UNEP/GEF project entitled “Integrated Stockholm Convention toolkit to improve the transmission of information under Articles 07 and 15”

Integrated articles 7 and 15 electronic toolkit populated with POPs information and data revised/collected

WORD VERSION

REPUBLIC OF MOLDOVA

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Elaborated by:

Dr. Tatiana TUGUI (national team leader)
Tatiana ECHIM (technical expert 1)
Natalia EFROS (technical expert 2)
Maria POPESCU (project assistant/outreach expert 3)
Leonidas CRISCIUNAS , IT Consultant

Endorsed by:

Svetlana BOLOCAN, National Focal Point on Stockholm Convention on POPs
Chief division Waste Management and Chemicals Policies Direction
Ministry of Agriculture, Regional Development and Environment

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NATIONAL IMPLEMENTATION PLAN MODULE

Executive summary

1. Introduction

1.2 Initial National Implementation Plan

[Placeholder for narrative]

Republic of Moldova ratified Stockholm Convention on February 19, 2004. The national strategy on the reduction and elimination of POPs and National Implementation Plan of the Stockholm Convention (NIP) have been approved by the Government decision nr.1155 on October 20, 2004, in a highly participatory manner, supported by GEF funds.

Pursuant to paragraph 4 of H.G. 1155 of 20.10.2004, the Ministry of Environment is responsible for implementation and control, being assigned the function of coordinator for the implementation of the Strategy and Plan, systematization of information and annual presentation of information synthesized to the Government. The institutions responsible, within the limits of their competence, for carrying out the planned actions are: Ministry of Health, Ministry of Agriculture and Food Industry, Ministry of Economy, Ministry of Defense, Civil Protection and Exceptional Situations Service of the Ministry of Internal Affairs, Academy of Sciences of Moldova, Ministry of Education National Statistics Office, Customs Service of the Ministry of Finance and local public authorities.

In order to reduce the impact of POPs on the environment and public health, Strategy/ NIP provides the following priority directions of state policy and the following achievements can be reported:

Strategic Direction 1. Evaluating the effectiveness and improving the legal framework in the field of sound management of toxic chemicals;

Strategic Direction 2. Identification and evaluation of primary and secondary sources of emissions of POPs and other toxic chemicals that may be included in the POPs list; assessing the harmful effects of these sources of POPs on the health of the population and the environment and developing action plans to prevent these effects;

Strategic Direction 3. Elaboration and implementation of research-development and monitoring programs of POPs in the sectors of the national economy;

Strategic Direction 4. Elaboration and implementation of training, awareness and education programs for different categories of population regarding POPs and their effects on the environment and human health;

Strategic Direction 5. Active public participation in addressing and solving POP issues;

Strategic Direction 6. Elaboration of plans for the implementation of international treaties in the field of POP; coordination of national activities with developed countries and international bodies, parties to international treaties, in order to facilitate the exchange of information and technology, attracting financial means to reduce the impact of POPs.

Table 1. Status of initial NIP transmission and technical and financial resources received for NIP development

Development status	**Transmission status**	**Date of transmission**	**Financial assistance from the Global Environment Facility (GEF) received**	**Reasons for not receiving GEF funding**	**Implementing agency from which GEF's financial assistance was received**
Yes	Transmitted	06/07/2006	Yes	NA	[] Food and Agriculture Organization (FAO) [] International Fund for Agricultural Development (IFAD) [] United Nations Development Programme (UNDP) [] United Nations Environment Programme (UNEP) [] United Nations Industrial Development Organization (UNIDO) [X] World Bank [] Regional Development Banks [] Directly accessed from the Global

					Environment Facility (GEF) [] Other

1.2 Updated National Implementation Plan

Table [insert number]. Status of updated NIP transmission and technical and triggers for its review and update

Reviewing and updating status	**Version(s) of the update**	**Status of transmission**	**Transmission Date**	**Trigger for the review and updating of the NIP**
[] Yes [X] Currently being developed [] No [] Other				There were several triggers identified that delayed the NIP update: 1.The acceptance of addendums to the SC Convention is rather difficult process, due to the fact that the Law on Ratification of the Stockholm Convention (Law Nr. 40-XV from 19.02.2004) includes the provision, that Art. 1 - ratify the Stockholm Convention on Persistent Organic Pollutants, adopted on 22 May 2001 in Stockholm (Sweden)

				and signed by Moldova on 23 May 2001 with the following statements: "In accordance with Article 25 paragraph 4 of the Convention, any amendment to Annexes A, B or C shall enter into force for Moldova after the deposit of its instrument of ratification, acceptance, approval or accession to the amendment." 2. Lack of updated POPs inventories, particularly related to new POPs that was needed in order to accept the addendums, and present the detailed information of the country's situation with reference to the new listings within the Annexes A, B, C (inventory, costs, etc).

1.3 Financial assistance from the Global Environment Facility to review and update the national implementation plan

The project NIP Update has been developed and approved by GEF and

Table [insert number]. Status of receiving financial assistance for NIP updating

Receiving financial assistance from the GEF to review and update the national	Objective of the updating of your NIP	Implementing agency that you received the GEF's financial assistance from

implementation plan		
[X] Yes [] No	For updating, the national implementation plan to address the 9 new POPs listed by decisions SC-4/10-SC-4/18.	[] Food and Agriculture Organization (FAO). [] International Fund for Agricultural Development (IFAD). [] United Nations Development Programme (UNDP). [X] United Nations Environment Programme (UNEP). [] United Nations Industrial Development Organization (UNIDO). [] World Bank. [] Regional Development Banks. [] Directly accessed to the Global Environment Facility (GEF). [] Other.
	For updating the national implementation plan to address endosulfan listed by decision SC-5/3.	[] Food and Agriculture Organization (FAO). [] International Fund for Agricultural Development (IFAD). [] United Nations Development Programme (UNDP). [x] United Nations Environment Programme (UNEP). [] United Nations Industrial Development Organization (UNIDO). [] World Bank. [] Regional Development Banks.

		[] Directly accessed to the Global Environment Facility (GEF). [] Other.
	For updating the national implementation plan to address hexabromocyclododecane listed by decision SC-6/13.	[] Food and Agriculture Organization (FAO). [] International Fund for Agricultural Development (IFAD). [] United Nations Development Programme (UNDP). [x] United Nations Environment Programme (UNEP). [] United Nations Industrial Development Organization (UNIDO). [] World Bank. [] Regional Development Banks. [] Directly accessed to the Global Environment Facility (GEF). [] Other.
	For updating the national implementation plan to address hexachlorobutadiene listed by decision SC-7/12.	[] Food and Agriculture Organization (FAO). [] International Fund for Agricultural Development (IFAD). [] United Nations Development Programme (UNDP). [x] United Nations Environment Programme (UNEP). [] United Nations Industrial Development Organization (UNIDO).

		[] World Bank. [] Regional Development Banks. [] Directly accessed to the Global Environment Facility (GEF). [] Other.
	For updating the national implementation plan to address pentachlorophenol and its salts and esters listed by decision SC-7/13.	[] Food and Agriculture Organization (FAO). [] International Fund for Agricultural Development (IFAD). [] United Nations Development Programme (UNDP). [x] United Nations Environment Programme (UNEP). [] United Nations Industrial Development Organization (UNIDO). [] World Bank. [] Regional Development Banks. [] Directly accessed to the Global Environment Facility (GEF). [] Other.
	For updating the national implementation plan to address polychlorinated naphthalenes listed by decision SC-7/14.	[] Food and Agriculture Organization (FAO). [] International Fund for Agricultural Development (IFAD). [] United Nations Development Programme (UNDP).

		[x] United Nations Environment Programme (UNEP). [] United Nations Industrial Development Organization (UNIDO). [] World Bank. [] Regional Development Banks. [] Directly accessed to the Global Environment Facility (GEF). [] Other.
	For updating the national implementation plan to address any other changes.	[] Food and Agriculture Organization (FAO). [] International Fund for Agricultural Development (IFAD). [] United Nations Development Programme (UNDP). [x] United Nations Environment Programme (UNEP). [] United Nations Industrial Development Organization (UNIDO). [] World Bank. [] Regional Development Banks. [] Directly accessed to the Global Environment Facility (GEF). [] Other.

2. Country baseline

2.1 Country profile

2.1.1 Geography and population

The Republic of Moldova (RM), covering an area of 33,846 square km, is located in Central Europe, in the northwestern Balkans. The RM's capital city is the municipality of Chisinau (mentioned in the historical records for the first time in 1436) with a population of approximately 820.5 thousand people (NBS, 2017). The RM borders on Ukraine in the North, East and South and on Romania in the West, with the Western borderline going along the river Prut (Figure 1-1). The total length of the RM's national border is 1,389 km, including 939 km of the border with Ukraine and 450 km of the border with Romania.

The RM is situated at longitude 28˚50' east and latitude 47˚ north. The exact location of the extreme points on the RM's territory is as follows: the northernmost point is Naslavcea (latitude 48˚ 21' north and longitude 27˚ 35' east); the southernmost point is Giurgiulesti (latitude 45˚ 28' north and longitude 28˚ 12' east) which is also RM's sole location on the bank of the Danube; the westernmost point is Criva (latitude 48˚ 16' north and longitude 26˚ 30' east); the easternmost point is Palanca (latitude 46˚ 25' north and longitude 30˚ 05' east). The distance between the extreme points is about 350 km from Naslavcea to Giurgiulesti and only 120 km from the West to the East at the latitude of the municipality of Chisinau.

The RM is a Black Sea region country. Its southern border extends almost as far as the Black Sea coast, and the access to the Black Sea is open for RM through the Dniester estuary and the Danube.

There are two administrative-territorial units in the Republic of Moldova: the Administrative-Territorial Unit Gagauzia (ATU Gagauzia) and the administrative-territorial units on the left bank of the Dniester (ATULBD). The area of ATU Gagauzia is approximately 3000 km2 (162.0 thousand people)5, while the area of ATULBD is respectively about 4163 km2 (475.7 thousand people)[6]

At 01.01.2020, the present population of the Republic of Moldova (right bank) was 2643,88 thousand inhabitants, its density is about 78.11 inhabitants/ km2. 1In terms of distribution in the territory, the

[1] The given population number represents the number revised by the NBS. The national population review and the estimation of domestic and international migration is carried out within the project "Improving the institutional capacity of the National Bureau of

population of the Republic of Moldova has a pronounced level of realization, continuing to be the country with the lowest degree of urbanization in Europe. In recent decades, demographic processes have been marked by a negative dynamic, manifested by the instability of demographic indicators and phenomena such as birth rate reduction, increased mortality, demographic ageing, depopulation and others. According to the demographic forecast for 2015-2035[2], the annual population decrease will be about 1.1-2%.

The female population, as in previous years, is dominant. The estimated number of the population with habitual residence in the Republic of Moldova at the beginning of 2020 still reveals the aging trend of the population, by increasing the proportions of adults and the elderly, while the proportions of children and adolescents are continuously decreasing.

The aging coefficient of the population is 21.8 people aged 60 and over per 100 inhabitants compared to 20.8 in 2019.

Table [insert number]. Statistics on population in the Republic of Moldova, including ATULB

Population (Number of inhabitants)	Census (Year)	Percent of Women vs. Men	Percent of people living in rural vs. urban areas
3146800	2019	54,6 woman vs 45,4 men	54,3 rural vs 45,7 urban

2.1.2 Political profile

The Republic of Moldova is a parliamentary republic with a president as head of state and a prime minister as head of government. The Republic of Moldova is a member state of the United Nations, the Council of Europe, Partnership for Peace, WTO, OSCE, GUAM, CIS, Black Sea Economic Cooperation and other international organizations. The Republic of Moldova has implemented the first 3-year Action Plan within the European Neighborhood Policy.

Statistics", funded by the Swiss Agency for Development and Cooperation, co-financed and implemented by the UN Population Fund in Moldova.

[2] The study "Analysis of the demographic population in the Republic of Moldova", developed by the Center for Demographic Research at the decision of the National Commission for Population and Development based on the Global Methodology of the United Nations Population Fund on Population Analysis, https://moldova.unfpa. org / sites / default / files / pub-pdf / PSA_RO.pdf

The Parliament of the Republic of Moldova is a unicameral one and has 101 seats (the simple majority, according to the Constitutional Court, being 52 votes), and its members are elected by popular vote every 4 years. According to the provisions of the Rules of Procedure of the Parliament, the President of the forum is elected during the term of office by secret ballot of the majority of the elected deputies, at the proposal of the parliamentary factions. The Vice-Presidents of the Parliament are elected by open vote of the majority of the elected deputies, at the proposal of the President of the Parliament, after consulting the parliamentary factions.

The working body of the Parliament - the Permanent Bureau - is formed taking into account the proportional representation of the factions in the Legislature. The President of the Parliament and the Vice-Presidents are part of it ex officio. The number of members of the Permanent Bureau shall be determined by a decision of Parliament.

The Government of the Republic of Moldova ensures, according to the Constitution, the realization of the internal and foreign policy of the state and exercises the general management of the public administration. The government is organized and operates in accordance with the constitutional provisions, based on a government program previously accepted by parliament. It is made up of a leader named prime minister, a first deputy prime minister, deputy prime ministers, ministers and other members established by organic law.

The government ensures the accomplishment of the internal and foreign policy of the state, exercises the general management of the public administration and is accountable before the parliament.

The government is formed in the following composition: the Prime Minister, the first deputy prime minister, the deputy prime ministers, the ministers and other members established by law. Members of the government may be only persons who hold the citizenship of the Republic of Moldova and are domiciled in the country.

2.1.3 Economic profile and economic sectors in the context of the POPs issue

The country's economy was in decline even before 1991, but the separation from the USSR has accelerated that process considerably. Gross Domestic Product levels were decreasing continuously during the period from 1990 to 1999 inclusively, when it fell down to as little as 34 per cent of the 1990 level. The only exception was year 1997, when a slight increase by 1.6 per cent versus the previous year was registered due to the excellent agricultural yields as result of the very favorable weather. The reasons for the economic collapse were multiple. First, the Republic of Moldova had been integrated completely in the

USSR economic system, and the independence resulted, among other things, in the cessation of any subsidies or cash transfers from the centralized government. Second, the end of the Soviet Era with its well-established commercial links has resulted in the emergence of multiple obstacles for free movement of products, and in access restrictions introduced by the emerging markets. Third, the lack of domestic energy resources and raw materials in the RM has contributed considerably to the nation's strong dependence on other former Soviet Republics. Certain internal reasons should be mentioned as well, such as: transition from a centralized economy to a market economy; loss of the industries located in Transnistria; frequent droughts; and the civil conflict. The considerable GDP growth achieved since 2000 seems to indicate that the economy is finally developing in the correct direction, although it should be remembered that in 2016 the GDP reached only 72.1 per cent of the 1990 level.

In 2020 the gross domestic product (GDP) of the Republic of Moldova was worth 11.91 billion US dollars in 2020, according to official data from the World Bank. The GDP value of Moldova represents 0.01 percent of the world economy.

In 2020, a decrease in GDP of 7,2 % [3]was estimate. The main drivers of GDP decline were household consumption, which also declined by 7 percent, followed by investment and inventories. On the supply side, the lockdown measures have halted trade and industrial production while a severe drought has impacted agriculture. Employment dropped to a five-year low. In 2021 the economy has started to rebound gradually, but most of the short-term indicators remain in negative territory. This would make it possible to recover GDP in 2021-2022, which would be conditional on the launch of the vaccination process, and on the ability of the authorities to move forward with long-term structural policy measures, in parallel with the implementation of measures to recover the economy.

Domestic risks relate to political instability, institutional weaknesses, and political constraints and authorizing environment to implement reforms of the judiciary and structural reforms. Fragile economic conditions and low productivity levels are exacerbated by the large footprint of the state in the economy, shrinking fiscal space, low financial intermediation, and governance challenges. Advancing long-term structural reforms on the background of economic recovery measures and political turmoil, is of paramount importance. The capacity to mitigate the impact of the crisis and support economic recovery will critically depend on external financing.

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[3] The article "Moldova. Economic Update, December 2020 ", http://pubdocs.worldbank.org/en/251531608708848757/Moldova-Economic-Update-Dec-22-ro.pdf

Agriculture is a basic segment of the economy of the Republic of Moldova, and the development of this sector should be a prerogative of the State, according to the National Strategy of agricultural and rural development for the years 2014-2020, approved by GD no. 409/2014.
The importance of the agricultural sector for the economy is confirmed by the share in GDP of 10.2%, the employment rate of 40.0% of the total employed.

In 2019, the share of vegetable production in total agricultural production was 71% (in 2018 - 73%), animal production accounted for 29% (in 2018 - 27%).

The Republic of Moldova produces a narrow range of chemicals, largely oriented for the domestic market, namely pharmaceuticals, dyes, paints and varnishes, perfumery products.
Since the spectrum of chemicals produced in the country is not vast, most of the chemicals used in the branches of the national economy are being imported. Meanwhile, the statistical information shows that significant quantities of chemicals are exported from the country, which can be explained by the fact that part of the imported chemicals are re-exported.
The main chemical substances imported into the country were: petroleum products, fertilizers, pesticides, diverse raw materials, products and substances for the manufacturing industry and for other industries.
The figure below presents the share of each sector in the manufacturing industry in 2019.

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2.1.4 Environmental Overview

Current national priority actions in the environmental sphere are national legal and normative framework adjustment to EU standards and international treaties requirements to which the Republic of Moldova is a Party in order to mutually contribute to the reduction of impact on environment at regional and international level.

2.2 Institutional, policy, and regulatory framework

2.2.1 Policy and regulatory framework

National Programme on Sound Management of Chemicals in the Republic of Moldova, (GD No. 973 of 18.10.2010) is the main document of long-term strategic planning, which determines the objectives of the sound chemicals management system until 2020. The Programme has been approved in order to reduce and eliminate the impact of chemicals on environment and human health by developing an integrated management of chemicals, technically, economically, socially and environmentally efficient and implementation of international treaties concerning chemical substances to which the Republic of Moldova is Party, as well as in line with the SAICM.
National Waste Management Strategy 2013-2027 (GD No 248 of 10.04.2013) establishes the strategic vision of waste management until 2027 as an integrated system, economically efficient and ensuring protection of human health and environment. Inter alia, the Strategy aims to promote separate waste collection and treatment for each type of waste, particularly toxic and hazardous waste. The Strategy shall be revoked with adoption of National Waste Management Program (2022-2027),that is currently drafted by the Ministry of Environment.

National Environmental Strategy for 2014-2023 (GD No. 301of 24.04.2014,) being elaborated on base of provisions established by the Government Program "European Integration: "Freedom, Democracy, Welfare" is the main document of long-term strategic planning which establishes the strategic framework on the environment protection, including protection of human health and the environment from adverse effects caused by chemicals, their stocks and waste.

Strategy for development with reduced emissions of the Republic of Moldova until 2030 (Government Decision no. 1470 as of December 30, 2016) is a strategic document that allows the Republic of Moldova to orient towards a low carbon economy and to achieve the targets mentioned

the document "Intentional determined national contribution" through green sustainable development, based on the socio-economic priorities of the country's development.
Also, this Strategy supports the achievement of sustainable development objectives, providing a national strategic context to the mitigation efforts for which the country receives international support. The specific objective 1 of the Strategy is to reduce, until 2030, the GHG emissions from the energy sector by 74% (unconditional) and up to 82% (conditioned) compared to 1990 level.

The draft ***National Development Strategy "Moldova 2030"*** shall be the strategic reference document for all policy documents at national, regional and local level, based on the principle of the human life cycle, its rights and quality of life and includes four pillars of sustainable development (sustainable and inclusive economy, robust human and social capital, honest and efficient institutions, healthy environment), with 10 corresponding long-term goals.
Under the goal ”Ensure ensuring the fundamental right to the best physical and mental health” it is foreseen, among others, the diversification of mechanisms, ensuring transparency and resource efficiency in the procurement of medicines, including modern contraception, medical equipment and transport, ensuring compliance with EU environmental protection standards.
Under the goal ”Ensuring the fundamental right to a healthy and safe environment” it is foreseen, among others, integration of environmental protection, sustainable development and green economic development principles, adaptation to climate change in all sectors of the national economy; and development of an integrated multifunctional system of records and management of hazardous chemicals, as well as of products, objects, devices, installations, technologies that pose risks.

Association Agreement between the European Union and the European Atomic Energy Community and their Member States, of the one part, and the Republic of Moldova, of the other part, (ratified by Law no 112 of 02 July 2014) covers activities related to transposition of European Union legislation on environment protection, chemicals and waste into national legislation and insurance of its implementation.

Chemicals Framework Law no. 277 of 28.11.2018 embraces the key EU directives and regulations, such as REACH, CLP, PIC, BPR, PPP and GLP. The law regulates the obligations of individuals and legal persons that produce or place on the market substances or mixtures; prohibitions and restrictions on the manufacture, marketing, import, export and use of hazardous chemicals and mixtures; conditions for classification, packaging and labeling of chemical substances and mixtures; creating and maintaining the registry of chemicals; chemical products reporting procedure; authorization of hazardous chemicals; reporting obligations; control and other issues related to chemical substances and mixtures. Chapter IV Prohibitions and Restrictions provide in para (2) that in order to protect human health and environment, some particularly hazardous chemicals may be prohibited or restricted for manufacture, placing on market and use by individuals and legal persons, such a

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mercury in measuring devices (medical thermometers, manometers, barometers, sphygmomanometers) and other products (PPP, BP, cosmetics, dental amalgams). Also, the same chapter, para (5) provides that requirements on the use of hazardous chemicals, including Persistent Organic Pollutants, mercury, lead, cadmium, tin organic compounds, hexavalent chromium, phthalates, substances depleting the ozone layer, including hydrochlorofluorocarbons in EEE, vehicles, batteries, packaging or components of packaging and other items or devices or products placed on market shall be regulated by the specific legislation.

Waste Framework Law no 209 of 29.07.2016 transposes the Waste Directive and establishes the legal bases, the state policy and the measures necessary to protect the environment and health of the population by preventing and reducing adverse effects caused by waste production and management, by reducing the overall effects of resource using and by making their use more efficient. As a priority order in waste prevention and management legislation and policy, the waste hierarchy shall be applied. In Chapter VII, the Law provides specific management requirements for certain waste categories, such as: B&A, WEEE, ELV, waste oils, POPs stocks and waste, packaging waste, clinical waste, biowaste, Hg waste, asbestos waste, used tyres.

2.2.1.1 Legal/administrative measures for chemicals listed in Annex A to the Convention

Table [insert number]. Status of legal/administrative measures taken for chemicals listed in Annex A of the Convention

Chemicals	**Legal/administrative measure (select all that apply)**		**Year**	**Remarks**
Aldrin	[]	Restriction in accordance with Annex A.		
	[x]	Prohibition on production.	2003	Included in Law on waste no. 209/2016, prohibited with no exemptions.
	[x]	Prohibition on all uses.	2003	
	[x]	Prohibition on import.	2003	Included in Law on waste no. 209/2016 No consent to import under RC

	[x]	Prohibition on export.	2020	Included in PIC Regulation, GD 505/2020
	[]	Currently being developed.		
	[]	No legal/administrative measures taken.		
Alpha hexachlorocyclohexane	[]	Restriction in accordance with Annex A.		
	[]	Prohibition on production.		
	[]	Prohibition on all uses.		
	[x]	Prohibition on import.	2020	Included in PIC Regulation, GD 505/2020
	[x]	Prohibition on export.	2020	Included in PIC Regulation, GD 505/2020
	[x]	Currently being developed.		
	[]	No legal/administrative measures taken.		
Beta hexachlorocyclohexane	[]	Restriction in accordance with Annex A.		
	[]	Prohibition on production.		
	[]	Prohibition on all uses.		
	[x]	Prohibition on import.	2020	Included in PIC Regulation, GD 505/2020
	[x]	Prohibition on export.	2020	Included in PIC Regulation, GD 505/2020
	[x]	Currently being developed.		
	[]	No legal/administrative measures taken.		
Chlordane	[]	Restriction in accordance with Annex A.		
	[x]	Prohibition on production.	2003	Included in Law on waste no. 209/2016, prohibited with no exemptions
	[x]	Prohibition on all uses.	2003	
	[x]	Prohibition on import.	2003	Law on waste no. 209/2016 No consent to import under RC

	[x]	Prohibition on export.	2020	PIC Regulation, GD 505/2020
	[]	Currently being developed.		
	[]	No legal/administrative measures taken.		
Chlordecone	[]	Restriction in accordance with Annex A.		
	[x]	Prohibition on production.	2016	Law on waste no. 209/2016, prohibited with no exemptions
	[x]	Prohibition on all uses.	2016	Law on waste no. 209/2016, prohibited with no exemptions
	[x]	Prohibition on import.	2016	Law on waste no. 209/2016
	[x]	Prohibition on export.	2020	PIC Regulation, GD 505/2020
	[]	Currently being developed.		
	[]	No legal/administrative measures taken.		
Dieldrin	[]	Restriction in accordance with Annex A.		
	[x]	Prohibition on production.	2003	Law on waste no. 209/2016, prohibited with no exemptions
	[x]	Prohibition on all uses.	2003	Law on waste no. 209/2016, prohibited with no exemptions
	[x]	Prohibition on import.	2003	Law on waste no. 209/2016 No consent to import under RC
	[x]	Prohibition on export.	2003	PIC Regulation, GD 505/2020
	[]	Currently being developed.		
	[]	No legal/administrative measures taken.		
Endrin	[]	Restriction in accordance with Annex A.		
	[x]	Prohibition on production.	2003	Law on waste no. 209/2016,

				prohibited with no exemptions
	[x]	Prohibition on all uses.	2005	Law on waste no. 209/2016, prohibited with no exemptions
	[x]	Prohibition on import.	2003	Law on waste no. 209/2016
	[x]	Prohibition on export.	2003	PIC Regulation, GD 505/2020
	[]	Currently being developed.		
	[]	No legal/administrative measures taken.		
Heptachlor	[]	Restriction in accordance with Annex A.		
	[x]	Prohibition on production.	2003	Law on waste no. 209/2016, prohibited with no exemptions
	[x]	Prohibition on all uses.	2003	Law on waste no. 209/2016, prohibited with no exemptions
	[x]	Prohibition on import.	2003	Law on waste no. 209/2016 No consent to import under RC
	[x]	Prohibition on export.	2003	PIC Regulation, GD 505/2020
	[]	Currently being developed.		
	[]	No legal/administrative measures taken.		
Hexabromobiphenyl	[]	Restriction in accordance with Annex A.		
	[x]	Prohibition on production.	2016	Law on waste no. 209/2016, prohibited with no exemptions
	[x]	Prohibition on all uses.	2016	Law on waste no. 209/2016, prohibited with no exemptions
	[x]	Prohibition on import.	2016	Law on waste no. 209/2016

	[x]	Prohibition on export.	2020	PIC Regulation, GD 505/2020
	[]	Currently being developed.		
	[]	No legal/administrative measures taken.		
Hexabromodiphenyl ether and heptabromodiphenyl ether	[]	Restriction in accordance with Annex A.		
	[x]	Prohibition on production.	2016	Law on waste no. 209/2016, prohibited with exemptions
	[x]	Prohibition on all uses.	2016	Law on waste no. 209/2016, prohibited with exemptions
	[x]	Prohibition on import.	2016	Law on waste no. 209/2016 No responce under RC
	[x]	Prohibition on export.	2020	PIC Regulation, GD 505/2020
	[]	Currently being developed.		
	[]	No legal/administrative measures taken.		
Hexabromocyclododecane	[]	Restriction in accordance with Annex A.		
	[]	Prohibition on production.		
	[]	Prohibition on all uses.		
	[x]	Prohibition on import.	2020	PIC Regulation, GD 505/2020
	[x]	Prohibition on export.	2020	PIC Regulation, GD 505/2020
	[x]	Currently being developed.		
	[]	No legal/administrative measures taken.		
Hexachlorobenzene	[]	Restriction in accordance with Annex A.		
	[x]	Prohibition on production.	2003	Law on waste no. 209/2016, prohibited with no exemptions
	[x]	Prohibition on all uses.	2003	Law on waste no. 209/2016, prohibited with no exemptions

	[x]	Prohibition on import.	2003	Law on waste no. 209/2016 Interim decision - no consent to import under RC
	[x]	Prohibition on export.	2020	PIC Regulation, GD 505/2020
	[]	Currently being developed.		
	[]	No legal/administrative measures taken.		
Hexachlorobutadiene	[]	Restriction in accordance with Annex A.		
	[x]	Prohibition on production.	2016	Law on waste no. 209/2016, prohibited with no exemptions
	[x]	Prohibition on all uses.	2016	Law on waste no. 209/2016, prohibited with no exemptions
	[x]	Prohibition on import.	2016	Law on waste no. 209/2016
	[x]	Prohibition on export.	2020	PIC Regulation, GD 505/2020
	[]	Currently being developed.		
	[]	No legal/administrative measures taken.		
Lindane	[]	Restriction in accordance with Annex A.		
	[x]	Prohibition on production.	2016	Law on waste no. 209/2016, prohibited with no exemptions
	[x]	Prohibition on all uses.	2016	Law on waste no. 209/2016, prohibited with no exemptions
	[x]	Prohibition on import.	2016	Law on waste no. 209/2016 No consent to import under RC
	[x]	Prohibition on export.	2020	PIC Regulation, GD 505/2020
	[]	Currently being developed.		

	[]	No legal/administrative measures taken.		
Mirex	[]	Restriction in accordance with Annex A.		
	[x]	Prohibition on production.	2003	Law on waste no. 209/2016, prohibited with no exemptions
	[x]	Prohibition on all uses.	2003	Law on waste no. 209/2016, prohibited with no exemptions
	[x]	Prohibition on import.	2003	Law on waste no. 209/2016, prohibited with no exemptions
	[x]	Prohibition on export.	2003	PIC Regulation, GD 505/2020
	[]	Currently being developed.		
	[]	No legal/administrative measures taken.		
Pentachlorobenzene	[]	Restriction in accordance with Annex A.		
	[x]	Prohibition on production.	2016	Law on waste no. 209/2016, prohibited with no exemptions
	[x]	Prohibition on all uses.	2016	Law on waste no. 209/2016, prohibited with no exemptions
	[x]	Prohibition on import.	2016	Law on waste no. 209/2016, prohibited with no exemptions
	[x]	Prohibition on export.	2020	PIC Regulation, GD 505/2020
	[]	Currently being developed.		
	[]	No legal/administrative measures taken.		
Pentachlorophenol and its salts and esters	[]	Restriction in accordance with Annex A.		
	[]	Prohibition on production.		
	[]	Prohibition on all uses.		
	[x]	Prohibition on import.	2020	PIC Regulation, GD 505/2020

	[x]	Prohibition on export.	2020	PIC Regulation, GD 505/2020
	[x]	Currently being developed.		
	[]	No legal/administrative measures taken.		
Polychlorinated biphenyls (PCB)	[]	Restriction in accordance with Annex A.		
	[x]	Prohibition on production.	2009	Law on waste no. 209/2016,
	[x]	Prohibition on all uses.	2009	Law on waste no. 209/2016, permissible to use articles already in use at the time of the entry into force of this Law. Regulation on PCB, GD 81/2009,
	[x]	Prohibition on import.	2009	Law on waste no. 209/2016, No consent to import under RC
	[x]	Prohibition on export.	2020	PIC Regulation, GD 505/2020
	[]	Currently being developed.		
	[]	No legal/administrative measures taken.		
Polychlorinated naphthalenes (PCN)	[]	Restriction in accordance with Annex A.		
	[x]	Prohibition on production.	2016	Law on waste no. 209/2016, prohibited with no exemptions
	[x]	Prohibition on all uses.	2016	Law on waste no. 209/2016, prohibited with no exemptions
	[x]	Prohibition on import.	2016	Law on waste no. 209/2016, prohibited with no exemptions
	[x]	Prohibition on export.	2020	PIC Regulation, GD 505/2020

	[]	Currently being developed.		
	[]	No legal/administrative measures taken.		
Technical endosulfan and its related isomers	[]	Restriction in accordance with Annex A.		
	[x]	Prohibition on production.	2016	Law on waste no. 209/2016, prohibited with no exemptions
	[x]	Prohibition on all uses.	2016	Law on waste no. 209/2016, prohibited with no exemptions
	[x]	Prohibition on import.	2016	Law on waste no. 209/2016, prohibited with no exemptions No consent to import under RC – interim decision
	[x]	Prohibition on export.	2020	PIC Regulation, GD 505/2020
	[]	Currently being developed.		
	[]	No legal/administrative measures taken.		
Tetrabromodiphenyl ether and pentabromodiphenyl ether	[]	Restriction in accordance with Annex A.		
	[x]	Prohibition on production.	2016	Law on waste no. 209/2016, prohibited with exemptions
	[x]	Prohibition on all uses.	2016	Law on waste no. 209/2016 prohibited with exemptions
	[x]	Prohibition on import.	2016	Law on waste no. 209/2016, prohibited with exemptions No response under RC
	[x]	Prohibition on export.	2020	PIC Regulation, GD 505/2020
	[]	Currently being developed.		

