-3

Nr	Measure	Effectiveness	Costs	Socio-economic impacts	Feasibility
Paper and pulp					
16.4	ELV and mandatory monitoring of release to water	2-3	1-2	2-3	1-2
Refinery					
17.1	ELV for POP releases	3	1	3	1-2
Residential combustion					
18.3	Users guidelines for sound burning of domestic coal, peat and wood	1-2	1	0-1	2-3
18.8	Mandatory particle filters for wood-burning stoves and fireplaces	3	1	3	1-2
Road transport					
19.1	Ban on certain chlorinated/brominated compounds as fuel additive	2-3	0-1	2-3	1-2

Table 9-5: Overview on category 5 measures

All other 55 measures are attributed to category 6. This category compiles measures which have been assessed both low regarding effectiveness and feasibility.

Nr	Measure	Effectiveness	Costs	Socio-economic impacts	Feasibility
Overall measures					
O.1	Quality standards for ambient air POP concentration and POP deposition rates	1	1-2	1-2	2-3
O.2	Training of environmental inspectors and authorities	1-2	1-2	1	2
O.3	Review of emission ceilings in the Directive 2001/81/EC	2	2-3	2-3	1-2
O.5	Enforcement of Stockholm Convention requirements regarding improved coordination within/ in between national administration (NFP approach)	2	2	1	1-2
O.17	Communication on food related POP risks towards affected groups	1-2	2	1	2
O.18	Inclusion of information on POPs in general education (e.g. schools)	1	2-3	0	1
O.19	Guidance for curriculum for courses on environmental studies	1	1-2	0	2
O.20	Financial support for university courses on environmental studies including information on POPs	0-1	2	0	1-2
O.22	Expansion of emission inventories in the scope of	1-2	1-2	1-2	1-2

Nr	Measure	Effectiveness	Costs	Socio-economic impacts	Feasibility
	further E_PRTR development				
O.25	Coordination human POP exposure monitoring (via EU-Biomonitoring)	2	2-3	0	1-2
O.26	Promotion of source related POP monitoring and reporting in the aquatic environment, e.g. in river basins and the marine environment	2	2-3	0	1-2
O.28	Setting up a framework and guidance for monitoring and identification of POP releases	1-2	1-2	0	2
O.32	Information campaign concerning POPs and possibilities for release reduction	1-12	2	1-2	2
General Industry					
I.1	Mandatory EVL and measurements for all 4 POPs in all IPPC facilities	3	1-2	3	1-2
I.3	Inclusion of POPs in emission trading	3	1-2	3	0-1
I.4	Expansion of IPPC Directive to cover sources < 50 MW	3	1-2	3	1
I.5	Mandatory annual inspections and regular instructions on proper use of combustion appliances	2-3	2-3	2-3	1
I.9	IPPC Directive: Obligation to carry out dispersion modelling for POPs	1	1	2-3	1-2
I.12	Information of Management and workers on BAT and BEP	1-2	2-3	0-1	1-2
Air transport					
1.1	Quality requirements for air transport fuel	1	1	1	1-2
1.2	Revisiting international air service agreements to introduce fuel taxes on international flights	1	1	3	1
1.3	Emission trading system for air transport	2	1-2	2	1
1.5	Environmental monitoring in surroundings of airports	2-3	2-3	1	1
Burning of agricultural waste					
3.2	Targeted information / education campaigns (workshops, media, etc.)	1	1	1	2-3
3.3	Financial incentives for composting of agricultural residues	1-2	2-3	1-2	1
Chemical industry					
4.2	Financial incentives for POP release reduction technologies	2	3	2	1

Nr	Measure	Effectiveness	Costs	Socio-economic impacts	Feasibility
4.3	EU-Standards for POP waste water monitoring	1-2	2	0-1	1-2
4.4	Review of “main activity approach” in EPER, PRTR reporting to reduce bias /confounding	2	2	0	1-2
Construction and demolition					
5.3	Obligation for separation of C & D waste fraction	2	1	2	1-2
5.4	Permitting for C & D measures	2	2	2-3	1-2
Crematoria / Animal carcass burning					
6.3	Guidelines for BAT and BEP for Crematoria	1-2	1-2	1-2	1-2
Dredging / Offshore / Dock works					
7.2	Mandatory filter technology for all tank/ship cleaning activities	2	1-2	2-3	1-2
7.3	Cycling systems for off-shore installations	2	1-2	2-3	1-2
7.7	Cycling and oil collection systems at dock installations	2	1	2-3	1-2
7.9	Specific requirements for products used for dock works	1-2	1-2	2	2
7.14	Information/education on impacts of oil spillage	1-2	1-2	1	2
Iron and steel industry					
8.4	Mandatory POP emission monitoring *)	2-3	2	3	1
Land filling					
9.1	Separate collection / disposal of residues from domestic solid fuel appliances	1-2	3	3	0-1
9.5	Review of 1999/31/EC to stipulate mandatory waste water monitoring for all 4 POPs	2-3	1-2	3	1
9.6	Public awareness raising campaigns on wastes with problematic POP concentration	0-1	1-2	0	2-3
Marine transport					
10.6	Mandatory particle filter for diesel / heavy oil engines	2	1-2	3	1
10.8	Systematic monitoring of POPs in harbour areas	2	2-3	0-1	1
10.9	Guidelines for awareness raising campaigns in harbour areas	1-2	1-2	0	2
Open burning of waste					
13.1	Ban on open burning of waste	0-1	1	0	2-3
13.3	Penalties for violation	1	2	0	1-2
13.4	Awareness raising in residential and agricultural sector (proper burning of household waste/agricultural waste)	1-2	2	0	2

Nr	Measure	Effectiveness	Costs	Socio-economic impacts	Feasibility
Residential combustion					
18.1	Negotiated agreements with manufacturers / importers to reduce PAH releases from stoves	1-2	0-1	2	2
18.2	Financial incentives for certified stoves	2	2	0	1-2
18.3	Users guidelines for sound burning of domestic coal, peat and wood	1	1	0	2-3
18.5	Inclusion of smaller residential and commercial buildings in an extended directive on energy efficiency	2	1	2-3	1-2
18.6	Awareness raising / guidelines for environmentally sound practices for small combustion appliances	1-2	2	0	2
18.7	Local programs to modernize residential combustion	2	3	2	1-2
18.9	Introduction of Smoke Control Zones where only smokeless fuels and smoke free appliances can be used	2	2	3	1-2
18.10	Mandatory annual internal inspections and regular instructions on the proper use of technical equipment for enterprises regarding combustion appliances	1-2	2	2	0-1
18.11	Mandatory separation of ashes from solid fuel applications and establishment of a collection system	1-2	3	3	0-1
18.13	Financial incentives for installation of catalytic flue gas cleaning	2-3	2	2	2
18.14	Research in releases from domestic burning	1	1-2	0	2-3
18.15	Research in cheap indicator methods for POP releases in chimney soot	1	1-2	0	2-3
18.16	Research in catalytic flue gas cleaning (PCDD/F, PAH)	1	2	0	2-3
Road transport					
19.2	Establishment of a common system of graded user charges for heavy goods vehicles above 12 tonnes depending on technical standards similar to the „Eurovignette”	1	1	2-3	1-2
19.3	Financial incentives related to fuel and motor type	1-2	1	3	1

Nr	Measure	Effectiveness	Costs	Socio-economic impacts	Feasibility
19.4	Mandatory particle filters for diesel engines	2	1-2	3	1-2
19.5	Further reduction of tolerated emission limits for heavy duty vehicles	2	0-1	2	1-2
19.6	Mandatory requirements and harmonised annual emission measurements for all vehicles	2	1-2	3	1
Shredder industry					
20.1	Improved enforcement of implementation of WEEE and ELV Directive at MS level	1-2	0-1	1-2	2
20.2	Introduction of a window take-back-system financed by window pane producers	2	1-2	2-3	1-2
20.3	Incentives for high temperature incineration of shredder wastes	1-2	3	1	1
Surface treatment / solvent use					
21.1	Expansion of IPPC Directive (Annex 1(6.7)) to include installations with capacity <150 kg/h or <200 t/y	1	1-2	3	1
Wood preservation					
23.1	Support for enforcement (guidelines, training for inspectors)	2	1-2	1-2	1-2

Table 9-6: Overview on category 6 measures

9.2 Pros and Cons of action at European level versus Member State level

Starting point for an assessment whether a measure should be taken at Community level or at Member States level is the subsidiarity principle as laid down in Article 5 of the treaty of Maastricht:

> *The Community shall act within the limits of the powers conferred upon it by this Treaty and of the objectives assigned to it therein.*
> *In areas which do not fall within its exclusive competence, the Community shall take action, in accordance with the principle of subsidiarity, only if and in so far as the objectives of the proposed action cannot be sufficiently achieved by the Member States and can therefore, by reason of the scale or effects of the proposed action, be better achieved by the Community.*
> *Any action by the Community shall not go beyond what is necessary to achieve the objectives of this Treaty.*

The subsidiarity principle is intended to ensure that decisions are taken as closely as possible to the citizen and that constant checks are made as to whether action at Community level is justified in the light of the possibilities available at national, regional or local level. Specifically, it is the principle whereby the Union does not take action (except in the areas which fall within its exclusive competence) unless it is more effective than action taken at national, regional or local level.

In principle it can be assumed that action from the European Community is advantageous and favourable for all activities where international experience and a larger overview is needed for effective realisation of a measure and in the field of international treaties and community legislation. Consequently action at Community level tends to be preferable for all coordination purposes, communication activities, standardisation, issues to harmonise economic framework conditions (competition aspects), research and for the review of community legislation or documents as well as for negotiations in international treaties.

In contrast measures in the fields of education, monitoring and control as well as information of general population or target groups tend to be better addressed by national authority, following the subsidiarity principle and taking benefit from the closer knowledge of national characteristics and needs.

This chapter presents a detailed compilation of pros and cons of action at European level versus Member States for each measure classified in priority categories 1 to 5 in chapter 0 . For final selection of a short list of measures to be proposed for future action only measures assessed to be advantageously addressed at Community level will be selected and further investigated in chapter 9.3.

