

**DIOXIN AND FURAN INVENTORY  
IN REPUBLIC OF CROATIA  
(SUMMARY)**

**Zagreb, 2003.**



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IN REPUBLIC OF CROATIA  
(SUMMARY)**

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## 1. INTRODUCTION

Inventory of polychlorinated dibenzo-p-dioxins (PCDD) and polychlorinated dibenzofurans emissions (PCDF) in the environment (Inventory of PCDD /PCDF) is part of the entirely planned inventory of persistent organic pollutants (POPs compounds) in the Republic of Croatia. PCDD/PCDF Inventory was made in accordance with preparations for the Stockholm Convention implementation - the Convention on persistent organic pollutants. The goal of the Convention is introducing systematic monitoring and supervision over production and usage of POPs, followed by the gradual cessation of its usage. The methodology stipulated from the UNEP Chemicals, the Standardized Toolkit for Identification and Quantification of Dioxin and Furan releases, UNEP 2001 was used in the inventory of PCDD/PCDF.

The emission of PCDD/PCDF in the environment is directly caused by release and/or transfer through 5 media:

- air,
- water,
- soil,
- products and
- residues/waste

Dioxin and furan are directly released in the environment by its releasing into the integral parts of the environment (air, water and soil).

Residue/waste is the potential and indirect source of dioxin and furan as well as the danger for the environment unless some adequate measures that would destroy these compounds were taken.

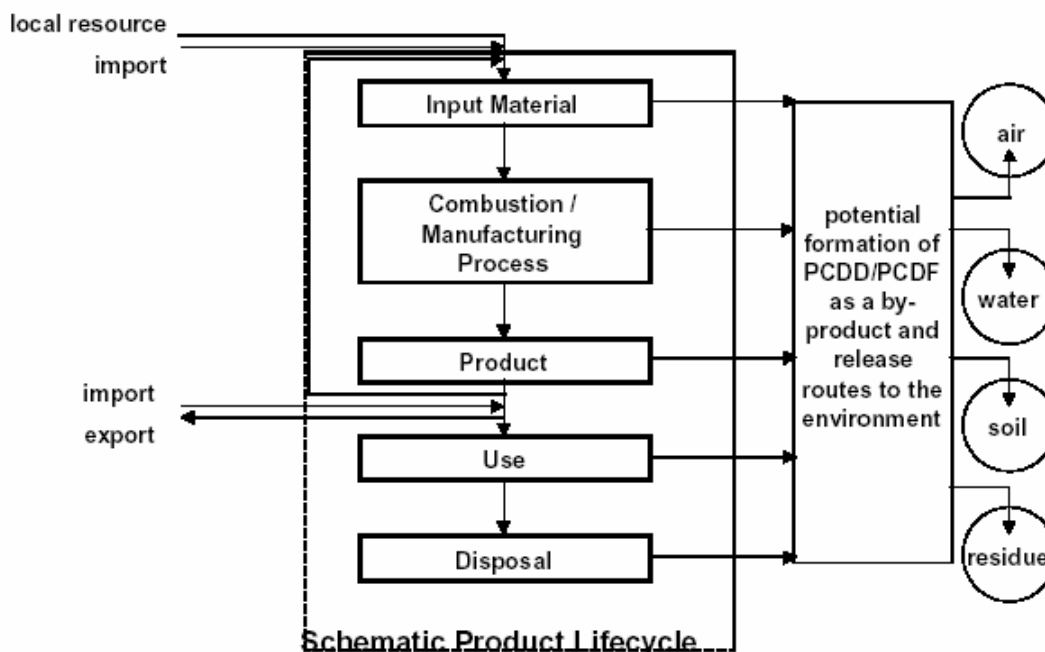


Fig. 1.1: Potential ways of spreading PCDD/PCDF in the environment

## 1.1. PREVIOUS MONITORING OF PCDD/PCDF EMISSIONS IN THE ENVIRONMENT

Reports on emissions of PCDD/PCDF are integral part of regular annual reports on the emission of polluting substances into the air in the Republic of Croatia. Emission balance of persistent organic pollutants, including PCDD/PCDF, in the Republic of Croatia started in 1996 in accordance with the international EMEP/CORINAIR methodology, officially accepted by the Convention on Long-Range Transboundary Air Pollution (CLRTAP) executive committee. The obligation to indicate emission results comes also from the Act on the air protection ("Official Gazette no: 48/95").

Calculation of dioxin and furan emissions was made in accordance with the SNAP 97 nomenclature of EMEP/CORINAIR methodologies and presented in table 1.1.

Table 1.1: Emission of PCDD/PCDF into the air from individual sectors in Croatia for the year 2000\*

Sector	Emission gTEQ/year
Combustion in public thermal power plants, heating plants and energy transformation facilities	0,13
Combustion in small economies, institutions, households, agriculture, forestry and fishing	93,06
Combustion in industry	10,47
Production processes without fuel combustion	4,97
Road transport	0,13
Other mobile sources and machinery	$< 1 \cdot 10^{-4}$
Processing and waste disposal	0,28
<b>Total</b>	<b>109,05</b>

The largest dioxin and furan emissions emerge during combustion of firewood in households and in devices for heat waste processing (utility, technological and hospital). Other significant sources are processes of steel production in electric arc furnaces, road transport and fuel combustion in power facilities (thermal power plants, heating plants and so on.)

