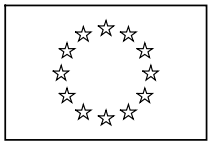

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Community Strategy for Dioxins, Furans and Polychlorinated Biphenyls

TABLE OF CONTENTS

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-NRW[3], 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 BREFs[4] 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

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