	[]	No legal/administrative measures taken.		
Toxaphene	[]	Restriction in accordance with Annex A.		
	[x]	Prohibition on production.	2003	Law on waste no. 209/2016, prohibited with no exemptions
	[x]	Prohibition on all uses.	2003	Law on waste no. 209/2016, prohibited with no exemptions
	[x]	Prohibition on import.	2003	Law on waste no. 209/2016, prohibited with no exemptions No consent to import under RC – interim decision
	[x]	Prohibition on export.	2003	PIC Regulation, GD 505/2020
	[]	Currently being developed.		
	[]	No legal/administrative measures taken.		

2.2.1.2 Legal/administrative measures for chemicals listed in Annex B to the Convention

Table [insert number]. Status of legal/administrative measures taken for chemicals listed in Annex B of the Convention

Chemicals	**Legal/administrative measure (select all that apply)**		**Year**	**Remarks**
DDT (1,1,1-trichloro-2, 2-bis (4-chlorophenyl) ethane)	[]	Restriction in accordance with Annex B.		
	[x]	Prohibition on production.	2003	Law on waste no. 209/2016, prohibited with no exemptions
	[x]	Prohibition on all uses.		
	[x]	Prohibition on import.	2003	Law on waste no. 209/2016, prohibited with no exemptions

				No consent to import under RC.
	[x]	Prohibition on export.		
	[]	Currently being developed.		
	[]	No legal/administrative measures taken.		
Perfluorooctane sulfonic acid, its salts and perfluorooctane sulfonyl fluoride	[]	Restriction in accordance with Annex B.		
	[x]	Prohibition on production.	2016	Law on waste no. 209/2016, prohibited with exemptions
	[x]	Prohibition on all uses.	2016	
	[]	Prohibition on import.	2016	Law on waste no. 209/2016, prohibited with exemptions No response under RC
	[x]	Prohibition on export.		
	[]	Currently being developed.		
	[]	No legal/administrative measures taken.		

2.2.1.3 Strategies/action plan/measures for polychlorinated biphenyls (PCBs) management

Table [insert number]. Status of strategies/measures for management of PCBs

Strategy/measure	**Status**	**Year**	**Elements included in the strategy/measure**
strategies for identifying stockpiles consisting of or containing greater than 0.005% (50 ppm) PCB	[x] Yes [] Currently being developed [] No	Before 2009	[x] Media campaign. [x] Regulatory and enforcement policies. [x] Incentives. [x] Partnerships with stakeholders. [x] Identification of relevant sectors. [x] Database (electronic or paper copy). [] Formal communication. [] Informal communication. [] Door to door search. [] Other :
strategies for identifying products and articles in use and wastes consisting of, containing or contaminated with greater than 0.005% (50 ppm) PCB	[x] Yes [] Currently being developed. [] No	Before 2009	[x] Media campaign. [x] Regulatory and enforcement policies. [x] Incentives. [x] Partnerships with stakeholders. [x] Identification of relevant sectors. [x] Database (electronic or paper copy). [] Formal communication. [] Informal communication. [] Door to door search. [] Other :
strategies for identifying products and articles containing more than 0.005% (50 ppm) PCB contaminated through open applications of PCB (e.g. cable-sheaths, cured caulk and painted objects),	[] Yes [] Currently being developed. [x] No	[]	[] Media campaign. [] Regulatory and enforcement policies. [] Incentives. [] Partnerships with stakeholders. [] Identification of relevant sectors. [] Database (electronic or paper copy). [] Formal communication. [] Informal communication. [] Door to door search. [] Other :

measures to ensure PCB or products and articles containing greater than 0.005% (50 ppm) PCB identified as wastes are managed in an environmentally sound manner	x[] Yes [] Currently being developed. [] No	2009	[x] Handled in an environmentally sound manner. [x] Collected in an environmentally sound manner. [x] Transported in an environmentally sound manner. [x] Stored in an environmentally sound manner. [x] Disposed of in such a way that the persistent organic pollutant content is destroyed or irreversibly transformed, or otherwise disposed of in an environmentally sound manner, in accordance with paragraph 1 (d) (ii) of Article 6 of the Convention.
strategies for identifying sites contaminated by greater than 0.005% (50 ppm) PCB	[X] Yes [] Currently being developed. [] No	2004	Part of NIP and Strategy for NIP implementation
taking measures to identify and label, where appropriate, equipment in use containing greater than 0.005% (50 ppm) PCB	[x] Yes [] No	2009	[] Constitution of task force. [] Questionnaire survey. [x] Legislation/regulation. [x] Development of inventory. [] Other :
taking measures to identify and/or label, where appropriate, wastes liable to contain greater than 0.005% (50 ppm) PCB	[] Yes [x] No	[]	[] Use of labels for identification. [] Use of screening test for identification. [] Use of laboratory analysis for identification. [] Other :
taking measures to identify articles containing more than 0.005% (50 ppm) PCB contaminated through open applications of PCB (e.g. cable-sheaths, cured caulk and painted objects)	[] Yes [x] No	[]	[] Constitution of task force. [] Questionnaire survey. [] Legislation/regulation. [] Development of inventory. [] Other :

Table [insert number]. Status of developing a specific plan for the management, phase-out and disposal of PCB

Status of developing a specific plan for the management, phase-out and disposal of PCB	Year	Difficulties encountered in the implementation of the specific plan for the management, phase-out and disposal of PCB	Main problem sources
[x] Yes [] No	2020	[X] Yes [] No	[] Lack of institutional or policy framework. [] Lack of financial resources. [] Limited human resources. [X] Insufficient technical capacity. [X] Lack of disposal facilities. [] Lack of storage facilities. [X] Lack of analytical laboratories. [X] Other : need for addendum of PCB regulation with new deadlines for phasing out

Table [insert number]. Status of promoting any measures to reduce exposures from the use of PCB

Status of promoting any measures to reduce exposures from the use of PCB	Year	Measures promoted
[x] Yes [] No	2009	[x] Use only in intact and non-leaking equipment and only in areas where the risk of environmental release can be minimized and quickly remedied. [x] No use in equipment in areas associated with the production or processing of food or feed. [x] When used in populated areas, measures are in place to protect from electrical failure which could result in a fire. [] When used in schools, measures are in place to protect from electrical failure which could result in a fire. [] When used in hospitals, measures are in place to protect from electrical failure which could result in a fire. [x] When used in populated areas, regular inspection of equipment is made for leaks. [] When used in schools, regular inspection of equipment is made for

		leaks. [] When used in hospitals, regular inspection of equipment is made for leaks. [] Other : Enforcement of PCB Regulation

2.2.1.4 Strategies/action plan/measures for POP-PBDEs management

Table [insert number]. Strategies/action plan/measures for POP-PBDEs management

Strategy/action plan/measure	**Status**	**Year**	**Description of actions or control measures**
taking actions or control measures to eliminate brominated diphenyl ethers contained in articles	[x]Yes [x]Hexabromodiphenyl ether and heptabromodiphenyl ether [x]Tetrabromodiphenyl ether and pentabromodiphenyl ether []Currently being developed []No []Lack of financial resources []Lack of technical capacity []Other	2016	Legislative measures – Law on waste 209/2016 – prohibition for marketing and using substances listed in the in Annex 6 (see table below), either individually or in preparations or as constituents of articles, in order to protect human health and the environment, and prevent the formation of hazardous waste. Exemptions: a) articles and preparations showing concentrations of tetrabromodiphenyl ether/ pentabromodiphenyl/ hexabromodiphenyl ether / heptabromodiphenyl ether below 0.1% by weight, produced (partly or wholly) on the basis of recycled materials or waste materials prepared for reuse; b) electrical and electronic equipment, according to

			the requirements referred to in Article 53(3). Articles containing tetrabromodiphenyl ether/ pentabromodiphenyl/ hexabromodiphenyl ether / heptabromodiphenyl ether as a constituent of these articles already in use shall remain in use until 2025

2.2.1.5 Strategies/action plan/measures for DDT

Table [insert number]. Status of development of laws and regulations for DDT purchase and use

Status of development of national laws and regulations governing and restricting the purchase or use of DDT	**National laws and regulations governing and restricting the purchase or use of DDT fully enforced**	**Quality control of DDT produced or imported**
[x] Yes [] No	[x] Yes By Law on Waste, the import and use of DDT is prohibited. DDT and preparations on its base has been prohibited since 1970.	[] Yes [] No [x] Not applicable

Table [insert number]. Status of Integrated vector management strategy development and implementation

Integrated vector management (IVM) strategy endorsed at national level	**IVM strategy implemented throughout the country**
[] Yes [X] No	[] Yes [X] No

2.2.1.6 Strategies/action plan/measures for PFOS, its salts and PFOSF management

Table [insert number]. Status of developing and implementing an action plan for reduction/eliminating PFOS, its salts and PFOSF

Strategy/action plan/measure	**Status**	**Year**
developing and implementing an action plan with the goal of reducing and ultimately eliminating the production and/or use of PFOS	[] Yes [] Currently being developed. [x] No	[]

Table [insert number]. Strategies/action plan/measures for PFOS, its salts and PFOSF management

Strategy/action plan/measure	**Status**	**Use**	**Description of the alternative substances or methods**	**Main problem sources**
taking any actions to phase out the use of PFOS as safer alternative substances or methods have become available,	[] Yes [x] No	[] Photo-imaging		[] Unavailability of information on alternative substances or methods. [x] Lack of financial resources. [x] Insufficient technical capacity. [x] Other : Moldova is not party to the amendment on PFOS/Moldova did not ratify
		[] Photo-resist and anti-reflective coatings for semi-conductors		
		[] Etching agent for compound semiconductors and ceramic filters		
		[] Aviation hydraulic fluids		
		[] Metal plating (hard metal plating) only in closed-loop systems		
		[] Certain medical devices (such as ethylene tetrafl uoroethylene copolymer (ETFE) layers and radio-opaque ETFE production, in-vitro diagnostic medical devices, and CCD colour filters)		
		[] Fire-fighting foam		
		[] Insect baits for control of leaf-cutting ants from Atta spp. and Acromyrmex spp		

		[] Photo masks in the semiconductor and liquid crystal display (LCD) industries		
		[] Metal plating (hard metal plating)		
		[] Metal plating (decorative plating)		
		[] Electric and electronic parts for some colour printers and colour copy machines		
		[] Insecticides for control of red imported fi re ants and termites		
		[] Chemically driven oil production		
		[] Carpets		
		[] Leather and apparel		
		[] Textiles and upholstery		
		[] Paper and packaging		
		[] Coatings and coating additive		
		[] Rubber and plastics		
		[] Other uses		

Table [insert number]. Status of promoting research and development of alternatives to PFOS, its salts and PFOSF management

Action	Status	Action taken	Main problem sources
taking action to promote research on and development of safe alternative chemicals and non-chemical products and processes, methods and strategies to the use of PFOS as parties are encouraged to do so in accordance with	[] Yes [x] No	[]	[] Unavailability of information on alternative substances or methods. [x] Lack of financial resources. [x] Insufficient technical capacity. [] Other :

paragraph 4 (c) of Part III of Annex B			
taken action to build the capacity of countries to transfer safely to reliance on alternatives to PFOS, its salts and PFOSF in accordance with paragraph 5 (d) of Part III of Annex B	[] Yes [x] No	[]	[] Unavailability of information on alternative substances or methods. [x] Lack of financial resources. [x] Insufficient technical capacity. [] Other :

2.2.1.7 Strategies/action plan/measures for unintentional POPs management

Table [insert number]. Status of developing an action plan to identify, characterize and address releases of chemicals listed in Annex C

Action Plan	Status	Year	Difficulties in the implementation of the action plan	Main problem sources
action plan designed to identify, characterize and address the release of the chemicals listed in Annex C	[] Yes [] Currently being developed. [x] No	Development of the action plan: Review and updating of the action plan:	[] Yes [] No	[x] Lack of institutional or policy framework. [x] Lack of financial resources. [x] Limited human resources. [x] Insufficient technical capacity. [x] Insufficient information. [] Other :

Table [insert number]. Status of participating in regional/sub-regional action plan identify, characterize and address releases of chemicals listed in Annex C

Action	Status	Name of regional or sub-regional action plan	Starting year

participating in any regional or sub-regional action plan	[x] Yes [] No	[]	[]

Table [insert number]. Status of evaluating efficacy of the laws and policies adopted to manage releases of unintentionally POPs

Action	**Status**	**Year**
evaluation of the efficacy of the laws and policies adopted to manage releases of unintentionally produced persistent organic pollutants	[x] Yes [] Currently being developed. [] No	[]

Table [insert number]. Status of promoting or introducing requirements for use of best available techniques (BAT) and best environmental practices (BEP) for new sources and existing sources

Measure	**Status**	**New sources**	**Existing sources**

promoted or introduced requirements for use of best available techniques (BAT) and best environmental practices (BEP) for new sources and existing sources	[] Yes [x] Currently being developed. [] No	[x] Require use of BAT for all source categories. Starting year: [] Require use of BAT for identified priority source categories only. Starting year: [] Promote use of BAT for all source categories. Starting year: [] Promote use of BAT for identified priority source categories only. Starting year: [x] Promote use of BEP for all source categories. Starting year: [] Promote use of BEP for identified priority source categories only Starting year:	[] Require use of BAT for all source categories. Starting year: [x] Require use of BAT for identified priority source categories only. Starting year: [] Promote use of BAT for all source categories. Starting year: [x] Promote use of BAT for identified priority source categories only. Starting year: [] Promote use of BEP for all source categories. Starting year: [] Promote use of BEP for identified priority source categories only. Starting year:

2.2.1.8 Strategies/measures for POPs stockpiles and waste management

Table [insert number]. Status of developing strategies and taking measure to identify and manage stockpiles consisting of, or containing, chemicals listed in either Annex A or Annex B to the Convention

			Year	**Type**	**Year**
Strategy/measures	**Status**	**Main problem sources**	***Pesticides listed in annexes A or B:***	***Industrial chemicals listed in annexes A or B:***	

developing strategies for identifying stockpiles consisting of, or containing, chemicals listed in either Annex A or Annex B to the Convention	[x] Yes [] Currently being developed. [] No	[] Lack of institutional or policy framework. [x] Limited financial resources. [x] Limited human resources. [x] Insufficient technical capacity. [] Other :	[]	[]	[]
taking any measures to manage stockpiles in a safe, efficient and environmentally sound manner	[x] Yes [] No		2004	[]	[]

Table [insert number]. Status of developing strategies and taking measure to identify and manage products and articles in use and wastes consisting of, containing, or contaminated with chemicals listed in Annex A, B or C, including contaminated sites.

Strategy/measures	Status	Main problem sources	**Year** ***Pesticides listed in annexes A or B:***	**Type** ***Industrial chemicals listed in annexes A or B:***	**Year**	**Year** ***Unintentional chemicals listed in annex C***
developing strategies for identifying products and articles in use and wastes consisting of, containing, or contaminated with chemicals listed in Annex A, B or C	[] Yes [] Currently being developed. [] No	[] Lack of financial resources. [] Limited human resources. [] Insufficient technical capacity. [] Other	[]	[]	[]	[]

taking any measures to manage wastes, including products and articles upon becoming wastes	[] Yes [] No		[]	[]	[]	[]
developing strategies for identifying sites contaminated by chemicals listed in Annex A, B or C	[] Yes [] Currently being developed. [] No		[]	[]	[]	[]

2.2.2 Institutional framework

The administrative system for environmental management and protection includes at the highest level: (i) the President, who is responsible for the state of the environment in the country in front of the global community; (ii) the Parliament, responsible for approving general environmental policy principles and adopting laws; and (iii) the Government, responsible for the implementation of national environmental policy. The Parliament has a Commission on Environment and Regional Development.

The main governmental bodies involved in chemicals management issues are: Ministry of Agriculture, Regional Development and Environment, Ministry of Health, National Food Safety Agency, Customs Service and General Inspectorate for Emergency Situations.

The Ministry of Environment (MoE) of the Republic of Moldova is the state authority responsible for the following areas: (1) environment protection and climate change; (2) natural resources.
The main responsibilities of the Ministry are:

- develop and promote policies, normative acts in the areas of competence;
- collaboration, according to the national legislation, with foreign institutions in the areas of competence;
- implementation of normative acts and international environment treaties to which the Republic of Moldova is a Part, reporting on their execution;

- examination and approval of draft normative acts elaborated by other public administration authorities and sent for examination;
- elaborating and presenting budget proposals in the areas of competence, elaborating the annual activity plan, as well as annual monitoring of implementation degree by generating and publishing the respective reports;
- organizing the planning, execution, financial accounting and budget reporting systems within the Ministry and, as necessary, within the subordinated budget authorities/ institutions;
- coordination and monitoring of administrative authorities activities, of the subordinated decentralized public services and of the public institutions in which it represents a founder;
- exercising other specific functions.

Since 1991, Moldova began to actively participate in international, regional and bilateral environmental
cooperation, signing 17 and ratifying 16 international conventions, including the following:.

- Montreal protocol on protection of ozone layer, adhered by the Parliamentary Decision nr. 966-XIII from 24 April 1996;
- Basel Convention was ratified by the Republic of Moldova in June 2nd, 1998 according to the Parliament of RM Decision nr.1599-XIII of 10 March 1998.
- -Rotterdam Convention on PIC was ratified by the Republic of Moldova according to Law nr 389-XV of 25 November 2004.
- Stockholm Convention on POPs was ratified by the Republic of Moldova by Law nr. 40-XV of 19 February 2004
- Protocol on Pollutant Release and Transfer Registers (PRTR) of Aarhus Convention on access to information, public participation in decision-making and access to justice in environmental matters - Moldova signed the PRTR Protocol on 9 August 1999 and ratified it on 26 April, 2013 by Law no 99
- Minamata Convention on Mercury, ratified by the Law no 51 of 30.03.2017.

2.2.3 Stakeholders roles

Table [insert number]. POPs management stakeholders and related roles

Stakeholder	Role
Ministry of Environment (MoE)	Coordinates the implementation of the treaties and international agreements related to waste and chemicals to which the Republic of Moldova is a party. It also contributes to the collection and dissemination of the information about waste and chemicals management, including the cross-border context, and ensure the public access to information

Environment Protection Agency	• participate in the implementation of the international treaties and agreements regarding waste management and their cross-border transportation • issues notification documents regarding the cross-border transportation of waste, according regulations approved by the Government; • ensure the set up of targets for the separate collection and recycling of product waste under the extended producer responsibility; • is the owner of Waste Management Information System and shall maintain it • is the owner of Pollutant Release and Transfer Register and shall maintain it.
Environment Protection Inspectorate	Implements state policy in the field of environmental protection and rational use of natural resources, to exercise state control and surveillance, to prevent and counteract violations in the areas of competence, in order to ensure a high level of supervision and protection. environment, public interests, ecological security of the state and other values protected by legislation. It has competencies in the fields of waste and chemicals management.
National Agency for Regulation of Nuclear, Radiological and <u>Chemical Activities</u> (to be established by the end of the year 2019)	- implement international treaties and agreements in the field of integrated management of substances and chemicals to which the Republic of Moldova is a party - establish and maintain of System and inventory of classification and labelling in accordance with the Regulation on classification, labelling and packaging of substances and mixtures; - create and maintain the automated information system "Register of chemicals placed on the market of the Republic of Moldova; - is the ”designated national authority” responsible for administrative tasks related to the implementation and management of Rotterdam Convention.

Ministry of Health, Labour and Social Protection	- authorize biocidal products, by using the single authorization platform of hazardous chemicals; - monitor, record, report and investigate cases of poisoning with hazardous chemicals, and take measures to prevent them; - cooperate, through the National Agency for Public Health, with the central public environment authority in the implementation of international environmental treaties related to this law; - develop and implement regulatory acts for clinical waste management
National Food Safety Agency	- performs the supervision and control of the production, import, marketing, use and storage of plant protection products in accordance with the legislation in the field of plant protection.
Customs Service of the Ministry of Finance	- controls and admits import/export of consumer goods, chemicals and waste on the territory of the Republic of Moldova on the basis of permissive acts, and cooperates with environment authorities in the process of implementing the international environmental treaties.
General Inspectorate for Emergency Situations	- provide specialized assistance to the Customs Service and other authorized institutions in the fight against trafficking and illicit use of hazardous chemicals and mixtures - cooperates with the National Agency in the process of implementing the international environmental treaties related to this law

2.3 Assessment of the POPs issue in the country

This subchapter would contain specific information on POPs listed under the three annexes of the Stockholm Convention, including: historical, current, and projected future production, use, import, export and waste management; existing policy and regulatory framework.

2.3.1 Assessment of POPs pesticides (Annex A, Part I)

2.3.1.1 Production

Table [insert number]. Production of POPs pesticides in [insert country name] in/during [insert year/period]

Chemicals	**Yes**	**No**	**N/Av***	**Not applicable (this is not under SC-ERS)**	**Year in which the production started**	**Year in which the production ended**	**Estimated total production [kg]**
Aldrin		X					
Alpha hexachlorocyclohexane		X					
Beta hexachlorocyclohexane		X					
Chlordane		X					
Chlordecone		X					
Dieldrin		X					
Endrin		X					
Heptachlor		X					
Hexachlorobenzene		X					
Lindane		X					
Mirex		X					
Pentachlorobenzene		X					
Pentachlorophenol and its salts and esters		X					

Technical endosulfan and its related isomers		X					
Toxaphene		X					
DDT (1,1,1-trichloro-2, 2-bis (4-chlorophenyl) ethane)		X					
Perfluorooctane sulfonic acid, its salts and perfluorooctane sulfonyl fluoride		X					

2.3.1.2 Import

Table [insert number]. POPs pesticides imports in/during [insert year/period]

Status	**Year**	**Chemical**	**Purpose**	**Countries of origin**	**Total annual import (kg/year)**
[X] Yes [] No	2015	HEPTACHLOR (ISO) U-PST-571 - 1AMB	Laboratory, ECOCHIMIE"SRL	-	0,010
	2015	DIELDRIN	Laboratory , ECOCHIMIE"SRL	-	0,005
	2015	DERIVATI HALOGENATI AI HIDROCARBURILOR HEXACLORBENZEN(ISO) SI DDT(ISO) [CLOFENOTAN (DCI)-EXACHLOROBENZENE CERTIFED	Laboratory , TEMEI-VTAC"SRL	-	0,005
	2016	DERIVATI HALOGENATI AI HIDROCARBURILOR HEXACLORBENZEN (ISO) SI DDT(ISO) ,HEXACLORBENZEN(TIP:4.4-DDT	Laboratory, TEMEI-VTAC"SRL	-	0,1
	2017	ERBICIDE OXYFLUORFEN (2*0.5G)	Laboratory , State Center for Attestation and Approval of Phytosanitary Products	-	0,001
	2018	DERIVATI HALOGENATI AI HIDROCARBURILOR CICLANICE,1,2,3,4,5,6-HEXACLOR CICLOHEXAN(TIP:ALPHA-HCH	Laboratory, "TEMEI-VTAC"SRL	-	0,001
	2018	DERIVATI HALOGENATI AI HIDROCARBURILOR,HEXACLORBENZEN(ISO) SI DDT(ISO) (TIP:DDT	Laboratory, "TEMEI-VTAC"SRL	-	0,002

2.3.1.3 Export

Table [insert number]. POPs pesticides exports in/during [insert year/period]

Status	Year	Chemical	Purpose	Destination Countries	Total annual export (kg/year)
[] Yes [x] No					

2.3.1.4 Use

Table [insert number]. POPs pesticides use in/during [insert year/period]

Status	Year	Chemical	Purpose	Total annual use (kg/year)
[] Yes [X] No [] Information not available				

2.3.1.5 Alternatives

Table [insert number]. Status of using alternatives in/during [insert year/period]

Status of alternatives use	Year of introducing the alternative	Type of alternative	Purpose	Total annual use (kg/year)	Risk assessment against POPs criteria listed in Annex D
[] Yes [] No [] Information not available					

2.3.2 Assessment of PCBs (Annex A, Part II)

2.3.2.1 Production

Table [insert number]. Production of PCBs in [insert country name] in/during [insert year/period]

Chemicals	Yes	No	N/Av*	Year in which the production started	Year in which the production ended	Estimated total production [kg]
Polychlorinated biphenyls (PCB)		X				

2.3.2.2 Import for destruction

Table [insert number]. Imports for destruction of the PCBs contained in equipment, liquids, or other wastes containing greater than 0.005% (50 ppm) in/during [2020]

Import for destruction of the PCBs contained in equipment, liquids, or other wastes containing greater than 0.005% (50 ppm):	PCBs contained in:	Year	Quantity (Metric Tons):
[] Yes [X] No			

2.3.2.3 Export for destruction

Table [insert number]. Exports for destruction of the PCBs contained in equipment, liquids, or other wastes containing greater than 0.005% (50 ppm) in/during [insert year/period]

Export for destruction of the PCBs contained in equipment, liquids, or other wastes containing greater than 0.005% (50 ppm):	PCBs contained in:	Year	Quantity (Metric Tons):
[X] Yes [] No	PCB dielectric oil and contaminated equipment from ICS Premier Energy Code: A3180, EWC 160209 Code A3180, EWC 13 03.01	2020	60 tons of transformers and circuit breakers 15 tons of oil

2.3.2.4 Use

Table [insert number].Status on developing the inventory of PCB in equipment (e.g. transformers, capacitors or other receptacles containing liquid stocks), articles, oils and waste

Status on developing the inventory of PCB in equipment (e.g. transformers, capacitors or other receptacles containing liquid stocks), articles, oils and waste	Type of inventory	Main problem sources
[] Yes [] Currently being developed. [] No	[] Complete inventory. [] Preliminary inventory.	[] Lack of institutional or policy framework. [] Lack of financial resources. [] Lack of human resources. [] Lack of technical capacity. [] Other :

Table [insert number]. Inventory of PCB containing equipment in/during [insert year/period]

Source	**Status of equipment**		**Year of inventory**	**Number of equipment**	**Total mass of equipment [kg]**	**Mass of solid parts of equipment (equipment without oil) [kg]**	**Mass of liquids (oil) [kg]**	**PCB content in oil (%)**	**Total mass (kg)**
Equipment containing greater than 10% (100,000 ppm) PCB and volumes greater than 5 litres	[]	Equipment in service							
	[]	Equipment out of service							
	[]	Unspecified							
Equipment containing greater than 0.05% (500 ppm) PCB and volumes greater than 5 litres	[]	Equipment in service							
	[]	Equipment out of service							
	[]	Unspecified							
Equipment containing greater than 0.005% (50 ppm) PCB and volumes greater than 0.05 litres.	[]	Equipment in service							
	[]	Equipment out of service							
	[]	Unspecified							
Equipment containing an undefined concentration of PCB	[]	Equipment in service							
	[]	Equipment out of service							
	[]	Unspecified							

Stored liquids (oil) containing PCB	[]	Equipment in service								
	[]	Equipment out of service								
	[]	Unspecified								
Other wastes containing PCB	[]	Equipment in service								
	[]	Equipment out of service								
	[]	Unspecified								

2.3.3 Assessment of POP-PBDEs (Annex A, Part IV and Part V), HBB (Annex A, Part I) and HBCD (Annex A, Part I and Part VII)

2.3.3.1 POP-PBDEs

2.3.3.1.1 Production

Table [insert number]. Production of POP-PBDEs in [insert country name] in/during [insert year/period]

Chemicals	Yes	No	N/Av	Year in which the production started	Year in which the production ended	Estimated total production [kg]
Hexabromodiphenyl ether and heptabromodiphenyl ether		X				
Tetrabromodiphenyl ether and pentabromodiphenyl ether		X				

2.3.3.1.2 Import

Table [insert number]. POP-PBDEs imports in/during [insert year/period]

Status	Year	Chemical	Purpose	Countries of origin	Total annual import (kg/year)
[] Yes [X] No					

Table [insert number]. Total estimated POP-PBDEs in articles/products imported/produced in 2001/2004/2008/2012/2016/2018/2019/2020

A Electric and electronic equipment (EEE)

Status	Year	Type of article/product containing POP-PBDEs	Countries of origin	Total annual import of article/product containing POP-PBDEs (tones/year)	Total estimated of POP-PBDEs content in the imported articles/products (tonnes/year)
[X] Yes [] No [] Information not available	**2001**	CRT	European countries, China	246,11	0,0004
	2004	CRT	European countries, China	1008,23	0,0017
	2008	CRT	European countries, China	3622,80	0,0063
	2012	CRT	European countries, China	4,43	0,0000
	2016	CRT	European countries, China	0,33	0,0000
	2018	CRT	European countries, China	3,19	0,0000
	2019	CRT	European countries, China	4,60	0,0000
	2020	CRT	European countries, China	0,85	0,0000
	2001	Flat screen	European countries, China	178,96	0,0002
	2004	Flat screen	European countries, China	155,46	0,0002
	2008	Flat screen	European countries, China	1237,59	0,0013
	2012	Flat screen	European countries, China	1725,07	0,0018
	2016	Flat screen	European countries, China	1080,05	0,0011
	2018	Flat screen	European countries, China	954,62	0,0010

	2019	Flat screen	European countries, China	1239,10	0,0013
	2020	Flat screen	European countries, China	1046,35	0,0011

B. Transport sector

Status	**Year**	**Type of article/product containing POP-PBDEs**	**Countries of origin**	**Total annual import of article/product containing POP-PBDEs (vehicles/year)**	**Total estimated of POP-PBDEs content in the imported articles/products (tonnes/year)**
[X] Yes [] No [] Information not available	**2018**	Vehicles	European countries, USA	32335	0,7344

2.3.3.1.3 Export

Table [insert number]. POP-PBDEs exports in/during [insert year/period]

Status	**Year**	**Chemical**	**Purpose**	**Destination Countries**	**Total annual export (kg/year)**
[] Yes [X] No					

Table [insert number]. Total estimated POP-PBDE in articles/products exported in/during [insert year/period]

Status	Year	Type of article/product containing POP-PBDEs	Destination countries	Total annual export of article/product containing POP-PBDEs (tonnes/year)	Total estimated of POP-PBDEs content in the exported articles/products (tonnes/year)
[] Yes [X] No [] Information not available					

2.3.3.1.4 Use

A Electric and electronic equipment (EEE)

Table [insert number]. Total estimated POP-PBDEs content in the EEE articles/products in use in 2001/2004/2008/2012/2016/2018/2019/2020

Status	Year	Type of article/product containing POP-PBDEs	Total quantity of articles/products containing POP-PBDEs in use (tonnes/year)	Total estimated polymeric fraction containing POP-PBDEs in the articles/products in use (tonnes/year)	Total estimated POP-PBDEs content in the articles/products in use (tonnes/year)	Main problem sources
[X] Yes [] No [] Information not available	**2001**	CRT	26075,58	7822,673	0,04514	[] Lack of legal, institutional or policy framework [] Lack of financial resources [] Lack of human resources Lack of technical capacity
	2004	CRT	19218,45	5765,534	0,03327	
	2008	CRT	28078,89	8423,666	0,04860	
	2012	CRT	28567,85	8570,355	0,04945	
	2016	CRT	108,42	32,527	0,00019	
	2018	CRT	59,10	17,731	0,00010	

						[] Other
	2019	CRT	22,83	6,850	0,00004	
	2020	CRT	13,76	4,128	0,00002	
[X] Yes [] No [] Information not available	**2001**	Flat screen	0,000	0,000	0,00000	[] Lack of legal, institutional or policy framework [] Lack of financial resources [] Lack of human resources Lack of technical capacity [] Other
	2004	Flat screen	4163,99	1540,678	0,00425	
	2008	Flat screen	2251,34	832,997	0,00230	
	2012	Flat screen	5074,72	1877,647	0,00518	
	2016	Flat screen	21979,52	8132,423	0,02244	
	2018	Flat screen	21984,13	8134,129	0,02244	
	2019	Flat screen	23433,72	8670,475	0,02392	
	2020	Flat screen	23777,52	8797,681	0,02427	

B Transport sector

Table [insert number]. Total estimated POP-PBDEs content in the transport sector articles/products in use in 2018

