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Community Strategy for Dioxins, Furans and Polychlorinated Biphenyls

TABLE OF CONTENTS

1.	Introduction and scope	3
2.	Objectives of the strategy	4
3.	The problem of dioxins and PCBs	5
	3.1. Chemical properties, sources and pathways	5
	3.2. Human health effects	5
	3.3. Ecotoxicology.....	6
4.	Progress in addressing the problem	6
	4.1. Achievements	6
	4.2. International approach	8
	4.3. Gaps.....	9
5.	Basis for Community action	12
6.	Strategy	14
	6.1. Strategy to reduce the presence of dioxins and PCBs in the environment	14
	<i>Short- to medium-term actions</i>	14
	<i>A) Hazard Identification</i>	14
	<i>B) Risk Assessment</i>	16
	<i>C) Risk Management</i>	17
	<i>D) Research</i>	19
	<i>E) Communication to the public</i>	19
	<i>F) Cooperation with third countries and international organisations</i>	19
	<i>Long-term actions</i>	20
	<i>A) Data Collection</i>	20
	<i>B) Monitoring and Surveillance</i>	20
	<i>C) Identification of Measures</i>	20
	6.2. Strategy to reduce the presence of dioxins and PCBs in feed and food	21
	<i>Establishment of Maximum limits</i>	21
	<i>Action levels and target levels</i>	22
7.	Conclusions	23
	Annex I : Existing Community legislation regarding dioxins and PCBs.....	24
	Annex II : Dioxin/PCB studies financed by the Commission/Exposure and Risk Assessments performed by the Commission.....	26
	Annex III : Research Priorities	28

1. INTRODUCTION AND SCOPE

Dioxins, furans and PCBs (*polychlorinated biphenyls*) are a group of toxic and persistent chemicals whose effects on human health and on the environment include dermal toxicity, immunotoxicity, reproductive effects and teratogenicity, endocrine disrupting effects and carcinogenicity. An increase in the presence in the environment of these substances coupled with several accidents (Yusho (Japan), Yu-cheng (Taiwan), Seveso (Italy), Belgium) have triggered a deep concern from the international community for their reduction and control. Moreover, there is considerable public, scientific and regulatory concern over the negative effects on human health and on the environment of long-term exposure to even the smallest amounts of dioxins and PCBs.

Over the past two decades the Commission has proposed wide ranging legislation aimed at directly or indirectly reducing the release of these compounds into the environment, with the objective of reducing human exposure and protecting human health and the environment. Recent exposure data show that measures introduced to control dioxin releases have resulted in a substantial reduction in intake of these compounds : levels in humans are decreasing since the mid eighties. Since 1995 this tendency is levelling out, even slightly rising levels have been observed.

There is a pressing need for further action to avoid environmental and adverse health effects from dioxins and PCBs, because :

- ***Bioaccumulation is continuing along the trophic chain*** and releases go on from landfills, polluted soils or sediments. The sharp decrease of “background levels” in the environment in the last 20 years will probably not be repeated in the coming decades.
- ***The toxic properties seem to have been underestimated*** and new epidemiological, toxicological and mechanistic data have emerged in particular with respect to ***neurodevelopmental, reproductive and endocrine effects***, which indicate that dioxins and some PCBs have a broader impact on health than previously assumed, even in very low doses and in particular on the most vulnerable groups like breast-fed infants and the foetus, which is directly exposed to the accumulated maternal body burdens.
- ***The dietary exposure to dioxins and dioxin-like PCBs exceeds the Tolerable Weekly Intake (TWI) or the Tolerable Daily Intake (TDI) for a considerable part of the European population:*** the Scientific Committee on Food (SCF) of the EU adopted on 30 May 2001 an opinion on the Risk Assessment of dioxins and dioxin-like PCBs in food. The Committee established a group TWI for dioxins and dioxin-like PCBs of 14 pg Toxic Equivalent (WHO-TEQ) /kg bodyweight. This TWI is in line with the provisional Tolerable Monthly Intake of 70 pg/kg bodyweight/month established by the Joint FAO/WHO Expert Committee on Food Additives (JECFA) at its fifty-seventh meeting (Rome, 5-14 June 2001) and concurs with the lower end of the range TDI of 1-4 pg WHO-TEQ/kg body weight, established by the World Health Organisation (WHO) Consultation in 1998. Representative recent dietary intake data indicate that the average dietary

intakes of dioxins and dioxin-like PCBs in the EU is in the range of 1.2-3 pg/kg bodyweight and day which means that a considerable part of the European population would still exceed the TWI or TDI.

- ***The European Community has acquired new obligations by becoming a contracting party to several conventions in the field of dioxin and PCB (see 4.2).***
- ***The enlargement of the European Union to include Accession Countries is likely to increase the average exposure in EU.*** Indeed, the accession countries are likely to produce higher emissions than the EU at the present time through variation in legislation and due to the vast abundance of worn industrial plants. They are probably high contributors to the total dioxin emissions into the European Environment. This puts an emphasis on the need to ensure compliance with the relevant environmental acquis in the Accession Countries.

In view of the general concern and the new elements that have been described, it has been deemed necessary to develop a Community Strategy for dioxins and PCBs. The Commission has therefore adopted this strategy in order to secure better protection of human health and of the environment from the effects of dioxins and PCBs.

The scope of this Strategy will cover the *polychlorinated dibenzodioxins (PCDDs)* commonly known as dioxins, *polychlorinated dibenzofurans (PCDFs)* commonly known as furans and *polychlorinated biphenyls (PCBs)*. As a way of simplification, throughout the document, the word dioxin will comprise dioxins and furans. Among the PCBs, in term of toxicity, special attention will be given to a small group of so called « *dioxin-like PCBs* »¹ which exhibit dioxin-like toxicity.

2. OBJECTIVES OF THE STRATEGY

The objectives of the strategy are :

- to assess the current state of the environment and the ecosystem;
- to reduce human exposure to dioxins and PCBs in the short-term and to maintain human exposure at safe levels in the medium to long term;
- to reduce environmental effects from dioxins and PCBs.

The quantitative objective is :

- to reduce human intake levels below 14 picograms WHO-TEQ per kg bodyweight per week.

¹ namely those with no chlorine in the ortho positions (= *coplanar PCB*) or those with only one chlorine in one of the four ortho positions (= *mono-ortho chlorinated PCB*)

3. THE PROBLEM OF DIOXINS AND PCBs

3.1. Chemical properties, sources and pathways

Dioxins, furans and PCBs are 3 of the 12 UNEP internationally recognised Persistent Organic Pollutants (POPs). POPs are organic compounds of mainly anthropogenic origin which are characterized by their lipophilicity, semi-volatility and resistance to degradation. These characteristics pre-dispose these substances to long environmental persistence and to long-range transport. They are also known for their ability to biomagnify and bioconcentrate under typical environmental conditions, thereby potentially achieving toxicologically relevant concentrations. Due to their toxic characteristics they pose a threat to humans and to the environment. It is important to highlight that dioxins and PCBs have similar chemical properties and hazardous characteristics but the sources of releases are different. Therefore an effective approach to controlling and reducing their release into the environment should address both of them, but taking into account the differences:

Dioxins are formed essentially as *unintentional by-products* in a number of chemical processes as well as in almost every combustion process. Soils and sediments are important reservoir sources given the persistence of these pollutants in the environment. The most important route for human exposure to dioxins is *food consumption*, contributing for more than 90 % of total exposure, of which products of fish and other animal origin account for approximately 80 % of the overall exposure.

PCBs, and that is the main difference with dioxins, are *intentionally produced* chemicals, that were manufactured for decades before the ban in marketing and use was adopted in 1985 due to their reproductive toxicity and bio-accumulative effects. The main part of these products, which are very persistent and bioaccumulable in fat of biota, is now spread in soils, sediments and in the whole aquatic environment ("historical pollution"). There are two types of uses of PCBs : 1) Closed uses : dielectric fluids in electrical equipment. From these uses, the main sources of releases are : leakage, fires, accidents, illegal dumping and inadequate disposal. 2) Open uses : as pesticide extenders, flame retardants, sealants, paints,... From these uses the main sources of releases are : landfilling, migration, air emissions from evaporation. Other less significant sources are waste incineration, sewage sludge application to land, combustion of waste oils, as well as PCB reservoirs, such as marine and river sediments and harbour sludges.