Nr	Category 1 Measure	Pros for action at European scale	Cons for action at European scale	Recommendation
Overall measures				
O.4	Promotion of environmentally sound practices for small combustion appliances	Developed guidance can be used in all 25 Member States (single development effort multiple use); Community wide BEP standard	No important identified	EU
O.8	Development and promotion of a POPs release management handbook (BAT)	Single development effort /multiple use Community-wide overview on techniques and experiences from all EU members	No important identified	EU
O.16	Establishment of a central institution for POP related issues ("POP coordination centre" within Commission Services)	- Overview on data and activities in all Member States - Distribution of information into all Member States	No important identified	EU
O.30	Research on analysis and sampling methods for POPs	Single development effort /multiple use	No important identified	EU
2. Asphalt processing				
2.5	Research on releases from asphalt processing	Single development effort /multiple use	No important identified	EU
3. Burning of agricultural waste				
3.4	Development of collection system for agricultural waste	No important identified Guidance possible	Not possible to execute via European Authorities; controversial to subsidiarity principle	MS
5. Construction and demolition				
5.5	Provisions/ Establishment for collection / recovery system for C & D waste	No important identified Guidance possible	Not possible to execute via European Authorities; controversial to subsidiarity principle	MS
6. Crematoria / Animal carcass burning				
6.5	Research in EFs for Crematoria	Single development effort /multiple use	No important identified	EU
7. Dredging / Offshore / Dock works				
7.1	Review of Sewage sludge Directive to include limits for all POPs and address dredging sludges	Review of EU Directive evidently has to be performed at EU level	No important identified	EU

Nr	Category 1 Measure	Pros for action at European scale	Cons for action at European scale	Recommendation
7.11	EIA for dredging of contaminated sludges	Single development effort /multiple use	No important identified	EU
7.12	Research on POP releases from dock works and off-shore activities	Single development effort /multiple use	No important identified	EU
9. Landfilling				
9.3	Research in POP releases from landfill	Single development effort /multiple use	No important identified	EU
16. Pulp and paper industry				
16.5	Research on POP releases from pulp and paper industry	Single development effort /multiple use	No important identified	EU
18. Residential combustion				
18.14	Research in releases form domestic burning	Single development effort /multiple use	No important identified	EU
19. Road transport				
19.7	Research in specific EF for fuels and motor types	Single development effort /multiple use	No important identified	EU
19.8	Research in EFs for tyre and brake wear	Single development effort /multiple use	No important identified	EU

Nr	Category 2 Measure	Pros for action at European scale	Cons for action at European scale	Recommendation
Overall measures				
O.5	Enforcement of Stockholm Convention requirements regarding improved coordination within / in between national administration	Central communicative function with overview on situation in all Member States	No possibility to act at national level according to subsidiarity principle	EU / MS
O.6	Information request on efficiency of the national legal system	Single development effort /multiple use Central communicative function Vital interest in effective implementation in all Member States	No important identified	EU
O.7	Guidance for assessment of the efficiency of the national legal system	- Single development effort /multiple use	No important identified	EU

Nr	Category 2 Measure	Pros for action at European scale	Cons for action at European scale	Recommendation
O.9	Research for substitute products and process technology to prevent formation and release of POPs	Single development effort /multiple use	No important identified	EU
O.13	Review and extension of CEN standards for POP sampling and analysis	Review / extension of EU standards evidently has to be performed at EU level		EU
O.14	Capacity building on POP monitoring and analysis	Central communicative function with overview on situation in all Member States	Limited possibility to use established contacts within scientific community	EU / MS
O.15	Platform for information exchange between Stakeholders (e.g. Consultative Forum)	Single development effort /multiple use Central communicative function with overview on situation in all Member States	No important identified	EU
O.21	Research on POP identification and detoxification techniques	Single development effort /multiple use	No important identified	EU
O.29	Support of documentation on EF achievable with specific process technology	Central communicative function with overview on situation in all Member States	No important identified	EU
O.31	Research on relations between health effects and exposure to POPs	Single development effort /multiple use	No important identified	EU
General Industry				
I.2	Further elaboration and adaptation of BREFs in accordance with POP Regulation objectives	BAT process is organised under the EC IPPC Directive		EU
I.7	Funding of training for environmental inspectors	Central communicative function with overview on situation in all Member States with possibility to identify and highlight typical gaps and deficits in enforcement Possibility to support countries with high needs	Limited knowledge on national characteristics and needs High costs Problems with balance in granting subsidies for MS (Expenditure of all MS money for limited number of MS; benefit for poor own MS action)	EU / MS
I.10	Environmental certification related to POPs; closed-loop / analysis; recovery rate	Central communicative function with overview on situation in all Member States Harmonised standards in all Member States	Problems in execution of certification; controversial to subsidiarity principle	EU / MS

Nr	Category 2 Measure	Pros for action at European scale	Cons for action at European scale	Recommendation
I.14	Coordination of cooperation between concerned industry and universities	Central communicative function with overview on situation in all Member States Improved knowledge on scientific state of the art	Limited knowledge of national characteristics, far distances; possible language barrier	EU / MS
1. Air transport				
1.4	Financial incentives (e.g. graded airport fees depending on age / type / emission level of plane)	Central communicative function with overview on situation in all Member States Harmonised standards in all Member States	Setting and collection of fees is national responsibility; controversial to subsidiarity principle	EU / MS
2. Asphalt processing				
2.3	Communication of already existing EF used for reporting	Central communicative function with overview on situation in all Member States	No important identified	MS
3. Burning of agricultural waste				
3.5	Research on releases and impacts	Single development effort /multiple use	No important identified	EU
5. Construction and demolition				
5.1	Differentiated limit values for use as secondary raw material in landfills	Single development effort /multiple use Harmonised standards throughout European Community	No important identified	EU
8. Iron and steel industry				
8.3	Research programs on efficient detoxification of contaminated dust	Single development effort /multiple use	No important identified	EU
9. Landfilling				
9.4	Development of CEN standards for POP analysis in waste	CEN standards have to be elaborated at EU level	No important identified	EU
10. Marine transport				
10.7	Funding research into low-release ship technologies	Single development effort /multiple use	No important identified	EU
16. Pulp and paper industry				
16.3	In depth consideration of POP issues in ongoing review of BAT	BAT review process is undertaken at EU level	No important identified	EU

Nr	Category 2 Measure	Pros for action at European scale	Cons for action at European scale	Recommendation
18. Residential combustion				
18.1	Negotiated Agreement with manufacturers / importers to reduce PAH emissions from stoves	Single development effort /multiple use Harmonised standards throughout European Community	Limited knowledge on national characteristics	EU / MS
18.12	Graded costs for chimney cleaning according to burning system and fuel type used	Single development effort /multiple use Harmonised standards throughout European Community	Setting and collection of fees is national responsibility; controversial to subsidiarity principle Execution of measure has to be performed at local level	EU / MS
18.15	Research in cheap indicator methods for POP releases in chimney soot	Single development effort /multiple use	No important identified	EU
18.16	Research in catalytic flues gas cleaning	Single development effort /multiple use	No important identified	EU
21. Surface treatment / solvent use				
21.2	Research on releases from solvent use and surface treatment	Single development effort /multiple use	No important identified	EU
22. Waste incineration				
22.1	Research on efficient detoxification of contaminated fly ash	Single development effort /multiple use	No important identified	EU

Nr	Category 3 Measure	Pros for action at European scale	Cons for action at European scale	Recommendation
Overall measures				
O.23	Updating of and information exchange on Emission Factors	Single development effort /multiple use Harmonised standards throughout European Community Central communicative function with overview on situation in all Member States	No important identified	EU

Nr	Category 3 Measure	Pros for action at European scale	Cons for action at European scale	Recommendation
General Industry				
I.8	Financial incentives for installations that apply BAT (non IPPC installations)	Harmonised standards throughout European Community	Limited knowledge on national characteristics and needs High costs Problems with balance in granting subsidies for MS Interference with subsidiarity principle	EU / MS
5. Construction and demolition				
5.7	Improved reporting on quantity and composition of waste fractions	Harmonised standards throughout European Community Improved knowledge on mass flows and source relevance Legal framework in place	No important identified.	EU
10. Marine transport				
10.3	High penalty for off-shore tank cleaning	Harmonised standards throughout European Community Even if detailed regulation could be left to MS, EU could set basic principle.	Penalties are a typical MS type of action but not commonly used at EU level	EU
15. Power production				
15.3	Mandatory flue gas treatment for biomass power plants not subject to IPPC	EC-wide harmonised conditions for operating of biomass power plants	No important identified	EU
16. Pulp and paper industry				
16.2	Review of sewage sludge directive	Review of EU Directive evidently has to be performed at EU level	No important identified	EU
18. Residential combustion				
18.2	Financial incentives for certified stoves	Harmonised standards throughout European Community	Limited knowledge on national characteristics and needs High costs Problems with balance in granting subsidies for MS Interference with subsidiarity principle	MS
18.4	Mandatory or voluntary quality standards for small combustion appliances and their fuels	Harmonised standards throughout European Community	No important identified	EU

Nr	Category 3 Measure	Pros for action at European scale	Cons for action at European scale	Recommendation
18.13	Financial incentives for installation of catalytic flue gas cleaning	Harmonised standards throughout European Community	Limited knowledge on national characteristics and needs High costs Problems with balance in granting subsidies for MS Interference with subsidiarity principle	EU / MS

Nr	Category 4 Measure	Pros for action at European scale	Cons for action at European scale	Recommendation
Overall measures				
O.12	EU-POP database	Single development effort /multiple use Central communicative function with overview on situation in all Member States	No important identified	EU
O.22	Expansion of emission inventories in the scope of E_PRTR implementation	Single development effort /multiple use Central communicative function with overview on situation in all Member States Improved knowledge on source and release dimensions	No important identified	EU
General Industry				
I.15	Lowering of threshold limits for reporting of PAH and HCB in E-PRTR regulation	Legal framework in place	No important identified	EU
1. Air transport				
1.6	Research on releases from air transport	- Single development effort /multiple use	No important identified	EU
2. Asphalt processing				
2.4	Extended reporting to EMEP	None identified	Data are requested and can only be available from Member States	MS
3. Burning of agricultural waste				
3.1	General ban of agricultural burning	Harmonised standards throughout European Community	No important identified	EU
5. Construction and demolition				
5.2	Limit values for contaminated waste wood in case of use for energy recovery	Harmonised standards throughout European Community	No important identified	EU

Nr	Category 4 Measure	Pros for action at European scale	Cons for action at European scale	Recommendation
5.8	Research on POP leaching properties / behaviour from inert landfill	- Single development effort /multiple use	No important identified	EU
7. Dredging / Offshore / Dock works				
7.5	Mandatory instrument providing globally-applicable ship recycling regulations for international shipping and for recycling activities	Harmonised standards throughout European Community Central communicative function in negotiation of international conventions	No important identified	EU
7.6	Include offshore platforms to IPPC	Review of EU Directive evidently has to be performed at EU level	No important identified	EU
10. Marine transport				
10.1	Launching a charging regime on the basis of ships' environmental performance to benefit the least damaging	- Equal conditions at all EC harbours - Leads to public attention towards this field	Subsidiarity principle; collection of fees is national or local responsibility	EU / MS
10.2	Increased harbour fees for transport companies violating rules or using inappropriately equipped ships (blacklist)	- Equal conditions at all EC harbours - Leads to public attention towards this field	Subsidiarity principle; collection of fees is national or local responsibility	EU / MS
10.4	Personal responsibility of Marine Master for violation of environmental requirements; mandatory element in Master License	- Equal conditions at all EC harbours - Leads to public attention towards this field	Details of personal responsibility and mandatory elements in Master License are rather to be taken at MS level from the subsidiarity point of view	EU / MS
13. Open burning of waste				
13.5	Support for efficient and consumer-friendly waste collection systems	Central communicative function with overview on all Member States (could be used for development of guidance or BEP standards)	Limited insight in national characteristics and needs; no possibility to install national or regional collection system	EU / MS
13.6	Subsidies for municipalities with excellent waste management	No important identified	Regional based measure which should rather be taken at MS level from the subsidiarity point of view	MS
13.7	"Concourse" for label "our clean community" at local and regional level	No important identified	Regional / local based measure which should rather be taken at MS level from the subsidiarity point of view	MS