Status	**Year**	**Type of article/product containing POP-PBDEs**	**Total quantity of articles/products containing POP-PBDEs in use (vehicles/year)**	**Total estimated polymeric fraction containing POP-PBDEs in the articles/products in use (tonnes/year)**	**Total estimated PUR foam containing POP-PBDEs in articles/products in use (tonnes/year)**	**Total estimated POP-PBDEs content in the articles/products in use (tonnes/year)**	**Main problem sources**
[X] Yes [] No	**2018**	1318013,0	214203,5	33,1	84,9	1318013,0	[] Lack of legal,

[] Information not available							institutional or policy framework [] Lack of financial resources [] Lack of human resources Lack of technical capacity [] Other

2.3.3.1.5 Recycling

Table [insert number]. Status of recycling articles that contain or may contain brominated diphenyl ethers and actions or control measure taken to ensure that recycling is carried out in an environmentally sound manner

Status of recycling articles that contain or may contain brominated diphenyl ethers	**Year**	**Description of actions or control measures taken to ensure that recycling is carried out in an environmentally sound manner**	**Type of articles that have been recycled**	**Main problem sources**
[] Yes [X] No [] Information not available		The individual and collective schemes should be authorized to perform WEEE collection and management operations.		[] Lack of legal, institutional or policy framework [] Lack of financial resources [] Lack of human resources

		Authorization of waste recycling operators. Annual reporting to the competent authority on collection and recycling/reuse targets		[X] Lack of technical capacity [] Other
Status of putting in place measures to separate articles containing brominated diphenyl ethers before recycling	**Year**	**Chemical**	**Description of the measure**	**Main problem sources**
[] Yes []Currently being developed [X]No		[] Hexabromodiphenyl ether and heptabromodiphenyl ether []Tetrabromodiphenyl ether and pentabromodiphenyl ether []Combined brominated diphenyl ethers		[X] Lack of financial resources [X] Lack of technical capacity [] Other

Table [insert number]. Status of using articles manufactured from recycled materials that contain or may contain brominated diphenyl ethers

Status of using articles manufactured from recycled materials that contain or may contain brominated diphenyl ethers	**Year**	**Information available on the articles**

[] Yes []No [XOther		The information is not available Legal provision]n Law 209/2016 on waste: *Aer. 12 Presence of hazardous substances in batteries and accumulators; electrical and electronic equipment;* *vehicles; oils; packages., such as mercury, cadmium, lead, hexavalent chromium, polybrominated biphenyls, polybrominated diphenyl ethers and substances that deplete the ozone layer, including hydrofluorocarbons, shall be regulated by this Law and by the regulations on the management of such products, as approved by the Government.* *Art. 50* *To protect human health and the environment, and to prevent the formation of hazardous waste, the following products may not be placed on the market: electrical and electronic equipment exceeding the maximum concentration of 0.1% by weight of mercury, lead, hexavalent chromium, polybrominated biphenyls, and polybrominated diphenyl ether and 0.01% of cadmium, except for the equipment for which exceptions are established according to the regulations approved by the Government.*

Table [insert number]. Status of taking steps to prevent the export of articles manufactured from recycled materials that contain levels or concentrations of brominated diphenyl ethers exceeding those permitted for the sale, use, import or manufacture of those articles

Status of taking steps to prevent the export of articles manufactured from recycled materials that contain levels or concentrations of brominated diphenyl ethers exceeding those	**Year**	**Description of the measures**

permitted for the sale, use, import or manufacture of those articles		
[] Yes [] Hexabromodiphenyl ether and heptabromodiphenyl ether [] Tetrabromodiphenyl ether and pentabromodiphenyl ether [] Combined brominated diphenyl ethers []Currently being developed [X]No [X]Lack of financial resources [X]Lack of technical capacity [X]Lack of legal, institutional or policy framework []Other		

A Electric and electronic equipment (EEE)

Table [insert number]. Total estimated POP-PBDEs content in the EEE articles/products recycled in/during [insert year/period]

Status	**Year**	**Type of article/product containing POP-PBDEs recycled**	**Total quantity of articles/products containing POP-PBDEs recycled (tonnes/year)**	**Total estimated POP-PBDEs content in the articles/products recycled (tonnes/year)**	**Total estimated polymeric fraction containing POP-PBDEs in the recycled articles/products (tonnes/year)**
[] Yes [X] No					

B Transport sector

Table [insert number]. Total estimated POP-PBDEs content in the transport sector articles/products recycled in/during [insert year/period]

Status	Year	Type of article/product containing POP-PBDEs recycled	Total quantity of articles/products containing POP-PBDEs recycled (tonnes/year)	Total estimated POP-PBDEs content in the articles/products recycled (tonnes/year)	Total estimated polymeric fraction containing POP-PBDEs of recycled articles/products (tonnes/year)	Total estimated PUR foam containing POP-PBDEs in the recycled articles/products (tonnes/year)
[] Yes [X] No						

2.3.3.2 HBCD

2.3.3.2.1 Production

Table [insert number]. Production of HBCD in [insert country name] in/during [insert year/period]

Chemicals	Yes	No	N/Av	Year in which the production started	Year in which the production ended	Estimated total production [kg]
Hexabromocyclododecane		X				

2.3.3.2.2 Import

Table [insert number]. HBCD imports in/during [insert year/period]

Status	Year	Chemical	Purpose	Countries of origin	Total annual import (kg/year)
[] Yes [X] No					

Table [insert number]. Total estimated HBCD content in articles/products imported in/during [insert year/period]

Status	Year	Type of article/product containing HBCD	Countries of origin	Total annual import of articles/products containing HBCD (tonnes/year)	Total estimated of HBCD content in the imported articles/products (tonnes/year)
[] Yes [] No	2005	Expanded polystyrene (EPS) (final products and raw materials)	Romania, Ukraine, Russia, Poland, Netherlands, Bulgaria, Germany, China	463,6	4,6
	2008	Expanded polystyrene (EPS) (final products and raw materials)	Romania, Ukraine, Poland, Germany, Italy, Turkey, China, Russia	2445,2	24,5
	2012	Expanded polystyrene (EPS) (final products and raw materials)	Romania, Ukraine, Germany, Poland, Turkey, Russia, China	2871,0	28,7
	2016	Expanded polystyrene (EPS) (final products and raw materials)	Romania, Ukraine, Poland, Italy, Russia, China	2394,2	23,9
	2017	Expanded polystyrene (EPS) (final products and raw materials)	Romania, Ukraine, Poland, Italy, Russia, China	2978,9	29,8
	2018	Expanded polystyrene (EPS) (final products and raw materials)	Romania, Ukraine, Poland, Italy, Russia, China	3010,8	30,1

	2019	Expanded polystyrene (EPS) (final products and raw materials)	Romania, Ukraine, Poland, Italy, Russia, China	3099,8	31,0
	2020	Expanded polystyrene (EPS) (final products and raw materials)	Romania, Ukraine, Poland, Italy, Russia, China	2757,2	27,6
	2005	Extruded polystyrene (XPS)	Romania, Ukraine, Italy, Poland, Russia, China	40,9	1,0
	2008	Extruded polystyrene (XPS)	Romania, Ukraine, Poland, Italy, Russia, Belarus	247,9	6,2
	2012	Extruded polystyrene (XPS)	Romania, Ukraine, Poland, Italy, Russia, Belarus	393,4	9,8
	2016	Extruded polystyrene (XPS)	Romania, Ukraine, Poland, Italy, Russia, Belarus	743,8	18,6
	2017	Extruded polystyrene (XPS)	Romania, Ukraine, Poland, Italy, Russia, Belarus	646,0	16,2
	2018	Extruded polystyrene (XPS)	Romania, Ukraine, Poland, Italy, Russia, Belarus	676,4	16,9
	2019	Extruded polystyrene (XPS)	Romania, Ukraine, Poland, Italy, Russia, Belarus	741,7	18,5
	2020	Extruded polystyrene (XPS)	Romania, Ukraine, Poland, Italy, Russia, Belarus	949,5	23,7

2.3.3.2.3 Export

Table [insert number]. HBCD exports in/during [insert year/period]

Status	Year	Chemical	Purpose	Destination Countries	Total annual export (kg/year)
[] Yes [] No					

Table [insert number]. Total estimated HBCD containing articles/products exported in/during [insert year/period]

Status	Year	Type of article/product containing HBCD	Destination countries	Total annual export of article/product containing HBCD (tonnes/year)	Total estimated of HBCD content in the exported articles/products (tonnes/year)
[] Yes [] No	2006	Expanded polystyrene (EPS	Romania	60,582	0,606
	2008	Expanded polystyrene (EPS	Romania	12,594	0,126
	2012	Expanded polystyrene (EPS	Romania, Russia, Ukraine	10,986	0,110
	2016	Expanded polystyrene (EPS	Romania, Russia	26,632	0,266
	2017	Expanded polystyrene (EPS	Romania	43,013	0,430
	2018	Expanded polystyrene (EPS	Romania	0,116	0,001
	2019	Expanded polystyrene (EPS	Romania	1,610	0,016

2.3.3.2.4 Use

Table [insert number]. HBCD used in/during [insert year/period]

Status	Year	Chemical	Purpose	Total annual use (tonnes/year)
[] Yes [] No				

Table [insert number]. Total estimated HBCD content in articles/products in use in/during [insert year/period]

Status	Year	Type of article/product containing HBCD	Total quantity of articles/products containing HBCD in use (tonnes/year)	Total estimated HBCD content in the articles/products in use (tonnes/year)
[] Yes [] No				

2.3.3.2.5 Alternatives

Table [insert number]. Status of using alternatives in/during [insert year/period]

Status of alternatives use	Year of introducing the alternative	Type of alternative	Purpose	Total annual use (kg/year)	Risk assessment against POPs criteria listed in Annex D
[X] Yes [] No [] Information not available					

2.3.4 Assessment of HCBD (Annex A, Part I)

2.3.4.1 Production

Table [insert number]. Production of HCBD in [insert country name] in/during [insert year/period]

Chemicals	Yes	No	N/Av	Year in which the production started	Year in which the production ended	Estimated total production [kg]
Hexachlorobutadiene		X				

2.3.4.2 Import

Table [insert number]. HCBD imports in/during [insert year/period]

Status	Year	Chemical	Purpose	Countries of origin	Total annual import (kg/year)
[] Yes [X] No					

Table [insert number]. Total estimated HCBD containing articles/products imported in/during [insert year/period]

Status	Year	Type of article/product containing HCBD	Countries of origin	Total annual import of articles/products containing HCBD (tonnes/year)	Total estimated of HCBD content in the imported articles/products (tonnes/year)
[] Yes [X] No					

2.3.4.3 Export

Table [insert number]. HCBD exports in/during [insert year/period]

Status	Year	Chemical	Purpose	Destination Countries	Total annual export (kg/year)

[] Yes [X] No					

Table [insert number]. Total estimated HCBD containing articles/products exported in/during [insert year/period]

Status	Year	Type of article/product containing HCBD	Destination countries	Total annual export of article/product containing HCBD (tonnes/year)	Total estimated of HCBD content in the exported articles/products (tonnes/year)
[] Yes [X] No					

2.3.4.4 Use

Table [insert number]. HCBD use in/during [insert year/period]

Status	Year	Chemical	Purpose	Total annual use (tonnes/year)
[] Yes [X] No				

Table [insert number]. Total estimated HCBD content in articles/products in use in/during [insert year/period]

Status	Year	Type of article/product containing HCBD	Total quantity of articles/products containing HCBD in use (tonnes/year)	Total estimated HCBD content in the articles/products in use (tonnes/year)
[X] Yes				

[] No				

2.3.5 Assessment of PCNs (Annex A, part I)

2.3.5.1 Production

Table [insert number]. Production of PCNs in [insert country name] in/during [insert year/period]

Chemicals	Yes	No	N/Av	Year in which the production started	Year in which the production ended	Estimated total production [kg]
		X				

2.3.5.2 Import

Table [insert number]. PCNs imports in/during [insert year/period]

Status	Year	Chemical	Purpose	Countries of origin	Total annual import (kg/year)
[] Yes [X] No					

Table [insert number]. Total estimated PCN containing articles/products imported in/during [insert year/period]

Status	Year	Type of article/product containing PCN	Countries of origin	Total annual import of articles/products containing PCN (tonnes/year)	Total estimated of PCN content in the imported articles/products (tonnes/year)
[] Yes [X] No					

2.3.5.3 Export

Table [insert number]. PCNs exports in/during [insert year/period]

Status	Year	Chemical	Purpose	Destination Countries	Total annual export (kg/year)
[] Yes [X] No					

Table [insert number]. Total estimated PCN containing articles/products exported in/during [insert year/period]

Status	Year	Type of article/product containing PCN	Destination countries	Total annual export of article/product containing PCN (tonnes/year)	Total estimated of PCN content in the exported articles/products (tonnes/year)
[] Yes [X] No					

2.3.5.4 Use

Table [insert number]. PCNs use in/during [insert year/period]

Status	Year	Chemical	Purpose	Total annual use (tonnes/year)

[] Yes [X] No				

Table [insert number]. Total estimated PCN content in articles/products in use in/during [insert year/period]

Status	Year	Type of article/product containing PCN	Total quantity of articles/products containing PCN in use (tonnes/year)	Total estimated PCN content in the articles/products in use (tonnes/year)
[] Yes [X] No				

2.3.5.5 Alternatives

Table [insert number]. Status of using alternatives in/during [insert year/period]

Status of alternatives use	Year of introducing the alternative	Type of alternative	Purpose	Total annual use (kg/year)	Risk assessment against POPs criteria listed in Annex D
[] Yes [] No [] Information not available					

2.3.6 Assessment with respect to DDT (Annex B, Part II)

2.3.6.1 Production

Table [insert number]. Production of DDT in [insert country name] in/during [insert year/period]

Chemicals	Yes	No	N/Av	Not applicable (not in SC-ERS)	Year in which the production started	Year in which the production ended	Estimated total production [kg]
		X					

Table [insert number]. Production of DDT per facility in/during [insert year/period]

No	Production facility and location	Total production capacity (kg)	Net output per year	Formulation (type and % of active ingredient)	% of in-country use

Table [insert number]. Status of reformulating/repackaging DDT in the country in/during [insert year/period]

Status of reformulating/repackaging DDT in the country	Origin of active ingredient & repackaging/reformulation facility	Formulation (type & % active ingredient)	Quantity per year (kg)		
[] Yes					
[] No					

2.3.6.2 Import

Table [insert number]. DDT imports in/during [insert year/period]

Status	Year	Chemical	Purpose	Countries of origin	Total annual import (kg/year)	Name of manufacturer	Formulation (type and % of active ingredient)

[] Yes [] No							

2.3.6.3 Export

Table [insert number]. DDT exports in/during [insert year/period]

Status	**Year**	**Chemical**	**Purpose**	**Destination Countries**	**Total annual export (kg/year)**	**Facility**	**Formulation (type and % of active ingredient)**
[] Yes [] No							

2.3.6.4 Use

2.3.6.4.1 Use in agriculture

Table [insert number]. DDT use in agriculture in/during [insert year/period]

Status	**Year**	**Chemical**	**Purpose**	**Total annual use (tonnes/year)**
[] Yes [] No				

2.3.6.4.2 Use for disease vector control

Table [insert number]. DDT use for disease vector control in/during [insert year/period]

Status of use for disease	**Planning to introduce the**	**Status of use for other purpose**	**Total amount of DDT used annually for disease vector control (kg)**	**Non-government agencies (e.g. private agencies, NGOs)**

vector control	use of DDT in the future	besides disease vector control	Formulation (type and % of active ingredient	Amount (kg)/year	involved in using DDT for disease vector control purposes
[] Yes [] No	[] Yes [] No	[] Yes [] No			[] Yes [] No

Table [insert number]. Disease, main vector species targeted and percent of population at risk that is covered by DDT

Disease	Main vector species targeted	% total national population at risk that is covered by DDT use per year

Table [insert number]. Status of training facilities and training conducted on insecticide use for disease vector control, and entomology laboratories used for vector resistance testing

Existence of training facilities on insecticide use for disease vector control	Training being conducted on insecticide use for vector control	Existence of formal mechanisms for inter-sectoral collaboration for disease vector control and collaboration being implemented	Entomology laboratory used for vector resistance testing	Entomology laboratory recognized internationally
[] Yes [] No	[] Yes [] No	[] Yes [] No	[] Yes [] No	[] Yes [] No

2.3.6.5 Alternatives

Table [insert number]. Status of research into the development or testing of locally appropriate alternative interventions to DDT and type of research/testing

Status of research into the development or testing of locally appropriate alternative interventions to DDT	Type of research/testing
[] Yes [] No	[] Microbial insecticides [] Residual chemical insecticide(s) [] Chemical larvicides [] Larvivorous fish [] Other

Table [insert number]. DDT alternatives currently used

Alternative control interventions	**Disease targeted**	**Product formulation, % active ingredient, quantity per year**	**Source (country) (import/local)**	**Resistance management strategy implemented**
Microbial larvicides & biological control				[] Yes [] No
Indoor residual spraying with insecticides other than DDT				
Insecticide-treated nets				
Others				

Table [insert number]. DDT alternatives used but no longer in use

Alternative control interventions	**Disease targeted**	**Year of last use &quantity**	**Reason why the use was stopped (import/local)**
Microbial larvicides & biological control			
Chemical larvicides			
Indoor residual spraying with insecticides other than DDT			
Insecticide-treated nets			
Environmental management			

2.3.7 Assessment of PFOS, its salts and PFOSF (Annex B, Part III)

2.3.7.1 Production

2.3.7.1.1 Acceptable purposes

Table [insert number]. Production of PFOS, its salts and PFOSF for the acceptable purposes listed in Annex B of the Convention in [insert country name] in/during [insert year/period]

Chemicals	**Produced PFOS?**			**Estimated total production (kg)**										
Photo-imaging	Yes	No	N/Av*	Before 2009	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
	☐	☐	☐											
Photo-resist and anti-reflective coatings for semi-conductors.	Yes	No	N/Av*	Before 2009	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
	☐	☐	☐											
Etching agent for compound semiconductors and ceramic filters.	Yes	No	N/Av*	Before 2009	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
	☐	☐	☐											
Aviation hydraulic fluids.	Yes	No	N/Av*	Before 2009	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
	☐	☐	☐											
Metal plating (hard metal plating) only in closed-loop systems.	Yes	No	N/Av*	Before 2009	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
	☐	☐	☐											
Certain medical devices (such as ethylene tetrafluoroethylene	Yes	No	N/Av*	Before 2009	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
	☐	☐	☐											

copolymer (ETFE) layers and radio-opaque ETFE production, in-vitro diagnostic medical devices, and CCD colour filters).														
Fire-fighting foam.	Yes	No	N/Av*	Before 2009	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
	☐	☐	☐											
Insect baits for control of leaf-cutting ants from Atta spp. and Acromyrmex spp.	Yes	No	N/Av*	Before 2009	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
	☐	☐	☐											

2.3.7.1.2 Specific exemptions

Table [insert number]. Production of PFOS, its salts and PFOSF for the specific exemptions listed in Annex B of the Convention in [insert country name] in/during [insert year/period]

Chemicals	**Produced PFOS?**			**Estimated total production (kg)**										
Photo masks in the semiconductor and	Yes	No	N/Av*	Before 2009	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
	☐	☐	☐											

liquid crystal display (LCD) industries.														
Metal plating (hard metal plating).	Yes	No	N/Av*	Before 2009	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
	☐	☐	☐											
Metal plating (decorative plating).	Yes	No	N/Av*	Before 2009	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
	☐	☐	☐											
Electric and electronic parts for some colour printers and colour copy machines.	Yes	No	N/Av*	Before 2009	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
	☐	☐	☐											
Insecticides for control of red imported fire ants and termites.	Yes	No	N/Av*	Before 2009	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
	☐	☐	☐											
Chemically driven oil production.	Yes	No	N/Av*	Before 2009	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
	☐	☐	☐											
Carpets	Yes	No	N/Av*	Before 2009	2009	2010	2011	2012	2013	2014	2015			
	☐	☐	☐											
Leather and apparel.	Yes	No	N/Av*	Before 2009	2009	2010	2011	2012	2013	2014	2015			
	☐	☐	☐											
Textiles and upholstery.	Yes	No	N/Av*	Before 2009	2009	2010	2011	2012	2013	2014	2015			
	☐	☐	☐											
Paper and packaging.	Yes	No	N/Av*	Before 2009	2009	2010	2011	2012	2013	2014	2015			

	☐	☐	☐											
Coatings and coating additive	Yes	No	N/Av*	Before 2009	2009	2010	2011	2012	2013	2014	2015			
	☐	☐	☐											
Rubber and plastics.	Yes	No	N/Av*	Before 2009	2009	2010	2011	2012	2013	2014	2015			
	☐	☐	☐											
Other uses.	Yes	No	N/Av*	Before 2009	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
	☐	☐	☐											

2.3.7.2 Import

Table [insert number]. PFOS, its salts and PFOSF imports in/during [insert year/period]

Status	Year	Chemical	Purpose	Countries of origin	Total annual import (kg/year)
[] Yes [] No					

Table [insert number]. Total estimated PFOS, its salts and PFOSF containing articles/products imported in/during [insert year/period]

Status	Year	Type of article/product containing PFOS, its salts and PFOSF	Countries of origin	Total annual import of articles/products containing PFOS, its salts and PFOSF (tonnes/year)	Total estimated of PFOS, its salts and PFOSF content in the imported articles/products (tonnes/year)
[] Yes [] No					

2.3.7.3 Export

Table [insert number]. PFOS, its salts and PFOSF exports in/during [insert year/period]

Status	Year	Chemical	Purpose	Destination Countries	Total annual export (kg/year)
[] Yes [] No					

Table [insert number]. Total estimated PFOS, its salts and PFOSF containing articles/products exported in/during [insert year/period]

Status	Year	Type of article/product containing PFOS, its salts and PFOSF	Countries of origin	Total annual export of articles/products containing PFOS, its salts and PFOSF (tonnes/year)	Total estimated of PFOS, its salts and PFOSF content in the exported articles/products (tonnes/year)
[] Yes [] No					

2.3.7.4 Use

2.3.7.4.1 Acceptable purposes

Table [insert number]. Use of PFOS, its salts and PFOSF for the acceptable purposes listed in Annex B of the Convention

Chemicals	**Use PFOS?**			**Estimated total use (kg)**										
Photo-imaging	Yes	No	N/Av*	Before 2009	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
	☐	☐	☐											
Photo-resist and anti-reflective coatings for semi-conductors.	Yes	No	N/Av*	Before 2009	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
	☐	☐	☐											
Etching agent for compound semiconductors and ceramic filters.	Yes	No	N/Av*	Before 2009	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
	☐	☐	☐											
Aviation hydraulic fluids.	Yes	No	N/Av*	Before 2009	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
	☐	☐	☐											
Metal plating (hard metal plating) only in closed-loop systems.	Yes	No	N/Av*	Before 2009	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
	☐	☐	☐											
Certain medical devices (such as ethylene tetrafluoroethylene copolymer (ETFE) layers	Yes	No	N/Av*	Before 2009	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018

and radio-opaque ETFE production, in-vitro diagnostic medical devices, and CCD colour filters).	☐	☐	☐												
Fire-fighting foam.	Yes	No	N/Av*	Before 2009	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
	☐	☐	☐												
Insect baits for control of leaf-cutting ants from Atta spp. and Acromyrmex spp.	Yes	No	N/Av*	Before 2009	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
	☐	☐	☐												

Table [insert number]. Total estimated PFOS, its salts and PFOSF content in articles/products in use for acceptable purposes in/during [insert year/period]

Status	**Year**	**Type of article/product containing PFOS, its salts and PFOSF**	**Total quantity of articles/products containing PFOS, its salts and PFOSF in use (tonnes/year)**	**Total estimated PFOS, its salts and PFOSF content in the articles/products in use (tonnes/year)**
[] Yes [] No				

2.3.7.4.2 Specific exemptions

Table [insert number]. Use of PFOS, its salts and PFOSF for the specific exemptions listed in Annex B of the Convention

Chemicals	**Use PFOS?**			**Estimated total use (kg)**										
Photo masks in the semiconductor and liquid crystal display (LCD) industries.	Yes	No	N/Av*	Before 2009	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
	☐	☐	☐											
Metal plating (hard metal plating).	Yes	No	N/Av*	Before 2009	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
	☐	☐	☐											
Metal plating (decorative plating).	Yes	No	N/Av*	Before 2009	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
	☐	☐	☐											
Electric and electronic parts for some colour printers and colour copy machines	Yes	No	N/Av*	Before 2009	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
	☐	☐	☐											
Insecticides for control of red imported fire ants and termites.	Yes	No	N/Av*	Before 2009	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
	☐	☐	☐											
	Yes	No	N/Av*	Before 2009	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018

Chemically driven oil production.	☐	☐	☐											
Carpets	Yes	No	N/Av*	Before 2009	2009	2010	2011	2012	2013	2014	2015			
	☐	☐	☐											
Leather and apparel.	Yes	No	N/Av*	Before 2009	2009	2010	2011	2012	2013	2014	2015			
	☐	☐	☐											
Textiles and upholstery.	Yes	No	N/Av*	Before 2009	2009	2010	2011	2012	2013	2014	2015			
	☐	☐	☐											
Paper and packaging.	Yes	No	N/Av*	Before 2009	2009	2010	2011	2012	2013	2014	2015			
	☐	☐	☐											
Coatings and coating additive	Yes	No	N/Av*	Before 2009	2009	2010	2011	2012	2013	2014	2015			
	☐	☐	☐											
Rubber and plastics.	Yes	No	N/Av*	Before 2009	2009	2010	2011	2012	2013	2014	2015			
	☐	☐	☐											
Other uses.	Yes	No	N/Av*	Before 2009	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
	☐	☐	☐											

Table [insert number]. Total estimated PFOS, its salts and PFOSF content in articles/products in use for specific exemptions in/during [insert year/period]

Status	**Year**	**Type of article/product containing PFOS, its salts and PFOSF**	**Total quantity of articles/products containing PFOS, its salts and PFOSF in use (tonnes/year)**	**Total estimated PFOS, its salts and PFOSF content in the articles/products in use (tonnes/year)**
[] Yes [] No				

2.3.7.5 Alternatives

Table [insert table]. Information on progress in building the capacity of countries to transfer safely to reliance on alternatives and research/development of safe alternatives

1. Progress in building the capacity of countries to transfer safely to reliance on alternatives	Information on the progress in building the capacity of countries to transfer safely to reliance on alternatives:
2. Research/development of safe alternatives	Information on research on and development of safe alternatives to PFOS, its salts and PFOSF:

Table [insert table]. Information on alternatives to PFOS, its salts, PFOSF and their related chemicals (chemical/non-chemical alternatives or processes)

1. Application	<u>Acceptable purpose</u> ☐ Photo-imaging ☐ Photo-resist and anti-reflective coatings for semi-conductors ☐ Etching agent for compound semi-conductors and ceramic filters ☐ Aviation hydraulic fluids	☐ Metal plating (hard metal plating) only in closed-loop systems ☐ Certain medical devices ☐ Fire-fighting foam ☐ Insect baits for control of leaf-cutting ants from *Atta spp.* and *Acromyrmex spp.*

<table>
<tr><td rowspan="2"></td><td><u>Specific exemptions</u>

☐ Photo masks in the semiconductor and liquid crystal display industries

☐ Metal plating (hard metal plating)

☐ Metal plating (decorative plating)

☐ Electric and electronic parts for some colour printers and colour copy machines</td><td>☐ Insecticides for control of red imported fire ants and termites

☐ Chemically driven oil production

☐ Carpets

☐ Leather and apparel

☐ Textiles and upholstery

☐ Paper and packaging

☐ Coatings and coating additives

☐ Rubber and plastics</td></tr>
<tr><td colspan="2">☐ Other use (please specify)</td></tr>
<tr><td rowspan="6">2. Description of the alternative</td><td colspan="2">Chemical name:</td></tr>
<tr><td colspan="2">CAS number and trade names of the alternative:</td></tr>
<tr><td colspan="2">Name of the chemical substituted:</td></tr>
<tr><td colspan="2">Quantities of production of the alternative in kg/year:</td></tr>
<tr><td colspan="2">Quantities of use of the alternative in kg/year:</td></tr>
<tr><td colspan="2">Characteristics of the non-chemical alternatives or processes:</td></tr>
<tr><td rowspan="2">3. Economic viability of the alternative</td><td colspan="2">Information on economic viability of the alternative:</td></tr>
<tr><td colspan="2">Information on cost-effectiveness, including environmental, health and socio-economic costs:</td></tr>
</table>

	Information on the general price of the alternative (e.g. USD/kg):
4. Technical feasibility and efficacy of the alternative	Information as to whether the alternative has demonstrated equivalent function and provides similar product performance characteristics:
	Information on efficacy, including performance, benefits and limitations of the alternative:
	Information on whether the alternative has actually been implemented or is at the trial or proposal stage:
5. Availability and accessibility of the alternative on the market	Existence of the alternative on the market and readiness for immediate use:
	Geographic, legal or other limiting factors affecting the usage of the alternative:
6. Health/environmental effects including POPs characteristics and other hazards	Classification according to the Global Harmonization System or other systems:
	Data used for assessing POPs characteristics (persistence, bioaccumulation, potential for long-range environmental transport, adverse effects) or other hazards:
	Information on exposure (e.g. monitoring data) and environmental fate of the chemical:
7. Risks, taking into account the criteria in Annex D for POPs characteristics and other hazard indicators	Information on whether the alternative has been thoroughly tested or evaluated to avoid inadvertently increasing risks to human health/environment:
8. Socio-economic considerations	Information on socio-economic impacts associated with the alternative:
9. Other information	

2.3.8 Assessment of releases of unintentional produced chemicals (Annex C)

Table [insert number]. Status of developing source inventories and release estimates of the chemicals listed in Annex C

Action	Status	Main problem sources
developing source inventories and release estimates of the chemicals listed in Annex C to the Convention taking into consideration the source categories identified in Annex	[X] Yes [] No	[] Lack of financial resources. [] Limited human resources. [] Insufficient technical capacity. [] Insufficient information. [] Other:

2.3.8.1 PCDD/PCDF

Table [insert number]. Status of developing an inventory of polychlorinated dibenzo-p-dioxins and dibenzofurans (PCDD/PCDF)

Action	Status	Reference year	Information source	Other published sources
Developing an inventory of polychlorinated dibenzo-p-dioxins and dibenzofurans (PCDD/PCDF)	[X] Yes [] No	2001 2004 2008 2012 2018	Statistical yearbooks and statistical publications www.statistica.md Import/export of goods statistics Customs Service of RM, https://comtrade.un.org/	National Inventory Report: 1990-2015. Greenhouse Gas Sources and Sinks in the Republic of Moldova / Ministry of Agriculture, Regional Development and Environment / United Nations Environment Programme

Table [insert number]. PCDD/PCDF release estimates in/during 2001/2004/2008/2012/2016/2018

Source group	Inventory, (g TEQ/y)						
Waste incineration	Year	NR	Air	Water	Land	Product	Residue
	Before 2001	[]					
	2018	[X]	9,9	0,0	0,0	0,0	0,0
	2016	[X]	18,8	0,0	0,0	0,0	0,1
	2012	[X]	35,2	0,0	0,0	0,0	0,2
	2008	[X]	25,4	0,0	0,0	0,0	0,1
	2004	[X]	24,5	0,0	0,0	0,0	0,1
	2001	[X]	15,2	0,0	0,0	0,0	0,1
Ferrous and non-ferrous metal production	Year	NR	Air	Water	Land	Product	Residue
	Before 2001	[]					
	2018	[]	3,0904	0,0000	0,0000	0,0000	15,2141
	2016	[]	1,1280	0,0000	0,0000	0,0000	5,4252
	2012	[]	2,0337	0,0000	0,0000	0,0000	10,1687
	2008	[]	5,1124	0,0000	0,0000	0,0000	25,5621
	2004	[]	5,4146	0,0000	0,0000	0,0000	27,0729
	2001	[]	5,3	0,0	0,0	0,0	26,4
Heat and power generation	Year	NR	Air	Water	Land	Product	Residue
	Before 2001	[]					