The fact that dioxins are more toxic than PCBs, but that the quantities of PCBs released to the environment are several times higher has to be taken into account.

3.2. Human health effects

A number of types of cancer, as well as total cancer incidence, have been related to accidental and occupational exposure to dioxins (mostly *TCDD*²). In addition, an increased prevalence of diabetes and increased mortality due to diabetes and cardiovascular diseases have been reported. In children exposed to dioxins and/or PCBs in utero, effects on neurodevelopment, neurobehaviour and effects on thyroid

² 2,3,7,8-tetrachlorodibenzo-p-dioxin

hormone status have been observed at exposures at or near background levels. At higher exposures, due to accidental and occupational exposure, children exposed transplacentally to PCBs and dioxins show skin defects (such as chloracne), tooth mineralisation defects, developmental delays, behaviour disorders, decrease in penile length at puberty, reduced height among girls at puberty and hearing loss. A shift in sex ratio towards females has been observed at the Seveso site when fathers were exposed to *TCDD*. Humans, sea birds and aquatic mammals are priority targets and victims, as they are at the end of the aquatic trophic chain of these products which bioaccumulate in animal fat. Although dioxin is known as a human carcinogen, cancer is not considered to be the critical effect for the derivation of the Tolerable Intake. The critical effects are neurobehavioral changes, endometriosis and immunosuppression. PCBs are classified as probable human carcinogens and produce a wide spectrum of adverse effects in animals, including reproductive toxicity, immunotoxicity and carcinogenicity.

3.3. Ecotoxicology

A wide range of toxicological effects has been observed in wildlife exposed to dioxins in their environment. They range from chronic to acute and include reduction in reproductive success, growth defects, immunotoxicity and carcinogenicity. However, outside the laboratory, it has not often been possible to demonstrate a clear cause/effect relationship between the observed effects and the exposure to dioxins. Early life stages (eggs, embryos, larval stages) of most species studied tend to be most sensitive to dioxin toxicity, because the chemicals act on a number of systems important to growth and development, such as Vitamin A and sex hormone metabolism.

4. PROGRESS IN ADDRESSING THE PROBLEM

4.1. Achievements

According to the "European Dioxin Emission Inventory, Stage II" (LUA-NRW³, 2001), launched by the Commission, considerable improvement of the general situation concerning emissions to air during the last decade has occurred which is due to comprehensive abatement measures carried out in the most industrialised Member States. This improvement is reflected by decreasing dioxin concentrations in ambient air and declining depositions. Furthermore, the above-mentioned report assessed the emission trend 1985-2005 and foresees that for those *industrial processes* which are considered as the most relevant emission sources a 90% reduction of dioxin emissions to air will be nearly realised in 2005. This is to a large part due to the successes regarding particular emission sources which already by 1985/1990 were target of active dioxin-abatement policy. In 1985 dioxin emissions from industrial sources represented 77 % of the total (industrial + non-industrial) dioxin emissions.

In order to get a clearer insight and to be able to address the problem in an efficient way the Commission has financed several *studies* (Annex 2) and has proposed a

³ Landesumweltamt Nordrhein-Westfalen

number of *Directives* (Annex 1) which reduce the releases of dioxins and PCBs into the environment thereby reducing human exposure to these compounds :

□ **Waste incineration**

In 1989, for the first time the EU adopted legislation to reduce dioxin emissions from municipal waste incineration by setting up so-called *operational conditions*, leading to a significant reduction of dioxin emissions. In response to the target set by the 5th EAP the Directive 94/67/EC on the incineration of hazardous waste has been added : for the first time an *emission limit value (ELV)* was set at Community level. In view of the importance of waste incineration as a source of dioxin emissions, the Commission has proposed a new Directive on incineration of waste which will become applicable to existing plants in summer 2005. This new directive which sets an *ELV for all waste incinerators* aims to reduce as far as possible negative effects on the environment caused by the incineration and co-incineration of waste and also targets the incineration of non-hazardous waste, which was once the largest source of emissions of dioxins into the atmosphere. The dominant source of dioxins in the EU has traditionally been *uncontrolled waste incineration*. The Directives on waste incineration ensure that this will no longer be the case.

□ **Integrated Pollution Prevention and Control (IPPC)**

Other relevant industrial sectors that generate dioxins are covered by the IPPC Directive and the BREFs⁴ address dioxins explicitly, giving clear indications on achievable ELVs. The Directive is an “*integrated*” (ie, simultaneously addressing all environmental media – air, water, soil) approach to industrial emission control, such as dioxin emissions. All installations covered by Annex I of the Directive, including installations with dioxin emission potentials are required to obtain a permit from the authorities in the EU countries. The permits must be based on the concept of *Best Available Techniques (BAT)* and must include ELVs for certain pollutants such as dioxins. The Directive provides for the set-up of a European Pollutant Emission Register, which is a monitoring and harmonization mechanism designed to collate and publish every three years an inventory of the principal industrial emissions, including dioxin emissions to the air and their sources. Existing installations have to comply by October 2007.

□ **The Seveso Directives on the control of major-accident hazards**

The Seveso Directives are of critical significance for the protection of communities in the surroundings of relevant installations, and seek to avoid serious accidents such as the Seveso catastrophe in 1976. Directive 96/82/EC, replacing Directive 82/501/EEC, aims at the prevention of major-accident hazards involving dangerous substances such as dioxins and secondly, as accidents still continue to occur, it aims at the limitation of the consequences of such accidents.

□ **Releases to water**

Directive 76/464/EEC establishes the framework for laying down emission limit values and environmental quality standards at EU level for certain categories of substances, including dioxins and PCBs. The Water Framework Directive

⁴ Best Available Techniques Reference documents

2000/60/EC integrated the provisions under 76/464/EEC and provides for the progressive reduction or cessation of discharges, emissions and losses of pollutants to water.

□ **Restrictions on marketing and use of chemicals :**

In 1985, the use of PCBs and PCTs was banned through Directive 85/467/EEC relating to restrictions on the marketing and use of certain dangerous substances and preparations.

□ **Shipment and disposal of PCB-containing waste**

Although PCBs and dioxins are identified as a hazardous waste in Council Directive 91/689/EEC the Commission has recognised the need for additional legislation on the disposal of PCB-containing waste, and has introduced such legislation : Council Directive 75/439/EEC on the disposal of waste oils set a maximum limit of 50 ppm for the PCB content of regenerated oil or oil used as fuel. The Council Regulation (EEC) No 259/93 sets strict control procedures for the shipment of PCB-containing waste, to avoid their illegal dumping. A specific Directive (96/59/EC) for the disposal of PCBs and PCTs aims at disposing completely of PCBs and equipment containing PCBs as soon as possible, and for big equipment before the end of 2010. This Directive sets the requirements for an environmentally sound disposal of PCBs. Member States have to make an inventory of big equipment containing PCBs, have to adopt a plan for disposal of inventoried equipment, and outlines for collection and disposal of non inventoried equipment (small electrical equipment very often present in household appliances manufactured before the ban on production of PCBs). The proposal for a Directive on Waste from Electric and Electronic Equipment, which is now being discussed by Council and the European Parliament, will certainly have a strong impact on the separate collection and environmentally sound disposal of electrical equipment containing PCBs, as it contains an explicit obligation of segregation of the hazardous components of electric and electronic equipment before any subsequent treatment is applied. The Directive on Landfill of Waste (99/31/EC) has resulted in a significant change in the volume and nature of waste accepted at Europe's landfill sites. It has also led to improvements in design and operating standards, as well as in the aftercare of new and existing landfills. Therefore it should achieve a significant decrease in the releases of PCBs in landfills.