Nr	Category 4 Measure	Pros for action at European scale	Cons for action at European scale	Recommendation
14. Pesticide Use				
14.1	Framework Directive for sustainable use of pesticides	Harmonised standards throughout European Community	No important identified	EU
16. Pulp and paper industry				
16.1	Legal ban on chlorine bleaching	Harmonised standards throughout European Community	No important identified	EU
19. Road transport				
19.3	Research in EF for tyre and brake wear	Single development effort /multiple use	No important identified	EU
20. Shredder industry				
20.4	Compilation and communication of info on what wastes contain POPs, and how decontamination before processing may reduce emissions	Single development effort /multiple use Central communicative function for dispersion of information	Limited insight into national characteristics Limited possibilities for direct communication Possible language barrier	EU / MS

Nr	Category 5 Measure	Pros for action at European scale	Cons for action at European scale	Recommendation
Overall measures				
O.10	Communication on substitute products and process technology to prevent formation and release of dioxins	Single development effort /multiple use Central communicative function for dispersion of information	No important identified	EU
O.11	POP website	Single development effort /multiple use Central communicative function for dispersion of information		EU
O.19	Guidance for a curriculum for courses on environmental studies	Single development effort /multiple use Central communicative function for dispersion of information	Courses on environmental studies are generally to be organised at MS level	EU / MS
O.24	Support and coordination of LRTAP-Monitoring and modelling on POP in cooperation with EMEP	Central communicative function with overview on all Member States	MS are members of CLRTAP	EU / MS
O.27	Mandatory PCB analysis in drinking water	Legal framework in place (Water Framework Directive)	No important identified	EU

Nr	Category 5 Measure	Pros for action at European scale	Cons for action at European scale	Recommendation
General Industry				
I.6	Guidance for training of environmental inspectors	Central communicative function with overview on all Member States Harmonised standards throughout European Community	Limited knowledge of national characteristics and needs at MS level	EU / MS
I.11	Dialogue with industry associations to promote new technologies	Central communicative function with overview on all Member States Possibility for large scale support for implementation of new technology	Subsidiarity principle Limited knowledge of national characteristics and used technologies at national or even at regional level Language barrier	EU / MS
I.13	Research in process technology concerning release reduction	Single development effort /multiple use	No important identified	EU
2. Asphalt processing				
2.1	Guidance document on asphalt production and processing	Central communicative function with overview on all Member States Harmonised standards throughout European Community	No important identified	EU
2.2	Specification as diffuse source in PRTR	Responsible body for measures related to diffuse sources under E_PRTR	No important identified	EU
3. Burning of agricultural waste				
3.2	Targeted information education campaigns (workshops, media, etc.)	Central communicative function with overview on all Member States Harmonised standards throughout European Community	Subsidiarity principle Limited knowledge of national characteristics and used technologies at national or even at regional level Language barrier Lack of possibility to execute measure	MS
4. Chemical industry				
4.3	CEN Standards for POP waste water monitoring	Responsible body for CE standardisation	No important identified	EU
5. Construction and demolition				
5.6	Development of screening standards for sampling and analysis at landfill	Harmonised standards throughout European Community	No important identified	EU
6. Crematoria / Animal carcass burning				
6.1	ELV for cremation plants (0.1	Harmonised standards throughout	No important identified	EU

Nr	Category 5 Measure	Pros for action at European scale	Cons for action at European scale	Recommendation
	ng/Nm³)	European Community		
6.2	Review of IPPC Annex I to cover Crematoria	Responsible body for review of EC Directive	No important identified	EU
6.3	Guidelines for BAT and BEP for crematoria	Harmonised standards throughout Europe	No important identified	EU
6.4	Mandatory flue gas treatment for crematoria	Harmonised standards throughout Europe	No important identified	EU
7. Dredging / Offshore / Dock works				
7.4	Guidelines for handling oily wastes	Harmonised standards throughout Europe	No important identified.	EU
7.8	ELV for unintended oil release from offshore platforms	Harmonised standards throughout Europe	No important identified	EU
7.10	Guidelines concerning best practice of dock works	Harmonised standards throughout Europe	No important identified	EU
7.13	Environmental monitoring for POPs in harbour areas and in surroundings of off-shore installation	Harmonised approach throughout Europe Comparability of data Improved knowledge on importance of source	Subsidiarity principle No possibility to execute measure without MS support	EU / MS
8. Iron and steel industry				
8.1	General emission limits for all POPs	Central communicative function with overview on situation in all MS Harmonised standards throughout Europe	No important identified	EU
8.2	Inventory of treatment methods for fly ash from incinerators and dusts from metallurgic processes	Central communicative function for dispersion of information	No important identified	EU
9. Landfilling				
9.2	Guidance for an effective system for monitoring and handling of POP containing waste	Central communicative function for dispersion of information	No important identified	EU
10. Marine transport				
10.5	Guidelines for handling oily waste	Harmonised standards throughout Europe	No important identified	EU

Nr	Category 5 Measure	Pros for action at European scale	Cons for action at European scale	Recommendation
10.9	Guidelines for awareness raising campaigns in harbour areas	Single development effort – multiple use Central communicative function with overview on all Member States Harmonised standards	Subsidiarity principle Limited knowledge on national/local characteristics and traditions	EU / MS
12. Non-ferrous metal industry				
12.1	ELV for POP releases	Central communicative function with overview on situation in all MS Harmonised standards throughout Europe	No important identified	EU
13. Open burning of waste				
13.2	Information about impacts from open burning, particularly with regard to bonfires	Single development effort – multiple use Central communicative function with overview on all Member States Harmonised standards	Subsidiarity principle Limited knowledge on national/local characteristics and traditions	EU / MS
14. Pesticide Use				
14.2	Screening of POP concentration in market pesticides	Single development effort – multiple use Central communicative function with overview on situation in all MS Harmonised standards throughout Europe	No important identified	EU
14.3	Research studies modelling transport and fate of POPs from pesticide use	Single development effort – multiple use Central communicative function with overview on all Member States Harmonised standards	No important identified	EU
15. Power production				
15.1	ELV for POP releases	Central communicative function with overview on situation in all MS Harmonised standards throughout Europe	No important identified	EU
15.2	Guidance for selection of Biomass; guidance on BEP and optimised process technology for biomass plant not subject to IPPC	Single development effort – multiple use Central communicative function with overview on all Member States Harmonised standards	Limited knowledge on national/local characteristics and traditions	EU / MS
16. Pulp and paper industry				
16.4	ELV and mandatory monitoring of POP release to water	Central communicative function with overview on situation in all MS Harmonised standards throughout Europe	No important identified	EU

Nr	Category 5 Measure	Pros for action at European scale	Cons for action at European scale	Recommendation
17. Refinery				
17.1	ELV for POP releases	Central communicative function with overview on situation in all MS Harmonised standards throughout Europe	No important identified	EU
18. Residential combustion				
18.3	Users guidelines for sound burning of domestic coal, peat and wood	Single development effort – multiple use Central communicative function with overview on all Member States Harmonised standards	Limited knowledge on national/local characteristics and traditions	EU / MS
18.8	Mandatory particle filters for wood-burning stoves and fireplaces	Harmonised standards throughout European Community	No important identified	EU
19. Road transport				
19.1	Ban on certain chlorinated/brominated compounds as fuel additive	Harmonised standards throughout European Community	No important identified	EU

9.3 Prioritisation of measures in accordance with need for action

In this chapter measures categorised in priority categories 1-5 in chapter 9.1 and assessed to be advantageously addressed at Community level in chapter 9.2 are ranked in each category based on the need for action attributed to each source sector in chapter 7.

In order to be able to further sort the proposed measures a weighing of other parameter has been included in the ranking according to the following principles:

- Overall measures and general industry measures are attributed higher priority than specific measures for single sources[3]
- Measures assessed as favourable at Community level alone are attributed higher priority than measures assessed preferably followed by a combined approach between Member States and European Commission
- Measures for release reduction are attributed higher priority than measures for information or knowledge gain. Within this category measures with combined effect (knowledge/information gain and side-effect on releases) are ranked higher than pure measures for information gain or improved knowledge
- Within single source categories ranking has been performed from high need for action to low need for action. Within these categories measures addressing all POP have been weighted higher than those addressing only single POPs.

With this approach it has been possible to provide a ranking of measures within the categories. However, it has to be taken into account that the ranking can only be relative and based on a screening assessment. Thus it should only be used as possible guidance and should not be seen as absolute.

In order to further reduce and focus the number of measures proposed as possible for additional action at Community level in chapter 9.4 a final ranking and selection of measures will be done for overall and general industry measures as well as for measures for source categories being classified high and medium need for action.

Measures for low need for action sources and measures assessed as preferably addressed at Member State level are not included in this final ranking.

[3] please note, that a need for action category can not be attributed for these types of measures as there is no direct association with a specific source sector

	Nr	Category 1 Measure	Recommendation	Need for action	Approach
1	O.4	Promotion of environmentally sound practices for small combustion appliances	EU	*	Release reduction
2	O.8	Development and promotion of a POPs release management handbook (BAT)	EU	*	Release reduction
3	O.16	Establishment of a central institution for POP related issues ("POP coordination centre" within Commission Services)	EU	*	Information/Knowledge gain
4	O.30	Research on analysis and sampling methods for POPs	EU	*	Information/Knowledge gain
5	18.14	Research on releases form domestic burning	EU	high	Information/Knowledge gain
6	19.7	Research in specific EF for fuels and motor types	EU	High (mainly PAH)	Information/Knowledge gain
7	19.8	Research in EFs for tyre and brake wear	EU	High (mainly PAH)	Information/Knowledge gain
8	6.5	Research in EFs for Crematoria	EU	low	Information/Knowledge gain
9	7.1	Review of sewage sludge directive to include limits for all POPs and address dredging sludges	EU	Medium (PAH)	Release reduction
10	7.11	EIA for dredging of contaminated sludges	EU	Medium (PAH)	Information/Knowledge gain
11	7.12	Research on POP releases from dock works and off-shore activities	EU	Medium (PAH)	Information/Knowledge gain
12	2.5	Research on releases from asphalt processing	EU	low	Information/Knowledge gain
13	9.3	Research in POP releases from landfill	EU	low	Information/Knowledge gain
14	16.5	Research on POP releases from pulp and paper industry	EU	low	Information/Knowledge gain

* not applicable as there is no direct association with a specific source sector

	Nr	Category 2 Measure	Recommendation	Need for action	Approach
1	I.2	Further elaboration and adaptation of BREFs in accordance with POP Regulation objectives	EU	*	Release reduction
2	I.7	Funding of training for environmental inspectors	EU / MS	*	Release reduction
3	I.10	Environmental certification related to POPs; closed-loop / analysis; recovery rate	EU / MS	*	Release reduction
4	I.14	Coordination of cooperation between concerned industry and universities	EU / MS	*	Release reduction
5	O.7	Guidance for assessment of the efficiency of the national legal system	EU	*	Information/Knowledge gain Release reduction
6	O.9	Research for substitute products and process technology to prevent formation and release of POPs	EU	*	Information/Knowledge gain Release reduction