	2018	[]	5,6839	0,0000	0,0000	0,0000	0,0303
	2016	[]	5,0223	0,0000	0,0000	0,0000	0,0255
	2012	[]	6,6426	0,0000	0,0000	0,0000	0,0739
	2008	[]	2,6947	0,0000	0,0000	0,0000	0,0686
	2004	[]	3,6637	0,0000	0,0000	0,0000	0,0178
	2001	[]	1,9004	0,0000	0,0000	0,0000	0,0012
Production of mineral products	Year	NR	Air	Water	Land	Product	Residue
	Before 2001	[]					
	2018	[]	0,5552	0,0000	0,0000	0,0007	0,0002
	2016	[]	0,3860	0,0000	0,0000	0,0007	0,0002
	2012	[]	0,3816	0,0000	0,0000	0,0007	0,0002
	2008	[]	0,6222	0,0000	0,0000	0,0012	0,0004
	2004	[]	0,3943	0,0000	0,0000	0,0013	0,0004
	2001	[]	0,4394	0,0000	0,0000	0,0009	0,0003
Transportation	Year	NR	Air	Water	Land	Product	Residue
	Before 2001	[]					
	2018	[]	0,3566	0,0000	0,0000	0,0000	0,0000
	2016	[]	0,4325	0,0000	0,0000	0,0000	0,0000
	2012	[]	0,1028	0,0000	0,0000	0,0000	0,0000
	2008	[]	0,1458	0,0000	0,0000	0,0000	0,0000

	2004	[]	0,2097	0,0000	0,0000	0,0000	0,0000
	2001	[]	0,4619	0,0000	0,0000	0,0000	0,0000
Open burning processes	Year	NR	Air	Water	Land	Product	Residue
	Before 2001	[]					
	2018	[]	3,4924	0,0000	0,1892	0,0000	0,0000
	2016	[]	3,2315	0,0000	0,2129	0,0000	0,0000
	2012	[]	2,6248	0,0000	0,0749	0,0000	0,0000
	2008	[]	2,5425	0,0000	0,0722	0,0000	0,0000
	2004	[]	2,2912	0,0000	0,0618	0,0000	0,0000
	2001	[]	2,3288	0,0000	0,0640	0,0000	0,0000
Production of chemicals and consumer goods	Year	NR	Air	Water	Land	Product	Residue
	Before 2001	[]					
	2018	[]	0,0040	0,0000	0,0000	0,0000	0,0000
	2016	[]	0,0045	0,0000	0,0000	0,0000	0,0000
	2012	[]	0,0080	0,0000	0,0000	0,0000	0,0000
	2008	[]	0,0052	0,0000	0,0000	0,0000	0,0000
	2004	[]	0,0002	0,0000	0,0000	0,0000	0,0000
	2001	[]	0	0	0	0	0
Waste disposal	Year	NR	Air	Water	Land	Product	Residue
	Before 2001	[]					

	2018	[]	0,0000	0,9779	0,0000	0,0000	95,4028
	2016	[]	0,0000	0,9374	0,0000	0,0000	91,4109
	2012	[]	0,0000	0,8245	0,0000	0,0000	80,1395
	2008	[]	0,0000	0,9060	0,0000	0,0000	88,5265
	2004	[]	0,0000	0,5461	0,0000	0,0000	52,4440
	2001	[]	0,0000	0,4638	0,0000	0,0000	43,9702
Miscellaneous	Year	NR	Air	Water	Land	Product	Residue
	Before 2001	[]					
	2018	[]	0,0005	0,0000	0,0000	0,0000	0,7935
	2016	[]	0,0008	0,0000	0,0000	0,0000	0,4339
	2012	[]	0,0014	0,0000	0,0000	0,0000	1,0903
	2008	[]	0,0015	0,0000	0,0000	0,0000	0,3035
	2004	[]	0,0017	0,0000	0,0000	0,0000	0,2458
	2001	[]	0,0032	0,0000	0,0000	0,0000	0,2290

2.3.8.2 PCBs

Table [insert number]. Status of developing an inventory of polychlorinated biphenyls (PCB)

Action	Status	Reference year	Information source	Other published sources

developing an inventory of polychlorinated biphenyls (PCBs) (kg/year)	[] Yes [] No	2001 2004 2008 2012 2018	Statistical yearbooks and statistical publications www.statistica.md Import/export of goods statistics Customs Service of RM, https://comtrade.un.org/	National Inventory Report: 1990-2015. Greenhouse Gas Sources and Sinks in the Republic of Moldova / Ministry of Agriculture, Regional Development and Environment / United Nations Environment Programme

Table [insert number]. PCBs release estimates in/during [insert year/period]

Commented [MP1]: For those sections not completed, please include either not estimated - NE, not relevant - NR or not available - NA

Source group	Inventory, (g TEQ/y)						
Waste incineration NR	Year	NR	Air	Water	Land	Product	Residue
	Before 2001	[]					
	2018	[]					
	2016	[]					
	2012	[]					
	2008	[]					
	2004	[]					
	2001	[]					
Ferrous and non-ferrous metal production	Year	NR	Air	Water	Land	Product	Residue
	Before 2001	[]					
	2018	[]	0,032	0,000	0,000	0,000	0,000
	2017	[]					
	2016	[]	0,029	0,000	0,000	0,000	0,000

	2015	[]					
	2014	[]					
	2013	[]					
	2012	[]	0	0	0	0	0
	2011	[]					
	2010	[]					
	2009	[]					
	2008	[]	0	0	0	0	0
	2007	[]					
	2006	[]					
	2005	[]					
	2004	[]	0	0	0	0	0
	2003	[]					
	2002	[]					
	2001	[]	0	0	0	0	0
Heat and power generation	Year	NR	Air	Water	Land	Product	Residue
	Before 2001	[]					
	2018	[]					
	2017	[]					
	2016	[]					

	2015	[]					
	2014	[]					
	2013	[]					
	2012	[]					
	2011	[]					
	2010	[]					
	2009	[]					
	2008	[]					
	2007	[]					
	2006	[]					
	2005	[]					
	2004	[]					
	2003	[]					
	2002	[]					
	2001	[]					
Production of mineral products	Year	NR	Air	Water	Land	Product	Residue
	Before 2001	[]					
	2018	[]					
	2017	[]					
	2016	[]					

	2015	[]					
	2014	[]					
	2013	[]					
	2012	[]					
	2011	[]					
	2010	[]					
	2009	[]					
	2008	[]					
	2007	[]					
	2006	[]					
	2005	[]					
	2004	[]					
	2003	[]					
	2002	[]					
	2001	[]					
Transportation	Year	NR	Air	Water	Land	Product	Residue
	Before 2001	[]					
	2018	[]					
	2017	[]					
	2016	[]					

	2015	[]					
	2014	[]					
	2013	[]					
	2012	[]					
	2011	[]					
	2010	[]					
	2009	[]					
	2008	[]					
	2007	[]					
	2006	[]					
	2005	[]					
	2004	[]					
	2003	[]					
	2002	[]					
	2001	[]					
Open burning processes	Year	NR	Air	Water	Land	Product	Residue
	Before 2001	[]					
	2018	[]					
	2017	[]					
	2016	[]					

	2015	[]					
	2014	[]					
	2013	[]					
	2012	[]					
	2011	[]					
	2010	[]					
	2009	[]					
	2008	[]					
	2007	[]					
	2006	[]					
	2005	[]					
	2004	[]					
	2003	[]					
	2002	[]					
	2001	[]					
Production of chemicals and consumer goods	Year	NR	Air	Water	Land	Product	Residue
	Before 2001	[]					
	2018	[]					
	2017	[]					
	2016	[]					

	2015	[]					
	2014	[]					
	2013	[]					
	2012	[]					
	2011	[]					
	2010	[]					
	2009	[]					
	2008	[]					
	2007	[]					
	2006	[]					
	2005	[]					
	2004	[]					
	2003	[]					
	2002	[]					
	2001	[]					
Waste disposal	Year	NR	Air	Water	Land	Product	Residue
	Before 2001	[]					
	2018	[]					
	2017	[]					
	2016	[]					

	2015	[]					
	2014	[]					
	2013	[]					
	2012	[]					
	2011	[]					
	2010	[]					
	2009	[]					
	2008	[]					
	2007	[]					
	2006	[]					
	2005	[]					
	2004	[]					
	2003	[]					
	2002	[]					
	2001	[]					
Miscellaneous	Year	NR	Air	Water	Land	Product	Residue
	Before 2001	[]					
	2018	[]					
	2017	[]					
	2016	[]					

	2015	[]					
	2014	[]					
	2013	[]					
	2012	[]					
	2011	[]					
	2010	[]					
	2009	[]					
	2008	[]					
	2007	[]					
	2006	[]					
	2005	[]					
	2004	[]					
	2003	[]					
	2002	[]					
	2001	[]					

2.3.8.3 PeCB

Table [insert number]. Status of developing an inventory ofpentachlorobenzene (PeCB)

Action	Status	Reference year	Information source	Other published sources

developing an inventory of pentachlorobenzene (PeCB) (kg/year)	[] Yes [] No			

Table [insert number]. PeCB release estimates in/during [insert year/period]

Commented [MP2]: For those sections not completed, please include either not estimated - NE, not relevant - NR or not available - NA

Source group	Inventory						
Waste incineration	Year	NR	Air	Water	Land	Product	Residue
	Before 2001	[]					
	2018	[]					
	2017	[]					
	2016	[]					
	2015	[]					
	2014	[]					
	2013	[]					
	2012	[]					
	2011	[]					
	2010	[]					
	2009	[]					
	2008	[]					
	2007	[]					
	2006	[]					

	2005	[]					
	2004	[]					
	2003	[]					
	2002	[]					
	2001	[]					
Ferrous and non-ferrous metal production	Year	NR	Air	Water	Land	Product	Residue
	Before 2001	[]					
	2018	[]					
	2017	[]					
	2016	[]					
	2015	[]					
	2014	[]					
	2013	[]					
	2012	[]					
	2011	[]					
	2010	[]					
	2009	[]					
	2008	[]					
	2007	[]					
	2006	[]					

	2005	[]					
	2004	[]					
	2003	[]					
	2002	[]					
	2001	[]					
Heat and power generation	Year	NR	Air	Water	Land	Product	Residue
	Before 2001	[]					
	2018	[]					
	2017	[]					
	2016	[]					
	2015	[]					
	2014	[]					
	2013	[]					
	2012	[]					
	2011	[]					
	2010	[]					
	2009	[]					
	2008	[]					
	2007	[]					
	2006	[]					

	2005	[]					
	2004	[]					
	2003	[]					
	2002	[]					
	2001	[]					
Production of mineral products	Year	NR	Air	Water	Land	Product	Residue
	Before 2001	[]					
	2018	[]					
	2017	[]					
	2016	[]					
	2015	[]					
	2014	[]					
	2013	[]					
	2012	[]					
	2011	[]					
	2010	[]					
	2009	[]					
	2008	[]					
	2007	[]					
	2006	[]					

	2005	[]					
	2004	[]					
	2003	[]					
	2002	[]					
	2001	[]					
Transportation	Year	NR	Air	Water	Land	Product	Residue
	Before 2001	[]					
	2018	[]					
	2017	[]					
	2016	[]					
	2015	[]					
	2014	[]					
	2013	[]					
	2012	[]					
	2011	[]					
	2010	[]					
	2009	[]					
	2008	[]					
	2007	[]					
	2006	[]					

	2005	[]					
	2004	[]					
	2003	[]					
	2002	[]					
	2001	[]					
Open burning processes	Year	NR	Air	Water	Land	Product	Residue
	Before 2001	[]					
	2018	[]					
	2017	[]					
	2016	[]					
	2015	[]					
	2014	[]					
	2013	[]					
	2012	[]					
	2011	[]					
	2010	[]					
	2009	[]					
	2008	[]					
	2007	[]					
	2006	[]					

	2005	[]					
	2004	[]					
	2003	[]					
	2002	[]					
	2001	[]					
Production of chemicals and consumer goods	Year	NR	Air	Water	Land	Product	Residue
	Before 2001	[]					
	2018	[]					
	2017	[]					
	2016	[]					
	2015	[]					
	2014	[]					
	2013	[]					
	2012	[]					
	2011	[]					
	2010	[]					
	2009	[]					
	2008	[]					
	2007	[]					
	2006	[]					

	2005	[]					
	2004	[]					
	2003	[]					
	2002	[]					
	2001	[]					
Waste disposal	Year	NR	Air	Water	Land	Product	Residue
	Before 2001	[]					
	2018	[]					
	2017	[]					
	2016	[]					
	2015	[]					
	2014	[]					
	2013	[]					
	2012	[]					
	2011	[]					
	2010	[]					
	2009	[]					
	2008	[]					
	2007	[]					
	2006	[]					

	2005	[]					
	2004	[]					
	2003	[]					
	2002	[]					
	2001	[]					
Miscellaneous	Year	NR	Air	Water	Land	Product	Residue
	Before 2001	[]					
	2018	[]					
	2017	[]					
	2016	[]					
	2015	[]					
	2014	[]					
	2013	[]					
	2012	[]					
	2011	[]					
	2010	[]					
	2009	[]					
	2008	[]					
	2007	[]					
	2006	[]					

	2005	[]					
	2004	[]					
	2003	[]					
	2002	[]					
	2001	[]					

2.3.8.4 HCB

Table [insert number]. Status of developing an inventory of hexachlorobenzene (HCB)

Action	Status	Reference year	Information source	Other published sources
developing an inventory of hexachlorobenzene (HCB) (kg/year)	[] Yes [] No	2001 2004 2008 2012 2018	Statistical yearbooks and statistical publications www.statistica.md Import/export of goods statistics Customs Service of RM, https://comtrade.un.org/	National Inventory Report: 1990-2015. Greenhouse Gas Sources and Sinks in the Republic of Moldova / Ministry of Agriculture, Regional Development and Environment / United Nations Environment Programme

Table [insert number]. HCB release estimates in/during [insert year/period]

Commented [MP3]: For those sections not completed, please include either not estimated - NE, not relevant - NR or not available - NA

Source group	Inventory, (g TEQ/a)						
Waste incineration	Year	NR	Air	Water	Land	Product	Residue
	Before 2001	[]					
	2018	[]					
	2017	[]					

	2016	[]					
	2015	[]					
	2014	[]					
	2013	[]					
	2012	[]					
	2011	[]					
	2010	[]					
	2009	[]					
	2008	[]					
	2007	[]					
	2006	[]					
	2005	[]					
	2004	[]					
	2003	[]					
	2002	[]					
	2001	[]					
Ferrous and non-ferrous metal production	Year	NR	Air	Water	Land	Product	Residue
	Before 2001	[]					
	2018	[]	2509,634	0,000	0,000	0,000	0,000
	2017	[]					

	2016	[]	880,698	0,000	0,000	0,000	0,000
	2015	[]					
	2014	[]					
	2013	[]					
	2012	[]	1694,780	0,000	0,000	0,000	0,000
	2011	[]					
	2010	[]					
	2009	[]					
	2008	[]	4260,345	0,000	0,000	0,000	0,000
	2007	[]					
	2006	[]					
	2005	[]					
	2004	[]	4512,155	0,000	0,000	0,000	0,000
	2003	[]					
	2002	[]					
	2001	[]	4395,450	0,000	0,000	0,000	0,000
Heat and power generation	Year	NR	Air	Water	Land	Product	Residue
	Before 2001	[]					
	2018	[]					
	2017	[]					

	2016	[]					
	2015	[]					
	2014	[]					
	2013	[]					
	2012	[]					
	2011	[]					
	2010	[]					
	2009	[]					
	2008	[]					
	2007	[]					
	2006	[]					
	2005	[]					
	2004	[]					
	2003	[]					
	2002	[]					
	2001	[]					
Production of mineral products	Year	NR	Air	Water	Land	Product	Residue
	Before 2001	[]					
	2018	[]					
	2017	[]					

	2016	[]					
	2015	[]					
	2014	[]					
	2013	[]					
	2012	[]					
	2011	[]					
	2010	[]					
	2009	[]					
	2008	[]					
	2007	[]					
	2006	[]					
	2005	[]					
	2004	[]					
	2003	[]					
	2002	[]					
	2001	[]					
Transportation	Year	NR	Air	Water	Land	Product	Residue
	Before 2001	[]					
	2018	[]					
	2017	[]					

	2016	[]					
	2015	[]					
	2014	[]					
	2013	[]					
	2012	[]					
	2011	[]					
	2010	[]					
	2009	[]					
	2008	[]					
	2007	[]					
	2006	[]					
	2005	[]					
	2004	[]					
	2003	[]					
	2002	[]					
	2001	[]					
Open burning processes	Year	NR	Air	Water	Land	Product	Residue
	Before 2001	[]					
	2018	[]	0,228	0	0,000	0	0
	2017	[]					

	2016	[]	0,211	0	0,000	0	0
	2015	[]					
	2014	[]					
	2013	[]					
	2012	[]	0,182	0	0,001	0	0
	2011	[]					
	2010	[]					
	2009	[]					
	2008	[]	0,173	0	0,000	0	0
	2007	[]					
	2006	[]					
	2005	[]					
	2004	[]	0,141	0	0,000	0	0
	2003	[]					
	2002	[]					
	2001	[]	0,139	0	0,001	0	0
Production of chemicals and consumer goods	Year	NR	Air	Water	Land	Product	Residue
	Before 2001	[]					
	2018	[]					
	2017	[]					

	2016	[]					
	2015	[]					
	2014	[]					
	2013	[]					
	2012	[]					
	2011	[]					
	2010	[]					
	2009	[]					
	2008	[]					
	2007	[]					
	2006	[]					
	2005	[]					
	2004	[]					
	2003	[]					
	2002	[]					
	2001	[]					
Waste disposal	Year	NR	Air	Water	Land	Product	Residue
	Before 2001	[]					
	2018	[]					
	2017	[]					

	2016	[]					
	2015	[]					
	2014	[]					
	2013	[]					
	2012	[]					
	2011	[]					
	2010	[]					
	2009	[]					
	2008	[]					
	2007	[]					
	2006	[]					
	2005	[]					
	2004	[]					
	2003	[]					
	2002	[]					
	2001	[]					
Miscellaneous	Year	NR	Air	Water	Land	Product	Residue
	Before 2001	[]					
	2018	[]					
	2017	[]					

	2016	[]					
	2015	[]					
	2014	[]					
	2013	[]					
	2012	[]					
	2011	[]					
	2010	[]					
	2009	[]					
	2008	[]					
	2007	[]					
	2006	[]					
	2005	[]					
	2004	[]					
	2003	[]					
	2002	[]					
	2001	[]					

2.3.8.5 PCN

Table [insert number]. Status of developing an inventory of polychlorinated naphthalenes (PCN)

Action	Status	Reference year	Information source	Other published sources
developing an inventory of polychlorinated naphthalenes (PCN) (kg/year)	[] Yes [] No			

Table [insert number]. PCNs release estimates in/during [insert year/period]

Commented [MP4]: For those sections not completed, please include either not estimated - NE, not relevant - NR or not available - NA

Source group	Inventory						
Waste incineration	Year	NR	Air	Water	Land	Product	Residue
	Before 2001	[]					
	2018	[]					
	2017	[]					
	2016	[]					
	2015	[]					
	2014	[]					
	2013	[]					
	2012	[]					
	2011	[]					
	2010	[]					
	2009	[]					
	2008	[]					
	2007	[]					

	2006	[]					
	2005	[]					
	2004	[]					
	2003	[]					
	2002	[]					
	2001	[]					
Ferrous and non-ferrous metal production	Year	NR	Air	Water	Land	Product	Residue
	Before 2001	[]					
	2018	[]					
	2017	[]					
	2016	[]					
	2015	[]					
	2014	[]					
	2013	[]					
	2012	[]					
	2011	[]					
	2010	[]					
	2009	[]					
	2008	[]					
	2007	[]					

	2006	[]					
	2005	[]					
	2004	[]					
	2003	[]					
	2002	[]					
	2001	[]					
Heat and power generation	Year	NR	Air	Water	Land	Product	Residue
	Before 2001	[]					
	2018	[]					
	2017	[]					
	2016	[]					
	2015	[]					
	2014	[]					
	2013	[]					
	2012	[]					
	2011	[]					
	2010	[]					
	2009	[]					
	2008	[]					
	2007	[]					

	2006	[]					
	2005	[]					
	2004	[]					
	2003	[]					
	2002	[]					
	2001	[]					
Production of mineral products	Year	NR	Air	Water	Land	Product	Residue
	Before 2001	[]					
	2018	[]					
	2017	[]					
	2016	[]					
	2015	[]					
	2014	[]					
	2013	[]					
	2012	[]					
	2011	[]					
	2010	[]					
	2009	[]					
	2008	[]					
	2007	[]					

	2006	[]					
	2005	[]					
	2004	[]					
	2003	[]					
	2002	[]					
	2001	[]					
Transportation	Year	NR	Air	Water	Land	Product	Residue
	Before 2001	[]					
	2018	[]					
	2017	[]					
	2016	[]					
	2015	[]					
	2014	[]					
	2013	[]					
	2012	[]					
	2011	[]					
	2010	[]					
	2009	[]					
	2008	[]					
	2007	[]					

	2006	[]					
	2005	[]					
	2004	[]					
	2003	[]					
	2002	[]					
	2001	[]					
Open burning processes	Year	NR	Air	Water	Land	Product	Residue
	Before 2001	[]					
	2018	[]					
	2017	[]					
	2016	[]					
	2015	[]					
	2014	[]					
	2013	[]					
	2012	[]					
	2011	[]					
	2010	[]					
	2009	[]					
	2008	[]					
	2007	[]					

	2006	[]					
	2005	[]					
	2004	[]					
	2003	[]					
	2002	[]					
	2001	[]					
Production of chemicals and consumer goods	Year	NR	Air	Water	Land	Product	Residue
	Before 2001	[]					
	2018	[]					
	2017	[]					
	2016	[]					
	2015	[]					
	2014	[]					
	2013	[]					
	2012	[]					
	2011	[]					
	2010	[]					
	2009	[]					
	2008	[]					
	2007	[]					

	2006	[]					
	2005	[]					
	2004	[]					
	2003	[]					
	2002	[]					
	2001	[]					
Waste disposal	Year	NR	Air	Water	Land	Product	Residue
	Before 2001	[]					
	2018	[]					
	2017	[]					
	2016	[]					
	2015	[]					
	2014	[]					
	2013	[]					
	2012	[]					
	2011	[]					
	2010	[]					
	2009	[]					
	2008	[]					
	2007	[]					

	2006	[]					
	2005	[]					
	2004	[]					
	2003	[]					
	2002	[]					
	2001	[]					
Miscellaneous	Year	NR	Air	Water	Land	Product	Residue
	Before 2001	[]					
	2018	[]					
	2017	[]					
	2016	[]					
	2015	[]					
	2014	[]					
	2013	[]					
	2012	[]					
	2011	[]					
	2010	[]					
	2009	[]					
	2008	[]					
	2007	[]					

	2006	[]						
	2005	[]						
	2004	[]						
	2003	[]						
	2002	[]						
	2001	[]						

2.3.9 Information on the state of knowledge on stockpiles, contaminated sites and wastes, identification, likely numbers, relevant regulations, guidance, remediation measures, and data on releases from sites

2.3.9.1 Stockpiles

Table [insert number]. Status of the identification and quantification of stockpiles consisting of, or containing, chemicals listed in Annex A or Annex B to the Convention

		Pesticides listed in annexes A or B:	***Industrial chemicals listed in annexes A or B:***	
Action	**Status**	**Year**	**Type**	**Year**
identified stockpiles consisting of, or containing, chemicals listed in Annex A or Annex B to the Convention	[] Yes [] No	[]	[]	[]
quantified the stockpiles consisting of, or containing, chemicals listed in	[] Yes [] No	[]	[]	[]

Annex A or Annex B to the Convention				

2.3.9.1.1 POPs pesticides

Table [insert number]. Status of POPs pesticides stockpiles in [2020]

Status on stockpiles existence	Year	Pesticide	Total amount stockpiled (tonnes)	State of the storage place (short description)	Location of the stockpile
[X] Yes [] No [] Information not available	2020	Unknown / partially identified	85,94 t – solid 19,58 - liquid	The pesticides detected are in solid and liquid state and in most cases are stored in polyethylene packaging, metal and plastic containers, in some cases they are mixed with soil. The locations are different: non-compliant warehouses, rooms under the management of economic agents, without security, secured and sealed deposits.	**Districts** Mun. Chisinau Anenii Noi Balti Cahul Edineț Briceni Falești Florești Orhei Râșcani Taraclia

2.3.9.1.2 PCBs

Table [insert number]. Status of PCB containing equipment stockpiled in [insert year]

Status on stockpiles existence	Year	Pesticide	Total amount stockpiled (tonnes)	State of the storage place (short description)	Location of the stockpile
[] Yes [] No [] Information not available					

Table [insert number]. Status of identifying articles and materials containing more than 0.005% (50 ppm) PCB contaminated through open applications in [insert year]

Action	Status	Articles or materials containing PCB	Other Articles containing PCB	Year or period in which the article was identified
identifying articles and materials containing more than 0.005% (50 ppm) PCB contaminated through open applications	[] Yes [] No			

2.3.9.1.3 POP-PBDEs

Table [insert number]. Total estimated POP-PBDEs content in the EEE articles/products stockpiled in/during [insert year/period]

Status of taking measures to dispose of articles that contain or may contain brominated diphenyl ethers in an environmentally sound manner	Description of measures	Year	Type of article/product containing POP-PBDEs disposed	Total amount of waste containing POP-PBDEs disposed (tonnes/year)	Total estimated POP-PBDEs content inwastes (tonnes)	Main problem sources
[X] Yes [] No	collected and dismantled	**2001**	CRT	931.1656	0.001612	[X] Lack of financial resources [X] Lack of technical capacity [X] Other
	collected and dismantled	**2004**	CRT	844.1745	0.001461	
	collected and dismantled	**2008**	CRT	758.2313	0.001312	
	collected and dismantled	**2012**	CRT	610.8868	0.001057	
	collected and dismantled	**2016**	CRT	461.2652	0.000798	
	collected and dismantled	**2018**	CRT	393.9992	0.000682	
	collected and dismantled	**2019**	CRT	362.9191	0.000628	
	collected and dismantled	**2020**	CRT	332.9649	0.000576	
	collected and dismantled	**2001**	Flat screen	5.2935	0.000005	

	collected and dismantled	**2004**	Flat screen	19.0775	0.000019	
	collected and dismantled	**2008**	Flat screen	151.7477	0.000155	
	collected and dismantled	**2012**	Flat screen	411.4645	0.000420	
	collected and dismantled	**2016**	Flat screen	662.2911	0.000676	
	collected and dismantled	**2018**	Flat screen	776.0113	0.000792	
	collected and dismantled	**2019**	Flat screen	854.2562	0.000872	
	collected and dismantled	**2020**	Flat screen	885.4620	0.000904	
	collected and dismantled	**2018**	Number of vehicles	1736	0.265404	
	collected and dismantled	**Until 2018**	Number of vehicles	36616	2.7848	

2.3.9.1.4 HBCD

Table [insert number]. Status of HBCD stockpiles in [insert year]

Status on stockpiles existence	**Year**	**Total amount of HBCD stockpiled (tonnes)**
[] Yes [] No [] Information not available		

Table [insert number]. Total estimated HBCD content in articles/products stockpiled in/during [insert year/period]

Status on stockpiles existence	Year	Type of article/product containing HBCD stockpiled	Total amount of articles/products containing HBCD stockpiled (tonnes)	Total estimated HBCD content in the articles/products stockpiled (tonnes)
[] Yes [] No [] Information not available				

2.3.9.1.5 HCBD

Table [insert number]. Total estimated HCBD content in articles/products stockpiled in/during [insert year/period]

Status on stockpiles existence	Year	Type of article/product containing HCBD stockpiled	Total amount of articles/products containing HCBD stockpiled (tonnes)	Total estimated HCBD content in the articles/products stockpiled (tonnes)
[] Yes [] No [] Information not available				

2.3.9.1.6 PCN

Table [insert number]. Status of PCN stockpiles in [insert year]

Status on stockpiles existence	Year	Total amount of PCN stockpiled (tonnes)
[] Yes [] No [] Information not available		

Table [insert number]. Total estimated PCN content in articles/products stockpiled in/during [insert year/period]

Status on stockpiles existence	Year	Type of article/product containing PCN stockpiled	Total amount of articles/products containing PCN stockpiled (tonnes)	Total estimated PCN content in the articles/products stockpiled (tonnes)
[] Yes [] No [] Information not available				

2.3.9.1.7 DDT

Table [insert number]. Status of DDT stockpiles in [insert year]

Status on stockpiles existence	Year	Location	Total amount in storage (kg)	Formulation (type and % of active ingredient)	Conditions of storage (e.g. storage capacity, access)
[] Yes [] No [] Information not available					

2.3.9.1.8 PFOS, its salts and PFOSF

Table [insert number]. Status of PFOS, its salts and PFOSF stockpiles in [insert year]

Status on stockpiles existence	Year	Total amount stockpiled (tonnes)	State of the storage place (short description)
[] Yes [] No [] Information not available			

Table [insert number]. Total estimated PFOS, its salts and PFOSF content in articles/products stockpiled in/during [insert year/period]

Status on stockpiles existence	Year	Type of article/product containing PFOS, its salts and PFOSF stockpiled	Total amount of articles/products containing PFOS, its salts and PFOSF stockpiled (tonnes)	Total estimated PFOS, its salts and PFOSF content in the articles/products stockpiled (tonnes)
[] Yes [] No [] Information not available				

2.3.9.2 Wastes

Table [insert number]. Status of disposing of wastes consisting of or containing chemicals listed in Annex A, B, or C to the Convention in an environmentally sound manner

Measure	**Status**	**Main problem sources**	***Pesticides listed in annexes A or B:***	***Industrial chemicals listed in annexes A or B:***	***Unintentional chemicals listed in annex C***

			Year	Type	Year	Total quantity of disposal (tonnes)	Year
disposing of wastes consisting of or containing chemicals listed in Annex A, B, or C to the Convention in an environmentally sound manner	[] Yes [] Currently being implemented. [] No [] Information not available.	[] Wastes consisting of or containing chemicals listed in Annex A, B, or C have not been identified. [] Lack of financial resources. [] Limited human resources. [] Insufficient technical capacity. [] Other	[]	[]	[]	[]	[]

2.3.9.2.1 POPs pesticides

Table [insert number]. Status of POPs pesticides waste disposed in [insert year]

Status on the waste disposal	Year	Chemical	Total disposed amount (tonnes)
[X] Yes [] No [] Information not available	2020	Unknown, OSCE project support, Ops coming from Transnistrian region	406.639

2.3.9.2.2 PCBs

Table [insert number]. Status of PCB containing waste disposed in [insert year]

Action	**Status**	**PCBs contained in:**	**Year**	**Quantity (Metric Tons)**
locally destroyed, in an environmentally sound manner, equipment, liquids, or other wastes containing greater than 0.005% (50 ppm) PCB (e.g. transformers, capacitors or other receptacles containing liquid stocks) identified	[] Yes [] No	[]	[]	[]

destroyed abroad, in an environmentally sound manner, equipment, liquids, or other wastes containing greater than 0.005% (50 ppm) PCB (e.g. transformers, capacitors or other receptacles containing liquid stocks) identified	[X] Yes [] No	Transformers and switches with PCB content (without oil) – to Germany	2020	30.51
	[X] Yes [] No	PCB contaminated oil	2020	8.8

Table [insert number]. Proportion of waste containing greater than 0.005% (50 ppm) PCB identified managed in an environmentally sound manner

Proportion of waste containing greater than 0.005% (50 ppm) PCB identified managed in an environmentally sound manner	**Year in which the environmentally sound management was completed**	**Approximate proportion**
[] All (100%). [] Partially [] None [X] Information not available.	[]	[] Most of the waste (greater than 50% and less than 100%)

		[X] Limited amount of waste (greater than 0% and less than or equal to 50%)

2.3.9.2.3 POP-PBDEs

Table [insert number]. Status of POP-PBDEs containing waste disposed in [insert year]

Status of taking measures to dispose of articles that contain or may contain brominated diphenyl ethers in an environmentally sound manner	**Description of measures**	**Year**	**Type of article/product containing POP-PBDEs disposed**	**Total amount of waste containing POP-PBDEs disposed (tonnes/year)**	**Total estimated POP-PBDEs content inwastes (tonnes)**	**Main problem sources**
[] Yes [] No						[] Lack of financial resources [] Lack of technical capacity [] Other

Table [insert number]. Status of disposing of articles manufactured from recycled materials that contain or may contain brominated diphenyl ethers in [insert year]

Status of disposing of articles manufactured from recycled materials that contain or may contain brominated diphenyl ethers	**Status of taking actions or control measures to ensure that disposal is carried out in an environmentally sound manner**	**Description of the action control measures**
[] Yes []No []Information not available	[] Yes []Currently being implemented []No	

	[]Lack of legal, institutional or policy framework []Lack of financial resources []Lack of human resources []Lack of technical capacity []Other	

2.3.9.2.4 HBCD

Table [insert number]. Status of HBCD containing waste disposed in [insert year]

Status on the waste disposal	**Year**	**Type of article/product containing HBCD disposed**	**Total amount of waste containing HBCD disposed (tonnes/year)**
[] Yes [] No [] Information not available			