□ **Animal nutrition**

As a consequence of two contamination incidents in the animal feed sector (citrus pulp pellets from Brazil with high dioxin contamination in 1998 and highly contaminated kaolinitic clay from certain mines in 1999) maximum limits have been established for dioxins in citrus pulp pellets and kaolinitic clay.

4.2. International approach

The international community has called for *urgent global actions* to reduce and eliminate the release of dioxins and PCBs. Therefore the Commission actively participates in a number of *relevant international activities*, of which the following are particularly worth mentioning :

- the 1990 declaration adopted by the *North Sea Conference* undertaking, inter alia, 70 % reductions of chlorinated dioxins;
- the revised Protocol of the *Barcelona Convention* for the protection of the waters of the Mediterranean from land-based sources, where dioxins are included in the list of substances to be controlled;
- The Joint *UNECE/WHO-ECEH⁵ Task Force on Health Aspects of Long-Range Transboundary Air Pollution* organised meetings in order to initiate the preparation of the assessment on health risks of POPs from LRTAP;
- a new *exchange of letters between the Commission and the WHO* has been finalised beginning of 2000 to strengthen and intensify the framework of co-operation. During the EC/WHO seminar on co-operation on environment and health issues (Brussels, September 2000) WHO and the EC discussed possible future co-operation in the field of dioxins and PCBs and decisions were reached on concrete actions.

The European Community is also a ***Contracting Party to several Conventions*** with regard to dioxins and PCBs :

- The *Basel Convention* is designed to control the transboundary movements of hazardous waste and their disposal. PCBs and dioxins are classified as hazardous wastes.
- the *OSPAR Convention for the protection of the marine environment of the north-east Atlantic* agreed in 1998 on the objective to cease emission, discharges and losses of hazardous substances by 2020 in order to achieve “close to zero” concentrations of compounds such as dioxins/PCBs in the marine environment.
- The *Convention on the protection of the marine environment of the Baltic Sea Area* : the contracting parties declare to prohibit, totally or partially, the use of PCBs in the Baltic Sea and its catchment areas.
- The *UNECE POPs Protocol to the Convention on Long-Range Transboundary Air Pollution*, signed by the EU in Aarhus in June 1998, aims to control and reduce the emissions of a number of POPs which require the most urgent action, such as dioxins and PCBs.
- the *Stockholm Convention (POPs Convention)*, signed by the EU in May 2001 in Stockholm, aims to reduce the total release of dioxins, furans and PCBs, with the goal of their continuing minimization and, where feasible, ultimate elimination.

4.3. Gaps

Although a lot of progress has been achieved in reducing the releases of dioxins/PCBs in the environment, the following facts have been stated :

⁵ United Nations Economic Commission for Europe/World Health Organisation-European Centre for Environment and Health

- ***The target set in the 5th EAP will not be achieved*** : for the *industrial sources* a considerable emission reduction has been attained (based on current trends and activities it is foreseen that the target set in the 5th EAP of a 90% reduction will be nearly realised in 2005 compared to the levels in 1985) BUT, for the *non-industrial sources* (domestic solid fuel burning, domestic waste burning, fires, etc..) the rate of emission reduction is much lower. The relation between industrial and non-industrial sources is shifting towards growing importance of non-industrial sources.
- 1 Million tons of PCBs have been produced and used during the 20th century until their ban in 1985. The main part of these products, which are highly resistant to degradation (>30 years) and bioaccumulable in fat of biota, is now spread in soils, sediments and the whole aquatic ecosystem ("**Historical pollution**").
- Much ***equipment and material containing PCBs*** will be reaching in the coming years, if they have not done so yet, their ***waste stage***, and a correct disposal has to be ensured to avoid additional releases in the environment.

Therefore, and in combination with the new elements described in the introduction, there is a need to further address the problem in order to protect human health. To reduce *human intake* it is important to reduce the levels in the *foodchain* because food consumption is the most important route for human exposure (90% of total exposure). The most efficient way to reduce the levels in the foodchain is to reduce the *contamination in the environment*. This should be done by :

- 1) avoiding "new releases" in the environment;
- 2) addressing "historical pollution".

In order to realise this the **remaining gaps** have been identified on the basis of which an action plan has to be developed. These gaps can be classified in gaps in knowledge, gaps in legislation and gaps in implementation of Community legislation.

□ ***Gaps in knowledge*** :

Sources and inventories : regarding the emission sources data gaps still exist causing considerable uncertainties of the emission estimates. The Inventory of releases to land and water is not complete : further research and data collection is needed to verify the scale of releases from the source sectors which have a high potential for release.

Emissions in the Accession Countries : important dioxin and PCB sources should be identified in the Accession Countries, which may be high contributors to the total dioxin and PCB emissions into the European environment.

Monitoring programmes should be developed in order to control compliance with existing legislation and to monitor the effects of this strategy, the state of the environment and the trends. These programmes will be essential in order to further identify measures.

Measurement methods and standards : a necessary condition for effective control and monitoring mechanisms is the availability of appropriate measurement methods and the comparability of data. At present, methods for analyses of dioxins and dioxin-like PCBs are expensive and slow. Therefore low-cost and fast methods have to be developed allowing to analyse in routinely manner a great number of samples and to provide quick, cheap, and reliable results on the presence of those compounds in the environment, feed and food. In order to obtain comparable, consistent, reliable and high quality measurement results it is necessary to implement a high quality measurement standard at Community level.

Dioxin-like PCBs : measurement programs performed in the past focused mostly on dioxins. Yet a variety of other compounds probably having similar adverse health effects have been identified, the so-called *dioxin-like PCBs*. The available database is insufficient to assess the current situation with respect to *dioxin-like PCBs*. Therefore the Commission recently launched a study to collect information on concentrations of dioxin-like PCBs in food, feed and in environmental samples across Europe.

Risk Assessment : the European Scientific Committee on Animal Nutrition (SCAN) adopted an opinion on “Dioxins in Feed” on 6/11/2000 and the Scientific Committee on Food (SCF) adopted an opinion on “Risk Assessment of dioxins and dioxin-like PCBs in Food” on 22/11/2000. The SCF updated its opinion on 30/5/2001 based on new scientific information available since the adoption of the SCF opinion of 22nd November 2000. However, for the *non dioxin-like ("classical" or "non-coplanar") PCBs* which have another toxicological profile, which circulate more easily through muscles and blood and affect directly the nervous system and brain development (namely for foetus and young children) and which could be several orders of magnitude more concentrated than dioxins in aquatic biota such as fish and shellfish a risk assessment should be carried out.

Public information is needed to inform the public, to allay public concern, to raise awareness about the risks associated with exposure to these compounds and about the role they have to play to prevent further contamination of the environment. It is also important to allow « self identification » of at-risk groups.

Further research is needed on environmental fate and transport, ecotoxicology and human health, agrofood industry, source inventories, analytical aspects, decontamination measures and monitoring. The most important gaps in knowledge concern : 1) *transfer and degradation processes* (a better understanding and quantification of the fundamental transfer processes by which dioxins and PCBs move between the different environmental media and of the degradation processes occurring within these media is needed); 2) *bio-accumulation and bio-magnification processes*; 3) *domestic incineration of wood* (there is an information deficit concerning the amount and the composition of wooden fuels used for room heating and cooking purposes); 4) *reservoir sources* (the contribution to human exposure, the behaviour and degradation processes and decontamination methods require examination); 5) *open uses of PCBs*; 6) *carry-over rates and transfer factors* for dioxins and PCBs from soil and feed to animal tissues and products (milk, eggs).

□ **Gaps in legislation** :

Legislation in order to limit and control the presence of dioxins and PCBs in feed and food:

In 1998, citrus pulp pellets (CPP) from Brazil with high dioxin contamination were found. Comprehensive investigations revealed that the use of highly contaminated lime (calcium hydroxide) used for the production of citrus pulp pellets was the source of the dioxin contamination of this CPP. It turned out that the highly contaminated lime used was a by-product from a chemical production process.