	Nr	Category 2 Measure	Recommendation	Need for action	Approach
7	O.13	Review and extension of CEN standards for POP sampling and analysis	EU	*	Information/Knowledge gain
8	O.21	Research on POP identification and detoxification techniques	EU	*	Information/Knowledge gain Release reduction
9	O.29	Support of documentation on EF achievable with specific process technology	EU	*	Information/Knowledge gain Release reduction
10	O.6	Information request on efficiency of the national legal system	EU	*	Information/Knowledge gain Release reduction
11	O.15	Platform for information exchange between Stakeholders (e.g. Consultative Forum)	EU	*	Information/Knowledge gain Release reduction
12	O.5	Enforcement of Stockholm Convention requirements regarding improved coordination within / in between national administration	EU / MS	*	Information/Knowledge gain Release reduction
13	O.14	Capacity building on POP monitoring and analysis	EU /MS	*	Information/Knowledge gain
14	18.1	Negotiated Agreement with manufacturers / importers to reduce PAH emissions from stoves	EU / MS	high	Release reduction
15	18.12	Graded costs for chimney cleaning according to burning system and fuel type used	EU / MS	high	Release reduction
16	18.15	Research in cheap indicator methods for POP releases in chimney soot	EU	high	Information/Knowledge gain
17	18.16	Research in catalytic flues gas cleaning	EU	high	Information/Knowledge gain Release reduction
18	10.7	Funding research into low-release ship technologies	EU	High (PAH)	Information/Knowledge gain Release reduction
19	5.1	Differentiated limit values for use as secondary raw material in landfills	EU	Medium (PCB, PCDD/PCDF)	Release reduction
20	3.5	Research on releases and impacts of agricultural waste burning	EU	medium	Information/Knowledge gain
21	21.2	Research on releases from solvent use and surface treatment	EU	Medium (PAH)	Information/Knowledge gain
22	16.3	In depth consideration of POP issues in ongoing review of BAT	EU	low	Release reduction
23	8.3	Research programs on efficient detoxification of contaminated dust	EU	low	Information/Knowledge gain Release reduction
24	9.4	Development of CEN standards for POP analysis in waste	EU	low	Information/Knowledge gain
25	22.1	Research on efficient detoxification of contaminated fly ash	EU	low	Information/Knowledge gain Release reduction
26	1.4	Financial incentives (e.g. graded airport fees depending on age / type / emission level of plane)	EU / MS	low	Release reduction

	Nr	Category 2 Measure	Recommendation	Need for action	Approach
27	2.3	Communication of already existing EF used for reporting	EU / MS	low	Information/Knowledge gain

* not applicable as there is no direct association with a specific source sector

	Nr	Category 3 Measure	Recommendation	Need for action	Approach
1	I.8	Financial incentives for installations that apply BAT (non IPPC installations)	EU / MS	*	Release reduction
2	O.23	Updating of and information exchange on Emission Factors	EU	*	Information/Knowledge gain
3	18.4	Mandatory or voluntary quality standards for small combustion appliances and their fuels	EU	high	Release reduction
4	18.2	Financial incentives for certified stoves	EU/MS	high	Release reduction
5	18.13	Financial incentives for installation of catalytic flue gas cleaning	EU / MS	high	Release reduction
6	10.3	High penalty for off-shore tank cleaning	EU/MS	High (PAH)	Release reduction
7	15.3	Mandatory flue gas treatment for biomass power plants not subject to IPPC	EU	medium	Release reduction
8	5.7	Improved reporting on quantity and composition of waste fractions	EU/MS	Medium (PCB, PCDD/PCDF)	Information/Knowledge gain
9	16.2	Review of sewage sludge directive	EU	low	Release reduction

* not applicable as there is no direct association with a specific source sector

	Nr	Category 4 Measure	Recommendation	Need for action	Approach
1	O.12	EU-POP database	EU	*	Information/Knowledge gain
2	O.22	Expansion of emission inventories in the scope of E_PRTR implementation	EU	*	Information/Knowledge gain
3	19.3	Research in EF for tyre and brake wear	EU	High (PAH)	Information/Knowledge gain
4	10.1	Launching a charging regime on the basis of ships' environmental performance to benefit the least damaging	EU / MS	High (PAH)	Release reduction
5	10.2	Increased harbour fees for transport companies violating rules or using inappropriately equipped ships (blacklist)	EU / MS	High (PAH)	Release reduction
6	10.4	Personal responsibility of Marine master for violation of environmental requirements; mandatory element in Masters License	EU / MS	High (PAH)	Release reduction
7	3.1	General ban of agricultural burning	EU	medium	Release reduction
8	5.2	Limit values for contaminated waste wood in case of use for energy	EU	Medium (PCB;	Release reduction

	Nr	Category 4 Measure	Recommendation	Need for action	Approach
		recovery		PCDD/PCDF)	
9	7.5	Mandatory instrument providing globally-applicable ship recycling regulations for international shipping and for recycling activities	EU	Medium (PAH)	Release reduction
10	7.6	Include offshore platforms to IPPC	EU	Medium (PAH)	Release reduction
11	13.5	Support for efficient and consumer-friendly waste collection systems	EU / MS	medium	Release reduction
12	16.1	Legal ban on chlorine bleaching	EU	low	Release reduction
13	1.6	Research on releases from air transport	EU	low	Information/Knowledge gain
14	5.8	Research on POP leaching properties / behaviour from inert landfill	EU	low	Information/Knowledge gain
15	14.1	Framework Directive for sustainable use of pesticides	EU	Low (HCB)	Release reduction/knowledge gain
16	20.4	Compilation and communication of info on what wastes contain POPs, and how decontamination before processing may reduce emissions	EU / MS	low	Release reduction
17	2.4	Extended reporting to EMEP	MS	low	Information/Knowledge gain
18	13.6	Subsidies for municipalities with excellent waste management	MS	medium	Release reduction
19	13.7	"Concourse" for label "our clean community" at local and regional level	MS	medium	Release reduction

* not applicable as there is no direct association with a specific source sector

	Nr	Category 5 Measure	Recommendation	Need for action	Approach
1	I.11	Dialogue with industry associations to promote new technologies	EU / MS	*	Release reduction
2	O.10	Communication on substitute products and process technology to prevent formation and release of dioxins	EU	*	Information/Knowledge gain Release reduction
3	I.13	Research in process technology concerning release reduction	EU	*	Information/Knowledge gain Release reduction
4	O.19	Guidance for a curriculum for courses on environmental studies	EU / MS	*	Information/Knowledge gain Release reduction
5	O.11	POP website	EU	*	Information/Knowledge gain
6	O.27	Mandatory PCB analysis in drinking water	EU	*	Information/Knowledge gain
7	I.6	Guidance for training of environmental inspectors	EU / MS	*	Information/Knowledge gain Release reduction
8	O.24	Support and coordination of LRTAP-Monitoring and modelling on POP in cooperation with EMEP	EU / MS	*	Information/Knowledge gain

	Nr	Category 5 Measure	Recommendation	Need for action	Approach
9	18.8	Mandatory particle filters for wood-burning stoves and fireplaces	EU	high	Release reduction
10	18.3	Users guidelines for sound burning of domestic coal, peat and wood	EU / MS	high	Release reduction
11	19.1	Ban on certain chlorinated/brominated compounds as fuel additive	EU	High (PAH)	Release reduction
12	10.5	Guidelines for handling oily waste	EU	High (PAH)	Release reduction
13	10.9	Guidelines for awareness raising campaigns in harbour areas	EU / MS	High (PAH)	Information/Knowledge gain Release reduction
14	15.1	ELV for POP releases	EU	medium	Release reduction
15	15.2	Guidance for selection of Biomass; guidance on BEP and optimised process technology for biomass plant not subject to IPPC	EU / MS	medium	Release reduction
16	13.2	Information about impacts from open burning, particularly with regard to bonfires	EU / MS	medium	Information/Knowledge gain Release reduction
17	3.2	Targeted information education campaigns (workshops, media, etc.)	MS	medium	Information/Knowledge gain Release reduction
18	5.6	Development of screening standards for sampling and analysis at landfill	EU	Medium (PCB, PCDD/PCDF)	Information/Knowledge gain
19	7.4	Guidelines for handling oily wastes	EU	Medium (PAH)	Release reduction
20	7.8	ELV for unintended oil release from offshore platforms	EU	Medium (PAH)	Release reduction
21	7.10	Guidelines concerning best practice of dock works	EU	Medium (PAH)	Information/Knowledge gain Release reduction
22	7.13	Environmental monitoring for POPs in harbour areas and in surroundings of off-shore installation	EU / MS	Medium (PAH)	Information/Knowledge gain
23	2.1	Guidance document on asphalt production and processing	EU	low	Information/Knowledge gain Release reduction
24	2.2	Specification as diffuse source in PRTR	EU	low	Information/Knowledge gain
25	4.3	CEN Standards for POP waste water monitoring	EU	low	Information/Knowledge gain
26	6.1	ELV for cremation plants (0.1 ng/Nm³)	EU	low	Release reduction
27	6.2	Review of IPPC Annex I to cover Crematoria	EU	low	Release reduction
28	6.3	Guidelines for BAT and BEP for crematoria	EU	low	Release reduction
29	6.4	Mandatory flue gas treatment for crematoria	EU	low	Release reduction
30	8.1	General emission limits for all POPs	EU	low	Release reduction
31	8.2	Inventory of treatment methods for fly ash from incinerators and dusts from metallurgic processes	EU	low	Information/Knowledge gain Release reduction

	Nr	Category 5 Measure	Recommendation	Need for action	Approach
32	9.2	Guidance for an effective system for monitoring and handling of POP containing waste	EU	low	Information/Knowledge gain Release reduction
33	12.1	ELV for POP releases	EU	low	Release reduction
34	16.4	ELV and mandatory monitoring of POP release to water	EU	low	Release reduction
35	17.1	ELV for POP releases	EU	low	Release reduction
36	14.2	Screening of POPs in market pesticides	EU	low (HCB)	Information/Knowledge gain
37	14.3	Research studies modelling environmental transport and fate of POPs from pesticide use	EU	low (HCB)	Information/Knowledge gain

* not applicable as there is no direct association with a specific source sector

9.4 Final categorisation based on policy approach (release reduction, knowledge gain)

As measures for release reduction and measures for improved knowledge information or communication use completely different approaches and a direct comparison would act as strong confounding factor (measures for information gain may have high effectiveness and feasibility with respect to information gain, but this does not mean that they are necessarily better for the overall purpose of release reduction than a reduction measure with medium effectiveness or feasibility in relation to release reduction) the ranked measures have been categorised into 3 different classes of measures

- Measures for release reduction
- Measures for information/knowledge gain and release reduction
- Measures for information/knowledge gain

With this approach it has been possible to provide a final categorisation and ranking of short-listed measures. All measures are ranked within the categories according to priority category and the ranking parameter as defined in chapter 3.5. (Overall measures >general industry> specific sector; within sectors high need for action > medium > low need for action; measure at EU level > measure requiring coodination EU/MS)

However, it has to be taken into account that the ranking can only be relative and based on a screening assessment. Thus it may only be used as possible guidance and may not be seen as absolute.