2.3.9.2.5 HCBD

Table [insert number]. Status of HCBD containing waste disposed in [insert year]

Status on the waste disposal	**Year**	**Total amount of waste containing HCBD disposed(tonnes/year)**
[] Yes [] No [] Information not available		

2.3.9.2.6 PCN

Table [insert number]. Status of PCN containing waste disposed in [insert year]

Status on the waste disposal	**Year**	**Total amount of waste containing PCN disposed (tonnes/year)**
[] Yes [] No [] Information not available		

2.3.9.2.7 DDT

Table [insert number]. Status of DDT containing waste disposed in [insert year]

Status on the waste disposal	**Year**	**Total amount of waste containing DDT disposed (tonnes/year)**
[] Yes [] No [] Information not available		

2.3.9.2.8 PFOS, its salts and PFOSF

Table [insert number]. Status of PFOS, its salts and PFOSF containing waste disposed in [insert year]

Status on the waste disposal	**Year**	**Type of article/product containing PFOS, its salts and PFOSF disposed**	**Total amount of waste containing PFOS, its salts and PFOSF disposed (tonnes/year)**
[] Yes [] No [] Information not available			

2.3.9.2.9 Unintentional POPs

Table [insert number]. Status of uPOPs containing waste disposed in [insert year]

Status on the waste disposal	Year	Total amount of waste containing unintentional POPs disposed (tonnes/year)
[] Yes [] No [] Information not available		

2.3.9.3 Contaminated sites

Table [insert number]. Status of identifying sites contaminated by chemicals listed in Annex A, B or C in [insert year]

		Pesticides listed in annexes A or B:	***Industrial chemicals listed in annexes A or B:***		***Unintentional chemicals listed in annex C***
Action	**Status**	**Year**	**Type**	**Year**	**Year**
identifying sites contaminated by chemicals listed in Annex A, B or C	[] Yes [] Currently being identified. [] No [] Information not available.	[]	[]	[]	[]

Table [insert number]. Status of taking steps to remediate the sites contaminated by chemicals listed in Annex A, B or C in [insert year]

Action	Status	Phase	Main problem sources
taking steps to remediate the sites contaminated by chemicals listed in Annex A, B or C	[] Yes [] No	[] Remediation plan is currently being prepared. [] Remediation is in progress since: Year: [] Remediation has been completed in: Year:	[] Have not yet identified sites contaminated by chemicals listed in Annex A, B or C. [] Lack of institutional or policy framework. [] Lack of financial resources. [] Limited human resources. [] Insufficient technical capacity. [] Other :

2.3.9.3.1 POPs pesticides

Table [insert number]. Status of identification and remediation of POPs pesticides contaminated sites

Action	Status	Years in which the contaminated sites were identified/remediated	Remarks
identifying sites contaminated by POPs pesticides	[X] Yes [] No [] Currently being developed	[2010]	Identification of POPs Residuals and Mapping of Polluted Areas was a component of GEF/WB ”Persistent Organic Pollutants Stockpiles Management and Destruction” Project In total 1 500 areas which are polluted with POPs, particularly around destroyed

			warehouses and depots for temporary storage of obsolete and banned pesticides were identified; 980 potentially polluted sites were investigated and sampled. The investigation covered 24 out of 33 administrative districts. Two remediation remediation (BAT) techniques techniques have been chosen for the three demonstration sites with a view to possible possible further further implementation implementation in Moldova: i) enhanced bioremediation *(vil.Balceana)* ii) Isolation in controlled soil stockpiles (cofferdam) – vil.*Congaz, vil. Bujor*

remediating sites contaminated by POPs pesticides	[] Yes [] No [] Currently being developed		

2.3.9.3.2 PCBs

Table [insert number]. Status of identification and remediation of PCB contaminated sites

Action	**Status**	**Years in which the contaminated sites were identified/remediated**	**Remarks**
identifying sites contaminated by greater than 0.005% (50 ppm) PCB	[] Yes [] No	[]	
remediating sites contaminated by greater than 0.005% (50 ppm) PCB	[] Yes [] No [] Currently being developed		

2.3.9.3.3 POP-PBDEs

Table [insert number]. Status of identification and remediation of POP-PBDE contaminated sites

Action	**Status**	**Years in which the contaminated sites were identified/remediated**	**Remarks**
identifying sites contaminated by POP-PBDE contaminated sites	[] Yes [] No [] Currently being developed	[]	
remediating sites contaminated by POP-PBDEs	[] Yes [] No [] Currently being developed		

2.3.9.3.4 HBCD

Table [insert number]. Status of identification and remediation of HBCD contaminated sites

Action	Status	Years in which the contaminated sites were identified/remediated	Remarks
identifying sites contaminated by HBCD contaminated sites	[] Yes [] No [] Currently being developed	[]	
remediating sites contaminated by HBCD	[] Yes [] No [] Currently being developed		

2.3.9.3.5 HCBD

Table [insert number]. Status of identification and remediation of HCBD contaminated sites

Action	Status	Years in which the contaminated sites were identified/remediated	Remarks
identifying sites contaminated by HCBD contaminated sites	[] Yes [] No [] Currently being developed	[]	
remediating sites contaminated by HCBD	[] Yes [] No [] Currently being developed		

2.3.9.3.6 PCN

Table [insert number]. Status of identification and remediation of PCN contaminated sites

Action	Status	Years in which the contaminated sites were identified/remediated	Remarks
identifying sites contaminated by PCN contaminated sites	[] Yes [] No [] Currently being developed	[]	
remediating sites contaminated by PCN	[] Yes [] No [] Currently being developed		

2.3.9.3.7 DDT

Table [insert number]. Status of identification and remediation of DDT contaminated sites

Action	Status	Years in which the contaminated sites were identified/remediated	Remarks
identifying sites contaminated by DDT contaminated sites	[] Yes [] No [] Currently being developed	[]	
remediating sites contaminated by DDT	[] Yes [] No [] Currently being developed		

2.3.9.3.8 PFOS, its salts and PFOSF

Table [insert number]. Status of identification and remediation of PFOS, its salts and PFOSF contaminated sites

Action	Status	Years in which the contaminated sites were identified/remediated	Remarks
identifying sites contaminated by PFOS, its salt and PFOSF contaminated sites	[] Yes [] No [] Currently being developed	[]	

remediating sites contaminated by PFOS, its salts and PFOSF	[] Yes [] No [] Currently being developed		

2.3.9.3.9 Unintentional POPs

Table [insert number]. Status of identification and remediation of uPOPs contaminated sites

Action	Status	Years in which the contaminated sites were identified/remediated	Remarks
identifying sites contaminated by uPOPs contaminated sites	[] Yes [] No [] Currently being developed	[]	
remediating sites contaminated by uPOPs	[] Yes [] No [] Currently being developed		

2.3.10 Summary of future production, use, and releases of POPs – requirements for exemptions

Table [insert number]. Status of notifying the Secretariat to register for specific exemptions listed in Annex A or Annex B or for acceptable purposes listed in Annex B

Action	Status
notifying the Secretariat to register for specific exemptions listed in Annex A or Annex B or for acceptable purposes listed in Annex B	[] Yes [] No [] In preparation for notification.

2.3.10.1 POPs pesticides

Table [insert number]. Status of registering for POPs pesticides specific exemptions

Chemical	Specific exemption	Activity (production/use)	Expiry date	Estimated quantity of production / use	Purpose(s) of production / use	Reason for exemption	Remarks

2.3.10.2 POP-PBDEs

Table [insert number]. Status of registering for POP-PBDEs specific exemptions

Status of registering for a specific exemption	Year	Status of undertaking a review of the continuing need for registration for a specific exemption for hexabromodiphenyl ether and heptabromodiphenyl ether and/or tetrabromodiphenyl ether and pentabromodiphenyl ether	Main problem sources
[] Yes [] No		(a) Specific exemption for hexabromodiphenyl ether and heptabromodiphenyl ether [] Yes [] No (b) Specific exemption for tetrabromodiphenyl ether and pentabromodiphenyl ether [] Yes [] No	[] Not needed [] Not assessed [] Lack of financial resources [] Lack of technical capacity [] Assessed but lack of technical capacity [] Assessed but lack of financial capacity [] Assessed but lack of human resources [] Other

2.3.10.3 HBCD

Table [insert number]. Status of registering for HBCD specific exemptions

Chemical	Specific exemption	Activity (production/use)	Expiry date	Estimated quantity of production / use	Purpose(s) of production / use	Reason for exemption	Remarks

2.3.10.4 PCN

Table [insert number]. Status of registering for PCN specific exemptions

Chemical	Specific exemption	Activity (production/use)	Expiry date	Estimated quantity of production / use	Purpose(s) of production / use	Reason for exemption	Remarks

2.3.10.5 DDT

Table [insert number]. Status of registering for DDT acceptable purpose

Production notification	Use notification	Date of notification	Remarks

2.3.10.6 PFOS, its salts and PFOSF

Table [insert number]. Status of registering for any of the specific exemptions related to PFOS, its salts and PFOSF

Action	Status	Specific exemption
registering for any of the specific exemptions related to PFOS listed in Annex B to the Convention	[] Yes [] No	[]

Table [insert number]. Status of registering for any of the acceptable purposes related to PFOS, its salts and PFOSF

Action	Status	Acceptable purpose
registering for any of the acceptable purposes related to PFOS listed in Annex B	[] Yes [] No	[]

Table [insert number]. Status of reviewing the continued need for the specific exemption(s) and/or acceptable purpose(s) for PFOS, its salts and PFOSF

Action	Status	Information on the review
reviewing the continued need for the specific exemption(s) and/or acceptable purpose(s) for PFOS, its salts and PFOSF	[] Yes [] No	[]

2.3.11 Existing programmes for monitoring releases and environmental and human health impacts, including findings

Table [insert number]. Status of undertaking any research, development, and monitoring and cooperation pertaining to persistent organic pollutants, and where relevant, to their alternatives and to candidate persistent organic pollutants

Action	**Status**	**Type of action(s)**	**Year(s) in which started the research, development, and monitoring and cooperation pertaining to persistent organic pollutants**	**Subject for research and development/monitoring/cooperation**	**Main problem sources**
undertaking any research, development, and monitoring and cooperation pertaining to persistent organic pollutants, and where relevant, to their alternatives and to candidate persistent organic pollutants	[] Yes [] No	[] Research and development [] Monitoring [] Cooperation	**[]**	[] Sources and releases into the environment. [] Presence, levels and trends in human health and the environment. [] Environmental transport, fate and transformation. [] Socio economic and cultural impacts. [] Effects on human health and the environment. [] Release reduction and/or elimination. [] Harmonised methodologies for making inventories of generating sources.	[] Lack of institutional or policy framework. [] Lack of financial capacity. [] Lack of human resources. [] Lack of technical capacity. [] Other :

				[] Analytical techniques for the measurement of releases. [] Other :	

2.3.11.1 POPs pesticides

Table [insert number]. POPs pesticides monitoring findings/results

Chemical	Type of programme	Monitoring findings/results	Remarks
	[] Research and development [] Monitoring [] Cooperation		

2.3.11.2 PCBs

Table [insert number]. PCB monitoring findings/results

Chemical	Type of programme	Monitoring findings/results	Remarks
	[] Research and development [] Monitoring [] Cooperation		

2.3.11.3 POP-PBDEs

Table [insert number]. POP-PBDE monitoring findings/results

Chemical	Type of programme	Monitoring findings/results	Remarks
	[] Research and development [] Monitoring [] Cooperation		

2.3.11.4 HBCD

Table [insert number]. HBCD monitoring findings/results

Chemical	Type of programme	Monitoring findings/results	Remarks
	[] Research and development [] Monitoring [] Cooperation		

2.3.11.5 HCBD

Table [insert number]. HCBD monitoring findings/results

Chemical	Type of programme	Monitoring findings/results	Remarks
	[] Research and development [] Monitoring [] Cooperation		

2.3.11.6 PCN

Table [insert number]. PCN monitoring findings/results

Chemical	Type of programme	Monitoring findings/results	Remarks
	[] Research and development [] Monitoring [] Cooperation		

2.3.11.7 DDT

Table [insert number]. Status of DDT resistance monitoring

Existence of surveillance mechanism for monitoring DDT resistance	Description of bioassay test procedures used for detecting DDT resistance

[] Yes [] No [] Not applicable	

Table [insert number]. Vector susceptibility to DDT according to the WHO susceptibility test

Vector species	**DDT concentration & exposure time (mins.)**	**% mortality**	**Year last tested**	**Geographical areas concerned within country**

Table [insert number]. Resistance observed for other insecticides used in disease vector control

Resistance observed for other insecticides used in disease vector control	**Description of vector**
Pyrethroids [] Yes [] No	
Organophosphates [] Yes [] No	
Carbamates [] Yes [] No	
Other [] Yes [] No	

2.3.11.8 PFOS, its salts and PFOSF

Table [insert number]. PFOS, its salt and PFOSF monitoring findings/results

Chemical	**Type of programme**	**Monitoring findings/results**	**Remarks**

	[] Research and development [] Monitoring [] Cooperation		

2.3.11.9 Unintentional POPs

Table [insert number]. uPOPs monitoring findings/results

Chemical	Type of programme	Monitoring findings/results	Remarks
	[] Research and development [] Monitoring [] Cooperation		

2.3.12 Current level of information, awareness, and education among target groups; existing systems to communicate such information to the various groups

Table [insert number]. Status of taking any measures to implement Article 10 of the Convention

Action/measure	Status	Year	Type of measure	Main problem sources

taking any measures to implement Article 10 of the Convention	[] Yes [] No	[]	[] Awareness on persistent organic pollutants among policy and decision makers. [] Provision to the public of all available information on persistent organic pollutants. [] Development and implementation of educational programmes especially for women, children and the least educated on persistent organic pollutants, as well as on their health and environmental effects and on their alternatives. [] Public participation in addressing persistent organic pollutants and their health and environmental effects. [] Training of workers, scientists, educators and technical and managerial personnel. [] Development and exchange of educational and public awareness materials at the national and international level. [] Development and implementation of education and training programmes at the national and international level. [] Other :	[] Lack of institutional or policy framework. [] Lack of financial capacity. [] Limited human resources. [] Insufficient technical capacity. [] Other :

2.3.13 Mechanism to report under Article 15 on measures taken to implement the provisions of the Convention and for information exchange with other Parties to the Convention

Table [insert number]. Mechanism to report under Article 15 and submission status

Mechanism/arrangements in place to prepare and submit the report under Article 15	Submission status	Main problems encountered	Remarks
[X] Yes [] No [] Currently under development	[X] 1st Report [X] 2nd Report [] 3rd Report 4th Report	Last 2 reports weren't submitted by Moldova due to lack of new POPs inventory and insufficient state institutional capacities to run it	

2.3.14 Relevant activities of non-governmental stakeholders

Table [insert number]. Relevant activities of non-governmental stakeholders

Non-governmental stakeholder	POPs related activities
ProDezvoltare Rurala	Phytoremediation of the POPs contaminated sites – activity run in 2010

2.3.15 Overview of technical infrastructure for POPs assessment, measurement, analysis, alternatives and prevention measures, research and development – linkage to international programmes and projects

Table [insert number]. Overview of technical infrastructure for POPs assessment, measurement, analysis, alternatives and prevention measures, research and development

Overview of technical infrastructure for	POPs assessment	POPs measurement	POPs analysis	POP alternatives	POPs prevention measure	POPs research and development	Main problems encountered

	[X] Yes [] No [] Currently under development	[] Yes [] No [] Currently under development	[] Yes [] No [] Currently under development	[] Yes [] No [] Currently under development	[] Yes [] No [] Currently under development	[] Yes [] No [] Currently under development	

2.3.16 Overview of technical infrastructure for POPs management and destruction

Table [insert number]. Overview of technical infrastructure for POPs management and destruction

Overview of technical infrastructure for	POPs management	POPs destruction	Main problems encountered	Remarks
	[] Yes [] No [] Currently under development	[] Yes [] No [] Currently under development		

2.3.17 Identification of impacted populations or environments, estimated scale and magnitude of threats to public health and environmental quality, and social implications for workers and local communities

Table [insert number]. Identification of impacted populations or environments, estimated scale and magnitude of threats to public health and environmental quality, and social implications for workers and local communities

POPs	Impacted populations or environments	Estimated scale and magnitude of threats to public health and environmental quality	Social implications for workers and local communities
POPs pesticides	Farmers	Approximately 1000 POPs contaminated sites were recorded in the country. The farmers using such land /in close vicinity of the contaminated sites report harvest issues and some were not able to	

		place the products at the market, due to POPs concentrations confirmed by lab.	

2.3.18 Details of any relevant system for the assessment and listing of new chemicals

Table [insert number]. Details of any relevant system for the assessment and listing of new chemicals

Action	**Status**	**Year**	**Measure**
taking measures to regulate new pesticides or new industrial chemicals (i.e. chemicals that have not yet been introduced in the market or registered in your country), with the aim of preventing the production and use of new chemicals that exhibit the characteristics of persistent organic pollutants	[] Yes [X] Currently being developed [] No	[2020]	[X] no regulatory and assessment schemes for new pesticides or industrial chemicals in place [] regulatory and assessment schemes for new pesticides or new industrial chemicals in place, but it does not take into consideration the criteria in paragraph 1 of Annex D.

2.3.19 Details of any relevant system for the assessment and regulation of chemicals already in the market

Table [insert number]. Details of any relevant system for the assessment and regulation of chemicals already in the market

Action	**Status**	**Year**	**Measure**
Taking into consideration the criteria in paragraph 1 of Annex D when conducting assessments of pesticides or industrial chemicals currently in use	[] Yes [] Currently being developed [] No	[]	[] no regulatory and assessment schemes for existing pesticides or industrial chemicals in place

			[] regulatory and assessment schemes for existing pesticides or industrial chemicals in place, but it does not take into consideration the criteria in paragraph 1 of Annex D.

2.4 Implementation status

Table [insert number]. Previous NIP action plans implementation status as of 2004

Previous NIP Action	**Previous NIP Action Plan Component**	**Implementation status**
Revision of existing legal acts; identification of gaps; recommendations for amendments; stakeholders consultations.	Modification of legal framework	Completed. Law n Chemicals no 277/2018 approved https://www.legis.md/cautare/getResults?doc_id=112668&lang=ro
Amendment of the statute of the National Committee on Environmental Policy; study tour	Administrative set-up	
Nomination of the National Focal Point for the Stockholm Convention within the MERN, exchange of information according to the provisions of the Convention and the initial actions of the Parties.	Administrative set-up	Completed.
Develop the project and create the Center for Chemicals Management (CCM); establish consulting support to CCM; improve the skills and managerial capacity of CCM staff; develop terms of reference and scope of its work for the implementation of the Basel, Stockholm, LRTAP and Aarhus Protocol; detailed design and tuning of NIP activities	Administrative set-up	
Establish an information system, procure hardware and software, train staff; set up statistical and reporting procedures (identification of information sources, setting reporting formats and information channels); establish PRTR	Administrative set-up	PRTR established and reporting system made operational. www.rept.gov.md Reporting and registration system for chemicals in process of development.

Draft regulations; stakeholders consultations	Development of regulatory mechanisms	Partially completed. PCB Regulation approved – GD 81/2009 https://www.legis.md/cautare/getResults?doc_id=22167&lang=ro PIC regulation approved - GD 505/2020 https://www.legis.md/cautare/getResults?doc_id=122468&lang=ro POPs Regulation developed and ready for approval. CLP Regulation developed and ready for approval.
Needs assessment; development of guidelines; consultations with operations staff	Drafting of guidelines and handbooks	Completed https://www.moldovapops.md/reports/default.htm
Design training curricula, training courses for 32 districts' and villages' authorities (to be repeated every 2 years), supply equipment	Increase capacity for better management of prohibited pesticides	
Preparation of environmental operational handbook for repackaging and transportation	Increase capacity for better management of prohibited pesticides	
Design training curricula, training of trainers, training of MOD and DES staff	Increase capacity for better management of prohibited pesticides	
Implementation of rapid feasibility study for 32 districts, preparation of 32 District Repackaging Plans, consultations with stakeholders and local authorities	Increase capacity for better management of prohibited pesticides	
Conducting an Environmental Impact Assessment at national scale and in one typical district (as a pilot activity)	Increase capacity for better management of prohibited pesticides	Completed
Preparation of the training manual, specification of sampling/ analytical kits, training courses for all energy enterprises, preparation of a practical handbook (PCBs identification, labeling, equipment hot-	Increase capacity of energy sector for PCBs identification in power equipment	

spot assessment and safety management, reporting), consultation with stakeholders		
Preparation and coordination of reconnaissance inventory plans for all energy enterprises, purchasing and distribution of sampling/analytical kits	Increase capacity of energy sector for PCBs identification in power equipment	Completed
Sampling and assessment of PCBs presence on-site (by simplified kits), labeling, hot-spot (risk) assessment, reporting	Inventory of PCBs in electrical power equipment	Completed
Planning, sampling, analysis (laboratory control), reporting	Inventory of PCBs in electrical power equipment	Completed
Preparation of check-lists and instructions for self-identification of PCBs in equipment, products, articles; familiarization of a wide spectrum of agencies with inventory needs; analysis of re-sponses; preparation of a national screening plan for further hot-spot detailed assessment	Widening of PCBs in-ventory to other than energy sectors	Completed. Developing and putting in operation of the online reporting form on PCB containing equipment www.siamd.gov.md
Formulate monitoring strategies tailored for different groups of POPs, sources and media; design monitoring programs and sampling requirements; define laboratories' responsibilities, create a platform for data exchange.	Increasing of POPs monitoring national capacities	
Identification of laboratories' needs, specification and purchasing of equipment, supplies, reagents and standards, setting QA/QC procedures and training the staff	Increasing of POPs monitoring national capacities	Completed
Preparation of questionnaire, analysis of replies, estimation of emissions, risk evaluation, sources prioritization	Capacity building for unintended POPs	Partially completed. uPOPs inventory conducted.
Selection of a pilot area and design of the sampling program, sampling and analysis (in EU laboratory), interpretation of results and formulating recom-mendations	Capacity building for unintended POPs	
Formulate courses curricula, implement seminars, study tour, formulate and discuss options for Moldova	BAT and BEP knowledge transfer	
Develop strategies for reduction of unintended POPs releases and promotion of BAT and BEP technologies	Developing an action plan addressing the issue of unintended POPs	Partially.

Preparation of methodology for risk assessment, formulation of contaminated sites criteria, consultations with stakeholders	Increasing preparedness for contaminated sites management	Completed in 2010, 3 demonstration projects implemented
Preparation of contaminated sites assessment plan; collection of relevant information; consultations with local authorities, population, businesses; description/mapping of sites identified; incipient analytical works	Increasing preparedness for contaminated sites management	
Preparation of know-how transfer program, conducting of seminars, study tour, low-cost remediation measures development	Increasing preparedness for contaminated sites management	
Organize international/regional conferences, include POPs research in GRM programs	Promotion of research and development	
Development of non-pollution technologies	Promotion of research and development	
Determination of POPs concentrations in environment compartments, including migration and transformation. Epidemiological studies on vulnerable and exposed population groups	Repackaging and centralization of obsolete pesticides	
Detailed needs assessment, specification, purchasing, delivery	Repackaging and centralization of obsolete pesticides	Completed
Selection of district deposits, preparation of rehabilitation plans, approval of selected district deposits by environmental and health authorities, small rehabilitation, commissioning	Repackaging and centralization of obsolete pesticides	Completed
Repackaging and centralization of obsolete dry and liquid pesticides, and contaminated packaging materials at 32 districts deposits	Repackaging and centralization of obsolete pesticides	Completed https://www.moldovapops.md/reports/default.htm
Preparation of low-cost urgent remediation plans for the abandoned pesticides deposits, approval and coordination of plans, fencing, safety/precaution symbols installation, blocking of doors and windows	Low-cost, community based urgent actions for abandoned deposits	
Selection of the "best" rural community per district, preparation of grant proposals	Low-cost, community based urgent actions for abandoned deposits	

Selection of implementation agency, training and provision of equipment for selected implementation agency, negotiations with commercial companies, activities at village level	Remove old DDT stocks from house-holds	Continuously
Feasibility study, investment project preparation, negotiations with donors	Assessment of final solution for obsolete pesticides and aban-doned stockpiles	
Feasibility study, investment project preparation, negotiations with donors	Assessment of final solution for obsolete pesticides and aban-doned stockpiles	Completed. In the period 2010-2020, with support of technical assistance projects Republic of Moldova managed to repackage, export and destroy approximately 3600 tons of obsolete persistent organic pollutants. https://www.moldovapops.md/reports/default.htm
Fencing of territory, renovation of drainage and run-off collection systems, covering of the site with a new protection layer, routine monitoring of soil and water	Remediation of Cismichioi pesticide dump	Completed. In 2016-2017 a feasibility study was carried out and the investigations found that the contamination in the perimeter of the landfill is concentrated inside the 14 sarcophagi in which the old pesticides are stored. The project to remedy the location of the pesticide depot in Cismichioi (carried out in 2019), implemented with the support of the Czech Development Agency, consisted in isolating the sarcophagi with waste and soil contaminated with impermeable layers with subsequent technical and biological recultivation of the land.
Feasibility study, investment project preparation, negotiations with donors	(option 1) Feasibility study for Vulcanesti	

	stock of out-of-use capacitors	
Hiring of a foreign company for full elimination of electrical capacitors shipping abroad	(option 2) Remediation measures for Vulcanesti stock of out-of-use capacitors	
Centralization of abandoned equipment, provision of safety containers, identification of technology for PCBs and PCB-contaminated equipment elimination	Country-wide handling of PCB-contaminated and damaged equipment	
10 short-term courses per year, manual, establishment of a communication framework, adaptation of existing communication channels for POPs issues, development of communication procedures	Improvement of communication	
2 interdisciplinary meetings/ forums per year, 5 group meetings and seminars on exposure risks per year, development of processes and procedures for participatory solution of POPs problems	Building up participatory process	
Development and dissemination of POPs- related information in mass media and accessible publications, including visual publicity (at least 10 events per year), one interactive dialog per year, one POPs caravan per year, preparation of one agricultural and industrial nonPOPs „oasis" for demonstration each year, participation at international forums	Exchange of information at country and international levels	
Organizing 5 training seminars per year for various target groups, one Olympiad for different age groups in POPs alternatives every year, development and introduction of training packages in POPs for current and future (students) public servants, family doctors, business managers and developers	Training of general public	
Development and dissemination of educational packages for specific groups (local and central authorities, pupils, students, vulnerable groups, etc.)	Education	

3. Strategy and action plan elements of the national implementation plan

3.1 Policy statement

In order to reduce and eliminate the impact of the persistent organic pollutants on the environment and human health, to implement the Stockholm Convention provisions and to create an efficient system of chemical safety, along with recognising that Persistent organic pollutants (POPs) are chemicals that persist in the environment, bioaccumulate through the food web, and pose a risk of causing adverse effects to human health and the environment, the Republic of Moldova developed and approved its second National Implementation Plan .

Given the fact that the import and the supply of most substances referred to the Annexes A and B of the Convention are prohibited in the Republic of Moldova, special emphasis will be given to the sound management of waste containing or contaminated with POPs, control of emissions of POPs listed in the Annex C of the Convention and to the environment sound disposal of the PCBs containing equipment. According to article 5(c) of the Stockholm Convention every possible effort will be made to promote the development and, where it deems appropriate, the use of substitute or modified materials, products and processes to prevent the formation and release of the chemicals listed in Annex C of the Convention will be promoted.

3.2 Implementation strategy

The goal of the Implementation Plan is not only to fulfil legal obligations, but to take actions and to establish a strategy and action plan for further measures aiming at elimination or reduction of releases of POPs and management of POPs containing waste.
The Implementation Plan reflects the national legal framework for POPs management, as well as the key challenges to achieve the goal to protect human health and the environment from exposure to POPs.

The Implementation Plan aims to:

- review the existing measures related to POPs;

- assess their efficiency and sufficiency in meeting the obligations of the Stockholm Convention;
- identify needs for further measures;
- establish a plan for implementing the further measures;
- management and the destruction of PCBs
- restriction of the uncontrolled burnings to reduce the emissions of POP since
- identify and strengthen links and potential synergies between POPs management, other environmental policies and other policy fields; and
- increase awareness on POPs and their control measures.

Since the ratification of the Stockholm Convention in 2004, the Republic of Moldova developed its first National Implementation Plan in 2004. The second implementation plan shall reflect developments both within the policy environment (i.e. further addition of new POPs to the Convention and the national legislation) and the scientific and technological environment (i.e. where new research furthers the elimination of POPs).

3.3 Action plans, including respective activities and strategies

3.3.1 Activity: Institutional and regulatory strengthening measures

Table [insert number].Activity: Institutional and regulatory strengthening measures

Objectives	Activities	Key performance indicators	Time Frame	Implementers	Resources / Needs
Improve legal basis for new POPs management	Amending the Law on waste no 209/2016	Amendment to the law	By 2023	Ministry of Environment	Within approved state budget
	Approval the secondary legislation for chemicals and POPs management	CLP regulation, POPs, regulation	By 2023	Ministry of Environment	Within approved state budget

Building capacity of the staff Chemicals Agency	Building capacities in risk assessment and risk management			Ministry of Environment	
	Inclusion and participation in the work of subsidiary bodies of the Stockholm Convention, as well as of related conventions, with the aim of capacity building			Ministry of Environment	
	Establish working group that would ensure reporting to SC	Report to SC	Every 4 years	Environment Agency Chemicals Agency	
Improve data management and reporting in the field of chemicals	Further operationalization of the Chemicals Registry www.repc.gov.md		By 2023	Environment Agency Chemicals Agency	
	Provide training for economic entities and national authorities in use if the Chemicals Registry		By 2023	Environment Agency Chemicals Agency	

3.3.2 Activity: Measures to reduce or eliminate releases from intentional production and use

Since Moldova is not producing, nor using in production any of the POPs listed under the convention, no measures are outlined for this section.