In 1999, in Belgium the contamination of fat used for production of feedingstuffs caused a severe contamination of different animal products. Investigations found that the discharge of a technical PCB mixture at fat collection sites used for feedingstuffs production had caused this dioxin contamination. In the same year, grass meal with high dioxin contamination was found in Germany. Here, the dioxin contamination came from the drying process: in an open system, all kinds of wood were burnt, including waste wood with chemical contamination from former paintings or use of preserved wood.

Also in 1999, kaolinitic clay, used as “anticaking agent” in feedingstuffs and as carrier for production of mineral feed was found to be highly contaminated if it originated from certain mines. Gradually it became obvious that a natural source was discovered. Possibly, geothermal processes formed this unique pattern of dioxins over time from organic material and chlorine.

In June 2000, dioxin levels were found in certain premixtures containing choline chloride, which is used as an animal feed additive. Investigations tracing back the source of contamination revealed that it was not the pure choline chloride itself but the carrier which was contaminated. Although the carrier was declared as corn cob meal, analysis demonstrated that it was not only composed of corn but also of rice husks and/or saw dust presumably treated with a wood preservative. The congener pattern found in the contaminated lots was consistent with the pattern typical of a pentachlorophenol contamination, which is used as wood preservatives. During the year 2000, the trace elements zinc oxide and copper oxide from certain origins have been found to be contaminated with dioxins at increased levels. These incidents clearly indicate the need to establish legislation in order to limit and control the presence of dioxins and PCBs in feed and food.

□ *Gaps in implementation of the Community legislation*

The PCB Directive has not been adequately implemented and several infringement cases have been launched against Member States for failure to implement the obligations under this Directive. In the case of PCBs there is currently a deadline of 2010 for destruction and disposal (pursuant to Directive 96/59/EC on the disposal of PCBs and PCTs) of big equipment. However, Member States are experiencing problems for establishing the mandatory inventories of PCB-containing equipment and to prevent the illegal dumping and inadequate disposal of PCBs.

5. BASIS FOR COMMUNITY ACTION

- *The Treaty establishing the European Community* provides in Article 152 that a high level of human health protection shall be ensured in the definition and implementation of all Community policies and activities and in Article 174 that Community policy on the environment is to contribute to preserving, protecting and improving the quality of the environment and to protecting human health.
- The *Feira European Council* held on 19 and 20 June 2000 reaffirmed the need to ensure a high level of protection of human health in the definition and

implementation of all Union policies. Food safety policy must apply to the entire animal and human food chain and food legislation meeting the most stringent public health criteria should be in place as soon as possible. The European Council asked the Commission to propose harmonised maximum levels for contaminants, in particular for dioxins.

- The **European Parliament** in its plenary session on 4 October 2000 discussed a proposal for a Directive of the European Parliament and of the Council on undesirable substances and products in animal nutrition. On this occasion, the European Parliament called upon the Commission to set maximum limits for dioxins and PCBs in all feedingstuffs without delay.
- The European Parliament (DG Research : Scientific and Technological Options Assessment) financed the study "Dioxins and PCBs : Environmental and Health Effects" (Bipro-Irce, July 2000) aimed at developing political and technical options for an integrated and systematic approach to secure better protection of human health and of the environment from the effects of dioxins and PCBs. The study aimed to effectively contribute to the European discussion and to support a European dioxin and PCB strategy.
- The European Parliament (Committee on the Environment, Public Health and Consumer Policy) prepared a report on the implementation of Directive 96/59/EC on the disposal of PCBs, and adopted a Resolution in January 2001. The Parliament recommended that the immediate priority should be to implement the existing legislation and called on Member States to make additional efforts to fulfill their obligations. Finally, the Parliament considered that the PCB Directive should be a test case for a better development of more effective policies on other highly toxic substances.
- **The Precautionary Principle** : precaution underlies the concern of the Commission and is embedded within this Strategy.
- In the **Fifth Environment Action Programme** entitled "**Towards sustainability**", presented by the European Commission to the Council, and approved by the Council in 1993 the need to reduce emissions of dioxins is specifically mentioned in relation to air pollution and the treatment of waste. In particular, a target is set for a 90% reduction of dioxin emissions to air from identified sources by the year 2005 compared to 1985 levels.
- In the **Sixth Environment Action Programme** entitled "**Environment 2010: Our Future, Our Choice**" the overall Environment-Health objective is to achieve a quality of the environment where the levels of man-made contaminants do not give rise to significant impacts on or risks to human health.
- In the **White Paper on Food Safety**, the Commission identified the obvious need to define standards for contaminants throughout the chain from feed to food. In the Action Plan on Food safety annexed to the White paper on Food Safety, the setting of maximum levels for several contaminants including dioxins and PCBs for foodstuffs was one of the measures to be implemented with a view to achieving the highest possible level of health protection. Unavoidably, complementary to the measures to be proposed at the level of food and feed, the need for source directed measures reducing the contamination of the environment has been identified.

6. STRATEGY

To secure better protection of human health and of the environment from the effects of dioxins and PCBs an integrated and systematic approach is needed. Therefore the Commission proposes a strategy :

- 1) to reduce the presence of dioxins and PCBs in the environment;
- 2) to reduce the presence of dioxins and PCBs in feed and food.

This strategy aims to fill the identified gaps, to improve the link between data collection and a consistent Community response system, to adjust the existing sectoral legislation in order to achieve the Environment-Health objectives of the 6th EAP and to develop incentive measures promoting exchange of information and experience between Member States.

Full enforcement of existing Community legislation by the Member States is a prerequisite to achieve the objectives pursued by this strategy. Furthermore the success of the strategy will critically depend on the action taken at local and regional level by communities and Member States.

6.1. Strategy to reduce the presence of dioxins and PCBs in the environment

All assessments have stressed the urgent need to reduce the sources of environmental contamination with these compounds to the lowest possible as the most appropriate way to reduce human exposure. Therefore, a set of actions has to be identified for the short- to medium-term and for the long-term.

SHORT- to MEDIUM-TERM ACTIONS (5 years)

This set of actions relates to Hazard Identification, Risk Assessment, Risk Management, Research, Communication to the public and Cooperation with third countries and international organisations.

A) Hazard Identification

Further identification of Dioxin and PCB sources

A complete inventory of sources and more knowledge on the share of the different *dioxin sources* is essential. "The European Dioxin Emission Inventory, Stage II", (LUA-NRW,2001), launched by the Commission, identified the need for further investigation or actions on specific sources. The Commission will therefore take the following actions :

Hospital waste incinerators : a comprehensive inventory on these facilities, including their main operation data will be generated in the short-term and those countries still relying on the on-site incineration of hospital waste will be encouraged to change to other, less emissive waste management systems and treatment methodologies as soon as possible. This will be supported through the new Directive 2000/76/EC on the incineration of waste as new hospital waste incinerators will have to comply with the obligations of the Directive in December 2002 and all the existing incinerators by December 2005.

Iron ore sintering might become the most relevant industrial sector. The importance of this source will be further enhanced by the facilities located in accession countries. Emission measurements at the plants still not tested will be carried out. Since dioxin emissions from sintering plants may be reduced considerably by primary measures the Commission will help to spread this knowledge to the respective contacts in the iron and steel industry. The BREF⁶ on the production of iron and steel - established under the IPPC⁷ Directive (96/61/EC) - describes such primary measures and is already available on the internet (<http://eippcb.jrc.es>). The Commission will further promote the use and implementation of BAT in this sector.

Electric arc furnaces might be the only industrial source with constant or increasing emissions to air. However, through application of suitable abatement technologies which have already been developed this trend could be stopped in the future. The same BREF as mentioned in the paragraph above provides also information about dioxins from electric arc furnaces. The Commission will further promote the use of BAT in this sector in the framework of the exchange of information co-ordinated by the European IPPC Bureau.

Non - ferrous metal industry : the facilities for zinc recovery from electric arc furnace (EAF) filter dusts have proven to be major dioxin emission sources. All facilities for zinc recovery from EAF dusts and similar materials and dioxin emissions from these installations will be determined. The BREF of the non-ferrous metal sector mentions the techniques for reduction of dioxin emissions in this sector, which the Commission will further promote.