9.4.1 Measures in the category release reduction

	Nr	Measure	Recommendation
Cat. 1	O.4	Promotion of environmentally sound practices for small combustion appliances	EU
Cat. 1	O.8	Development and promotion of a POPs release management handbook (BAT)	EU
Cat. 1	7.1	Review of sewage sludge directive to include limits for all POPs and address dredging sludges	EU
Cat. 2	I.2	Further elaboration and adaptation of BREFs in accordance with POP Regulation objectives	EU
Cat. 2	5.1	Differentiated limit values for use as secondary raw material in landfills	EU
Cat. 2	I.7	Funding of training for environmental inspectors	EU / MS

	Nr	Measure	Recommendation
Cat. 2	I.10	Environmental certification related to POPs; closed-loop / analysis; recovery rate	EU / MS
Cat. 2	18.1	Negotiated Agreement with manufacturers / importers to reduce PAH emissions from stoves	EU / MS
Cat. 2	18.12	Graded costs for chimney cleaning according to burning system and fuel type used	EU / MS
Cat. 3	18.4	Mandatory or voluntary quality standards for small combustion appliances and their fuels	EU
Cat. 3	15.3	Mandatory flue gas treatment for biomass power plants not subject to IPPC	EU
Cat. 3	I.8	Financial incentives for installations that apply BAT (non IPPC installations)	EU / MS
Cat. 3	18.2	Financial incentives for certified stoves	EU / MS
Cat. 3	18.13	Financial incentives for installation of catalytic flue gas cleaning	EU / MS
Cat. 3	10.3	High penalty for off-shore tank cleaning	EU / MS
Cat. 4	10.1	Launching a charging regime on the basis of ships' environmental performance to benefit the least damaging	EU / MS
Cat. 4	10.2	Increased harbour fees for transport companies violating rules or using inappropriately equipped ships (blacklist)	EU / MS
Cat. 4	10.4	Personal responsibility of Marine master for violation of environmental requirements; mandatory element in Master License	EU / MS
Cat. 4	3.1	General ban of agricultural burning	EU
Cat. 4	5.2	Limit values for contaminated waste wood in case of use for energy recovery	EU
Cat. 4	7.5	Mandatory instrument providing globally-applicable ship recycling regulations for international shipping and for recycling activities	EU
Cat. 4	7.6	Include offshore platforms to IPPC	EU
Cat. 4	14.1	Framework Directive for sustainable use of pesticides	EU
Cat. 4	13.5	Support for efficient and consumer-friendly waste collection systems	EU / MS
Cat. 5	I.11	Dialogue with industry associations to promote new technologies	EU / MS
Cat. 5	18.8	Mandatory particle filters for wood-burning stoves and fireplaces	EU
Cat. 5	19.1	Ban on certain chlorinated/brominated compounds as fuel additive	EU
Cat. 5	15.1	ELV for POP releases	EU
Cat. 5	7.8	ELV for unintended oil release from offshore platforms	EU
Cat. 5	18.3	User guidelines for sound burning of domestic coal, peat and wood	EU / MS
Cat. 5	15.2	Guidance for selection of Biomass; guidance on BEP and optimised process technology for biomass plant not subject to IPPC	EU / MS
Cat. 5	7.4	Guidelines for handling oily wastes	EU / MS

Following exclusion of measures favourably addressed at Member State level and low priority measures classified in category 6 in chapter 9.1 about 30 measures remain that could be taken into consideration in decreasing order by Commission Services as additional measures to address POP releases in the future.

As illustrated in the table measures mainly address process optimisation and improved release management as basis for release reduction with focus on high release areas such as small combustion installations, open burning and marine source sectors. In addition a focus is on further improvement of enforcement of existing legal framework.

9.4.2 Measures in the category improved knowledge with side-effect on release reduction

In addition to the measures for release reduction 16 measures have been ranked in decreasing order in this chapter that focus on guidance, communication, research and information transfer in order to generate a release reduction effect in the middle or long-term perspective.

	Nr	Measure	Recommendation
Cat. 2	O.7	Guidance for assessment of the efficiency of the national legal system	EU
Cat. 2	O.9	Research for substitute products and process technology to prevent formation and release of POPs	EU
Cat. 2	O.21	Research on POP identification and detoxification techniques	EU
Cat. 2	O.29	Support of documentation on EF achievable with specific process technology	EU
Cat. 2	O.6	Information request on efficiency of the national legal system	EU
Cat. 2	O.15	Platform for information exchange between Stakeholders (e.g. Consultative Forum)	EU
Cat. 2	I.14	Coordination of cooperation between concerned industry and universities	EU / MS
Cat. 2	18.16	Research in catalytic flues gas cleaning	EU
Cat. 2	10.7	Funding research into low-release ship technologies	EU
Cat. 2	O.31	Research on relations between health effects and exposure to POPs	EU
Cat. 2	O.5	Enforcement of Stockholm Convention requirements regarding improved coordination within / in between national administration	EU / MS
Cat. 4	I.15	Lowering of threshold limits for reporting of PAH and HCB in E-PRTR regulation	EU
Cat. 5	O.10	Communication on substitute products and process technology to prevent formation and release of dioxins	EU
Cat. 5	I.13	Research in process technology concerning release reduction	EU
Cat. 5	7.10	Guidelines concerning best practice of dock works	EU
Cat. 5	13.2	Information about impacts from open burning, particularly with regard to bonfires	EU / MS

As illustrated in the table measures mainly address thorough implementation of existing legal framework and process optimisation as basis

for release reduction.

9.4.3 Measures in the category improvement of knowledge and information exchange

	Nr	Measure	Recommendation
Cat. 1	O.16	Establishment of a central institution for POP related issues ("POP coordination centre" within Commission Services)	EU
Cat. 1	O.30	Research on analysis and sampling methods for POPs	EU
Cat. 1	18.14	Research on releases form domestic burning	EU
Cat. 1	19.7	Research in specific EF for fuels and motor types	EU
Cat. 1	19.8	Research in EFs for tyre and brake wear	EU
Cat. 1	7.11	EIA for dredging of contaminated sludges	EU
Cat. 1	7.12	Research on POP releases from dock works and off-shore activities	EU
Cat. 2	O.13	Review and extension of CEN standards for POP sampling and analysis	EU
Cat. 2	18.15	Research in cheap indicator methods for POP releases in chimney soot	EU
Cat. 2	3.5	Research on releases and impacts	EU
Cat. 2	21.2	Research on releases from solvent use and surface treatment	EU
Cat. 2	O.14	Capacity building on POP monitoring and analysis	EU / MS
Cat. 3	O.23	Updating of and information exchange on Emission Factors	EU
Cat. 3	5.7	Improved reporting on quantity and composition of waste fractions	EU / MS
Cat. 4	O.12	EU-POP database	EU
Cat. 4	O.22	Expansion of emission inventories in the scope of E_PRTR implementation	EU
Cat. 4	19.3	Research in EF for tyre and brake wear	EU
Cat. 5	O.27	Mandatory PCB analysis in drinking water	EU
Cat. 5	O.24	Support and coordination of LRTAP-Monitoring and modelling on POP in cooperation with EMEP	EU / MS
Cat. 5	O.11	POP website	EU
Cat. 5	5.6	Development of screening standards for sampling and analysis at landfill	EU
Cat. 5	14.2	Screening of POP concentrations in market pesticides	EU
Cat. 5	14.3	Research studies modelling transport and fate of POPs from pesticide use	EU
Cat. 5	7.13	Environmental monitoring for POPs in harbour areas and in surroundings of off-shore installation	EU / MS
Cat. 5	10.9	Guidelines for awareness raising campaigns in harbour areas	EU / MS

Although not in the focus of Stockholm Convention requirements and Commission policy measures to improve the state of knowledge on

POP releases could work as fundamental instrument to direct further policy action in the field of release reduction.

23 Measures in the field of knowledge gain and improved communication have been ranked in the table above in decreasing order. As illustrated in the table, measures address generation of sound knowledge on actual releases and risks hereof in source sectors where knowledge currently is highly limited as well as improved presentation of POP issues as such.

10 Conclusions and recommendations

This chapter provides an overview on major results of this project and gives an indication on recommended actions.

10.1.1 Conclusions on source inventory

The inventory of potential source sectors for POP releases showed that the overall data base on POP releases in Europe is still limited especially for PCB, HCB and PAH and it is difficult to generate a well founded and scientifically sound overview on all sources. Due to lack of measurement obligations the data base is especially limited as concerns releases to water and land.

Nevertheless is has been possible to give a first indication of the dimension of unintentional production and releases of POP in the European Union, being aware that figures for releases to water and waste tend to be underestimated for PCB, HCB and PAH due to deficits in data availability.

Based on available data overall roughly 20 kg of PCDD/PCDF-TEQ are emitted unintentionally with about ¾ being discharged to waste and only ¼ emitted to air. This reflects the fact that a lot of activities have been taken in the industrial sector to establish effective flue gas treatment.

Consequently air emissions are dominated by residential combustion in small combustion installations and open burning of waste. Wood preservation tends to be another important source for releases to air, which however already has been addressed by means of a legal ban for use of the relevant wood preservatives, so that this issue should fade out over time. Major industrial sources in the field or air emissions of PCDD/PCDF are iron and steel and power production, with sinter plants and biomass power plants as major contributors. A consequent cycling of dusts and reduction of diffuse emissions from sinter plants and effective flue gas treatment in biomass combustion installations are seen as the most effective measures in this field.

The issue of POP releases into waste and the risk for releases to land is taken into account in the European POP regulation (setting limit values for irreversible destruction of the POP content), in the European waste directive with the subsequent European waste catalogue and the Landfill directive. This leads to the situation that most of the POP containing solid residues are send to controlled disposal installations from where releases to land are estimated to be low.

Due to low water solubility of PCDD/PCDF releases to water are low in comparison.

While releases of PCDD/PCDF do only occur from unintentional production unintentional releases of PCB are absolutely dominated by stocks from historic production. As this issue has already been addressed by existing legislation and in previous studies, the investigation in this project is focused on sources for unintentional production in this report. Based on available data overall roughly 5,000 kg of total PCB is emitted unintentionally with about 4,000 kg being emitted to air. This reflects the fact that poor information is available on PCB

concentrations in solid residues from combustion processes and in water.

Air emissions seem to be dominated by power generation, road transport and iron and steel production; however, data uncertainty is high for road transport.

The issue of PCB releases into waste and the risk for releases to land is taken into account in a number of existing legal documents. This leads to the situation that most of the POP containing residues are either destroyed or send to controlled disposal installations from where releases to land are estimated to be low.

Unintentional production generates releases to waste in a dimension below 1 t/y whereas releases from remaining products are assumed to be in a dimension of 6,000 tons per year.

Due to low water solubility of PCB releases to water are comparably low.

Also releases of HCB to environment are dominated by stocks of historic production which have not been taken into consideration in this report. Based on available data releases from unintentional production account for about 4,000 kg/year with roughly 3,500 kg being released to air and thus are in the same dimension as releases of PCB. As for PCB information on releases to waste and water is incomplete.

Air emissions seem to be dominated by pesticide use and metal industry (predominantly non-ferrous metal production); other sources are chemical industry and residential combustion. Releases to water are due to chemical production but are low in comparison.

Releases of PAHs take place in another dimension than releases of other POP. Based on available data overall roughly 3000 tons of UNECE PAHs (Sum 4) are emitted unintentionally per year with about 2000 tons being emitted to air and roughly 900 tons being discharged to water.

Air emissions seem to be dominated by residential combustion, road transport and wood preservation, however all other sources also contribute with almost one third of the total. Except of refinery and anode production industrial sectors are no major sources for PAH releases.

Releases to water are related to marine activities mainly.

10.1.2 Conclusions on inventory of measures

The inventory of measures has been based on Member State answers to a questionnaire, evaluation of available NIPs and draft NIPs, literature search and an investigation of European legislation. A large number of measures – directly or indirectly addressing POPs – has been identified, that has been established, has been proposed or is planned at international, Community or Member State level.

