

## DIOXIN INVENTORY IN THE CHECHEN REPUBLIC: 3 PERIODS

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### Introduction

Genesis of POPs pollution in the Chechen Republic has minimum three periods due to the development of the technosphere of the region with different structure of pollution, sources and limiting processes. It is mainly industrial, military and constructional technogenesis with oil component covering all the three periods. Oil in Chechnya is being produced for over 115 years. During the period of maximum development of the petrochemical complex in Chechnya in 1971 oil recovery and refining made 22 million tons per year, then a gradual decrease followed down to 7.5 million tons per year (1988) and an abrupt fall to 2.5 million tons per year in 2000, with actually no refining. Over 90% of refinery objects were destroyed.

The problems of POPs pollution assessment in the Chechen Republic consist in the fact that besides the lack of information about emissions and levels of polychlorinated dioxins and dibenzofurans in the environment, gaps in the information about PCB-containing equipment, PCB-waste, obsolete pesticides and so on, there was a specific period of military actions in the history of the development of the industrial region.

A study of the current state (a survey experimental monitoring of PCDD/Fs in the environment) was carried out during recent years in the Chechen Republic (soils of different use) and biota (tissues of animals and fish, blood and breast milk of residents)<sup>1-4</sup>. It was shown that though pollution of agricultural lands and residential settlements was not very high but agricultural lands were often polluted more than soils in residential districts of settlements and cities. Considerably increased PCDD/Fs levels were found in cities, near destroyed plants and in residential blocks of the city of Grozny<sup>2</sup>.

Pollution of the local foodstuff now also corresponds to the norms of the EU and Russia<sup>4</sup>. The water net of the region displayed no considerable POPs pollution; the assessment was made using several species of fish<sup>3</sup>. The aftermath of a long effect of burning processes are marked by increased level of PCDD/Fs in blood of residents of Grozny in the age group of 40-50, though the content of PCDD/Fs in breast milk of women living in the suburbs of Grozny is not higher than the average level for different countries<sup>1</sup>.

It is obvious that this research reflects the current situation but does not reveal the main sources. The accumulated environmental damage was formed during many years of economic activity before the war, then the extreme environmental impact during military actions, especially during the second Chechen war in 1999-2000 and by the influence of the construction boom at present.

### Materials and methods

The calculated PCDD/Fs inventory in the Chechen Republic is difficult due to the same reasons. In fact there are three different objects for assessment – before the war, the war period and post-war period of reconstruction. Pre-war accounting data base on emissions of the Chechen Republic industrial complex exists only for 1992; forming of a new accounting data base after two military campaigns was started only in 2006. The situation with POPs pollution during the military action is characterized by the absence of industrial production and by occurrence of specific sources of uncontrolled burning the formal assessment of which is hardly possible.

The current situation is formed by the aftermath of technogenesis of the period of industrial development that is aggravated by the results of a strong impact of uncontrolled burning processes during the war period on the transport and building component of POPs emission of the recent years.

According to Standardized Toolkit for Identification and Quantification of Dioxin and Furan Releases (in compliance with the recommendations of the UNEP Chemicals) the assessment of the contribution of different dioxin emission sources (industrial plants, transport, etc.) was carried out with the use of available statistical data and information published in different editions<sup>5</sup>. For assessment of the scale of the processes of uncontrolled burning during the war period the mass-media information and internet resources were used.

Assessment calculations for the post-war period were made on the basis of analysis of statistical information, reference books, and governmental reports on the state of the environment in the Chechen Republic for 2003-2010, reports of scientific research institutes, monographs, scientific publications, etc.

For calculations the design factors of emissions<sup>5</sup> and coefficients adapted for Russia<sup>6</sup> were used. The calculation of PCDD/Fs emission in the process of burning gas and oil is given for a ton of equivalent fuel.

### Results and discussion

Table 1 Assessment of PCDD/Fs emission into the air from different sources in the territory of the Chechen Republic during different periods of historical development

Source category	Emission factor*	PCDD/Fs emission, g TEQ/year		
		1994	2000	2010
Oil production	0.00044 µg/t.e.f.	0.003	0.0005	0.001
Gas production	0.00001 µg/t.e.f.	0.0004	0.0002	0.0003
Transport	0.1-2.2 µg/t.e.f.	0.102	0.018	0.239
Cement production	5.0 µg/t	0.004	0	0
Brick production	0.2 µg/t	0.068	0	0.003
Asphalt processing	0.7 µg/t	0.012	0	0.006
Domestic/household heating	0.044 µg/t.e.f.	0.149	0.044	0.087
Fires on transport	94 /µg/event	0	0.190	0
Oil burning	0.1 µg/t.e.f.	0.004	1.643	0.004
Gas burning, flares	0.0003 µg /m <sup>3</sup>	0.005	0.084	0.002
Forest fires	5.0 µg/hectar	0.004	0.091	0.002
Fires in buildings	400 µg/t	0.016	72.800	0.013
Uncontrolled burning of solid waste	300 µg/t	0.020	0.720	0.040
Total		0.521	75.591	0.394