Miscellaneous industrial sources : there is a vast number of miscellaneous industrial installations with small dioxin releases per each facility but together contributing considerably to the annual dioxin emissions in Europe, such as secondary smelters for non-ferrous metals (aluminium, copper), iron foundries (cupola furnaces), cement production. The Commission will encourage the licensing authorities to evaluate possible dioxin emissions from these "low emissive" installations in a case-by-case consideration taking into account the information available on BAT for those sectors.

For the categories of installations with the highest dioxin emission potential the IPPC Directive envisages the adoption of emission limit values for dioxins when the need for Community action has been identified on the basis, in particular, of the exchange of information provided for in Article 16.

Non-industrial emission sources : concerning the *domestic solid fuel combustion* the Commission intends to set up an emission inventory for all EU and Accession countries and to carry out further research and an accurate quantification on domestic wood and coal combustion. In the framework of the Risk Communication Strategy (see 6.1.E) better information will be provided to the public on the environmental effects and the abuse of inappropriate materials as fuels for heating purposes and on the risks of *domestic waste burning* ("backyard burning"). More research on the *natural sources* of dioxins (clay, mines, etc..) and their share in the overall release into the environment will be promoted. Recently concern was raised on the emission of dioxins, among a range of other substances, from the *burning of animal carcasses*

⁶ Best Available Techniques Reference document
⁷ Integrated Pollution Prevention and Control

on pyres as a result of the foot and mouth disease. The Commission will consider whether this choice of disease control strategy is sustainable in view of the practical difficulties it presents in containing its environmental impact in a timeframe that is consistent with rapid and effective disease control. The aim will be to ensure that unacceptable emission of hazardous substances into the environment and consequently in feed and food chain do not occur.

The Inventory of releases to *land and water* is still incomplete. Further research and data collection will be carried out to verify the scale of releases from the source sectors which have a high potential for release. Not just measurements on concentrations, but also further research on details of activity and processes will be included.

For the *PCB sources* the Commission will accelerate the establishment of PCB inventories as Directive 96/59/EC requires and will gain more knowledge on the different open uses of PCBs. In that view, the Commission intends to launch a study on the open uses of PCBs. The PCB problem has been seen as an historic one but recent studies indicate that there may be significant contemporary emissions from a number of industrial processes. Therefore, more recent data are required to assess whether PCBs are formed in the processes or whether the findings are due to re-emission of existing PCBs.

B) Risk Assessment

Non dioxin-like PCBs

The Commission will address to the SCF⁸ a request for evaluation of the "*non dioxin-like PCB's ("classical" or "non-coplanar" PCBs)*" which have another toxicological profile, which circulate more easily through muscles and blood and affect directly the nervous system and brain development and which could be several orders of magnitude more concentrated than dioxins in aquatic biota such as fish and shellfish.

Development of measurement methods

It is necessary to perform more measurements in order to 1) *control compliance* with existing legislation and also, in order to 2) *monitor* the effects of executed measures, the state of the environment and the trends. Therefore, scientific research and technological development on low-cost and easily applied routine tests for the measurement of dioxin and dioxin-like PCB contamination in environmental samples in feed and food as well as research in the field of continuous measurements of dioxin emissions to air will be promoted. Moreover, guidelines and standards for sampling, data generation and reporting will be developed.

During the EC/WHO seminar (Brussels, September 2000) the WHO and the EC decided to jointly organise a workshop to evaluate rapid screening methods and to identify the research needs in this area.

Establishment of environmental indicators, including bio-indicators

In order to monitor the impact of regulatory controls on the environment and on human exposure to dioxins and PCBs indicators will be developed. The selection of environmental indicators for monitoring purposes will be a short- to medium term

⁸ Scientific Committee on Food

action, even though its monitoring is a long-term action. Key organisms, products or compartments will be selected to monitor their dioxin and PCB concentration. This will be done in close co-operation with the Joint Research Centre, the European Environment Agency and the WHO.

C) Risk Management

Prevention measures

Priority will be given to specific actions preventing the formation and release of dioxins and PCB : the Commission will promote the development and use of substitute or modified materials, products and processes to prevent the formation and release of dioxins and PCBs taking into consideration the general guidance on prevention and release reduction measures in Annex C of the UNEP POPs⁹ Convention. This will be done by funding research in this field and by co-ordinating the exchange of information and experiences between Member States.

Control of emissions

To reduce the total releases derived from anthropogenic sources of dioxins and PCBs with the goal of their continuing minimization and, where feasible, ultimate elimination the Commission shall take the following measures according to the obligations of the UNEP POPs Convention :

Promote the exchange of information and experiences between Member States as concerns the current application of available, feasible and practical measures that can expeditiously achieve a realistic and meaningful level of release reduction or source elimination.

Promote the use of BAT and technology transfer in sectors with dioxin and PCB emission potential : the Commission has organised an exchange of information between experts, industry and environmental organisations, co-ordinated by the European IPPC Bureau. In this framework the Commission will encourage the Member States to phase in existing IPPC installations well before the deadline of October 2007. The Commission will also encourage the representatives of Member States and the industries concerned to continue to fully participate in the ongoing information exchange on BAT, and pay special attention to the sectors with dioxin/PCB emission potential thereby ensuring that the final BREFs will contain progressive BAT conclusions regarding dioxins/PCBs. The Commission will encourage organisations representing the industries concerned as well as public authorities to continue to raise awareness within the industries concerned of the obligations under the IPPC Directive, so that operators are well prepared to implement BAT at the latest by October 2007.

Support voluntary measures for the prevention of accidents : commercial enterprises can voluntarily participate in an environmental management system according to Council Regulation (EEC) No 1836/93 (EMAS) or according to ISO 14000. This action is an additional effort to reduce emissions from accidents in spite of existing legal regulations which are laid down in the Council Directive 96/82/EC on the control of major-accident hazards involving dangerous substances. Therefore the

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United Nations Environment Programme Persistent Organic Pollutants

Commission will encourage the development of codes of "best risk management practices" to prevent accidents in the relevant industries.

Clean Air for Europe programme (CAFE) : an important goal for CAFE, as far as dioxin emissions to air are concerned, is to ensure that the various inventories (EIONET, CORINAIR, EPER, EMEP) are harmonised. The identification of measures to reduce dioxin emissions to the air is another area in which links with CAFE are foreseen. The sectoral co-ordination group to be set up under CAFE will foster information exchange between CAFE, the sectoral integration dossiers and specific sectoral emission reduction policies (such as IPPC). Dioxins will be one of the files to be represented on this group.

Control of the quality of the environment

In order to address the problem of fraudulent dumping of PCBs in the environment the Commission will initiate a debate within the Community to assess the suitability of public or private subsidies for the disposal granted to the holders of PCB-containing equipment to prevent any illegal dumping.

The Commission will take all necessary steps to control dioxins and PCBs in all the environmental compartments :

Water : The Commission supports two studies on priority substances, including dioxins and PCBs, in the field of water policy with regards to emissions, discharges and losses, source identification, proposals for measures, and quality standards. The "Marine Global Strategy" will include monitoring of micropollutants such as dioxins and PCBs in water, sediment and ecosystem.

Soil : The Commission will establish the cartography of highly polluted soils and sediments. A complete map with accurate results can be only foreseen within 5-10 years. Since the dioxin/PCB contamination of feed and food is highly dependent on the soil and sediment contamination this will provide competent authorities with an important tool to limit the contamination of the feed and food chain as much as possible.

Waste : in order to ensure that stockpiles consisting of or containing PCBs and wastes, including products and articles upon becoming wastes, consisting of, containing or contaminated with dioxins and PCBs are managed in a manner protective of human health and the environment, the Commission shall take the following measures according to the obligations of the Stockholm Convention :

- Support the development of appropriate strategies for identifying a) stockpiles consisting of or containing PCBs and b) products and articles in use and wastes consisting of, containing or contaminated with dioxins and PCBs;
- Support the identification, to the extent practicable, of stockpiles consisting of or containing PCBs on the basis of the above-mentioned strategies;
- Endeavour to develop appropriate strategies for identifying sites contaminated by dioxins and PCBs.