To differentiate and evaluate the results the investigation has been performed in the categories existing legislation, review of legislation, planned new legislation, implementation and enforcement of existing legislation (administrative, technical), new approaches (economic incentives, eco-labelling, taxes, subsidies, etc), funding,

communication/education, monitoring/inventory and research.

With respect to legislation a number of efficient instruments has been established for general release reduction or specific reduction of POP releases.

- The major instrument for release control from industrial sources and for reporting on POP releases is the IPPC Directive in connection with the EPER Decision and the E-PRTR regulation.

- Other legal instruments for releases to air are the LCP directive 2001/80/EC, the Waste Incineration Directive 2000/76/EC, the ambient air Directive 96/62/EC and its 4th daughter directive (2004/107/EC), the Emission Ceiling Directive (2001/81/EC) and the Energy Efficiency Directive 2002/91/EC which contains provisions for energy performance and inspections of small combustion installation.

- Regarding releases to water, Directive 76/464/EEC and the Water Framework Directive 2000/60/EC are the major instruments for monitoring and release control.

- Releases are also addressed via restriction in use and provisions for management as specified in the PCB Directive 96/59/EC, Directive 76/769/EEC and Directive 98/70/EC.

- With respect to releases from waste not directed to incineration, Directive 75/442/EEC and the Landfill directive (1999/31/EC) with all related legislation as well as the EU POP regulation constitute an effective legal framework.

- On the Member State level the list of legislation addressing POP releases is completed by instruments addressing crematoria, residential combustion, traffic and releases to water.

Planning for review of existing legislation mostly addresses releases to air.

- Namely in the framework of the “Thematic Strategy on Air pollution” (2005) involving the CAFE (Clean Air For Europe) programme proposals for measures have been developed.

- At Member States level reported planning with respect to review of existing legislation focuses on PRTR, technical rules for releases to waste water, and reporting from industry to authorities.

A large number of measures have been reported in the fields of implementation and enforcement, communication and research or inventory. The focus of measures is laid on institutional strengthening, capacity building, training, effective permitting and control, improved coordination within national administration, development of technical standards, the adaptation to technical standards, coordination, knowledge exchange and awareness raising, process technology, detoxification, risk assessment and verification of emission estimates. Little activities have been identified for new approaches such as economic incentives, certification etc., funding and new legislation.

Based on an allocation of the identified measures with the source sectors and an evaluation of number, type and effectiveness of related existing measures and mass flow relevance performed in chapter 7 gaps and deficits have been identified and need of action categories from low to high could be attributed as basis for the generation of proposals for measures to be taken by the Commission for further release reduction or information purpose.

In this evaluation industrial sources generally have been attributed low need of action due to existing regulatory framework and BAT concept. Burning of agricultural waste, the construction and demolition sector, marine activities, surface treatment and solvent use and wood preservation have been attributed medium need for action and residential combustion as well as road transport has been identified as priority sectors.

Based on this outcome roughly 160 possible measures have been identified in chapter 8 grouped in overall measures applicable to all source categories, general industrial measures with relevance for all IPPC installations and specific measures for each source category. This broad list of measures did not provide prioritisation and did not take into account aspects of mass flow relevance and need for action.

Following an assessment of effectiveness, feasibility, cost and socio-economic impacts a first categorisation of the proposed measures has been performed in chapter 9.1. From the 160 measures about 100 address all POPs, about 40 focus mainly on PAH and 20 on PCDD/PCDF. Only 7 measures address PCB and no measures have been specifically proposed for HCB. About 2/3 of the measures are designed for release reduction the rest focuses on knowledge gain. Corresponding to the importance of the air as release pathway the majority of measures focuses on this compartment. Medium effectiveness and medium to high feasibility were attributed for more than half of the measures.

After ranking according to need for action in chapter 9.3 and exclusion of measures favourably addressed at Member State level as well as low priority measures about 30 measures remain in the category of releases reduction that could be taken into consideration by Commission Services as additional measures to address POP in the future.

Based on the priority given to measures applicable to different sources (overall measures and general industry measures) and due to the identified need for action, measures mainly address process optimisation and improved release management as basis for release reduction with focus on high release areas such as small combustion installations, open burning and marine source sectors. In addition a focus is on further improvement of enforcement of existing legal framework.

In addition to the measures for release reduction 16 measures that focus on guidance, communication, research and information transfer could be used to generate a release reduction effect in the middle or long term perspective. These measures mainly address thorough implementation of existing legal framework and research in process optimisation as basis for release reduction.

As measures to improve the state of knowledge on POP releases could work as fundamental instrument to direct further policy action in the field of release reduction 23 Measures in the field of knowledge gain and improved communication have been short-listed for possible action. Measures relate to generation of sound knowledge on actual releases and risks hereof in source sectors where knowledge currently is highly limited as well as to improved presentation and communication of POP issues as such.

10.1.3 Recommendations

Based on the results of source inventory and the inventory of existing and planned measures, mass flow relevance and priority on release reduction under the Stockholm Convention the following recommendations can be provided for further action.

- Focus on BREF and BAT approach for control of releases from IPPC installations, with special emphasis on primary measures (prevention of POP generation in the process) and secondary detoxification measures (exhaust gas and soild residues)
- Extend documentation of available information on POP releases to all compartments in BREF documents
- Assure thorough implementation of IPPC legislation as prerequisite for low need of action classification of industrial source sectors
- Focus on quality standards, BEP and possibilities for flue gas treatment for small combustion sources
- Focus on marine activities for control of PAH releases to water
- Discuss expansion of IPPC or LCP to include smaller combustion sources
- Assure complete ban of leaded petrol and mandatory use of particle filter for diesel engines as well as implementation of restriction in PAH content of tyres as pre-requisite for reduction of POP releases from transport sectors
- Promote up-date and round-off of emission factors for all potential sources sectors
- Discuss review of E_PRTR in terms of lower threshold levels for HCB to better reflect real releases
- Discuss review of E-PRTR in terms of assuring reporting from smaller combustion sources and diffuse source sectors

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List of Tables

List of Figures

Annex 1

Intention of the questionnaire:

The results of the questionnaire will support the elaboration of the Community Implementation Plan under the Stockholm Convention. They will be included in a project that aims at four major objectives:

- Identification and quantification of main sources for PCDD/PCDF, PCB, HCB, PAH (material flows) and inventory of existing and planned measures for release reduction
- Identification of gaps in relation to the objective of minimising releases
- Compilation of possible measures to fill the identified gaps
- Assessment of feasibility, impacts, costs and benefits of listed measures including pros and cons of action at EU vs. national level.

Deadline for feedback

Please send the questionnaire and any attached information as soon as possible but before

06 February 2006

preferably in electronic form to anke.joas@bipro.de or post it to BiPRO GmbH, Grauertstr. 12, D-81545 München, Germany.

The results of the feed back will be discussed at the Member State Meeting related to the Implementation of the European POP Regulation scheduled for 21 February 2006.

The project team is charged with centralising and analysing your answers, and to pursue the work by organising more detailed interviews if necessary. We thank you in advance for your efforts on this work and will appreciate if you could support your statements with references and further background material.

We would also like to encourage you to send replies, even if you cannot answer all of the questions. If you cannot reply to certain questions because the corresponding data is not at your disposal, please indicate this in your reply: absence of data is also of interest for the Commission. Also, please respond with a holding reply, when some of the items require further research among your sector (or members of organisations).

Please indicate clearly if you whish that the provided information shall be kept confidential.

Support to answer the questionnaire

A few words shall support you to complete the questionnaire in a time saving and efficient way.

The questionnaire is provided as an MS-Word-file. The only fields where input is desired are the boxes below each question. The most convenient way is to fill it in the electronic version and to write directly in the document intended to be send back as an answer.

The questionnaire is divided in 2 parts:

Part A: Emission/Discharge data on POPs

Part B: Strategies, policies and measures related to emission/discharge reduction

Related to each question we ask for information as specified in the questionnaire. Four information types are possible

- *"Insert your answer"*

  Please fill in the desired information as far as possible

- *"Information attached as annex"*

  Please attach the desired information as annex or fill in the table in the annex to this document

- *"Electronic Link"*

  Please provide the link to documents electronically available in English language.

- *"No Information available"*

  Please indicate in any case if you do not have information related to the corresponding question by typing "X" in the answer field.

- *"Contact data"*

  Please inform us whom you would recommend to contact for information related to the corresponding question

If a question is unclear or if you desire to discuss a certain aspect, please do not hesitate to contact Ms. Anke Joas, Mr Ferdinand Zotz or Ms Sonja Bauer at BiPRO GmbH, Munich (e-mail: mail@bipro.de; tel.: +49-89-18.97.90.50, fax.: +49-89-18.97.90.52).

11.1 Questionnaire Authority

Contact Data:

Please provide below name, address, phone and fax number, and e-mail address of the contact person for further discussion.

Member State	
Name	
Address	
Telephone	
Fax	
E-mail	

Part A: Emissions/Discharge of POPs

According to article 6, paragraph 1 of the POP Regulation (850/2004) and article 5 of the Stockholm Convention Member States shall draw up and maintain release inventories in accordance with their obligations under the Stockholm Convention and the POP Protocol.

Q 1: Please provide available data from source inventories or release estimates for POPs to air, water and land/waste. Please give data for all sectors and pollutants available.

(In annex Q1 to this document a form is available which can be used for answering. However it might be more convenient to send your existing inventory as an answer.)

Insert you answer	
Information attached as annex	
Electronic link	*www.*
No information available	
Contact data for further information	*Name:* *e-mail:* *phone:* *fax:*

Q 2: If possible please provide measurement data on POP concentrations in exhaust gases and waste water.

(You find a list of source sectors in annex Q2 to this document which can be used for answering. However it might be more convenient to send existing reporting documents as an answer.)

Insert you answer	
Information attached as annex	
Electronic link	*www.*
No information available	
Contact data for further information	*Name:* *e-mail:* *phone:* *fax:*

Part B: Strategies, policies and measures

According to article 6, paragraph 2 of the POP Regulation (850/2004), article 7, paragraph 1 of the POP Protocol and article 5 of the Stockholm Convention Member States shall draw up action plans on measures to identify, characterise and minimise the total releases including an evaluation of the efficacy of the laws and policies related to the management of the releases.

According to Article 8, paragraph 3 of the POP Regulation when preparing their National Implementation Plans Member States shall exchange information on the content.

Following the 23rd session of the Executive Body for the convention on long-range transboundary air pollution 12-15 December 2005 in Geneva, a draft questionnaire on strategies and policies for air pollution abatement has been developed.

The questionnaire is to be made available on the UNECE Convention's website by 15 January 2006. Deadline for submission of replies by Parties is scheduled for 31 March 2006. Due to a common background, the UNECE questionnaire in parts covers questions related to unintentional emissions/releases of POPs as specified under the Stockholm Convention and the EU POP Regulation.

In order to limit efforts and avoid double work, questions have been limited to the extent possible and have been designed in a way that the answers to the EU questionnaire can be used directly for several questions of the UNECE questionnaire.

Q 3: Please specify the national strategies, policies and programmes your country has developed to reduce unintentional emission/discharge of POPs. Please mention the current status of the elaboration of a National Implementation Plan or other policy approaches used in your country with respect to management of unintentionally emitted/released POPs.

It would be helpful, if you could attach relevant documents in your answer.