\*t.e.f. - ton of equivalent fuel

Approximate assessment of the contribution of different sources in Chechnya at the present time in comparison with the results of the inventory of dioxins in Russia is given in Fig. 1 and 2. The data of Russian inventory were used that are presented in the Draft of the National Plan for Realization of the Stockholm Convention on POPs in the Russian Federation developed by the Center of International Projects<sup>6,7</sup>.

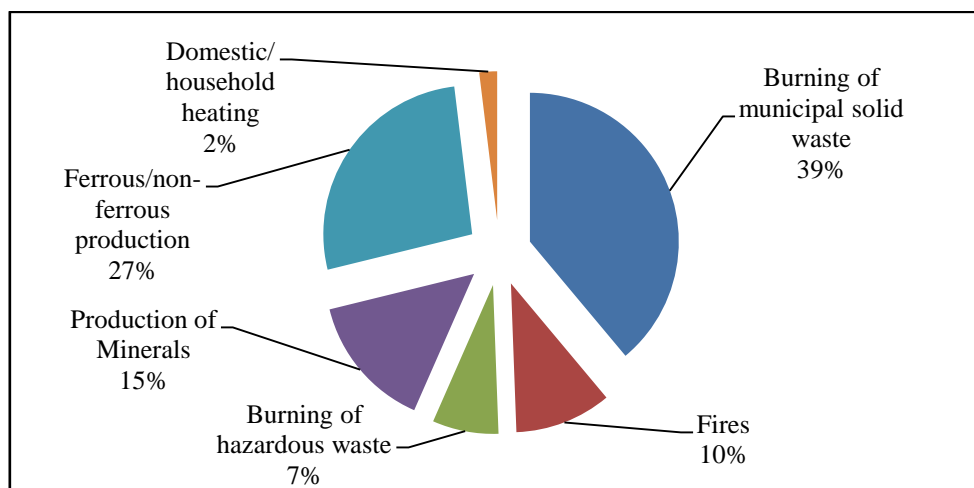


Fig.1. Contribution of PCDD/Fs sources (emission into the air) in the territory of Russia, 2007 (data of the CIP<sup>7</sup>)

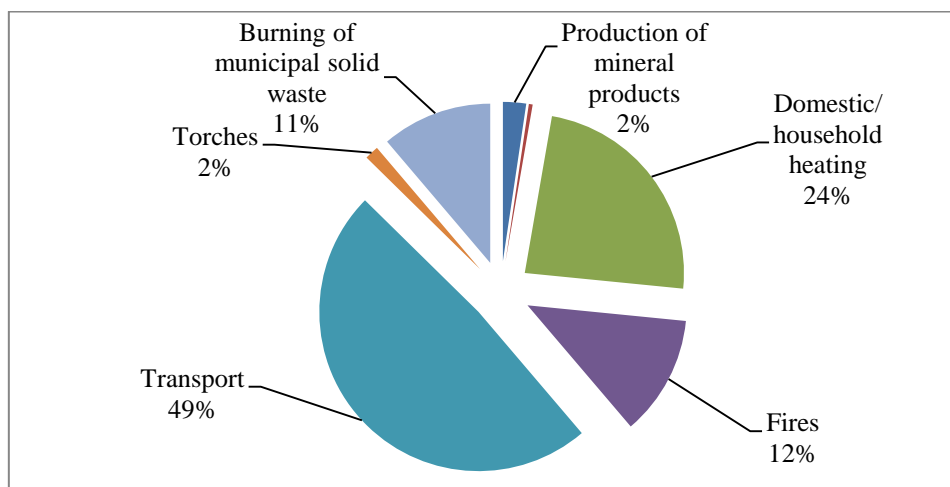


Fig.2. Contribution of PCDD/Fs sources (emission into the air) in the Chechen Republic, 2010

The results of the retrospective analysis of the war period data are given in Fig.3. It is known that as a result of aviation strikes practically the whole city of Grozny was destroyed and that means over 20000 buildings. A similar situation was in other cities and settlements. For 10 years more than 37 thousand tons of oil at 50 oil wells had been burnt and over 150 million cubic meters of associated gas had been emitted. In the course of military actions there occurred fires of black oil fuel and oil tanks at the Grozny oil refinery. In more than 130 reservoirs 81600 tons of gasoline, 5800 tons of kerosene, 26500 tons of diesel fuel and 69000 tons of black oil fuel had been burnt. A diverse structure of emission sources during the period of industrial development of Chechnya is given in Fig.4. Processes of uncontrolled burning also prevail during this period because the branches of oil production and oil processing do not make any considerable contribution into emission of dioxins into the air<sup>8</sup>.