The Commission will promote the exchange of information between inspectorates of the different Member States on the subject of PCB waste and compliance with current EU regulations. In the context of the BAT Reference document on waste recovery and disposal activities, to be prepared in 2002 to 2004, special attention will be given to determining BAT for the treatment of waste materials contaminated by PCBs and dioxins. The Commission supports a study entitled "Dioxins and other POPs in wastes and their potential to enter the foodchain" in order to fill the data gaps on the subject of the re-use of contaminated waste in the feedingstuff production. Lands have been heavily contaminated by disposal of dioxin and PCB-containing waste. As one of many possible preventive measures of further contamination of the soils, the Commission is considering to amend Directive 86/278/EEC on the protection of the environment, and in particular of the soil, when sewage sludge is used in agriculture in order to ensure a high level of environmental protection. A careful assessment of the opportunity of including threshold limit values in sewage sludge for dioxins and PCBs will be carried out.

D) Research

The Commission will encourage all types of research that will contribute to reduce the impact of dioxins and PCBs. It will also bring together researchers across projects to exchange information and will facilitate co-ordination among Member States. In order to 1) *further identify measures* to reduce the contamination, to 2) *predict the effects of regulatory controls* and to 3) be able to *monitor* the environment (both on ecotoxicological and epidemiological aspects) in the future an integrated approach to research, thus ensuring value for money and appropriate coverage of the key issues is needed. This strategy sets a guidance list of priorities for further research (Annex III) both for the Commission and for the Member States.

E) Communication to the public

To allay public concern, to raise awareness and to inform the public reliable, accurate, clear and comprehensible information will be provided on activities of the Commission, on possible effects and risks, on uncertainties, etc ... During the EC/WHO seminar (Brussels, September 2000) the WHO and the EC decided to jointly define elements of an appropriate *risk communication strategy* on the subject of dioxins and related compounds and develop approaches, involving various fields of science as well as all stakeholders. Within the CAFE programme active dissemination and Communication to the public of technical information and policy development will be given high profile, to ensure the full involvement of the public in the development and implementation of policy.

To educate the public : the general public has not only to be informed, but has *to play an active role* in the prevention of releases into the environment. The influence of the public in the emissions of dioxins can generally only come from a certain awareness concerning the domestic incineration of wood, waste, etc...(the public will be educated on the environmental effects and the abuse of inappropriate materials as fuels for heating purposes - such as treated wood, coal for domestic combustion - and on the risks of domestic waste burning), but the influence of the public in the releases of PCBs can be much more important, as household electrical appliances are a very important source of PCBs and the households can ensure that their electrical appliances are given to authorised undertakings that will dispose of them in an environmentally sound manner (the public will be educated on the

disposal of PCB containing equipment). Therefore, exchange of information and experience between Member States as regard education, training and awareness raising will be promoted by the Commission.

F) Cooperation with third countries and international organisations

Emissions in the Accession Countries are likely to be higher than in the EU. The Commission intends to launch a project in order to identify important dioxin sources and to carry out measurements in the Accession Countries. Cooperation with WHO is essential to avoid duplication of work and will continue in the future. As a contracting party to several conventions in the field of dioxins and PCBs the Commission will continue international cooperation on this subject.

LONG-TERM ACTIONS (10 years)

An important part of this strategy will be a long-term preparation to 1) *further identify* source directed actions and to 2) *evaluate* the efficacy of existing legislation. In order to implement the "Environment-Health" objectives in the 6th EAP a set of actions are identified which relates to data collection, monitoring and surveillance and further identification of measures.

A) Data collection on the level of dioxin/PCB contamination in air, water (sediment) and soil :

- The Commission will support the collection of existing data and the setting up of a Geographical Information System (GIS) for the selected indicators. This GIS will be integrated in the global environment GIS strategies. Consequently "hot spots" of high contamination levels will be identified.
- The Commission will support the collection of epidemiological and toxicological data in the same database in order to be able to establish a link between environment and health.

B) Monitoring and surveillance of the level of dioxin/PCB contamination in air, water (sediment) and soil :

- The Commission will support the establishment of programmes to monitor the level of contamination. It is important to set up a very detailed and common procedure of continuous monitoring of the selected indicators in the selected areas. Having a common methodology of monitoring for all areas, the results will be comparable and an overall trend could be drawn across the EU.
- The Commission will conduct surveys and measurements of the *status* and *trends* of the contamination in order to measure progress in reducing the presence of dioxins and PCBs in the environment.
- The Commission will investigate the possibility to link epidemiological data collection and monitoring of the environment in the framework of the 6th EAP implementation.
- The Commission will examine the opportunity to develop a rapid alert and reaction system for acute or emergent environmental dioxin and PCB dangers

in the framework of the 6th EAP. This system will help to establish information consultation and co-ordination procedures between Member States.

C) Identification of measures :

The above-mentioned information will provide a comprehensive picture of the environmental dioxin/PCB problem and a good understanding of the trend, which will permit further policy making and evaluation. The Commission will then further identify :

source directed measures to further reduce the environmental contamination and to guarantee that maximum levels in food and feed can be respected and target levels achieved within a certain period of time;

measures to improve consumer's protection : regular revisions of feed and food limits, adjusted to environmental contamination trends and to risk assessment (including vulnerable groups) will be proposed as well as transitory restriction for consumption of natural food from "hot spots" and with high bio-accumulation rate.

6.2. Strategy to reduce the presence of dioxins and PCBs in feed and food

Food of animal origin is a predominant source of human exposure to dioxins and PCBs. As food contamination is directly related to feed contamination, an integrated approach is followed to reduce dioxin/PCB incidence all along the food chain, i.e. from feed materials through food-producing animals to humans. Taking measures with regard to feed is therefore a decisive step to reduce human intake. Measures in food and feed solely based on establishing maximum levels would not be sufficiently effective in reducing the level of feed and food contamination unless the levels are set so low that a large part of the feed and food supply would be declared unfit for animal/human consumption. Besides the important measures to limit the release of dioxins and PCBs into the environment, other measures for aiming at the reduction of dioxins and dioxin-like PCBs in feed and food, are envisaged to come into application in the course of the year 2002.

These legislative measures concerning feedingstuffs and foodstuffs consist of three pillars:

- the establishment of maximum levels at a strict but feasible level in food and feed
- the establishment of action levels acting as a tool for "early warning" of higher than desirable levels of dioxin in food or feed
- the establishment of target levels, over time, to bring exposure of a large part of the European population within the limits recommended by the Scientific Committees.

Establishment of maximum limits:

The establishment of maximum limits at a strict but feasible level, gradually decreasing with time, in order to discard the unacceptably highly contaminated products. The establishment of such a limit is a necessary tool for management and to ensure uniform application across the EU.

From a toxicological point of view, limits should include dioxins and dioxin-like PCBs. However, as the data on the occurrence of dioxin-like PCBs are still very limited, in particular for feedingstuffs but also for foodstuffs, this approach may lead to unrealistic limits because the contribution of the dioxin-like PCBs to the total contamination load is different for different food and feed matrices and may be high (up to 4 times the dioxin contribution). But not acting immediately for dioxin-like PCBs should not prevent immediate action for dioxins. Therefore measures are proposed for dioxins (PCDD/F) only, awaiting more comprehensive data for dioxin-like PCBs. An active approach is pursued to obtain these data and build up a reliable database in order to allow a revision of the limits for dioxins before the end of the year 2004 to cover also dioxin-like PCBs, and this in accordance with the toxicological evaluation.

In order to ensure that all operators in the food and feed chain continue to do efforts and take all the necessary measures to limit the presence of dioxins in feed and food, it is envisaged to set substantial stricter maximum limits within a period of 5 years time.