Insert you answer	
Information attached as annex	
Electronic link	*www.*
No information available	
Contact data for further information	*Name:* *e-mail:* *phone:* *fax:*

Q 4: Please provide brief information on the legislation in place regarding unintentional emissions/discharges of POPs. If such legislation is foreseen in the near future, please give the expected date of coming into force.

Insert you answer					
	Legislation in place	***Planned legislation***	***POPs addressed***	***Corresponding EU legislation***	***Expected date of coming into force***
Air					
Land					
Water					
Residues					
Information attached as annex					
Electronic link		*www.*			
No information available					
Contact data for further information		*Name:* *e-mail:* *phone:* *fax:*			

Q 5: Which economic instruments (tax incentives, fees, charges, subsidies, credit guarantees and low interest loans) and market-based programmes (e.g. emission trading programmes) or innovative approaches are used in your country which might have a reduction effect on unintentional POP emissions/discharge?

Could you please provide information on your experiences with these instruments or related planning?

Insert you answer	
Information attached as annex	
Electronic link	*www.*
No information available	
Contact data for further information	*Name:* *e-mail:* *phone:* *fax:*

Q 6: Please provide information on activities undertaken in the fields of research, development, monitoring and cooperation related to the overall aim of emission reduction. Indicate the scientific and technical programmes under the Conventions in which your country participates.

Insert you answer		
	National activities related research, development, monitoring and cooperation	***Scientific and technical programme under the Conventions***
Air		
Land		
Water		
Residues		
Information attached as annex		
Electronic link	*www.*	
No information available		
Contact data for further information	*Name:* *e-mail:* *phone:* *fax:*	

Q 7: What are the highest priorities concerning unintentional emissions/releases of POPs in your country? Besides other please provide information on specific source categories your country expects to regulate further in future. What types of policy or regulatory approaches are most likely to be used?

Insert you answer	
Information attached as annex	
Electronic link	*www.*
No information available	
Contact data for further information	*Name:* *e-mail:* *phone:* *fax:*

11.2 Questionnaire Industry

Contact Data:

Please provide below name, address, phone and fax number, and e-mail address of the contact person for further discussion.

Member State	
Name	
Address	
Telephone	
Fax	
E-mail	

Part A: Emissions/Discharge of POPs

According to article 6, paragraph 1 of the POP Regulation (850/2004) and article 5 of the Stockholm Convention Member States shall draw up and maintain release inventories in accordance with their obligations under the Stockholm Convention and the POP Protocol.

Q 1: Please provide measurement data on POP concentrations in exhaust gases and waste water as far as available. Please provide information on concentrations in process residues if recently data have become available.

(You find a list of source sectors in annex Q 1 to this document which can be used for answering. However it might be more convenient to send existing reporting documents as an answer.)

Insert you answer	
Information attached as annex	
Electronic link	*www.*
No information	
Contact data for further information	*Name:* *e-mail:* *phone:* *fax:*

Part B: Strategies, policies and measures

Q 2: Is the legal framework (in Europe/in your country) related to reduction of unintentionally produced/released POPs sufficient, in your opinion?

Would you consider strategies, policies and programmes which have been developed in your country/in Europe this field sufficient?

Where do you see major deficits?

It would be helpful, if you could attach relevant documents in your answer.

Insert you answer	
Information attached as annex	
Electronic link	*www.*
No information available	
Contact data for further information	*Name:* *e-mail:* *phone:* *fax:*

Q 3: Which national/European economic instruments (tax incentives, fees, charges, subsidies, credit guarantees and low interest loans), market-based programmes (e.g. emission trading programmes) or innovative approaches would you consider to have a reduction effect on unintentional POP emissions/discharge?

Which existing instruments would you consider most effective, where would you see deficits? Which additional instruments would you propose for use in future?

It would be helpful, if you could attach relevant documents in your answer.

Insert you answer	
Information attached as annex	
Electronic link	*www.*
No information available	
Contact data for further information	*Name:* *e-mail:* *phone:* *fax:*

Q 4: Please provide information on activities undertaken in the fields of research, development, monitoring and cooperation related to the overall aim of emission reduction in you industry sector.

Are existing national/European activities sufficient? Which activities would you consider most effective, where would you see deficits? Which additional activities would you propose for use in future?
Please provide examples as far as possible. It would be helpful, if you could attach relevant documents in your answer.

Insert you answer	
Information attached as annex	
Electronic link	*www.*
No information available	
Contact data for further information	*Name:* *e-mail:* *phone:* *fax:*

Q 5: What would you consider as highest priorities concerning unintentional emissions/releases of POPs in your country/ in the European Union?

What types of policy or regulatory approaches would you propose?

It would be helpful, if you could attach relevant documents in your answer.

Insert you answer	
Information attached as annex	
Electronic link	*www.*
No information available	
Contact data for further information	*Name:* *e-mail:* *phone:* *fax:*

11.3 Questionnaire NGO Science

Contact Data:

Please provide below name, address, phone and fax number, and e-mail address of the contact person for further discussion.

Member State	
Name	
Address	
Telephone	
Fax	
E-mail	

Part A: Emissions/Discharge of POPs

According to article 6, paragraph 1 of the European POP Regulation and article 5 of the Stockholm Convention Member States shall draw up and maintain release inventories in accordance with their obligations under the Stockholm Convention and the POP Protocol.

Q 1: What would you consider to be the most relevant sources for unintentional emission/ release of POPs in your country/ in the European Union?

It would be helpful if you could attach relevant documents in your answer.

Insert you answer	
Information attached as annex	
Electronic link	*www.*
No information available	
Contact data for further information	*Name:* *e-mail:* *phone:* *fax:*

Q 2: If possible please provide any available measurement data on POP concentrations in exhaust gases and waste water as far as available. Please provide information on concentrations in process residues if recently data have become available.

(You find a list of source sectors in annex Q 2 to this document which can be used for answering. However it might be more convenient to send existing reporting documents as an answer.)

Insert you answer	
Information attached as annex	
Electronic link	*www.*
No information	
Contact data for further information	*Name:* *e-mail:* *phone:* *fax:*

Part B: Strategies, policies and measures

Q 3: Is the legal framework (in Europe/in your country) related to reduction of unintentionally produced/released POPs sufficient, in your opinion?

Would you consider strategies, policies and programmes which have been developed in your country/in Europe this field sufficient?

Where do you see major deficits?

It would be helpful if you could attach relevant documents in your answer.

Insert you answer	
Information attached as annex	
Electronic link	*www.*
No information available	
Contact data for further information	*Name:* *e-mail:* *phone:* *fax:*

Q 4: Are you aware of national/European economic instruments (tax incentives, fees, charges, subsidies, credit guarantees and low interest loans), market-based programmes (e.g. emission trading programmes) or innovative approaches relevant to reducing unintentional POP emissions/discharge?

(If available, please include information on approaches used in other countries e.g. USA, Japan, Canada, Australia.)

Which existing instruments would you consider most effective, where would you see deficits?

Which additional instruments would you propose for use in future?

It would be helpful if you could attach relevant documents in your answer.

Insert you answer	
Information attached as annex	
Electronic link	*www.*
No information available	
Contact data for further information	*Name:* *e-mail:* *phone:* *fax:*

Q 5: As far as available to your organisation please provide information on activities undertaken in the fields of research, development, monitoring and cooperation related to the overall aim of emission reduction (If available, please include information from other countries e.g. USA, Japan, Canada, Australia.)

Do you consider existing national/European activities sufficient?

Which existing activities would you consider most effective, where would you see deficits?
Which additional activities would you propose for use in future?
Please provide examples as far as possible. It would be helpful if you could attach relevant documents in your answer.

Insert you answer	
Information attached as annex	
Electronic link	*www.*
No information available	
Contact data for further information	*Name:* *e-mail:* *phone:* *fax:*

Q 6: What would you consider as highest priorities concerning unintentional emissions/releases of POPs in your country/ in the European Union?

What types of policy and regulatory approaches or which innovations in process technology etc. would you propose?

(If available, please include information on approaches used or planned in other countries e.g. USA, Japan, Canada, Australia.)

It would be helpful if you could attach relevant documents in your answer.

Insert you answer	
Information attached as annex	
Electronic link	*www.*
No information available	
Contact data for further information	*Name:* *e-mail:* *phone:* *fax:*

11.4 Questionnaire Marine Conventions

Contact Data:

Please provide below name, address, phone and fax number, and e-mail address of the contact person for further discussion.

Member State	
Name	
Address	
Telephone	
Fax	
E-mail	

Part A: Emissions/Discharge of POPs

Q 1: Please provide available data from source inventories or release estimates for POPs to air, water and land/waste in your region. Please give data for all sectors and pollutants available.

(In annex Q1 to this document a form is available which can be used for answering. However it might be more convenient to send existing inventories as an answer.)

Insert you answer	
Information attached as annex	
Electronic link	*www.*
No information available	
Contact data for further information	*Name:* *e-mail:* *phone:* *fax:*

Q 2: If possible please provide measurement data on POP concentrations in exhaust gases and waste water.

(You find a list of source sectors in annex Q2 to this document which can be used for answering. However it might be more convenient to send existing reporting documents as an answer.)

Insert you answer	
Information attached as annex	
Electronic link	*www.*
No information available	
Contact data for further information	*Name:* *e-mail:* *phone:* *fax:*

Part B: Strategies, policies and measures

Q 3: Please specify the strategies, policies, programmes and recommendations that your regional organisation has developed to reduce unintentional emission/discharge of POPs. Please mention the current status of any policy approaches taken by your organisation with respect to management of unintentionally emitted/released POPs.

It would be helpful, if you could attach relevant documents in your answer.

Insert you answer	
Information attached as annex	
Electronic link	*www.*
No information available	
Contact data for further information	*Name:* *e-mail:* *phone:* *fax:*

Q 5: Are any economic instruments (tax incentives, fees, charges, subsidies, credit guarantees and low interest loans) and market-based programmes (e.g. emission trading programmes) or innovative approaches used in your region which might have a reduction effect on unintentional POP emissions/discharge?

Could you please provide information on your experiences with these instruments or related planning?

Insert you answer	
Information attached as annex	
Electronic link	*www.*
No information available	

Contact data for further information	*Name:* *e-mail:* *phone:* *fax:*

Q 6: Please provide information on activities undertaken by your regional organisation in the fields of research, development, monitoring and cooperation related to the overall aim of emission reduction.

Insert you answer		
	tional activities related research, development, monitoring and cooperation	***ientific and technical programme under the Conventions***
r		
nd		
ater		
sidues		

Information attached as annex	
Electronic link	*www.*
No information available	
Contact data for further information	*Name:* *e-mail:* *phone:* *fax:*

Q 7: What are the highest priorities concerning unintentional emissions/releases of POPs in your region? What types of policy or regulatory approaches should be used to address them?