Table [insert number]. Activity: Measures to reduce or eliminate releases from intentional production and use

Objectives	Activities	Key performance indicators	Time Frame	Implementers	Resources / Needs

3.3.3 Activity: Production, import and export, use, stockpiles, and wastes of Annex A POPs pesticides (Annex A, Part I chemicals)

Table [insert number]. Activity: Production, import and export, use, stockpiles, and wastes of Annex A POPs pesticides (Annex A, Part I chemicals)

Objectives	Activities	Key performance indicators	Time Frame	Implementers	Resources / Needs
Transportation Disposal of Obsolete Pesticides from Transnitrian region		Tons of OPS safely disposed		OSCE mission to Moldova Environmental Agency Environmental Protection Inspectorate	Funding agreement Basel Notifications
Compiling the list of the new POPs pesticides alternatives	Official information from National Food Safety Agency on registered alternatives	List of available POPs pesticide alternatives		Ministry of Environment, Ministry of Agriculture,	Official requests

Ensure environment sound management of POPs pesticides stocks	Implementation of CLP and related labelling	CLP implemented		Ministry of Environment, Ministry of Agriculture, NFSA, Environmental Protection Inspectorate	
	Establishing of proper POPs and waste pesticide storages and securing them	Number of storages built			
	Develop regulatory measures to combat illegal traffic of banned pesticides and counterfeit pesticides	Regulatory measures in place			
	Establishing of an empty containers collecting and management system, with specific attention to address the use and recycling of pesticides empty containers – through respecting the EPR principle provisions, compliant with Packaging and Packaging waste regulation - Gov. Dec. nr. 561/2020				

Establish legal frame for manageme nt of all POPs pesticides and waste	Amending the Law on waste no 209/2016 and inclusion of Alphahexachlorocyclohe xane and Betahexachlorocyclohex anein list of banned or restricted substances. (or list as exemption)	Alphahexachlorocy clohexane and Betahexachlorocyc lohexanein banned	2022-2023	Ministry of Environmen t	

3.3.4 Activity: Production, import and export, use, identification, labelling, removal, storage, and disposal of PCBs and equipment containing PCBs (Annex A, Part II chemicals)

Table [insert number]. Activity: Production, import and export, use, identification, labelling, removal, storage, and disposal of PCBs and equipment containing PCBs (Annex A, Part II chemicals)

Objectives	Activities	Key performance indicators	Time Frame	Implementers	Resources / Needs
Inventory on PCB containing dielectric oil/ PCB contaminated equipment within power supply sector of the Republic of Moldova performed	Conduct assessment of quantities of the closed-used of PCB in power supply companies	Nr of companies contacted National Inventory of PCB contaminated equipment/ oil is updated as per 2020	2022 - 2023	Ministry of Environment Environmental Agency (responsible for PCB inventory according to PCB Regulation nr. 81/2009)	Inventory team of expert Questionnaire Electronic Data entry in the waste management information system – www.siamd.gov.md
Analyze the business plan for power supply companies/	Check for status of companies – holders of PCB contaminated oil/ equipment actions on phasing out according to	Nr of units/ quantity of oil (in tonnes) of PCB subject to phase out by	2020-2021	Economic operators, subject of reporting	Data on remaining stocks of PCB oil/ equipment is reflected un the National PCB

consumers on phasing out the PCB equipment	provisions of art 7 of PCB regulation	key enterprises/ consumer holders Annual Report of MARDE to Government on PCB regulation execution to		Ministry of Environment Environmental Agency (responsible for PCB inventory according to PCB Regulation nr. 81/2009)	annual inventory for 2021
Perform inventory of PCB/ PCN contaminated sites	PCB contaminated Site sampling and remediation of 400KV power station of Moldelectica in Vulcanesti	Surface of PCB contaminated site, site risk assessment and prioritization measures Remediation measures	2021-2023	Ministry of Environment Dekonta Company under the Czech Development assistance project State Enterprise Moldelecrtica	Technical specification of the project subject to approval of the Ministry for 2021
Mapping of the PCB contaminated sites	GIS map on PCB contaminated sites	Map with PCB contaminated locations	2022	Environment Agency	GPS measurements PCB inventory results
Addendums to PCB regulation nr. 81/2009	Review the phase out deadlines, set as per end of 2020 and enforce the modifications within the Government	Governmental Decision on modification of the Regulation on PCB approved	2022	Ministry of Environment	Governmental Action Plan
Information on PCB equipment yearly updated	Record keeping and submission of yearly reports on equipment containing PCBs, and PCBs	Number of reports Inventory of PCB	Continuously	Environment Agency	Electronic Data entry in the waste management information system

	(including information about disposed PCBs and remaining PCBs/equipment)	equipment and PCB			– www.siamd.gov.md
Equipment containing PCBs removed until 2030 Equipment containing PCBs removed until 2030	Defining a National PCBs/PCNs Elimination Plan, define the responsibilities for institutions and companies for PCB/PCN containing wastes management and disposal	Action Plan	By 2023	Environment Agency	Financial resources to cover the costs for small users
	Carry out removal from use/disposal of equipment containing PCBs	Quantity of equipment removed	By 2030	Mandatory for holders/owners of equipment; Control over implementation – Environment Protection Inspectorate)	
Education and raising awareness of target groups	Education of entities on the obligation and replacement of equipment containing PCBs	Number of companies	Continuously	Environmental Protection Inspectorate	
	Establishing penalties/fines for the improper management of PCB/PCN containing equipment.	Penalties/fines included in regulatory frame and communicated to PCB owners.			
	Developing and implementing incentives for electric utilities to	Incentives established			

	comply with the phase-out of PCBs/PCNs				
Establish legal frame for management of PCN	Amending the Law on waste no 209/2016 and inclusion of Pentaclorphenl and its salts in list of banned or restricted substances. (or list as exemption)	Pentaclorphenl and its salts restricted (or exemption listed)	2022-2023	Ministry of Environment	

3.3.5 Activity: Production, import and export, use, stockpiles, and wastes of hexaBDE and heptaBDE (Annex A, Part IV chemicals) and tetraBDE and pentaBDE (Annex A, Part V chemicals) (and HBB, where applicable (Annex A, Part I chemicals))

Table [insert number]. Activity: Production, import and export, use, stockpiles, and wastes of hexaBDE and heptaBDE (Annex A, Part IV chemicals) and tetraBDE and pentaBDE (Annex A, Part V chemicals) (and HBB, where applicable (Annex A, Part I chemicals))

Objectives	Activities	Key performance indicators	Time Frame	Implementers	Resources / Needs
Establish legal frame for management of POP-BFRs and related articles and waste categories	Amending the Law on waste no 209/2016 and inclusion of Decabromodiphenyl ether and d Hexabromocyclododecan in list of banned or restricted substances. (or list as exemption)	DecaBDE, and HBCD restricted (or exemption listed)	2022-2023	Ministry of Environment	
Identification and safe removal of products containing	Update the inventory of articles containing PBDE (EEE, vehicles), including their waste	Updated inventory	Every 4 years	Environment Agency	Statistical data on import/export of articles and other openly available statistical data

PBDE and their waste	Ensure proper reporting of waste containing PBDE collected and recycled	Quantity of waste collected and recycled Reports provided by EPR schemes and recyclers	Annual	Environment Agency	Waste reporting system – www.siamd.gov.md
	Develop guidelines for management of articles containing brominated diphenyl ethers before recycling	Instructions for environmentally sound management of waste containing PBDE	2022-2023	Environment Agency	TA
	Increase capabilities and methodology for rapid detection of PBDE in used/new imported EEE, furniture and vehicles.	Number of detected aticles containing PBDE	Continuously	Environment Agency in collaboration with Customs Authorities Environment Protection Inspection	Specialized equipment for rapid detection of brominated compounds
	Assessment of management and destruction option of waste categories containing POP-BFR (WEEE; ELV, insulation foam)				
	Compile guidelines and guidance on safe handling of POP-BFR polymers in EEE,				

	ELV etc. and develop national guidance for management of POP-BFRs containing insulation foam from construction.					
	Development of sound management (financing, collection, storage, treatment according to waste hierarchy) of POP-BFR containing plastic and other polymer in EEE/WEEE within the frame of hazardous substance					
Raising awareness and strengthening technical capacities for PBDE management	Prepare awareness rising activities for further raising of awareness on the harmful effects of PBDE	Number of educational activities	Annually	Environment Agency Chemicals Agency Civil society	TA	
	Developing awareness raising materials on POPBFRs and other hazardous substances in EEE, ELVs, buildings etc					
	awareness campaigns to reduce/eliminate the practice of open burning of EEE/WEEE and ELV polymer					

	scrap.)				
	Develop procedures on inspections and maintenance of stockpiles and waste of plastic and other polymers in EEE.				
	Training/education of customs authorities on control of import of import control of WEEE, ELVs and other relevant products				
	Development of education and training materials for life cycle management of POPBFRs (considering already available materials) and training of related recyclers and waste management sector for relevant sectors within the life cycle management of hazardous substances in EEE, vehicles, buildings, furniture, textiles Capacity building of life cycle management for POP-BFRs (considering available materials) and training of recyclers and waste management				

	sector for relevant sectors within the life cycle management of hazardous substances in EEE, vehicles, buildings,				
Established monitoring of POPBFRs and pollutants in the atmosphere and other priority areas	Vom avea capacități de monitoring ori nu are sens de setat așa acțiune ambițioasă?				
	Custom control and improvement of the traceability in imports (including chemicals in products)	Customs trained			
	Extended producer/user responsibility for management of POP PBDE throughout product life cycle (including disposal)	EPR in place			

3.3.6 Activity: Production, import and export, use, stockpiles, and wastes of DDT (Annex B, Part II chemicals) if used in the country

No special action plan was prepared nor further activity relating to DDT proposed within the NIP, given that it was assessed in the first NIP and that DDT does not present a problem in the Republic of Moldova regarding the potential risk to health and the environment (it is not produced or imported and its use is prohibited since 1970). Not included in the official register of permitted substances for use in agriculture, including and individual farms, forestry and household. No import or sale permitted.

Table [insert number]. Activity: Production, import and export, use, stockpiles, and wastes of DDT (Annex B, Part II chemicals) if used in the country

Objectives	Activities	Key performance indicators	Time Frame	Implementers	Resources / Needs

3.3.7 Activity: Production, import and export, use, stockpiles, and wastes of PFOS, its salts and PFOSF (Annex B, Part III chemicals)

Table [insert number]. Activity: Production, import and export, use, stockpiles, and wastes of PFOS, its salts and PFOSF (Annex B, Part III chemicals)

Objectives	Activities	Key performance indicators	Time Frame	Implementers	Resources / Needs
Identification and safe removal of products containing PFOS and their waste	Updating the inventory on the products/articles containing PFOS or its salts (including total quantity) (surface treated materials, medical devices, hydraulic fluids, insecticides etc.);	Updated inventory	Every 4 years	Environment Agency	Inventory Methodology Data from the relevant institutions
	Custom control and improvement of the traceability in imports (including chemicals in products)	Customs trained			

Raising awareness and strengthening technical capacities for PBDE management	Prepare awareness rising activities for further raising of awareness on the harmful effects of PFOS	Number of educational activities	Annual	Environment Agency Chemicals Agency Civil society	TA

3.3.8 Activity: Register for specific exemptions and the continuing need for exemptions (Article 4)

Table [insert number]. Activity: Register for specific exemptions and the continuing need for exemptions (Article 4)

Objectives	Activities	Key performance indicators	Time Frame	Implementers	Resources / Needs

3.3.9 Action plan: Measures to reduce releases from unintentional production (Article 5)

Table [insert number]. Action plan: Measures to reduce releases from unintentional production (Article 5)

Objectives	Activities	Key performance indicators	Time Frame	Implementers	Resources / Needs
Identification and quantification of uPOPs releases sources	Updating the inventory of uPOPs (PCDD/PCDF, PCB, HBC)	Updated inventory	Every 4 years	Environment Agency	Inventory Methodology Data from the relevant institutions
	Harmonization and combination of	Harmonized procedures for data collection	At the moment of inventory	Environment Agency	Inventory methodologies

	inventory with other inventories at national level (UNFCCC, LRTAP) in order to avoid duplication in the process of data collection				
Reduction and removal of uPOPs releases	Promotion of energy efficiency in the industrial/ public sectors and in households		Continuously	Ministry of Environment	
	Promotion of implementation of BAT/BEP				Approval of Law on industrial emissions
	Promote use of renewable sources of energy		Continuously	Ministry of Environment	
	Reduce and control the open burning processes (waste, biomass)		Continuously	Ministry of Environment NGO	
	Raise awareness of population on the effects of uncontrolled combustion				

3.3.10 Activity: Identification and management of stockpiles, waste and articles in use, including release reduction and appropriate measures for handling and disposal (Article 6)

Table [insert number]. Activity: Identification and management of stockpiles, waste and articles in use, including release reduction and appropriate measures for handling and disposal (Article 6)

Objectives	Activities	Key performance indicators	Time Frame	Implementers	Resources / Needs
Please note: The management of the stockpiles of the individual POPs (PCBs, pesticides, PBDEs, HBCD) is in the action plans of individual POPs above					
Develop measures for safe handling, separation and sound disposal of stockpiles of chemical and articles in use and to appropriately recover resources and energy to move to more circular economy.	Develop manuals for safe handling and disposal. Establish collection scheme for POPs containing articles in use. Establish appropriate separation, recycling and energy recovery schemes for impacted waste categories	Guidelines on Collections points/scheme for articles in use established			
Destruction, disposal or export of POPs and other	Destruction of POPs containing waste and	POPs and other hazardous chemical			

hazardous chemicals and waste in an ESM	other hazardous chemicals containing waste in an ESM Export of POPs and other hazardous chemical waste which cannot be treated or disposed in the country ESM and disposal of hazardous waste	waste (including hazardous chemicals in products) managed in ESM			

3.3.11 Activity: Identification of contaminated sites (Annex A, B, and C Chemicals) and, where feasible, remediation in an environmentally sound manner

Table [insert number]. Activity: Identification of contaminated sites (Annex A, B, and C Chemicals) and, where feasible, remediation in an environmentally sound manner

Objectives	Activities	Key performance indicators	Time Frame	Implementers	Resources / Needs
Improve management system for	Identify existing	Numbers and surface of		Ministry of Environment	

contaminated areas	contaminated sites	contaminated sites.			

3.3.12 Activity: Facilitating or undertaking information exchange and stakeholder involvement

Table [insert number]. Activity: Facilitating or undertaking information exchange and stakeholder involvement

Objectives	Activities	Key performance indicators	Time Frame	Implementers	Resources / Needs
Strengthening the capacity of competent authorities and improving cooperation and information exchange for a more efficient management of POPs	Supervise the fulfilment of the Stockholm Convention requirements by the NFP and promote adequate cooperation and information dissemination, as well as regular monitoring	Number of meetings	Continuously	Ministry of Environment	
Improve exchange of information on the import, use and release of POPs and on their substitutes,	Appointment of contact persons for data collection and exchange of information depending on the issue and the Stockholm				

including information on their harmful properties, as well as financial and social costs that they might generate	Convention requirements, inclusion of representatives from economy, scientists, non-governmental organisations and other stakeholders, and				
Improved information exchange on national level between stakeholders	Facilitate the dialogue between industry, users, research and policy makers facilitate dialogue between environment and customs authorities	information exchange on national level between stakeholders take place			

3.3.13 Activity: Public and stakeholder awareness, information and education (Article 10)

Table [insert number]. Activity: Public and stakeholder awareness, information and education (Article 10)

Objectives	Activities	Key performance indicators	Time Frame	Implementers	Resources / Needs
Increase awareness and education regarding	Development and dissemination of educational	Number of trained persons	2023-2029	Ministry of Environment ad Ministry of Education	

the issue of POPs	packages for specific groups (local and central authorities, pupils, students, vulnerable groups, etc.)				
Increase public awareness about the potential sources of the so-called new POPs, their potential harmful effects on health and the environment, since their production and use is prohibited or restricted	Organize awareness rising events, publish leaflets and brochures		Every year	Ministry of Environment NGOs	
	Implement the activities to raise awareness and training for chemical inspectors; customs, enforcement officers, on the contents related to	Trainings and workshops conducted			

	POPs management				

3.3.14 Activity: Effectiveness evaluation (Article 16)

Table [insert number]. Activity: Effectiveness evaluation (Article 16)

Objectives	Activities	Key performance indicators	Time Frame	Implementers	Resources / Needs
Conduct a monitoring of POPs in human milk or human blood	Monitoring of POPs in human milk or blood	Data on POPs in human milk/blood			
Evaluating the effectiveness of the implementation of the Convention by other approach	Develop further national performance evaluation criteria. Assessment of the implementation and progress performance	Criteria Developed. Assessment report			

3.3.15 Activity: Reporting (Article 15)

Table [insert number]. Activity: Reporting (Article 15)

Objectives	Activities	Key performance indicators	Time Frame	Implementers	Resources / Needs
Fulfill the obligation of reporting on taken measures, strategies and stockpiles	Appointment of responsible division for regularly reporting to the SC	Report submitted to the SC	Every 4 years	Environment Agency	Using as basis the previous reports and the current NIP
Complying with article 15 reporting	Compile information for reporting (updated inventory and other information) Submit report to the secretariat (website)	Reporting submitted deadlines met	Every 4 year cycles	Stockholm Convention Focal Point	

3.3.16 Activity: Research, development and monitoring (Article 11)

Table [insert number]. Activity: Research, development and monitoring (Article 11)

Objectives	Activities	Key performance indicators	Time Frame	Implementers	Resources / Needs
Provide a more clear picture of the state of the environment with regards to POPs	Establishment of an effective control and monitoring of POPs in the environment	Environment state reports	Every 4 years	Environment Agency	

	Conduct laboratory accreditation for priority POPs		2023-2014	Environment Agency	
	Ensure conditions and adequate equipment necessary for the implementation of research, development and monitoring activities				

3.3.17 Activity: Technical and financial assistance (Articles 12 and 13)

Table [insert number]. Activity: Technical and financial assistance (Articles 12 and 13)

Objectives	**Activities**	**Key performance indicators**	**Time Frame**	**Implementers**	**Resources / Needs**
Financial assistance for priority areas identified	Financial needs assessment Identify sources of financial assistance Write project proposals	Studies evaluating and demonstrating financial needs List of potential donors identified Number of proposals	Continuously	Ministry of Environment Environment Agency Environment Protection Inspection	

		prepared an			

3.4 Development and capacity-building proposals and priorities

Subchapter 3.4 would detail the priority areas where current capacity and capability need to be strengthened to achieve the objectives of the NIP. Priorities based on the need to meet Convention obligations and country priority issues would be highlighted.

Table [insert number]. Development and capacity-building proposals and priorities

Priority area	**Capacity building proposal**	**Remarks**
Ensure the continuous inventory of POPs	Create an effective system of inventory, including data collection, estimations, reporting and archiving procedures	There is need to consider all the national inventories in order to avoid duplication of efforts, in particular for data collection
Environment sound management of waste containing POPs, in particular POPs pesticides, PCB, PBDE and HBCD.	Building capacity of control and enforcement authorities in checking and enforcing hazardous waste management operations	

3.5 Timetable for implementation strategy and measures of success

This subchapter would summarize the principal targets contained in the detailed strategy, outlining specific targets,milestones, and performance indicators to allow progress to be reviewed and monitored.

Table [insert number]. Timetable for implementation strategy and measures of success

Objective	**Action/activity**	**Key performance indicators**	**Time frame**	**Remarks**

3.6 Resource requirements

Subchapter 3.6 would detail the projected costs of measures included in the NIP. Incremental costs for measureswould be identified and potential sources of funding for both incremental costs and baseline costs would be noted.In accordance with Article 13 of the Convention, alternate sources of funding would be considered, as appropriate,by countries that are seeking development assistance.

Table [insert number]. Resource requirements for NIP implementation

Objective	**Action/activity**	**Source of funding**	**Baseline costs**	**Incremental costs**	**Remarks**

Annexes

Annexes could be used to provide detailed background data and information, specific action plans, and other relevant information to meet the objectives of the NIP while keeping the main document clear and simple structure. Such annexes might include:
A1: Government and key stakeholder endorsement documents
A2: Record of stakeholder and public consultation
A3: Representative public information materials
A4: Supporting information on chemicals
A5: Details of relevant international and regional treaties
A6: Country history in addressing the POPs issue/status of Convention implementation to date

Republic of Moldova

National Inventory Report on Dioxins and Furans

The uPOPs Inventory Report of the Republic of Moldova for the reporting years: 2001, 2004, 2008, 2012, 2016, 2018 was performed in August-November 2020 witin the UNEP/GEF project entitled "Integrated Stockholm Convention toolkit to improve the transmission of information under Articles 07 and 15".

It should be noted that first uPOPs Inventory Report of the Republic of Moldova conducted in 2003, PCDD/PCDF emissions have been estimated for 2001. In frames of UNEP/SP project "Improving sustainable institutional and regulatory framework for chemicals and waste management throughout their lifecycle in the Republic of Moldova" uPOPs emissions data was upgraded for 2001 and 2016 for the same range of pollutants.

Elaborated by:

Dr. Tatiana TUGUI, National team leader

Tatiana ECHIM, Technical expert
Natalia EFROS, Technical expert
Maria POPESCU, Project assistant/outreach expert
Nadejda Gindea, ECO Contact expert with UNEP/SP Project

Endorsed by:

Svetlana BOLOCAN, National Focal Point on Stockholm Convention on POPs
Chief division Waste Management and Chemicals Policies Direction
Ministry of Agriculture, Regional Development and Environment

Chisinau 2020

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Abbreviations and Acronyms

a	Year (annum), 365 days
APCS	Air Pollution Control Systems
ATULBD	Administrative territorial units on the left bank of Dniestr river
BF	Blast furnace
BOF	Basic oxygen furnace
CHP	Combined heat and power
CF	Cupola furnace
CNG	Compressed natural gas
DDT	Dichloro-diphenyl-trichloroethane
EAF	Electric arc furnace
IF	Induction furnace
L	Liter
LBRD	Left bank of river Dniestr
LPG	Liquefied petroleum gas
LoC	Level of Confidence
HCB	Hexachlorobenzene
GEF	Global Environment Facility
GHG	Greenhouse Gas
m^3	Cubic meter
MSW	Municipal solid waste
NA	Not applicable (not a relevant release vector)
ND	Not determined/no data (in other words: so far, no measurements available)
NE	Not estimated (so far, no attempt to estimate is made)
PCB	Polychlorinated biphenyls
PCDD	Polychlorinated dibenzo - p - dioxins
PCDF	Polychlorinated dibenzofurans
PeCBz	Pentachlorobenzene
PCP	Pentachlorophenol
POPs	Persistent organic pollutants
PVC	Polyvinyl chloride
RBRD	Reft bank of river Dniestr
RM	Republic of Moldova
t	Ton (metric)
TEQ	Toxic Equivalent
WHO	World Health Organization

Definitions

Unintentional POPs	Throughout the document, the term “unintentional POPs” will be used to address the persistent organic pollutants that are listed in Annex C Part I of the Stockholm Convention.

Summary

Persistent organic pollutants (POPs) are chemicals which due to their particular combination of physical and chemical properties are recognized for their high toxicity, stability, bioaccumulation through the food chain and persistence in the environment, including their inherent toxicity to wildlife and human beings. POPs can be transported across international boundaries far from their sources and pose a risk of causing adverse effects to human health and the environment. In response to the international community request to reduce and eliminate production, use and releases of these chemicals, two international legally binding instruments have been negotiated and concluded, the Protocol on Persistent Organic Pollutants (1998) and the Stockholm Convention (2001).

The setup of a country POP inventory is considered a crucial step toward the elimination of worldwide POPs contamination. Furthermore, identification of the emission sources of POPs in the environment is essential in establishing the quantitative factor for reducing primary emissions that would also lead to the reduction of secondary POPs contamination, since these are supported by primary atmospheric emissions. Taken measures would bring the benefit of reduction in local, regional, and global concentrations.

The Republic of Moldova has ratified the Stockholm Convention on Persistent Organic Pollutants by Law no. 40-XV from 19.02.2004 regarding the ratification of Stockholm Convention on Persistent Organic Pollutants (Official Journal of RM, 2004, no. 39-41) as well the Protocol on Persistent Organic Pollutants (POPs) to Geneva Convention on Long-range Transboundary Air Pollution (1979) was ratified by Law no. 1018-XV from 25.02.2002 regarding the ratification of the Protocol on Persistent Organic Pollutants (Official Journal of RM, 2005, no. 66-68). Being as a party to the Convention on Long Range Transboundary Air Pollution (LRTAP Convention), the Protocol on Persistent Organic Pollutants, and the Stockholm Convention, the Republic of Moldova is obliged to comply with all requirements set in these international and regional agreements.

In this respect, the Toolkit for Identification and Quantification of Releases of Dioxins, Furans and Other Unintentional POPs has been used to develop national release inventories as required by Article 5 and Article 15 of the Stockholm Convention. These emission data present a general picture of emissions of individual POP substances in quantitative terms for the reporting years: 2001, 2004, 2008, 2012, 2016, 2018.

The inventory heavy rely on the latest versions of default UNEP Toolkit and EMEP/EEA Guidebook emission factors to address gaps related used technologies, operating conditions and practices and pollution control equipment. This is particularly relevant for industrial processes, where there is often a lack of knowledge about abatement systems used, and uncertainty on the year they were installed and the impact on emissions across different POPs. Unless specific information was available, the default emission factors suggested in the EMEP/EEA Guidebook have been used throughout this project. This approach, although conservative, ensures consistency and may be useful to compare emissions from CEE Region. In order to provide some indication of the effect of control technologies, emission factors in the UNEP Toolkit for all relevant sectors are supplied with the range of emission

factors used for GHG inventory. It should be mentioned that used approach is still relying on expert judgment to select the most appropriate category, which in some cases was difficult in view of the limited available information.

This section provides summary of quantitative estimate of the releases to all vectors for the main sources of POPs to air, water, land, residue and products existent in RM, drawn upon the most current available data as well researches done within other related projects implemented in the Republic of Moldova, but are also largely derived from calculations using literature emission factors.

Since the first PCDD/PCDF inventory was completed in 2003, an update of the POPs inventories is required to comply with the new obligations related to the listing of new substances in the Stockholm Convention, as well as to apply updated emission factors made available in the new versions of UNEP Toolkit and EMEP/EEA Guidebook. Thus, the second multi-media inventory included releases to air, land and water for PCDD/PCDF, HCB and PCBs.

The present report includes a methodological approach applied to the development of emissions inventory for selected POPs based on anthropogenic sources, based on available Activity Data from the official sources of information, as well data available from the National GHG Inventory for 1990-2018. As a result it was generated a comprehensive inventory in order to understand the extent of POPs emissions to air from major sources in the Republic of Moldova. Since there is an increasing concern over the world about sustainable development strategies, an immediate priority is to reduce atmospheric emissions mainly related to thermal processes, agriculture and urban activities.

The Toolkit mainly focuses on dioxins with very scarce data available for other unintentionally produced POPs. However, it now contains emission factors for all relevant sectors, focusing not only on release to air but also to other vectors. The EMEP/EEA Guidebook proved to be a valuable source of emission factors for releases to air from all major source sectors, mainly for PCBs and PAHs. However, very limited data are available for HCB and PeCB, although it has been possible to estimate their emissions from a reduced number of sources. In some cases, when potential sources were identified but no EFs were available, it has been necessary to transfer emission factors from a similar source to make a first estimate. For instance this approach was used in the case of Ceramics production. EF from Brick production were applied due to lack of specific EF for this sector. Emission factors have been identified from various sources, such as the Toolkit for Identification and Quantification of Releases of Dioxins, Furans and Other Unintentional POPs, national / international publications, GHG Inventories, PRTR reports provided by the private sector related to industrial activities, reports from environmental agency/inspection. The detailed estimates of emissions, as well descriptions of the level of activity of each sector is detailed in subsequent sections.

In 2018, Republic of Moldova contributed with 136 g TEQ of PCDD/PCDF releases to the global environment, of which 23.1 g TEQ to the Air, 1.0 g TEQ to Water, 0.2 g TEQ to Land, 0.0 g TEQ to Product and 111.5 g TEQ to Residues. Largest share (approx. 71%) of total PCDD/PCDF releases in 2018 resulted from Disposal of waste to landfills and waste dumps in category 9 Disposal/Landfill, followed by Iron and steel production plants and foundries in category 2 Ferrous and Non-Ferrous Metal Production (13.5%) and Incineration of medical waste in category 1 Waste Incineration (7.3%).

In the first POPs Inventory Report of the Republic of Moldova from 2003, PCDD/PCDF calculated emissions in 2001 totaled 775.5 g TEQ, with approx. 97.4% of releases resulting from Open water dumping in Category 9 Disposal/Landfill. In the Inventory of dioxins, furans and other unintentional POPs drafted based on the 2013 Toolkit methodology, for the year 2001 additional source categories have been estimated, new activity data have been added to existing source categories, as well as several classes of emission factors have been revised for certain categories. Thus, additional estimation of emissions from source categories 1c Medical Waste Incineration, 6b Waste burning and accidental fires, 8d Dry Cleaning residues and 9a Landfills, Waste dumps and Landfill Mining was carried out. In addition, in category 2 Ferrous and Non-ferrous metal production, activity data on production of steel and rolling mills from Left Bank of Dniestr River has been added. Besides, activity data used in category 4 Mineral Products (all sub-categories), data for Diesel consumption in category 5 Transport and data on biomass burning has been revised based on the data available for year 2001 from the National GHG Inventory for 1990-2018. Finally, in category 9 Disposal/Landfill, the data on Treated water according to normative requirements has been reallocated from sub-category 9c Open Water Dumping to sub-category 9b Sewage and sewage treatment. In the sub-category 9c Open Water Dumping, only the data on Untreated and insufficiently treated wastewater discharged into Surface Water Basins has been taken into account.

Consequently, total PCDD/PCDF emissions for year 2001 were significantly revised, decreasing from 775.5 g TEQ to 97 g TEQ. Due to revised values for year 2001, releases to the Air increased from 13.5 g TEQ to 25.7 g TEQ, releases to Water significantly decreased from 755 g TEQ to 0.5 g TEQ, releases to Land decreased from 4.2 g TEQ to 0.1 g TEQ and releases to Residues increased from 2.8 g TEQ to 70.7 g TEQ. From 2001 to 2018, total PCDD/PCDF releases to environment increased by 40% (from 97 g TEQ to 136 g TEQ). Releases to the Air decreased by 10% (from 25.7 g TEQ to 23.1 g TEQ), releases to Water increased by 100% (from 0.5 g TEQ to 1.0 g TEQ), releases to Land increased by 200% (from 0.1 g TEQ to 0.2 g TEQ), releases to Residues increased by 58% (from 70.7 g TEQ to 111.5 g TEQ) (see Figure 1 and Table 1 below).

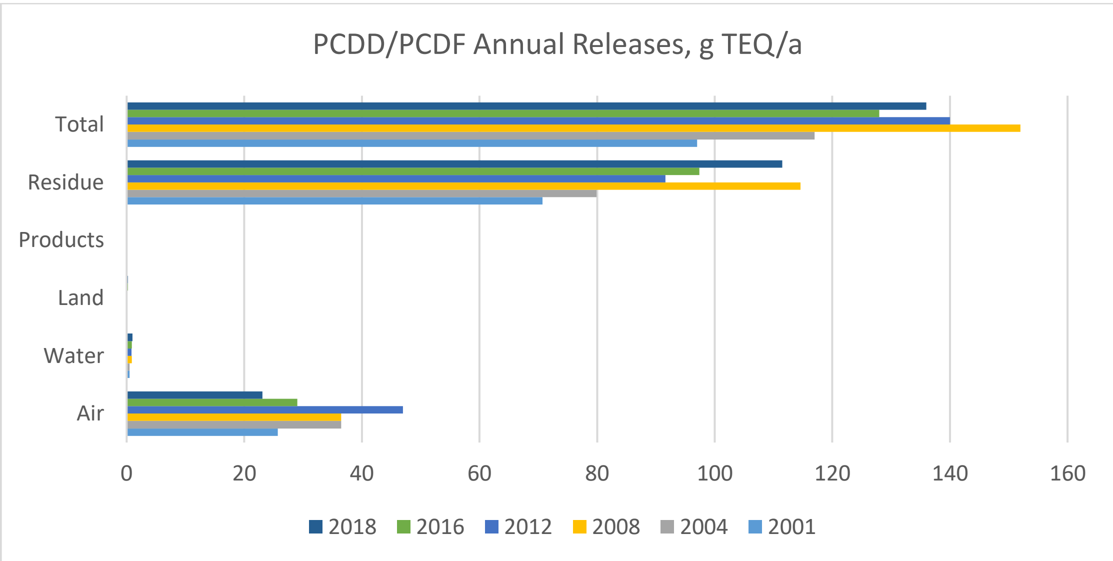

Figure 1. Summary of total PCDD/PCDF releases for year 2001 to 2018 in the Republic of Moldova

Table 1: Summary of total PCDD/PCDF releases for year 2001, 2004, 2008, 2012, 2016 and 2018 in the Republic of Moldova

Year	PCDD/PCDF Annual Releases, g TEQ/a					
	Air	Water	Land	Products	Residue	Total
2001	25.7	0.5	0.1	0.0	70.7	**97**
2004	36.5	0.5	0.1	0.0	79.9	**117**
2008	36.5	0.9	0.1	0.0	114.6	**152**
2012	47.0	0.8	0.1	0.0	91.6	**140**
2016	29.0	0.9	0.2	0.0	97.4	**128**
2018	23.1	1.0	0.2	0.0	111.5	**136**

PCDD/PCDF releases per category illustrated in Figure 2 and are presented in Table 2 below. Total PCDD/PCDF releases from sub-category 1c Medical waste incineration decreased by 35% from 2001 to 2018. PCDD/PCDF releases from source category 2 Ferrous and Non-Ferrous Metal Production decreased by 42% from 2001 to 2018. Emissions from category 3 Heat and Power Generation increased in 2018 by 3 times over the 2001 values, while emissions from category 8 Miscellaneous increased by 4 times. At the same time, total releases from category 9 Disposal/Landfill increased by over 2 times from 2001 to 2018.