With regard to feedingstuffs, the Commission submitted on 20 July 2001 draft measures establishing maximum levels for dioxins and furans in several feed materials and feedingstuffs for an opinion to the Standing Committee for Feedingstuffs. Not having received a favourable opinion on the proposed draft measures, the Commission has referred on August 2001 these proposed measures to Council for adoption¹⁰.

With regard to foodstuffs, the Commission submitted on 25 July 2001 draft measures establishing maximum levels for dioxins and furans in several foodstuffs for an opinion to the Standing Committee for Foodstuffs. Also not having received a favourable opinion on the proposed draft measures, the Commission has referred on August 2001 also these proposed measures to Council for adoption¹¹.

For the classical ("non dioxin-like") PCBs which show a different toxicological profile a risk assessment will be carried out and will be followed by discussions on limit values proposals in the coming years, at least in sea food, which is the main source of human exposure in the EU.

Action levels and target levels :

Permanent monitoring of the presence of dioxins and PCBs in feed and food across the EU is necessary. In case of an abnormal increase in the level those compounds, sources and/or pathways of contamination have to be identified. Once identified, the measures to prevent or reduce contamination from this source could be determined and applied.

In order to determine what has to be considered as an abnormal increased level, an *action level* is set. Action levels are designed to trigger a proactive approach from competent authorities and operators to identify sources and pathways of

¹⁰ Proposal for a Council Directive amending Council Directive 1999/29/EC on undesirable substances and products in animal nutrition (COM (2001) 493 of 28 August 2001)

¹¹ Proposal for a Council Regulation amending Regulation (EC) No 466/2001 setting maximum levels for certain contaminants in foodstuffs. (COM (2001) 495 of 28 August 2001)

contamination and to take measures to eliminate them. Exceeding the action level would also automatically imply an analysis of the dioxin-like PCBs in order to build up quickly a reliable database, besides the regular at random analysis of the presence of dioxin-like PCBs in food and feed.

Target levels are the levels to be achieved in food and feed whereby it can be reasonably assumed that the dietary exposure of a large majority of the European population will be within the tolerable weekly intake for dioxins and dioxin-like PCBs. These target values will be set in the light of more accurate information on the impact of the environmental measures on the reduction of the presence of dioxins and dioxin-like PCBs in the different feedingstuffs and foodstuffs, more occurrence data, etc. Target values will act as the driving force for measures necessary to further reduce emissions into the environment.

A Commission Recommendation on action and target levels in feed and food addressed to the member states will be adopted at the same time as the Directive and Regulation on maximum limits

The measures to reduce the emissions of dioxins and PCBs resulting in a downward trend of their presence in the environment, food and feed, together with the active approach pursued to reduce the presence of dioxins in feed and food, based on the continued efforts of the operators will cause the contamination levels for the different feed/food groups to shift to lower levels and to ultimately reach the target levels. Therefore a regular review, gradually decreasing the maximum limits and action levels will be necessary.

7. CONCLUSIONS

Dioxins and PCBs are occupying a predominant situation in the consciousness of the European citizens because these compounds are known to cause severe and far-reaching environmental and health effects. In spite of the existing legislation and of the progress already achieved in reducing emissions and human exposure deficiencies still remain. An integrated and systematic approach is missing. There is an urgent need for action to further reduce emissions and avoid environmental and adverse health effects from dioxins and PCBs. Therefore it is essential that the Commission adopt a strategy to reduce the presence of those compounds in the environment, in feed and food, including short- to medium-term and long-term actions. Such an integrated approach would have to guarantee that the dioxin and PCB problem is totally under control in 10 years. At that point this strategy will have to be assessed and eventually revised to take account of the latest progress. The results of this strategy could then be applied to reduce the presence of other persistent hazardous substances in the environment.

ANNEX I

EXISTING COMMUNITY LEGISLATION REGARDING DIOXINS AND PCBs

Waste incineration

- Council Directive 89/429/EEC of 21 June 1989 on the reduction of air pollution from existing municipal waste incineration plants
- Council Directive 89/369/EEC of 8 June 1989 on the prevention of air pollution from new municipal waste incineration plants
- Council Directive 94/67/EC of 16 December 1994 on the incineration of hazardous waste.
- Directive 2000/76/EC of the European Parliament and of the Council of 4 December 2000 on the incineration of waste

Waste

- Council Directive 75/442/EEC of 15 July 1975 on waste
- Council Directive 91/689/EEC of 12 December 1991 on hazardous waste
- Council Regulation (EEC) No 259/93 on the supervision and control of shipments of waste within, into and out of the European Community
- Council Directive 99/31/EC of 26 April 1999 on the landfill of waste
- Council Directive 75/439/EEC of 16 June 1975 on the disposal of waste oils

Integrated Pollution Prevention and Control

- Council Directive 96/61/EC of 24 September 1996 concerning integrated pollution prevention and control
- Commission Decision 2000/479/EC of 17 July 2000 on the implementation of a European pollutant emission register (EPER) according to Article 15 of Council Directive 96/61/EC.

Water

- Council Directive 80/68/EEC of 17 December 1979 on the protection of groundwater against pollution caused by certain dangerous substances
- Council Directive 76/464/EEC of 4 May 1976 on pollution caused by certain dangerous substances discharged into the aquatic environment of the Community
- Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy

Restrictions on marketing and use of chemicals

- Council Directive 85/467/EEC of 1 October 1985 amending for the sixth time (PCBs/PCTs) Directive 76/769/EEC on the approximation of the laws, regulations and administrative provisions of the Member States relating to restrictions on the marketing and use of certain dangerous substances and preparations
- Council Directive 91/173/EEC of 31 March 1991 amending for the ninth time Directive 76/769/EEC on the approximation of the laws, regulations and administrative provisions of the Member States relating to restrictions on the marketing and use of certain dangerous substances and preparations

Other PCB legislation

- Council Directive 76/403/EEC of 6 April 1976 on the disposal of polychlorinated biphenyls and polychlorinated terphenyls (banning the use of PCBs in open applications such as printing inks and adhesives)
- Council Directive 96/59/EC of 16 September 1996 on the disposal of polychlorinated biphenyls and polychlorinated terphenyls (PCB/PCT)

Major Accident Hazards

- Council Directive 82/501/EEC of 24 June 1982 on the major-accident hazards of certain industrial activities
- Council Directive 96/82/EC of 9 December 1996 on the control of major-accident hazards involving dangerous substances

Animal Nutrition

- Council Directive 1999/29/EC of 22 April 1999 on the undesirable substances and products in animal nutrition
- Commission Regulation (EC) No 2439/1999 of 17 November 1999 on the conditions for the authorisation of additives belonging to the group “binders, anti-caking agents and coagulants” in feedingstuffs, as amended by Commission Regulation (EC) No 739/2000 of 7 April 2000.

ANNEX II

DIOXIN/PCB STUDIES FINANCED BY THE COMMISSION

- « The European Dioxin Inventory : Identification of Relevant Industrial Sources of Dioxins and Furans in Europe », by North Rhine-Westphalia State Environment Agency, 1997
- "The European Dioxin Emission Inventory - Stage II", by LUA-NRW, January 2001
- « Releases of Dioxins and Furans to Land and Water in Europe », by AEA Technology, September 1999
- « Compilation of EU Dioxin Exposure and Health Data », by AEA Technology, England, October 1999
- « Evaluation of occurrence of PCDD/PCDF and POPs in wastes and their potential to enter the food chain », by the University of Bayreuth at the Department of Prof. Hutzinger, September 2000
- "Exploration of possible future POP control areas", AEA Technology Environment, September 2000
- "Dioxins and other POPs in wastes and their potential to enter the foodchain - stage II",
- « PCDD/Fs, PCBs, PBBs and PBDD/Fs : environmental pathways for human exposure », by Arbeitsgemeinschaft Dioxin Projekt
- "Environmental cycling of selected persistent organic pollutants in the Baltic region (POPCYCLING-BALTIC)"
- "Global mass balance of persistent semi-volatile organic compounds : an approach with PCB as an indicator (GLOBAL-SOC)"
- "Measuring and modelling the dynamic response of remote mountain lake ecosystems to environmental change : a programme of mountain lake research (MOLAR)"