Insert you answer	
Information attached as annex	
Electronic link	*www.*
No information available	
Contact data for further information	*Name:* *e-mail:* *phone:* *fax:*

11.5 Annex to the questionnaires

Annex Q1: Source inventories, emission estimates

1. ***Emission to air:***

Source sector	*PCDD/PCDF*	*PCB*	*HCB*	*PAH*
MSWI				
HWI				
HospWI				
Wood and biomass incineration				
Animal carcass burning				
Iron ore sintering				
Coke production				
Iron and steel foundries				
Copper production secondary				
Copper primary				
Aluminium production secondary				
Aluminium primary				
Lead production secondary				
Zinc production secondary				
Magnesium production				
shredders				
Cable stripping				
Thermal wire reclamation				
Fossil fuel power plants				
Biomass power plants				
Domestic heating coal				
Domestic heating wood				
Domestic heating biomass				
Crematoria				
Cement kilns				
Lime production				

Source sector	*PCDD/PCDF*	*PCB*	*HCB*	*PAH*
Glass production				
Ceramics production				
Wood preservation				
Road transport				
Marine transport				
Air traffic				
Uncontrolled burning of waste				
Pulp and paper production				
Chemical industry PCP				
Chemical industry Chlorinated pesticides				
Chemical industry Chloranil				
Chemical industry EDC/VCM/PVC				
Petroleum refineries				
other				

2. ***Discharge to water:***

Source sector	*PCDD/PCDF*	*PCB*	*HCB*	*PAH*
MSWI				
HWI				
HospWI				
Wood and biomass incineration				
Animal carcass burning				
Iron ore sintering				
Coke production				
Iron and steel foundries				
Copper production secondary				
Copper primary				
Aluminium production secondary				
Aluminium primary				
Lead production secondary				
Zinc production secondary				

Source sector	*PCDD/PCDF*	*PCB*	*HCB*	*PAH*
Magnesium production				
shredders				
Cable stripping				
Thermal wire reclamation				
Fossil fuel power plants				
Biomass power plants				
Domestic heating coal				
Domestic heating wood				
Domestic heating biomass				
Crematoria				
Cement kilns				
Lime production				
Glass production				
Ceramics production				
Wood preservation				
Road transport				
Marine transport				
Air traffic				
Uncontrolled burning of waste				
Pulp and paper production				
Chemical industry PCP				
Chemical industry Chlorinated pesticides				
Chemical industry Chloranil				
Chemical industry EDC/VCM/PVC				
Petroleum refineries				
other				

3. ***Discharge to land/waste:***

Analogue if information has recently become available

4. ***Please provide annual emission/discharge data from sectors not covered above, but of importance in your country.***

Source sector	*PCDD/PCDF*	*PCB*	*HCB*	*PAH*

Annex Q2: Measurement data on POP concentrations

(1) Concentration exhaust gas:

Source sector	*PCDD/PCDF*	*PCB*	*HCB*	*PAH*
MSWI				
HWI				
HospWI				
Wood and biomass incineration				
Animal carcass burning				
Iron ore sintering				
Coke production				
Iron and steel foundries				
Copper production secondary				
Copper primary				
Aluminium production secondary				
Aluminium primary				
Lead production secondary				
Zinc production secondary				
Magnesium production				
shredders				
Cable stripping				
Thermal wire reclamation				
Fossil fuel power plants				
Biomass power plants				
Domestic heating coal				
Domestic heating wood				
Domestic heating biomass				

Source sector	*PCDD/PCDF*	*PCB*	*HCB*	*PAH*
Crematoria				
Cement kilns				
Lime production				
Glass production				
Ceramics production				
Wood preservation				
Road transport				
Marine transport				
Air traffic				
Uncontrolled burning of waste				
Pulp and paper production				
Chemical industry PCP				
Chemical industry Chlorinated pesticides				
Chemical industry Chloranil				
Chemical industry EDC/VCM/PVC				
Petroleum refineries				
other				

(2) Concentration waste water, sludge and filter cakes:

Source sector	*PCDD/PCDF*	*PCB*	*HCB*	*PAH*
MSWI				
HWI				
HospWI				
Wood and biomass incineration				
Animal carcass burning				
Iron ore sintering				
Coke production				
Iron and steel foundries				
Copper production secondary				
Copper primary				
Aluminium production secondary				
Aluminium primary				
Lead production secondary				
Zinc production secondary				
Magnesium production				
shredders				
Cable stripping				
Thermal wire reclamation				
Fossil fuel power plants				
Biomass power plants				
Domestic heating coal				
Domestic heating wood				
Domestic heating biomass				
Crematoria				
Cement kilns				
Lime production				
Glass production				
Ceramics production				
Wood preservation				
Road transport				

Source sector	***PCDD/PCDF***	***PCB***	***HCB***	***PAH***
Marine transport				
Air traffic				
Uncontrolled burning of waste				
Pulp and paper production				
Chemical industry PCP				
Chemical industry Chlorinated pesticides				
Chemical industry Chloranil				
Chemical industry EDC/VCM/PVC				
Petroleum refineries				
other				

(3) analogue concentration in solid process residues (if recently data have become available)

(4) ***analogue concentration other waste (if recently data have become available)***

Annex 2 – List of consulted Stakeholders

1. National Authorities (National Focal Points POP Regulation and Stockholm Convention)

AT	Dr. Helga Schrott	helga.schrott@bmlfuw.gv.at
AT	Barbara PERTHEN-PALMISANO	Barbara.perthen-palmisano@lebensministerium.gv.at
BE	Mr. Bart NAESSENS	bart.naessens@lin.vlaanderen.be
BE	Mr Ortwin Meeuws	ortwin.meeuws@ovam.be
BE	Ms Cécile HERICKX	che@ibgebim.be
BE	Mr Claude DELBEUCK	c.delbeuck@mrw.wallonie.be
BE	Mr Michel AMAND	m.amand@mrw.wallonie.be
BE	Ms Marianne PETITJEAN	m.petitjean@mrw.wallonie.be
BE	Mr Benoît TRICOT	b.tricot@mrw.wallonie.be
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CZ	Jaromir Manhart	jaromir_manhart@env.cz
CZ	Karel Blaha	Karel_Blaha@env.cz
DE	Ms Ulrike KOWALSKI	chemg@baua.bund.de
DE	Dr. Steffi Richter	steffi.richter@uba.de
DK	Mona Westergaard	momwe@mst.dk
EE	Mr Aare Sirendi	aare.sirendi@eu.estemb.be
ES	Jose Elorrieta	jelorrieta@mma.es
ES	Mr. Victor ESCOBAR	vaescobar@mma.es
ES	Ana Garcia	aggonzalez@mma.es
ES	Oscar Gonzalez Sanchez	sgiaprat10@mma.es
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FR	M. Pablo Libreros	pablo.libreros@ecologie.gouv.fr
FR	Xavier Capilla	xavier.capilla@ecologie.gouv.fr
GR	Mr Epaminondas Kriparakos	n.kriparakos@dpers.minenv.gr
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IE	Mr Gerard O'Leary	g.oleary@epa.ie
IE	Mr. Patrick O'SULLIVAN	patrick_o'sullivan@environ.ie
IT	Guiliano Peru	peru.alessandro@minambiente.it
IT	Guiliana Gasparrini	gasparrini.guiliana@minambiente.it
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LV	Ms. Ingrida Apene	ingrida.apene@vidm.gov.lv
LV	Rolands Arturs Bebris	rolands.bebris@vidm.gov.lv
LU	Mr Robert Schmit	robert.schmit@aev.etat.lu
LU	Mr Pierre Dornseiffer	pierre.dornseiffer@aev.etat.lu
LU	Mr Frank Thewes	frank.thewes@aev.etat.lu
MT	Mr Paul SALIBA	paul.saliba@magnet.mt
NL	Mr Jan-Karel B.H. Kwisthout	jankarel.kwisthout@minvrom.nl
NL	Edwin Koekkoek	Edwin.Koekkoek@minvrom.nl
PL	Maria.Klokocka	maria.klokocka@mos.gov.pl
PT	Ms. Tereza Vinhas	_teresa.vinhas@inambiente.pt

PT	**Ms. Paula Santana**	paula.santana@inresiduos.pt
SE	**Ms Monica Törnlund**	monica.tornlund@sustainable.ministry.se
SE	**Lars Lindau**	lars.lindau@naturvardsverket.se
SE	**Niklas Johansson**	Niklas.Johansson@naturvardsverket.se
SE	**Maria Nyholm**	maria.nyholm@naturvardsverket.se
SI	**Vesna Ternifi**	vesna.ternifi@gov.si
SI	**Bojan Rode**	bojan.rode@gov.si
SK	**Ms Marta Fratričová**	fratricova.marta@enviro.gov.sk
SK	**Viera Fecková (Cleaner Prod Center)**	scpc@scpc.sk
UK	**Sekai Ngarize**	sekai.ngarize@defra.gsi.gov.uk
UK	**Jane Stratford**	jane.stratford@defra.gsi.gov.uk
UK	**Ms Nicola Lettington**	Nicola.Lettington@defra.gsi.gov.uk

2. Task Force POPs National Focal Points (First mailing round)

Authorities

Country	Name	authority	e-mail
BE	**Mr. Bart NAESSENS**	ANIMAL	bart.naessens@lin.vlaanderen.be
CY	**Mr. Christos MALIKKIDES**	Head, Industrial Pollution Control Section Department of Labour Inspection	cmalikkides@dli.mlsi.gov.cy
CZ	**Ms. Yvonna HLINOVA**	Air Protection Department Ministry of the Environment	yvonna_hlinova@env.cz
DE			
DE	**Mr. Michael HERRMANN**	UBA	michael.herrmann@uba.de
EE	**Mr. Marek MAASIKMETS**	Senior Officer Environmental Management and Technology Department Ministry of Environment, Estonia	marek.maasikmets@envir.ee
ES	**Mr. Victor ESCOBAR**	Subdireccion General de Calidad del Aire y Prevencion de Riesgos Direccion General de Calidad y Evaluacion Ambiental	vaescobar@mma.es
ES		Ministerio de Medio Ambiente	
FR	**Mrs. Anne-Christine LE GALL**	INERIS	anne-christine.le-gall@ineris.fr
GR			
HU	**Mr. Gabor KOVACS**	Councillor Ministry of Environment and Water Management; Department for Integrated Pollution Control	kovacsg@mail.kvvm.hu
IE	**Mr. Patrick O'SULLIVAN**	Assistant Principal Air/Climate (Rm 2.56); Department of the Environment, Heritage and Local Government	patrick_o'sullivan@environ.ie
IE			
IT	**Ms. Elena DE FELIP**	National Institute of Health	defelip@iss.it
IT	**Mr. Marco STRINCONE**	Functionary National Research Council- Institute on Atmospheric Pollution Ministry for the Environment and Territory	strincone.marco@minambiente.it
NL	**Mr. Ton BLOM**	Directorate Climate Change and Industry Ministry of Housing, Spatial Planning and Environment	ton.blom@minvrom.nl
NL	**Mr. Kaj SANDERS**	policy advisor	kaj.sanders@minvrom.nl

NL	**Mr. Johan SLIGGERS**	Co-ordinator, Acidification and Continental Air Pollution Directorate Climate Change & Industry	johan.sliggers@minvrom.nl
NL	**Mr. Louis ZUIDGEEST**		louis.zuidgeest@minvrom.nl
NL	**Edwin Koekkoek**		Edwin Koekkoek
PL	**Ms. Elzbieta NIEMIRYCZ**	Institute of Meteorology and Water Management (Warszawa)	Elzbieta.Niemirycz@imgw.pl
SE	**Mr. Erik GRAVENFORS**	Ecotoxicologist/Chemist, Senior Technical Officer National Chemicals Inspectorate Sweden Ministry of the Environment	erik.gravenfors@kemi.se
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