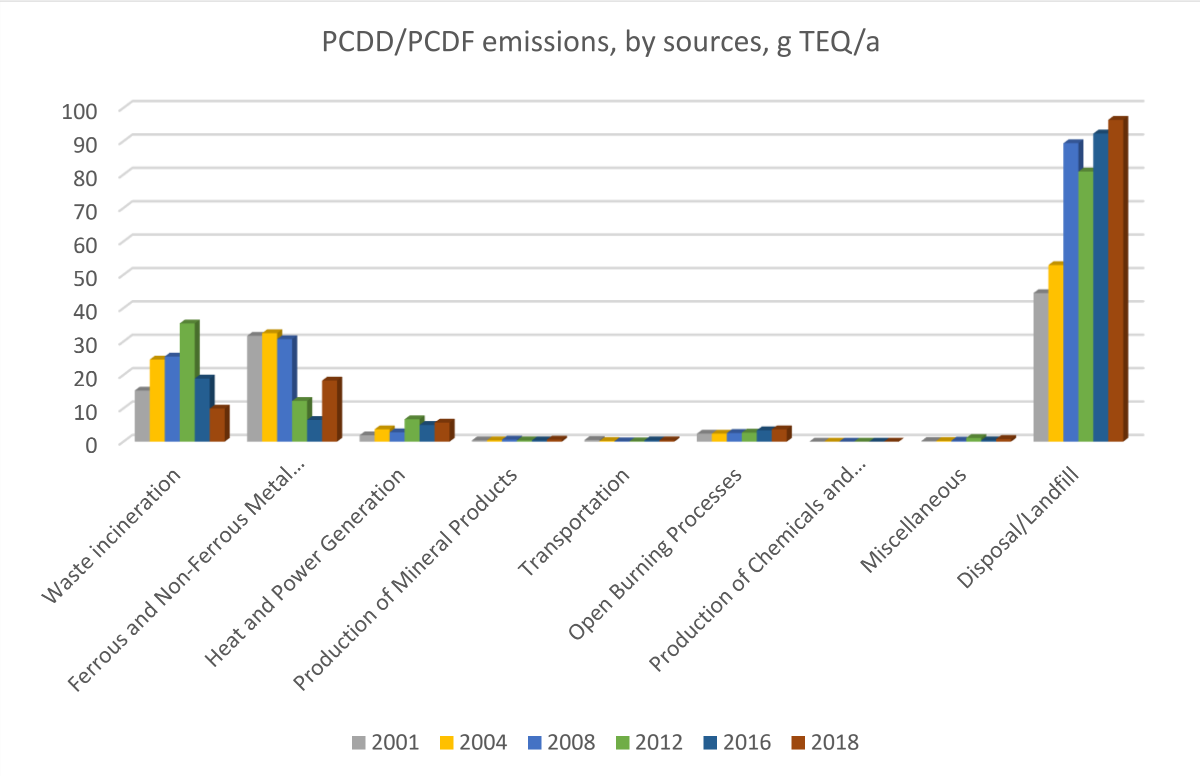

Figure 2. Total PCDD/PCDF releases, by sources, for year 2001 to 2018 in the Republic of Moldova

As it was mentioned above, in the 2013 Toolkit methodology new emission factors are available for HCB and PCBs in Category 2 Ferrous and Non-ferrous Metal Production and Category 6 Open Burning Processes. Therefore, emissions for these unintentional POPs were calculated for 2001 to 2018 and are presented in Table 3 below. From 2001 to 2018, HCB emissions decreased from 4395 g TEQ to 2510 g TEQ and PCTB emissions increased from 0.148 g TEQ to 0.260 g TEQ.

Table 2: Summary of PCDD/PCDF emissions, by sources, in the Republic of Moldova for year 2001, 2004, 2008, 2012, 2016 and 2018

No. cat.	Source categories	2001	2004	2008	2012	2016	2018
1	Waste incineration	15.3	24.6	25.5	35.4	18.9	9.9
2	Ferrous and Non-Ferrous Metal Production	31.7	32.5	30.7	12.2	6.5	18.3
3	Heat and Power Generation	1.9	3.7	2.8	6.7	5.0	5.7
4	Production of Mineral Products	0.4	0.4	0.6	0.4	0.4	0.6
5	Transportation	0.5	0.2	0.1	0.1	0.4	0.4
6	Open Burning Processes	2.4	2.4	2.6	2.7	3.4	3.7
7	Production of Chemicals and Consumer Goods	0.0	0.0	0.0	0.0	0.0	0.0
8	Miscellaneous	0.2	0.2	0.3	1.1	0.4	0.8
9	Disposal/Landfill	44.5	52.9	89.4	80.9	92.3	96.4
	TOTAL:	**97**	**117**	**152**	**140**	**128**	**136**

Table 3: Summary of HCB and PCB emissions, by sources, in the Republic of Moldova for year 2001, 2004, 2008, 2012, 2016 and 2018, kg

Other Unintentional POPs	Source categories	2001	2004	2008	2012	2016	2018
HCB	Ferrous and Non-Ferrous Metal Production	4.4	4.5	4.3	1.7	0.9	2.5
	TOTAL:	**4.4**	**4.5**	**4.3**	**1.7**	**0.9**	**2.5**
PCB	Ferrous and Non-Ferrous Metal Production	0	0	0	0	0	0
	Open Burning Processes	0	0	0	0	0	0
	TOTAL:	**0**	**0**	**0**	**0**	**0**	**0**

In spite it is the first comprexensive POPs inventory for the Republic of Moldova performed in very short period of time, according to the expert team opinion the results seem to be reasonable within its geographical and economic context. However, the contribution by sectors to the total amount released to the atmosphere has certain distinctive features which should be highlighted:

1. Due to poor waste managemnet infrastrutctre the open burning of MSW in the suburbs and rural areas is the most significant source for compounds emitted for this activity.
2. The estimated emissions are closely related to urban areas and their suburbs, mostly due to MSW burning, although the sources related to the use of BRF-containing products, directly affected with the degree of urbanization, are also relevant.
3. The estimated emissions of PCBs are directly associated to the estimated stock, which is much smaller than those at the begining of years 2000.

As further steps, the Ministry of Agriculture, Rural Development and Environment is expected to validate the emissions calculated in this inventory after its consultation with relevant stakeholders during the national workshops. The expert team also will suggest relevant abatement measures in the area of interest and will update the NIP accordingly.

Acknowledgments

The team of experts would like to acknowledge the Ministry of Agriculture, Regional Development and Environment, particularly the Stockholm Convetion National Focal Point, as well all involved country public institutions and private sectors for providing datasets. Special gratitide goes to the team of experts from the Climate Change Office that supports our work by providing activity data on diferent entities as well economic sector such energy, industry and waste.

Introduction

The Republic of Moldova, being a party to the Stockholm Convention on Persistent Organic Pollutants (POPs) from 2001, has made a commitment to reduce total anthropogenic emissions of the chemicals listed in Annex C, with a view to continuously minimize and, where feasible, eliminate the release of these unintentionally produced chemicals. To this end, the country is expected to identify, characterize and reduce unintended POP emissions listed in Annex C and develop strategies with concrete measures, timelines and goals to minimize or eliminate these releases.

Pursuant to Article 5 of the Convention, the following unintentional POPs are listed in Annex C:

- Polychlorinated dibenzo-p-dioxins (PCDD),
- Polychlorinated dibenzofurans (PCDF),
- Polychlorinated biphenyls (PCB),
- Hexachlorobenzene (HCB),
- Pentachlorobenzene (PeCBz),
- Hexachlorobutadiene (HCBD), and Polychlorinated naphthalenes (PCNs).

Among these, PCDD and PCDF (also collectively referred to as PCDD/PCDF) have never been used as commercial products, nor were intentionally manufactured for any reason other than laboratory purposes. PCB, HCB and PeCBz are also unintentionally formed, usually from the same sources that produce PCDD/PCDF. However, unlike PCDD/PCDF, they have also been manufactured and used for specific purposes, their intentional production and use being by far higher than the unintentional formation and release.

PCDD/PCDF releases are accompanied by releases of other unintentional POPs, which can be minimized or eliminated by the same measures that are used to address PCDD/PCDF releases. When a comprehensive inventory of PCDD/PCDF is elaborated, it allows to identify priority sources, set measures and develop action plans to minimize releases of all unintentional POPs. It is thus recommended, for practical reasons, that inventory activities be focused on PCDD/PCDF, as these substances are indicative of the presence of other unintentional POPs.

Taken as a whole, PCDD and PCDF are a group of 210 tricyclic, chlorine-containing aromatic chemicals; there are 75 congeners of PCDD and 135 congeners of PCDF possible. PCDD and PCDF typically occur as mixtures. The most toxic compounds have chlorines in the 2, 3, 7 and 8 positions (17 congeners). Mixtures of these congeners are often evaluated and reported as a single number called toxic equivalent (TEQ).

Inventory of Unintentional POPs in the Republic of Moldova such as PCDD and PCDF should allow national authorities to assess the extent to which unintentional POP emissions have been reduced at national level and to incorporate the necessary changes into the adopted national strategies. The Inventory of PCDD and PCDF emissions is performed using the methodology provided by the Toolkit for Identification and Quantification of Emissions of Dioxins, Furans and other Unintentional POPs, 2013 edition. This Toolkit version is updating and amending edition 2, which was published in 2005.

1 Source categories identified in the Republic of Moldova

The list of dioxin and furan emission sources in the Republic of Moldova is presented in Table 1-1.

Tabel 1-1 Sources of dioxin and furan emissions identified in the country; Present sources (Yes), absent (No), possible sources but not enough data to estimate emissions (NE – Not estimated)

No. cat.	**Source categories and subcategories**	**Present in the RM (Yes/No/NE)**
1	**Waste Incineration**	**Yes**
1.a	Municipal solid waste incineration	No
1.b	Hazardous waste incineration	No
1.c	Medical waste incineration	Yes
1.d	Light-fraction shredder waste incineration	No
1.e	Sewage sludge incineration	No
1.f	Waste wood and waste biomass incineration	NE
1.g	Destruction of animal carcasses	No
2	**Metal Production**	**Yes**
2.a	Iron ore sintering	No
2.b	Coke production	No
2.c	Iron and steel production and foundries	Yes
2.d	Copper production	No
2.e	Aluminium production	Yes
2.f	Lead production	No
2.g	Zinc production	No
2.h	Brass and bronze production	No
2.i	Magnesium production	No
2.j	Other non-ferrous metal production	No
2.k	Shredders	No
2.l	Thermal wire reclamation	No
3	**Heat and Power Generation**	**Yes**
3.a	Fossil fuel powr plants	Yes
3.b	Biomass power plants	Yes
3.c	Landfill Biogas combustion	Yes
3.d	Household heating and cooking (biomass)	Yes
3.e	Domestic heating (fossil fuels)	Yes
4	**Production of Mineral Products**	**Yes**
4.a	Cement production	Yes
4.b	Lime production	Yes
4.c	Brick production	Yes
4.d	Glass production	Yes
4.e	Ceramics production	Yes
4.f	Asphalt Mixing	Yes
4.g	Oil Shale Processing	No
5	**Transport**	**Yes**
5.a	4-Stroke engines	Yes
5.b	2-Stroke engines	Yes
5.c	Diesel engines	Yes
5.d	Heavy oil fired engines	No
6	**Open Burning Processes**	**Yes**

No. cat.	Source categories and subcategories	Present in the RM (Yes/No/NE)
6.a	Biomass burning	Yes
6.b	Waste burning and accidental fires	Yes
7	**Chemicals and Consumer Goods**	**Yes**
7.a	Pulp and paper production	No
7.b	Chlorinated inorganic chemicals	No
7.c	Chlorinated aliphatic chemicals	No
7.d	Chlorinated aromatic chemicals	No
7.e	Other chlorinated and non-chlorinated chemicals	No
7.f	Petroleum industry	Yes
7.g	Textile production	NE
7.h	Leather refining	NE
8	**Miscellaneous**	**Yes**
8.a	Drying of biomass	NE
8.b	Crematoria	No
8.c	Smoke houses	NE
8.d	Dry cleaning	Yes
8.e	Tobacco smoking	Yes
9	**Disposal**	**Yes**
9.a	Landfills, waste dumps and landfill mining	Yes
9.b	Sewage/ sewage treatment	Yes
9.c	Open water dumping	Yes
9.d	Composting	No
9.e	Waste oil treatment (non-thermal)	NE
10	**Hot Spots**	**Yes**
10.a	Sites used for the production of chlorine	No
10.b	Production sites of chlorinated organics	No
10.c	Application sites of PCDD/PCDF containing, pesticides and chemicals	Yes
10.d	Timber manufacture and treatment sites	NE
10.e	Textile and leather factories	NE
10.f	Use of PCB	Yes
10.g	Use of chlorine for production of metals and inorganic chemicals	NE
10.h	Waste incinerators	No
10.i	Metal industries	NE
10.j	Fire accidents	NE
10.k	Dredging of sediments and contaminated flood plains	No
10.l	Dumps of wastes/residues from source groups 1-9	NE
10.m	Kaolin or ball clay sites	No

Source Group 1: Waste Incineration

1.c Incineration of Medical Waste

Medical waste (MW) is considered to be every waste generated from medical activities regardless if these activities take place in a hospital or are performed by a medical doctor, dentist or any other healthcare facility or provider. In many cases, waste generated during these activities contains infectious materials, human secretions, blood, pharmaceuticals and packaging materials and/or tools used during or for the medical treatment of people or animals. To destroy viruses, bacteria, and pathogens this waste is often thermally treated (by incineration or pyrolysis). Further, due to its origin and its composition, medical waste can contain toxic chemicals, e.g., heavy metals or precursors, high concentrations of organic (polyvinyl chloride and certain pharmaceuticals) and inorganic (saline solution and body fluids) chlorine that may alter combustion characteristics, and absent proper technology may enhance PCDD/PCDF formation. It has also been shown that incineration of medical waste in small and poorly controlled incinerators is a major source of PCDD/PCDF. Typically, medical waste is incinerated locally at the hospital or any other medical facility in small furnaces in a batch-type mode[1].

Emission Factors

PCDD/PCDF emission factors for four classes of MW incinerators are listed in Table 1-5.

Table 1-1 PCDD/PCDF emission factors for source category 1c Medical Waste Incinerators

1c	**Medical Waste Incinerators**	**Emission Factors (µg TEQ/t MW incinerated)**	
Classification		**Air**	**Residue**
1	Uncontrolled batch type combustion, no APCS	40 000	200*
2	Controlled, batch type combustion, no or minimal APCS	3 000	20*
3	Controlled, batch type combustion, good APCS	525	920**
4	High technology, continuous, controlled combustion, sophisticated APCS	1	150**

* Refers only to bottom ash left in the combustion chamber.
** Refers to combined bottom and fly ashes.

For selection of the most appropriate emission factors, the range of MW incineration technologies is divided into four classes:
Class 1 includes very small and simple, small box type incinerators operated intermittently (in which waste loads are ignited and left) with no secondary combustion chamber, no temperature controls and no air pollution control equipment.
Class 2 applies to all medical waste incinerators with controlled combustion and an afterburner, but still operated in a batch type mode.
Class 3 includes controlled batch-type plants, with good APC systems in place, e.g., ESPs or preferably baghouse filters.
Class 4 includes highly sophisticated medical waste incineration plants that are capable of complying with an air emission 0.1 ng TEQ/Nm³ (at 11% O2). Whether these plants are continuous or batch type operations is not relevant when they are preheated with oil or natural gas to achieve a furnace operating temperature of usually well above 900°C or higher before medical waste is introduced into the furnace.

[1] Toolkit for Identification and Quantification of Releases of Dioxins, Furans and Other Unintentional POPs, CH. I Waste Incineration, p. 40

Activity Data

There are no authorized incinerators in the Republic of Moldova for the incineration of medical waste. Nevertheless, medical waste is burned in heating boilers at several hospitals in the country[2]. Also, it is common practice that medical institutions, across the country, to open burn infectious waste[3]. Also, a certain category of plastic clinical waste generated by several medical institutions in the country is treated through the pyrolysis method by the "TRISUMG" LTD. Medical institutions in the RM practice the burning of clinical waste by three methods: 1) open burning; 2) closed burning in heating boilers or metal barrels; and 3) transport for pyrolysis treatment.

Activity data for the estimation of PCDD/PCDF emissions from the open burning of the clinical waste were available in the National Mercury Emissions Inventory. The National Public Health Centre of the Ministry of Health of the Republic of Moldova had provided data for the period 2010-2014 on clinical waste treated by medical institutions across the country through the three methods mentioned above.

Data for the year 2001 to 2016 have been extrapolated from the data provided by the Ministry of Health for the period 2010-2014 and presented in the National GHG Inventory Report 1990-2017[4]. This data is offered in Table 1-2 below.

Table 1-2 Activity data on amount of MW incinerated in the RM, tons

	2001	**2004**	**2008**	**2012**	**2016**	**2018**
Total mass of incinerated MW	380.7	611.6	634.5	880.9	469.3	248.3

Source: Draft National GHG Inventory Report 1990-2018

Calculation of emissions

Due to the fact that no APCS are present in the boilers used for closed burning of medical waste, the emission factors selected for calculation of emissions through this method correspond to Class 1 Uncontrolled batch type combustion, no APCS. In this class, fall as well open burned medical waste.

Table 1-3 PCDD/PCDF Emissions for category 1c Incineration of Medical Waste

		Annual Release, g TEQ/a					
		Air	**Water**	**Land**	**Product**	**Fly ash**	**Bottom ash**
2001	**Medical Waste Incineration**	15.228	0	0	0	0.000	0.076
	Uncontrolled batch type combustion, no APCS	15.228				0.000	0.076
2004	**Medical Waste Incineration**	24.48	0	0	0	0.000	0.122
	Uncontrolled batch type combustion, no APCS	24.48				0.000	0.122
2008	**Medical Waste Incineration**	25.4	0	0	0	0.000	0.127
	Uncontrolled batch type combustion, no APCS	25.4				0.000	0.127
2012	**Medical Waste Incineration**	35.24	0	0	0	0.000	0.176
	Uncontrolled batch type combustion, no APCS	35.24				0.000	0.176
2016	**Medical Waste Incineration**	18.772	0	0	0	0.000	0.094

[2] Letter from the Ministry of Health no. 3214 as of 24.03.2020, in response to the letter of the Ministry of Agriculture, Regional Development and Environment no. 14-07/1386 from 16.03.2020.
[3] Letter from the Ministry of Health no. 06t-3/2521 as of 30.10.2015, in response to the letter of the Ministry of Environment no. 05-07 / 1425 as of 13.08.2015.
[4] Draft National Inventory Report: 1990 - 2018. Greenhouse Gas Sources and Sinks in the Republic of Moldova

	Uncontrolled batch type combustion, no APCS	18.772				0.000	0.094
2018	**Medical Waste Incineration**	9.932	0	0	0	0.000	0.050
	Uncontrolled batch type combustion, no APCS	9.932				0.000	

Level of Confidence

For class 1 and 2, where the processes are less controlled, emission factors are thus assigned a low confidence level. Level of confidence for activity data is estimated to be medium, since it is based on extrapolation of data available for other years.

Source Group 2: Ferrous and Non-Ferrous Metal Production

PCDD/PCDF are relevant to the production of metals. In particular, the production from secondary raw materials has been recognized as a source of PCDD/PCDF. In addition, processes that need chlorination such as the electrolytic production of magnesium from seawater and dolomite may generate PCDD/PCDF. PCDD/PCDF or their precursors may be present in some raw materials and enter the process, or are newly formed from short-chain hydrocarbons via *de novo* synthesis in furnaces or abatement systems. PCDD/PCDF are easily adsorbed onto solid matter and may be collected and subsequently removed by air pollution control systems[5].

The source categories relevant to the national context in the year 2018 are the following: 2c Iron and steel production and foundries, 2e Aluminum production and 2f Lead production.

2c. Iron and Steel Production, Foundries and Hot-Dip Galvanizing Plants

In this section, all processes used in the manufacture of iron and steel are covered. Four routes are currently used for the production of steel: the classic blast furnace/basic oxygen furnace route, direct melting of scrap (electric arc furnace), smelting reduction and direct reduction. For the purpose of the Toolkit, a categorization can be done according to the type of input material: blast furnaces (BF) are used only for the production of pig iron and are fed with iron ores from either sintering plants or pelletizing plants. Blast furnaces do not utilize scrap. Scrap is being used in electric arc furnaces (EAF), Basic Oxygen Furnaces (BOF) as well as in foundries where cupola furnaces (CF) and induction furnaces (IF) are found.

The hot-dip galvanizing process is included in this section since its objective is to protect steel from corrosion.

Emission Factors

PCDD/PCDF emission factors are listed in Table 2-2. Revised or newly added emission factors are highlighted in red. PCDD/PCDF emission factors for residues were revised for class 3 (iron and steel making). In particular, the previous definition of classes 2 and 3 (iron and steel making) only included clean scrap; this was revised to cover both clean and dirty scrap. Regarding hot-dip galvanizing plants, air emission factors were confirmed while residues emission factors were significantly modified. Emission factors for other unintentional POPs are listed in Table 2-3 and Table 2-4.

Table 2-2 PCDD/PCDF emission factors for source category 2c Iron and Steel Production Plants

2c	**Iron and Steel Production Plants**	**Emission Factors (µg TEQ/t LS)**				
Classification		**Air**	**Water**	**Land**	**Product**	**Residue**
Iron and Steel Making						
1	Dirty scrap (cutting oils, general contamination), scrap preheating, limited controls	10	ND	NA	NA	15
2	Clean scrap/virgin iron or dirty scrap, afterburner and fabric filter	3	ND	NA	NA	15
3	Clean scrap/virgin iron or dirty scrap, EAF equipped with APC designed for low PCDD/PCDF emission, BOF furnaces	0.1	ND	NA	NA	0.1
4	Blast furnaces with APCS	0.01	ND	NA	NA	ND

[5] Toolkit for Identification and Quantification of Releases of Dioxins, Furans and Other Unintentional POPs, CH.II.2 Ferrous and Non-Ferrous Metal Production

Iron Foundries						
1	Cold air cupola or hot air cupola or rotary drum with no gas cleaning	10	NA	NA	NA	ND
2	Rotary Drum - fabric filter or wet scrubber	4.3	NA/ND *	NA	NA	0.2
3	Cold air cupola – fabric filter or wet scrubber	1	NA/ND *	NA	NA	8
4	Hot air cupola or induction furnace and fabric filter or wet scrubber	0.03	NA/ND *	NA	NA	0.5
Hot-dip Galvanizing Plants - Emission Factors (µg TEQ/t of galvanized iron/steel)						
1	Facilities without APCS	0.06	NA	NA	NA	0.01
2	Facilities without degreasing step, good APCS (bagfilters)	0.05	NA	NA	NA	2
3	Facilities with degreasing step, good APCS (bagfilters)	0.02	NA	NA	NA	1

* ND where wet scrubbers are used

<u>Guidance for Classification of Sources in the iron and steel making category:</u>

Class 1 includes all iron and steel making processes (such as electric arc furnaces and open hearth furnaces), except basic oxygen furnaces and blast furnaces, using dirty scrap containing cutting oils or plastic materials and plants with scrap preheating and relatively poor controls; **Class 2** includes all iron and steel making processes (such as electric arc furnaces and open hearth furnaces), except basic oxygen furnaces and blast furnaces, using dirty scrap or clean scrap or virgin iron that are fitted with some after-burners and fabric filters for gas cleaning; **Class 3** includes electric arc furnaces using dirty scrap or clean scrap or virgin iron and efficient gas cleaning with secondary combustion and fabric filters (sometimes in combination with a rapid water quench), and basic oxygen furnaces; **Class 4** should be used for blast furnaces with air pollution control systems.

Table 2-3 PCB emission factors for source category 2c Iron and Steel Production and Foundries

2c	**Iron and Steel Production Plants**	**Emission Factors (µg TEQ/t LS)**				
Classification		**Air**	**Water**	**Land**	**Product**	**Residue**
Iron and Steel Making						
1	Dirty scrap (cutting oils, general contamination), scrap preheating, limited controls					
2	Clean scrap/virgin iron or dirty scrap, afterburner and fabric filter					
3	Clean scrap/virgin iron or dirty scrap, EAF equipped with APC designed for low PCDD/PCDF emission, BOF furnaces	0.001				
4	Blast furnaces with APCS	0.001				
Iron Foundries						
1	Cold air cupola or hot air cupola or rotary drum with no gas cleaning					
2	Rotary Drum - fabric filter or wet scrubber	0.05				
3	Cold air cupola – fabric filter or wet scrubber	0.05				0.1
4	Hot air cupola or induction furnace and fabric filter or wet scrubber	0.02				0.01

Table 2-4 HCB emission factors for source category 2c Iron and Steel Production and Foundries

2c	Iron and Steel Production Plants	Emission Factors (µg TEQ/t LS)				
Classification		**Air**	**Water**	**Land**	**Product**	**Residue**
Iron and Steel Making						
1	Dirty scrap (cutting oils, general contamination), scrap preheating, limited controls	2500				
2	Clean scrap/virgin iron or dirty scrap, afterburner and fabric filter	2500				
3	Clean scrap/virgin iron or dirty scrap, EAF equipped with APC designed for low PCDD/PCDF emission, BOF furnaces	2500 - EAF 2 - BOF				
4	Blast furnaces with APCS	1				

Activity data

The Metal Integrated Works in Ribnita in the ATULBD is a mini-metallurgical plant established in the early 80's of the twentieth century. At the time its activity was launched in 1985, the facility was provided with advanced equipment and efficient technologies, at the level of Western European plants. Part of the production, **scrap metal** collected mainly in the Republic of Moldova is used, but also from the neighboring countries, especially from Ukraine. From 2001 to 2018, steel production decreased from 967 to 503 thousand tons of **steel** and from 791 to 498 thousand tons of **rolling mills** (see Table 2-5).

On the right bank of Dniestr River, there are a number of enterprises, such as "Incomas" JSC, Plant "Fiting" JSC, Pipe Plant "Protos" JSC owned by company IM "Orvento Metall Trading Co" Ltd and others, that use low-capacity electric arc furnaces (less than 50 tones)[6].

Activity Data related to iron and steel production in the RM is available in the statistical publications of the RM and ATULBD and is provided in Table 2-5 below.

Table 2-5 Activity data on iron and steel production in the RM, tons

Year	Steel and rolling mills production	Right Bank of Dniester River	Left Bank of Dniester River	**RM Total**
2001	Steel Production	133	967 000	967 133
	Rolling Mills		791 000	791 000
	Cast Iron Production	NA		
	Total	133	1 758 000	**1 758 133**
2004	Steel Production	862	1 013 000	1 013 862
	Rolling Mills		791 000	791 000
	Cast Iron Production			
	Total	862	1 804 000	**1 804 862**
2008	Steel Production	1145	884 958	886 103
	Rolling Mills		818 035	818 035
	Cast Iron Production			
	Total	1145	1 702 993	**1 704 138**
2012	Steel Production	828	316 682	317 510
	Rolling Mills		360 402	360 402

[6] National Inventory Report: 1990 - 2016. Greenhouse Gas Sources and Sinks in the RM, p. 205

	Total	828	677 084	**677 912**
2016	Steel Production	2 098	127 549	129 647
	Rolling Mills		222 489	222 489
	Cast Iron Production	651		651
	Total		350 038	**352 136**
2018	Steel Production	2915	502 881	505 796
	Rolling Mills		497 899	497 899
	Cast Iron Production	790		790
	Total	2915	1 000 780	**1 003 695**

Source: Statistical Yearbooks of the RM for 2003 (p. 391), 2004 (p.441), 2010 (p.305); Statistical Reports PRODMOLD-A "Total production, as a natural expression, in the Republic of Moldova, by product type, for 2005-2018"; Statistical Yearbooks of the ATULBD for 2002 (p. 103), 2006 (p. 93), 2010 (p. 93), 2013 (p.99), 2017 (p. 101) and 2019 (p. 99).

PCDD/PCDF emission factors selected in the first National POPs Inventory from 2003 for Iron and steel plants and Foundries belong to Class 3 Clean scrap/virgin iron, BOF furnaces[7]. According to the Process chart available at https://www.aommz.com/sites/default/files/images/shema.jpg, Electric Arc Furnace (EAF) is present at JSCC "Moldova Steel Works" in Ribnitsa, ATULBD. Also, on the Right Bank of Dniestr River, several enterprises use low-capacity electric arc furnaces[8]. No information is available on the type of APCS in place at these plants, thus it is uncertain whether efficient gas cleaning with secondary combustion may be in place. Nevertheless, it is assumed that the EAFs are fitted with some after-burners and fabric filters for gas cleaning. For this reason, Class 2 emission factors for Iron and Steel Making are used for calculation of emissions from Steel Production and Rolling Mills from plants equipped with EAF.

The National POPs Inventory from 2003 included activity data for the year 2001 only for the RM, excluding the LBDR. The emissions for this category were revised according to the new available data for the year 2001 (see Table 2-5). Also, the emission factors selected for year 2016 and 2018 were applied in the revised calculation for year 2001.

Calculation of Emissions

The emissions for PCDD/PCDF results are presented in Table 2-6. Emissions for other unintentional POPs such as PCB and HCB were calculated in the same Excel Spreadsheet provided for PCDD/PCDF. Due to lack of EF for PCB corresponding to Class 2, PCB emissions were not calculated. HCB emissions are presented in Table 2-7.

Table 2-6 PCDD/PCDF emissions from category 2c Iron and steel production plants and foundries

		Annual Release, g TEQ/a				
		Air	**Water**	**Land**	**Product**	**Residue**
2001	**Iron and steel plants**	5.274	0	0	0	26.372
	2 Clean scrap/virgin iron or dirty scrap, afterburner and fabric filter	5.274				26.372
	Iron and steel production plants and foundries	**5.274**	**0**	**0**	**0**	**26.372**
2004	**Iron and steel plants**	5.415				27.073
	2 Clean scrap/virgin iron or dirty scrap, afterburner and fabric filter	5.415				27.073
	Iron and steel production plants and foundries	**5.415**	**0**	**0**	**0**	**27.073**
2008	**Iron and steel plants**	5.112	0	0	0	25.562

[7] Republic of Moldova's National POPs Inventory, Interim report, 1990-2001, Chisinau, 2003, p. 20-21
[8] National Inventory Report: 1990 - 2016. Greenhouse Gas Sources and Sinks in the RM, p. 206

	2 Clean scrap/virgin iron or dirty scrap, afterburner and fabric filter	5.112				25.562
	Iron and steel production plants and foundries	**5.112**	**0**	**0**	**0**	**25.562**
2012	**Iron and steel plants**	2.034	0	0	0	10.169
	2 Clean scrap/virgin iron or dirty scrap, afterburner and fabric filter	2.034				10.169
	Iron and steel production plants and foundries	**2.034**	**0**	**0**	**0**	**10.169**
2016	**Iron and steel plants**	1.056	0	0	0	5.282
	2 Clean scrap/virgin iron or dirty scrap, afterburner and fabric filter	1.056				5.282
	Iron and steel production plants and foundries	**1.056**	**0**	**0**	**0**	**5.282**
2018	**Iron and steel plants**	3.011	0	0	0	15.055
	2 Clean scrap/virgin iron or dirty scrap, afterburner and fabric filter	3.011				15.055
	Iron and steel production plants and foundries	**3.011**	**0**	**0**	**0**	**15.055**

Table 2-7 HCB Emissions from category 2c Iron and steel production plants and foundries

		Annual Release, kg				
		Air	**Water**	**Land**	**Product**	**Residue**
2001	**Iron and steel plants**	4,395	0	0	0	0
	2 Clean scrap/virgin iron or dirty scrap, afterburner and fabric filter	4,395				
	Iron and steel production plants and foundries	**4,395**				
2004	**Iron and steel plants**	4,512	0	0	0	0
	2 Clean scrap/virgin iron or dirty scrap, afterburner and fabric filter	4,512				
	Iron and steel production plants and foundries	**4,512**				
2008	**Iron and steel plants**	4,260	0	0	0	0
	2 Clean scrap/virgin iron or dirty scrap, afterburner and fabric filter	4,260				
	Iron and steel production plants and foundries	**4,260**				
2012	**Iron and steel plants**	1,694	0	0	0	0
	2 Clean scrap/virgin iron or dirty scrap, afterburner and fabric filter	1,694				
	Iron and steel production plants and foundries	**1,694**				
2016	**Iron and steel plants**	0,988	0	0	0	0
	2 Clean scrap/virgin iron or dirty scrap, afterburner and fabric filter	0,988				
	Iron and steel production plants and foundries	**0,988**				
2018	**Iron and steel plants**	2,509	0	0	0	0
	2 Clean scrap/virgin iron or dirty scrap, afterburner and fabric filter	2,509				
	Iron and steel production plants and foundries	**2,509**				

Level of confidence

For PCDD/PCDF emission factors

For iron and steel making, emission factors for PCDD/PCDF are provided: with a high level of confidence for air emissions (all classes) and with a medium level of confidence for residue releases related to class 3, as emission factors are not based on expert judgment but are not derived from a broad geographical coverage. For iron foundries, emission factors for PCDD/PCDF are provided: with a medium level of confidence for air emission and with a low level of confidence for class 3 residue releases, as emission factors are based on extrapolations and expert judgment.

For PCB/HCB emission factors

For iron and steel making, emission factors for PCB/HCB are provided: with a low level of confidence for HCB emissions related to class 3 and for PCB emissions (all classes), as emission factors are based on extrapolations and expert judgment. For iron foundries, emission factors for PCB are provided: with a medium level of confidence for class 3 air emissions and with a low level of confidence for class 3 residue releases, as emission factors are based on extrapolations and expert judgment.

Activity data is assigned a high level of confidence as it was collected from official statistical sources.