EXPOSURE AND RISK ASSESSMENTS PERFORMED BY THE COMMISSION

- "Assessment of dietary intake of dioxins and related PCBs by the population of EU Member States », Scientific Co-operation on questions relating to Food – Task 3.2.5. – 7 June 2000
- "Dioxin contamination of feedingstuffs and their contribution to the contamination of food of animal origin", Opinion of the Scientific Committee on Animal Nutrition adopted on 6 November 2000
- "Risk assessment of Dioxins and Dioxin-like PCBs in Food", Opinion of the Scientific Committee for Food (SCF) adopted on 22 November 2000

- Update of the “Risk Assessment of Dioxins and Dioxin-like PCBs in Food “ based on new information available since the adoption of the SCF opinion of 22nd November 2000; Opinion of the Scientific Committee for Food adopted on 30 May 2001
- "Risks of environmental dioxins: Linking epidemiology with toxicity studies to strengthen accurate risk assessment", February 2000

ANNEX III

RESEARCH PRIORITIES Dioxins and PCBs

H = high priority

m = medium priority

1. Environmental Fate and Transport	
<i>Atmospheric environment</i>	
• Vapour/particle partitioning of individual PCDD/F congeners	<i>m</i>
• Particle size distribution data for PCDD/Fs associated with particles	<i>m</i>
• Measurements of wet and dry deposition	<i>H</i>
• Modelling studies of PCDD/F behaviour in the atmospheric environment	<i>H</i>
• Long range transport (over Europe)	<i>H</i>
<i>Terrestrial environment</i>	
• Define the rates of transport and degradation in soils	<i>m</i>
• The significance of root uptake especially the interspecies variability	<i>H</i>
• PCDD/Fs transferred to plant via soil splash and animal trampling	<i>m</i>
• Assessment of air to soil transfer and of the various deposition mechanisms to vegetation (wet, dry particle, and dry gaseous)	<i>H</i>
• Fate and transport of PCBs and PCDD/Fs in landfills	<i>H</i>
• Studies on the levels of PCDD/Fs associated with burning PCP treated wood	<i>H</i>
• Studies on the levels and sources of PCDD/Fs in composted material and the environmental fate of the PCDD/Fs in the composted material and in sewage sludge	<i>H</i>
• Modelling studies of PCDD/F behaviour in the terrestrial environment	<i>H</i>
• Appropriate plants to be used as bio-accumulators of PCBs and PCDD/Fs	<i>H</i>
• More measurements of background concentrations of PCBs and PCDD/Fs in vegetation and animal tissue and definition of reference values	<i>H</i>

<i>Aquatic environment</i> : general research has been very extensive, therefore it is proposed to focus on more specific gaps	
• Quantify input of PCDD/Fs from soil runoff at catchment level	<i>m</i>
• Further information about the stability of PCBs and PCDD/Fs in sediments under different redox environments especially if the toxicity of the PCBs and PCDD/F mixture increases through degradation	<i>m</i>
• Development of standardised sampling strategies for determining representative PCDD/F concentrations in fish and sediments	<i>H</i>
• Partitioning of PCDD/Fs between the particulate and dissolved organic phases in the water column; apply experimental work to field situations	<i>m</i>
• Availability of organic carbon-associated PCDD/Fs in sediments for aquatic ecosystem	<i>H</i>
• Modelling studies of PCB and PCDD/F bio-accumulation/bio-magnification in the aquatic environment and the food chain	<i>H</i>
• Degradation of PCBs into metabolites in water and sediments	<i>H</i>
2. Ecotoxicology and Human Health	
• Estimates of human exposure to dioxin and PCBs through ingestion, inhalation, skin contact	<i>H</i>
• the effects of chronic or periodic exposure to PCBs (and metabolites) and to dioxins	<i>H</i>
• identification of particular vulnerable species as bio-indicator for the monitoring and protection of “at risk” habitats or sites	<i>H</i>
• elaboration of a methodology to set limit values for lower effect levels in fauna	<i>H</i>
• upgrading knowledge on bio-accumulation factors in the trophic chain	<i>H</i>
• Establish a Toxic Equivalent Factor for non-coplanar PCB congeners with thyroid interaction or neurotoxicity.	<i>H</i>
• significance of climate, agricultural practices and dietary regimes to PCB and dioxin exposure in Southern Member States of the EU, which differ from those of the Northern Member States	<i>H</i>
• Epidemiological studies, including target groups like foetus, infants, etc ...	<i>H</i>
• Identification of biomarkers of health effects in humans and animals	<i>m</i>

3. Agrofood industry	
<ul style="list-style-type: none"> • Studies on the carry-over and establishing pertinent transfer factors for the different PCBs and PCDD/F from soil, sediment and feedingstuffs to animals tissues, including fish (e.g meat, fat) and products (e.g milk and eggs). Particular attention needs to be paid to the dioxin-like PCBs : <ul style="list-style-type: none"> – Determination of transfer factors for PCDD/F from soil and feedingstuffs to animal tissues and products for cattle (ruminants) – Determination of transfer factors for dioxin-like PCBs from soil and feedingstuffs to animal tissue and products (milk) for cattle (ruminants) – Determination of transfer factors for PCDD/F and PCBs (in particular dioxin-like PCBs) from soil and feedingstuffs to animal tissues and products (eggs) for poultry – Determination of transfer factors for PCDD/F and PCBs (in particular dioxin-like PCBs) from feedingstuffs to animal tissues and products for pigs – Determination of transfer factors for PCDD/F and PCBs (in particular dioxin-like PCBs) from sediment and feedingstuffs for fish 	<p><i>H</i></p> <p><i>m</i></p> <p><i>H</i></p> <p><i>H</i></p> <p><i>H</i></p>
<ul style="list-style-type: none"> • A characteristic profile of dioxin like compounds congener in beef 	<i>m</i>
<ul style="list-style-type: none"> • Assessment of agricultural or industrial practices (such as hot air feedstuff drying, use of chemical substances like solvents, pelleting aids etc...for the production of feedingstuffs, fermentation, ...) for their potential to produce PCDD/Fs 	<i>H</i>
<ul style="list-style-type: none"> • Quantification of potential PCB and PCDD/F input into animal feedstuff via recyclates such as used eadible oils & fats, slaughterhouse wastes etc... 	<i>H</i>
<ul style="list-style-type: none"> • PCDD/F in manure 	<i>m</i>
4. Source inventories	
<ul style="list-style-type: none"> • Source data on PCBs 	<i>H</i>
<ul style="list-style-type: none"> • Contribution of waste and recycling of waste (including processes) to total emissions into environment /foodchain 	<i>H</i>
<ul style="list-style-type: none"> • Contribution of products to total emission into the environment (eg cosmetics, pesticides, textiles, plastics, paper, ...) 	<i>H</i>
<ul style="list-style-type: none"> • Domestic incineration of wood and coal combustion (domestic + industrial) 	<i>H</i>

• Reservoir sources (behaviour, degradation processes, decontamination methods,..)	<i>H</i>
• Natural sources of dioxins and their share in the overall release into the environment	<i>m</i>
• New sources of PCBs as by-products of chemical industry	<i>m</i>
• Dioxin from accidental and incidental fires (buildings, vehicles, waste, etc..)....	<i>m</i>
5. Analytical Aspects	
• Investigation on cheaper,faster and reliable analytical alternatives and their limitations	<i>H</i>
• A standard approach to interpreting data sets containing values below the Limit of Detection (LOD)	<i>m</i>
• Inter-calibration of dioxin laboratories in order to ensure consistent results across Europe	<i>H</i>
• guidelines/standards for sampling, data generation and reporting	<i>H</i>
6. Decontamination measures	
• Decontamination methods for products (mothermilk, fish oil, ...)	<i>H</i>
• Decontamination methods for soils and sediments	<i>H</i>
7. Monitoring	
• Development of a Geographical Information System (GIS) integrated in the global environment GIS strategies	<i>H</i>