Comparing with the year 1999, the year 2000 shows a higher rate of growth of dioxins and furan emissions in the amount of approximately 11 percent. That is so because of the larger usage of firewood in households. A trend of dioxin and furan emissions is shown in the Fig. 1.2.

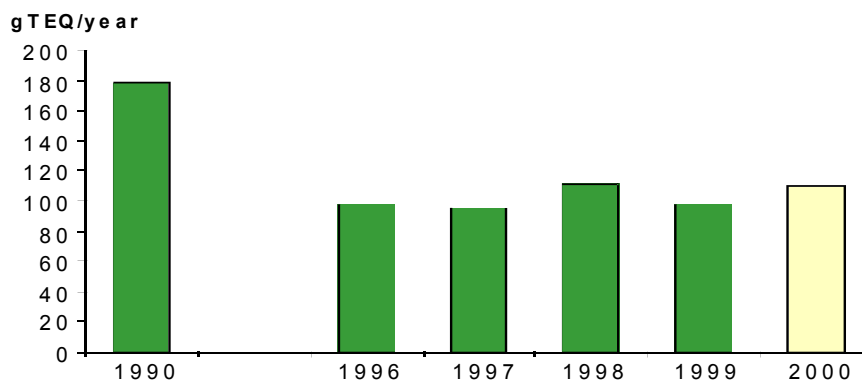


Fig. 1.2.: Dioxin and furan emission trend in Croatia

## 2. IDENTIFICATION OF PRESENCE AND EVALUATION OF DIOXIN AND FURAN RELEASING IN THE ENVIRONMENT (2001), BASED ON UNEP METHODOLOGY

The available data and existing reports from Ministries Of Environmental Protection and Physical Planning, many publications of Croatian Bureau Of Statistics, Croatian Chamber Of Economy, EkonerG and UNEP Toolkit have been analyzed in the process of presence identification and evaluations of dioxin and furan release in the environment.

Table 2.1. Shows total evaluation of releasing PCDD/PCDF in the environment for the year 2001, based on UNEP methodology.

*Table 2.1: Total evaluation of releasing PCDD/PCDF in the environment, 2001*

No.	Main categories of PCDD/PCDF sources	Annual release of PCDD/PCDF (g TEQ/year)				
		air	water	soil	products	leftovers/waste
1	Waste Incineration	1.4				3,6
2	Ferrous and Non-Ferrous Metal Production	3.1	?	?		22,3
3	Power Generation and Heating	105.7?				20,6
4	Production of Mineral Products	2.3				0,01?
5	Transport	0.9				
6	Uncontrolled Combustion Processes	2.2?		1,7		?
7	Production and Use of Chemicals and Consumer Goods	0.1	0,002?		0,8	0,3?
8	Miscellaneous	0.001?			?	?
9	Disposal	?	?	?		2,7
<b>1-9</b>	<b>Total</b>	<b>115.7?</b>	<b>0,002?</b>	<b>1,7?</b>	<b>0,8?</b>	<b>49,5?</b>

\* only medians given; an empty field indicates that the release route is considered to be insignificant