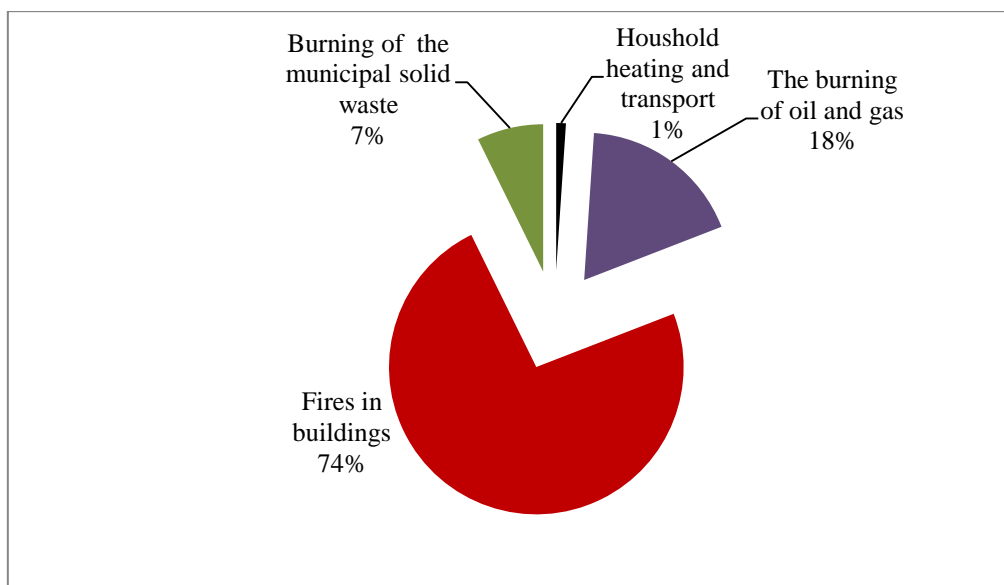


Fig.3. Contribution of PCDD/Fs sources (emission into the air) in the Chechen Republic, 2000 (the period of war, retrospective)

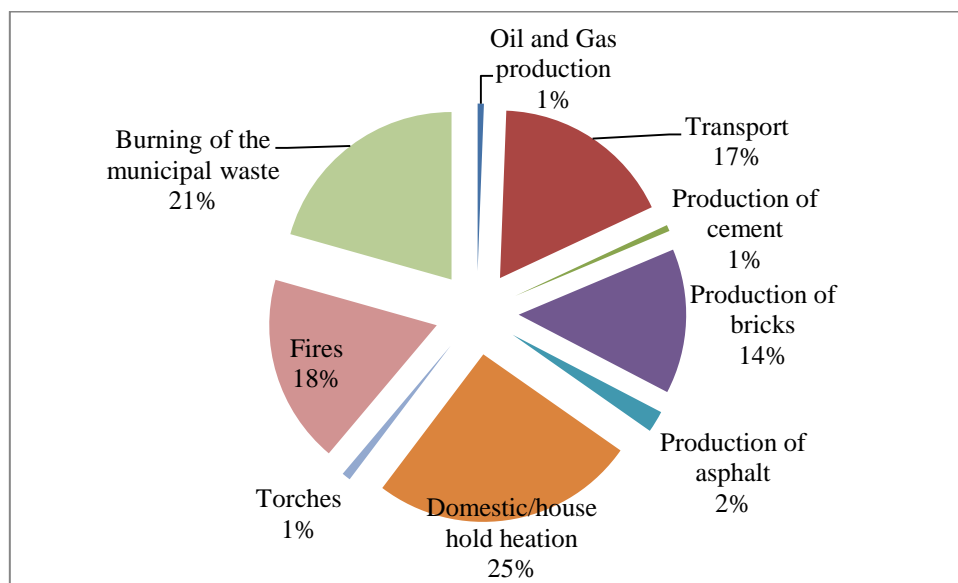


Fig.4. Contribution of PCDD/Fs sources in the Chechen Republic, 1994 (retrospective)

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