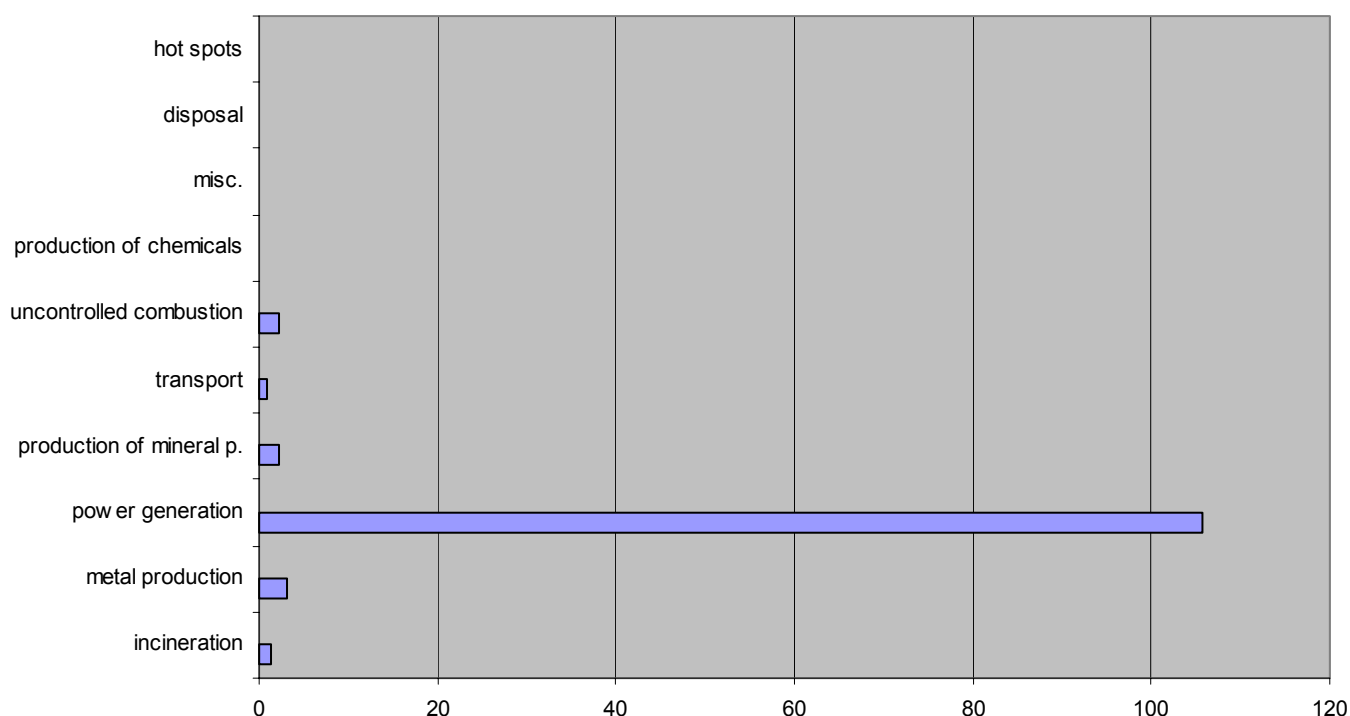
? indicates that the release route may be significant, but no emission factors or activity data were available

? behind a number indicates that the number may be underestimated as some subcategories have not been quantified

The most significant way of releasing PCDD/PCDF is its releasing into the air and residue/waste.

The largest dioxin and furan emissions emerge during the combustion of firewood in households. Other significant sources are the uncontrolled combustion processes, fuel combustion in power facilities (thermal power plants, heating plants and so on), ferrous and non-ferrous metal production, road transport, etc.

Dioxin and furan emerge as secondary products in manufacture and production in industry and during combustion. They appear as waste from air pollution control system.



Emissions into the air (g I-TEQ/year)

Fig. 2.2: Possible PCDD/PCDF emissions into the air from all sources in Croatia, 2001

#### *Uncertainties in calculations of releasing PCDD/PCDF in the environment*

Evaluation of calculation uncertainty is one of the essential requirements in inventory of dioxin and furan in the Republic Of Croatia. The aim of this information is not to deny validity of the calculation, but to help in establishing the priority measures and efforts in order to make the calculation more precise and to assist in choosing the methodology options.

The completely estimated uncertainty of releasing PCDD/PCDF in the environment is a combination of individual uncertainties of releasing components evaluation:

- uncertainty related to direct determination of emission factors
- uncertainty related to activity data
- uncertainty related to individual measurements of PCDD/PCDF releasing levels in the environment

At the moment, the total quantitative uncertainty in budget has not been declared. Relatively subjective qualitative evaluations in certain categories, subcategories and specific processes were collected with the intention to quantify the evaluation in the future as much as possible.

### **3. CONCLUSION**

In Dioxin and Furan Inventory (according to the UNEP Toolkit) the main categories and subcategories have been identified together with specific processes during which PCDD /PCDF is being released in the environment (ground, air, water) as well as products and waste.

The most significant ways of releasing PCDD/PCDF is through emissions into the air and in waste.

The largest emission of dioxin and furan emerge during combustion of firewood in households. Other significant sources are uncontrolled burning processes, fuel combustion in power facilities (thermal power plants, heating plants and so on), iron ferrous and non-ferrous metal production, road transport, etc. Dioxin and furan emerge as secondary products in manufacture and production in industry and during combustion. They appear as waste from the air pollution control systems.

PCDD/PCDF inventory result (2001)

Annual release of PCDD/PCDF (g TEQ/year)				
air	water	soil	products	waste
115,7?	0,002?	1,7?	0,8?	49,5?

? behind a number indicates that the number may be underestimated as some subcategories have not been quantified

In accordance with the Stockholm Convention and pursuant to the inventory results, the following guidelines were given:

- to enable better data access on activities for certain categories and subcategories and data on specific technological processes and correct emission factors for the evaluation of PCDD/PCDF emission
- to enable and carry out better insight into the equipment status for decreasing the emission and better insight into capacities of filters on facilities; in that sense to correct emission factors for the evaluation of PCDD/PCDF emission
- to regulate and organize monitoring of crucial emission places for PCDD/PCDF, in other words to establish the points where the level of PCDD/PCDF in the environment would be measured at the national level at least twice a year, for example
- to carry out the prevention measures for uncontrolled outdoor combustion (burning biomasses, burning waste, etc.)
- to apply the best techniques available and the best environmental protection practice (BAT, BEP)
- to improve waste management
- to avoid and reduce the usage of substances that have been identified as the ones that cause PCDD/PCDF to emerge.