2.e Aluminum production

Aluminum (Al) can be produced from aluminum ore, most commonly bauxite (primary production), or from scrap (secondary production). Primary aluminum production is generally thought not to be a significant source of unintentionally produced POPs. However, PCDD/PCDF formation and release is possible through the graphite-based electrodes used in the electrolytic smelting process[9].

Emission factors

Table 2-10 PCDD/PCDF emission factors for source category 2e Aluminum Production

2e	Aluminum Production	Emission Factors (µg TEQ/t aluminum)				
Classification		Air	Water	Land	Product	Residue
1	Thermal processing of scrap Al, minimal treatment of inputs and simple dust removal	100	ND	NA	NA	200
2	Thermal Al processing, scrap pre-treatment, well-controlled, fabric filters with lime injection	3.5	ND	NA	NA	400
3	Optimized for PCDD/PCDF control – afterburners, lime injection, fabric filters and active carbon	0.5	NA	NA	NA	100
4	Shavings/turning drying (simple plants)	5	NA	NA	NA	NA
5	Thermal de-oiling of turnings, rotary furnaces, afterburners, and fabric filters	0.3	NA	NA	NA	NA
6	Pure primary Al production	ND	NA	NA	NA	ND

Class 1 Emission factors: *Processing scrap Al, minimal treatment of inputs, simple dust removal* have been used in the National POPs Inventory from 2003.

[9] Toolkit for Identification and Quantification of Releases of Dioxins, Furans and Other Unintentional POPs, CH.II.2 Ferrous and Non-Ferrous Metal Production

Table 2-11 PCB emission factors for source category 2e Aluminum Production

2e	Aluminum Production	Emission Factors (µg TEQ/t aluminum)				
Classification		Air	Water	Land	Product	Residue
1	Thermal processing of scrap Al, minimal treatment of inputs and simple dust removal	40				

Table 2-12 HCB emission factors for source category 2e Aluminum Production

2e	Aluminum Production	Emission Factors (µg TEQ/t aluminum)				
Classification		Air	Water	Land	Product	Residue
1	Thermal processing of scrap Al, minimal treatment of inputs and simple dust removal	500				

Activity Data

Activity data on Secondary Aluminum production is found for the year 2001 in the first National POPs Inventory (see Table 2-13 below). Activity data related to die casting of non-ferrous metals was identified in the statistical data found on the NBS website and the Statistical Report PRODMOLD for the year 2016 and 2018 (see Table 2-14). However, data on *Molded pieces from non-ferrous metals* for the year 2001 is treated as Confidential (C). Also, data on the share of aluminum from non-ferrous metals is not available.

Table 2-13 Aluminum die casting in the Republic of Moldova

	2001	2004	2008	2012	2016	2018
Molded pieces from non-ferrous metals (titanium, aluminum, magnesium) (TOTAL), tons	C	40.7	7.6	11.5	4.020	4.769
Prefabricated constructions from aluminum, tons	NA	NA	NA	NA	600.3	672.8
Constructions and construction parts from aluminum, excluding doors, windows and their frames, tons	NA	NA	NA	NA	1779.6	2015.7
Articles from aluminum, not classified elsewhere, tons	NA	NA	NA	NA	115.6	120.8
Doors, windows and their frames, sills from aluminum (Total)	C	1197 (tons)	31926 (pieces)	61126 (pieces)	21736 (pieces)	25280 (pieces)

Source: Statistical Report PRODMOLD for year 2016 and 2018; Statistical databank of the NBS, Production of main industrial products in 1997-2004 and 2005-2019

The activity data used in the calculation of emissions from this category includes only *Prefabricated constructions from aluminum* and *Articles from aluminum, not classified elsewhere.* Data referring to *Molded pieces from non-ferrous metals* was not included since it is not known the amount corresponding just to Aluminum. Production of other types of constructions from aluminum are assumed as not constituting a significant source of unintentionally produced POPs.

Table 2-14 Activity data on Secondary Aluminum production in the Republic of Moldova, tons

	2001	2004	2008	2012	2016	2018
Secondary Aluminum production	200.6	NA	NA	NA	715.9	793.6

Source: Republic of Moldova's National POPs Inventory, 1990-2001, Chisinau, 2003, Appendix 1, p. 38; Statistical Report PRODMOLD for year 2016 and 2018

Calculation of Emissions

As no information is currently identified regarding foundry processes for die casting of non-ferrous metal alloys, which include induction furnaces, reverberatory or crucible for instance, the Toolkit methodology suggests that emission factors of the "iron foundries" section may be used as default factors for such non-ferrous foundry processes[10]. Therefore, emission factors listed for foundries in Table 2-2 were applied to calculate emissions from this category.

Table 2-15 PCDD/PCDF emissions from category 2e Aluminum Production

		Annual Release, g TEQ/a				
		Air	**Water**	**Land**	**Product**	**Residue**
2001	**Aluminum Production**	0.020	0	0	0	0.040
	1 Thermal processing of scrap Al, minimal treatment of inputs and simple dust removal	0.020				0.040
2004	**Aluminum Production**	0	0	0	0	0
	1 Thermal processing of scrap Al, minimal treatment of inputs and simple dust removal	0				
2008	**Aluminum Production**	0	0	0	0	0
	1 Thermal processing of scrap Al, minimal treatment of inputs and simple dust removal	0				
2012	**Aluminum Production**	0	0	0	0	0
	1 Thermal processing of scrap Al, minimal treatment of inputs and simple dust removal	0				
2016	**Aluminum Production**	0.072	0	0	0	0.143
	1 Thermal processing of scrap Al, minimal treatment of inputs and simple dust removal	0.072				0.143
2018	**Aluminum Production**	0.079	0	0	0	0.159
	1 Thermal processing of scrap Al, minimal treatment of inputs and simple dust removal	0.079				0.159

Table 2-16 PCB Emissions from category 2e Aluminum Production

		Annual Release, kg				
		Air	**Water**	**Land**	**Product**	**Residue**
2001	**Aluminum Production**	0.000008	0	0	0	0
	1 Thermal processing of scrap Al, minimal treatment of inputs and simple dust removal	0.000008				0
2004	**Aluminum Production**		0	0	0	0
	1 Thermal processing of scrap Al, minimal treatment of inputs and simple dust removal	0				
2008	**Aluminum Production**	0	0	0	0	0

[10] Toolkit for Identification and Quantification of Releases of Dioxins, Furans and Other Unintentional POPs, CH.II.2 Ferrous and Non-Ferrous Metal Production

	1 Thermal processing of scrap Al, minimal treatment of inputs and simple dust removal	0				
2012	**Aluminum Production**	0	0	0	0	0
	1 Thermal processing of scrap Al, minimal treatment of inputs and simple dust removal	0				
2016	**Aluminum Production**	0.00002	0	0	0	0
	1 Thermal processing of scrap Al, minimal treatment of inputs and simple dust removal	0.00002				0
2018	**Aluminum Production**	0.00003	0	0	0	0
	1 Thermal processing of scrap Al, minimal treatment of inputs and simple dust removal	0.00003				0

Table 2-17 HCB Emissions from category 2e Aluminum Production

		Annual Release, kg				
		Air	**Water**	**Land**	**Product**	**Residue**
2001	**Aluminum Production**	0,0001	0	0	0	0
	1 Thermal processing of scrap Al, minimal treatment of inputs and simple dust removal	0,0001				0
2004	**Aluminum Production**	0	0	0	0	0
	1 Thermal processing of scrap Al, minimal treatment of inputs and simple dust removal	0				
2008	**Aluminum Production**	0	0	0	0	0
	1 Thermal processing of scrap Al, minimal treatment of inputs and simple dust removal	0				
2012	**Aluminum Production**	0	0	0	0	0
	1 Thermal processing of scrap Al, minimal treatment of inputs and simple dust removal	0				
2016	**Aluminum Production**	0,00035	0	0	0	0
	1 Thermal processing of scrap Al, minimal treatment of inputs and simple dust removal	0,00035				0
2018	**Aluminum Production**	0,0004	0	0	0	0
	1 Thermal processing of scrap Al, minimal treatment of inputs and simple dust removal	0,0004				0

Level of confidence

For aluminum production, emission factors for PCDD/PCDF are provided: with a medium level of confidence for class 1 (air and residue vectors), as emission factors are based on a low data range but are not derived from a broad geographical coverage. Emission factors for PCB/HCB are provided with: a low level of confidence for class 1 PCB/HCB, as emission factors are based on extrapolations and expert judgment.

A medium Level of confidence is assigned to the Activity data used for this category due to uncertainties related to total coverage of data on aluminum production for year 2016.

2.f Lead Production

Two main routes for primary lead production from sulfide ores are available – sintering/smelting and direct smelting. Emissions from direct smelting are low and not considered further. Considerable quantities of lead are recovered from scrap materials, in particular vehicle batteries. A variety of furnace designs are used, including rotary furnaces, reverberatory, crucible, shaft, blast and electric furnaces. Continuous direct smelting processes may be used.

PCDD/PCDF emissions may be linked to high organic matter and the presence of chlorine in scrap materials; in particular, a link between the use of PVC separators in vehicle batteries and PCDD/PCDF emissions has been made.

Emission Factors

PCDD/PCDF emission factors are listed in Table 2-18. Revised or newly added emission factors are highlighted in red. Emission factors for other unintentional POPs are listed in Table 2-19 and 2-20.

Table 2-18 PCDD/PCDF emission factors for category 2f Lead Production

2f	**Lead Production**	**Emission Factors (µg TEQ/t lead)**				
Classification		**Air**	**Water**	**Land**	**Product**	**Residue**
1	Lead production from scrap containing PVC	80	ND	NA	NA	ND
2	Lead production from PVC/Cl2 free scrap, some APCS	8	ND	NA	NA	50
3	Lead production from PVC/Cl2 free scrap in highly efficient furnaces, with APC including scrubbers	0.05	ND	NA	NA	ND
4	Pure primary lead production	0.4	NA	NA	NA	ND

Table 2-19 PCB emission factors for category 2f Lead Production

2f	**Lead Production**	**Emission Factors (µg TEQ/t lead)**				
Classification		**Air**	**Water**	**Land**	**Product**	**Residue**
1	Lead production from scrap containing PVC	2				

Table 2-20 HCB emission factors for category 2f Lead Production

2f	**Lead Production**	**Emission Factors (µg TEQ/t lead)**				
Classification		**Air**	**Water**	**Land**	**Product**	**Residue**
1	Lead production from scrap containing PVC	1000				

Activity Data

Activity data on Lead production is found for the year 2001 in the first National POPs Inventory (see Table 2-21 below). For the years 2004 - 2018, no data on Lead products has been identified in the Statistical Reports of the NBS.

Table 2-21 Activity data on Lead production in the Republic of Moldova, tons

	2001	2004	2008	2012	2016	2018
Lead production	16.7	NA	NA	NA	NA	NA

Source: Republic of Moldova's National POPs Inventory, 1990-2001, Chisinau, 2003, Appendix 1, p. 38

Calculated Emissions

PCDD/PCDF Emission factors used in the National POPs Inventory from 2003 for the year 2001 belong to Class 1 *Lead production from scrap, PVC battery separators*. Hence, the same Class of EF are used to calculate PCB and HCB emissions from this category.

Table 2-22 PCDD/PCDF emissions from category 2f Lead Production

		Annual Release, g TEQ/a				
		Air	**Water**	**Land**	**Product**	**Residue**
2001	**Lead Production**	0.001	0	0	0	0
	1 Lead production from scrap containing PVC	0.001				
2004	**Lead Production**	0	0	0	0	0
	1 Lead production from scrap containing PVC	0				
2008	**Lead Production**	0	0	0	0	0
	1 Lead production from scrap containing PVC	0				
2012	**Lead Production**	0	0	0	0	0
	1 Lead production from scrap containing PVC	0				
2016	**Lead Production**	0	0	0	0	0
	1 Lead production from scrap containing PVC	0				
2018	**Lead Production**	0	0	0	0	0
	1 Lead production from scrap containing PVC	0				

Table 2-23 PCB Emissions from category 2f Lead Production

		Annual Release, kg				
		Air	**Water**	**Land**	**Product**	**Residue**
2001	**Lead Production**	0.00000003	0	0	0	0
	1 Lead production from scrap containing PVC	0.00000003				
2004	**Lead Production**	0	0	0	0	0
	1 Lead production from scrap containing PVC	0				
2008	**Lead Production**	0	0	0	0	0
	1 Lead production from scrap containing PVC	0				
2012	**Lead Production**	0	0	0	0	0
	1 Lead production from scrap containing PVC	0				
2016	**Lead Production**	0	0	0	0	0
	1 Lead production from scrap containing PVC	0				
2018	**Lead Production**	0	0	0	0	0
	1 Lead production from scrap containing PVC	0				

Table 2-24 HCB Emissions from category 2f Lead Production

		Annual Release, kg				
		Air	Water	Land	Product	Residue
2001	**Lead Production**	0.000017	0	0	0	0
	1 Lead production from scrap containing PVC	0.000017				
2004	**Lead Production**	0	0	0	0	0
	1 Lead production from scrap containing PVC	0				
2008	**Lead Production**	0	0	0	0	0
	1 Lead production from scrap containing PVC	0				
2012	**Lead Production**	0	0	0	0	0
	1 Lead production from scrap containing PVC	0				
2016	**Lead Production**	0	0	0	0	0
	1 Lead production from scrap containing PVC	0				
2018	**Lead Production**	0	0	0	0	0
	1 Lead production from scrap containing PVC	0				

Level of Confidence

For lead production, emission factors for PCDD/PCDF are provided: with a high level of confidence for residue releases, as emission factors are derived from a broad geographical coverage and are based on a low data range and not on expert judgment; and with a medium level of confidence for class 1 air emissions, as emission factors are based on a low data range but are not derived from a broad geographical coverage. Emission factors for PCB/HCB are provided with: a medium level of confidence for class 2 (PCB) and classes 3 and 4 (HCB), as emission factors are not based on expert judgment but are not derived from a broad geographical coverage; and a low level of confidence for classes 1 (PCB) and (HCB), as emission factors are based on extrapolations and expert judgment.

Level of confidence of activity data for year 2001 is considered to be low due to uncertainty related to the source of data used in the Republic of Moldova's National POPs Inventory for 1990-2001.

Total PCDD/PCDF emissions from source group 2 Ferrous and Non-Ferrous Metal Production

		Annual Release, g TEQ/a				
		Air	Water	Land	Product	Residue
2001	Iron and steel production plants and foundries	5.274	0	0	0	26.372
	Aluminum production	0.020	0	0	0	0.040
	Lead production	0.001	0	0	0	0.000
	Ferrous and Non-Ferrous Metal Production	**5.296**	**0**	**0**	**0**	**26.412**
2004	Iron and steel production plants and foundries	5.415	0	0	0	27.073
	Aluminum production	0	0	0	0	0
	Lead production	0	0	0	0	0
	Ferrous and Non-Ferrous Metal Production	**5.415**	**0**	**0**	**0**	**27.073**
2008	Iron and steel production plants and foundries		0	0	0	

	Aluminum production	0	0	0	0	0
	Lead production	0	0	0	0	0
	Ferrous and Non-Ferrous Metal Production		**0**	**0**	**0**	
2012	Iron and steel production plants and foundries		0	0	0	
	Aluminum production	0	0	0	0	0
	Lead production	0	0	0	0	0
	Ferrous and Non-Ferrous Metal Production		**0**	**0**	**0**	
2016	Iron and steel production plants and foundries	1.056	0	0	0	5.282
	Aluminum production	0.072	0	0	0	0.143
	Lead production	0	0	0	0	0
	Ferrous and Non-Ferrous Metal Production		**0**	**0**	**0**	
2018	Iron and steel production plants and foundries		0	0	0	
	Aluminum production		0	0	0	
	Lead production		0	0	0	
	Ferrous and Non-Ferrous Metal Production		**0**	**0**	**0**	

Total PCB emissions from source group 2 Ferrous and Non-Ferrous Metal Production

		Annual Release, kg				
		Air	**Water**	**Land**	**Product**	**Residue**
2001	Iron and steel production plants and foundries	0	0	0	0	0
	Aluminum production	0.000008	0	0	0	0
	Lead production	0.00000003	0	0	0	0
	Ferrous and Non-Ferrous Metal Production	**0.000008**	**0**	**0**	**0**	**0**
2004	Iron and steel production plants and foundries	0	0	0	0	0
	Aluminum production	0	0	0	0	0
	Lead production	0	0	0	0	0
	Ferrous and Non-Ferrous Metal Production	**0**	**0**	**0**	**0**	**0**
2008	Iron and steel production plants and foundries	0	0	0	0	0
	Aluminum production	0	0	0	0	0
	Lead production	0	0	0	0	0
	Ferrous and Non-Ferrous Metal Production	**0**	**0**	**0**	**0**	**0**
2012	Iron and steel production plants and foundries	0	0	0	0	0
	Aluminum production	0	0	0	0	0
	Lead production	0	0	0	0	0
	Ferrous and Non-Ferrous Metal Production	**0**	**0**	**0**	**0**	**0**
2016	Iron and steel production plants and foundries	0	0	0	0	0

	Aluminum production	0.000029	0	0	0	0
	Lead production	0	0	0	0	0
	Ferrous and Non-Ferrous Metal Production	**0.000029**	**0**	**0**	**0**	**0**
2018	Iron and steel production plants and foundries	0	0	0	0	0
	Aluminum production	0.00003	0	0	0	
	Lead production		0	0	0	
	Ferrous and Non-Ferrous Metal Production	**0.00003**	**0**	**0**	**0**	

Total HCB emissions from source group 2 Ferrous and Non-Ferrous Metal Production

		Annual Release, kg				
		Air	**Water**	**Land**	**Product**	**Residue**
2001	Iron and steel production plants and foundries	4.3953	0	0	0	0
	Aluminum production	0.0001	0	0	0	0
	Lead production	0.000016	0	0	0	0
	Ferrous and Non-Ferrous Metal Production	**4.3954**	**0**	**0**	**0**	**0**
2004	Iron and steel production plants and foundries	4.512	0	0	0	0
	Aluminum production	0	0	0	0	0
	Lead production	0	0	0	0	0
	Ferrous and Non-Ferrous Metal Production	**4.512**	**0**	**0**	**0**	**0**
2008	Iron and steel production plants and foundries	4,260	0	0	0	0
	Aluminum production	0	0	0	0	0
	Lead production	0	0	0	0	0
	Ferrous and Non-Ferrous Metal Production	**4.260**	**0**	**0**	**0**	**0**
2012	Iron and steel production plants and foundries	1.694	0	0	0	0
	Aluminum production	0	0	0	0	0
	Lead production	0	0	0	0	0
	Ferrous and Non-Ferrous Metal Production	**1,694**	**0**	**0**	**0**	**0**
2016	Iron and steel production plants and foundries	0.8803	0	0	0	0
	Aluminum production	0.00039	0	0	0	0
	Lead production	0	0	0	0	0
	Ferrous and Non-Ferrous Metal Production	**0.8806**	**0**	**0**	**0**	**0**
2018	Iron and steel production plants and foundries	**2.509**	0	0	0	0
	Aluminum production	**0**	0	0	0	0
	Lead production	**0**	0	0	0	0
	Ferrous and Non-Ferrous Metal Production	**2.509**	**0**	**0**	**0**	**0**

Source Group 3: Power Generation and Heating

This source group includes power stations, industrial firing places (furnaces) and installations for providing space heating, which are fired with fossil fuels (including up to 1/3 co-combustion of waste), biogas including landfill gas, and biomass only. The main release vectors are air and residue. Land is considered as a release vector only in the case of domestic heating and cooking using either biomass (mostly wood) or fossil fuels. Releases to land can occur if residues are dumped on the ground.

As generation of heat or power is the aim of these plants, in the case of the combustion of biomass or fossil fuels, the amount of PCDD/PCDF cannot easily be equated to mass (in tons) or energy input (in Joule) of fuel burned. The preferred basis to report emissions of PCDD/PCDF would be the energy input of the fuel. As the heat or power output is the "product" of the processes in this group, the default emission factors derived from the available data are linked to the heating value of the fuel. Thus, instead of reporting default emission factors in µg TEQ/t of fuel, these factors are given in µg TEQ/TJ of heat input. The reason for this approach is the high variety of fuels used for power generation[11].

3.a Fossil Fuel Power Plants

Six classes are defined within this category according to the types of fuels used, namely coal, heavy fuel oil, shale fuel oil, peat, light fuel oil and natural gas, as well as any type of fossil fuel in a combination with the co-combustion of any kind of waste or sludge. For all classes, it is assumed that reasonably well-operated and maintained power steam generators are employed in order to maximize power output. In all cases, air and residue are the only release vectors under consideration.

Emission factors

PCDD/PCDF emission factors for six source classes are listed in Table 3-1. The emission factors apply to the operation of boilers in general and therefore include the combined heat and power production as well as the production of heat only. Revised or newly added emission factors are highlighted in red.

Table 3-1 PCDD/PCDF emission factors for source category 3a Fossil Fuel Power Plants

3a	**Fossil Fuel Power Plants**	**Emission Factors (µg TEQ/TJ fossil fuel burned)**				
Classification		**Air**	**Water**	**Land**	**Product**	**Residue**
1	Fossil fuel/ waste co-fired power boilers	35*	ND	NA	NA	ND
2	Coal fired power boilers	10**	ND	NA	NA	14
3	Peat fired power boilers	17.5	ND	NA	NA	ND
4	Heavy fuel fired power boilers	2.5	ND	NA	NA	ND
5	Shale oil fired power boilers	1.5	ND	NA	NA	***
6	Light fuel oil/natural gas fired power boilers	0.5	ND	NA	NA	ND

* including co-firing of biomass (range: 30-50 µg TEQ/ TJ).
** high range depending on fuel quality and combustion conditions (3-100 µg TEQ/TJ).
*** Releases with residues can be calculated on a mass basis

Class 1 For the co-firing of waste, the allocation to this class depends on the main purpose of the process (here: heat and power generation, not waste incineration). Co-firing usually occurs with solid fuels (coal, lignite) together with sewage sludge, biomass, organic waste from industry or other waste-derived fuels.

[11] Toolkit for Identification and Quantification of Releases of Dioxins, Furans and Other Unintentional POPs, CH. II.3 Power Generation

Class 2 The emission factors refer to the combustion of hard coal. In case of information lacking at the national level, this factor may be transferred to lignite fired boilers.
Class 4 The emission factor refers to heavy fuel oil combustion in boilers for heat and/or power production. Heavy fuel oil is a fraction from mineral oil refining with standardized properties. Residual oils or other residues from the refining process are not considered here.
Class 6 The emission factor refers to the combustion of natural gas or light fuel oil in boilers for heat and/or power production. This factor may be transferred to the combustion in gas turbines or in combined cycle power plants as well.

Activity data

Electricity Generation in the Republic of Moldova

In the Republic of Moldova electricity generation capacity include: Moldavian Thermal Power Plant (MTPP) in Dnestrovsk (on the left bank of the Dniester River) with an installed capacity of 2,520 MW, built between 1964-1982; CHP-2 Chisinau, with an installed capacity of 240 MW and 1,200 Gcal/h heat capacity, built between 1976-1980; CHP-1 Chisinau, with an installed capacity of 66 MW and 254 Gcal/h heat capacity, built between 1951-1961; CHP-North Balti, with an installed capacity of 24 MW and 200 Gcal/h heat capacity built in during 1956-1970; other power plants, including CHP owned by sugar plants with an installed capacity of 97.5 MW operating on natural gas and residual fuel oil, built during 1956-1981. In recent years, renewable energy sources of small power are being developed.

Activity data on fuel consumption for electricity generation for RBDR and LBDR for years 2001 – 2016 is presented based on summarized data from the National GHG Inventory for 1990-2016[12]. For the year 2018, data for RBDR is available from the Energy Balance of the RM for year 2019 and data for LBDR has been estimated based on information on natural gas provided by MoldovaGaz through Letter No. 03-4-676 of 03.03.2020, data from Press release of MTPP for year 2018 on moldgres.com and information on total amount of natural gas distributed through networks of ATULBD (see Table 3-2 and 3-3 below).

Table 3-2 Fuel consumption for Electricity generation in the RM (RBDR), by fuel type, TJ

	2001	2004	2008	2012	2016	2018
Coal	NO	NO	NO	NO	NO	NO
Petroleum Products	NO	NO	NO	10	8	8
Natural Gas	NO	NO	NO	7	1	0

Table 3-3 Fuel consumption for Electricity generation for LBDR, by fuel type, TJ

	2001	2004	2008	2012	2016	2018
Coal	NA	NA	2937	4070	191	11
Petroleum Products	NA	NA	306	558	82	35
Natural Gas	31282	28153	25790	42617	45238	38316

Combined Heat and Power Generation
On the RBDR there are 3 Combined Heat and Power (CHP) Plants: in Chisinau municipality the CHP-1 and the CHP-2, and in Balti municipality: the CHP-North. Also, there are some small power plants with cogeneration at sugar plants.

Data on fuel consumption for electricity and heat production in the RM is available from the Energy Balances of the RM (see Table 3-4).

[12] National Inventory Report: 1990 - 2016. Greenhouse Gas Sources and Sinks in the RM, p. 97

Table 3-4 Fuel consumption for Electricity and Heat production at CHPs in the RM, by fuel type, TJ

	2001	2004	2008	2012	2016	2018
Coal	NO	NO	NO	NO	5	NO
Petroleum Products	264	72	56	68	476	436
Natural Gas	10034	8351	8140	6699	12210	12692

Heat Plants

There are many heat plants (HPs) in the Republic of Moldova, mainly operating on natural gases and residual fuel oil, less on coal and biomass. The amount of fuel consumption is accounted in the Energy Balances of the Republic of Moldova. Activity data on fuel consumption for heat generation on the left bank of Dniester River have been provided to the authors of the National GHG Inventory 1990-2016 by JSC "Moldovagaz". These were considered as the difference between total fuel consumption in the energy sector of the LBDR and fuel consumption at the MTTP[13]. Data for year 2018 for RBDR the activity data is available from the Energy Balance of the RM for year 2019 and for LBDR the activity data has been estimated based on the mean values for years 2008 – 2016 offered in the National GHG Inventory 1990-2016 (see Table 3-5 and 3-6).

Table 3-5 Fuel consumption for Heat production in the RM (RBDR), by fuel type, TJ

	2001	2004	2008	2012	2016	2018
Coal	88	137	99	74	69	72
Petroleum Products	1437	732	397	495	44	32
Natural Gas	21178	17255	18398	16961	9889	3238

Table 3-6 Fuel consumption for Heat generation for LBDR, by fuel type, TJ

	2001	2004	2008	2012	2016	2018
Coal	NA	NA	NA	NA	NA	NA
Petroleum Products	NA	NA	NA	NA	NA	NA
Natural Gas	8356	5096	6362	6892	6620	6684

Table 3-7 Total Fuel consumption of Fossil Fuel Power Plants for RBDR and LBDR, by fuel type, TJ

	2001	2004	2008	2012	2016	2018
Coal	88	137	3036	4144	265	83
Petroleum Products	1701	804	759	1121	602	511
Natural Gas	70850	58855	58690	73176	73958	60930

Emission factors selected to calculate emissions for 3a Fossil Fuel Power Plants are corresponding to Class 2 and 6. Data on Coal is attributed to Class 2 Coal fired power boilers, while data pertaining to consumption of Petroleum Products and Natural Gas is attributed to Class 6 *Light fuel oil/ Natural gas fired power boilers* (see Table 3-4 below).

Table 3-8 Activity data for calculation of emissions from category 3a Fossil Fuel Power Plants, TJ

	2001	2004	2008	2012	2016	2018
2 Coal fired power boilers	88	137	3036	4144	265	83
6 Light fuel oil/ Natural gas fired power boilers	72551	59659	59449	74297	74560	61441

In the first National POPs Inventory, PCDD/PCDF emissions were calculated using another set of data for year 2001[14]. It also included data on Heavy fuel power boilers. However, heavy fuel oil as it is

[13] National Inventory Report: 1990 - 2016. Greenhouse Gas Sources and Sinks in the RM, p. 91-95
[14] RM's National POPs Inventory, Interim report, 1990-2001, Chisinau, 2003, Appendix 2, p. 38

defined in Class 4 is a fraction from mineral oil refining with standardized properties. At the same time, residual oils or other residues from the refining process are not considered in this class. But the Energy Balance of the Republic of Moldova provides data only for Residual oil (*Romanian - 'Pacura'*). Hence, the Residual Oil is assigned also to Class 6 *Light fuel oil/ Natural gas fired power boilers*.

Data from Table 3-3 for year 2001, cited from the National GHG Inventory for 1990-2016, are used to revise the emissions for this category for year 2001. The revised results are presented in Table 3-5.

Calculation of Emissions

Table 3-9 PCDD/PCDF Emissions for category 3a Fossil Fuel Power Plants

		Annual Release, g TEQ/a				
		Air	**Water**	**Land**	**Product**	**Residue**
2001	**Fossil Fuel Power Plants**	**0.037**	**0**	**0**	**0**	**0.001**
	2 Coal fired power boilers	0.001				0.001
	6 Light fuel oil/ Natural gas fired power boilers	0.036				
2004	**Fossil Fuel Power Plants**	**0.031**	**0**	**0**	**0**	**0.002**
	2 Coal fired power boilers	0.001				0.002
	6 Light fuel oil/ Natural gas fired power boilers	0.030				
2008	**Fossil Fuel Power Plants**	**0.060**	**0**	**0**	**0**	**0.043**
	2 Coal fired power boilers	0.030				0.043
	6 Light fuel oil/ Natural gas fired power boilers	0.030				
2012	**Fossil Fuel Power Plants**	**0.079**	**0**	**0**	**0**	**0.058**
	2 Coal fired power boilers	0.041				0.058
	6 Light fuel oil/ Natural gas fired power boilers	0.37				
2016	**Fossil Fuel Power Plants**	**0.040**	**0**	**0**	**0**	**0.004**
	2 Coal fired power boilers	0.003				0.004
	6 Light fuel oil/ Natural gas fired power boilers	0.037				
2018	**Fossil Fuel Power Plants**	**0.032**	**0**	**0**	**0**	**0.001**
	2 Coal fired power boilers	0.001				0.001
	6 Light fuel oil/ Natural gas fired power boilers	0.031				

Level of Confidence

The level of confidence of emission factors is high for natural gas (due to high range of data from many literature results, high variability of emissions observed) and decreases too low for solid fuels[15]. Level of confidence pertaining to activity data regarding fuel consumption is considered to be high.

3.b Biomass Power Plants

Biomass fuels may include wood including twigs, bark, saw dust, wood shavings, peat, and/or agricultural residue (e.g., straw). In most cases, biomass is burned directly and without any addition of fossil fuels in small, continuously operated steam boilers. In the Toolkit, four classes are defined within this category according to the type of biomass used. Herbaceous biomass often has higher

[15] Toolkit for Identification and Quantification of Releases of Dioxins, Furans and Other Unintentional POPs, CH. II.3 Power Generation

chlorine content compared to wood, leading to problems during combustion (e.g. slagging) but also to potentially higher formation of PCDD/PCDF. Therefore emission factors are distinguished from those for wood combustion.

Emission Factors

PCDD/PCDF emission factors for four source classes are listed in Table 3-10. Revised or newly added emission factors are highlighted in red.

Table 3-10 PCDD/PCDF emission factors for source category 3b Biomass Power Plants

3b	**Biomass Power Plants**	**Emission Factors (µg TEQ/TJ biomass burned)**				
Classification		**Air**	**Water**	**Land**	**Product**	**Residue***
1	Mixed biomass fired power boilers	500	ND	NA	NA	ND
2	Clean wood fired power boilers	50	ND	NA	NA	15
3	Straw fired boilers	50	ND	NA	NA	50
4	Boilers fired with bagasse, rice husk, etc.	50	ND	NA	NA	70

* Total of bottom ash and fly ash.

Class 1 includes boilers firing wood waste which is not contaminated by paints or coatings. Here, mixed biomass refers to the category characterizing low contamination. This type of wood waste is frequently used in CHP boilers.
Class 2 includes boilers firing log wood, wood chips or pellets as a high quality fuel allowing optimized combustion conditions.
Class 3 includes boilers firing straw for heat or power production. Straw-fired boilers need to be adapted to this fuel with regard to ash properties (slagging) and combustion conditions.

Activity data

Activity data on Biomass used as fuel in Power Plants in TJ units is presented in Table 3-7 from the National GHG Inventory: 1990-2016, Table 3-51, p. 95-96.

Table 3-11 Biomass consumption for heat production in the RM, TJ

	2001	**2004**	**2008**	**2012**	**2016**	**2018**
Briquettes and pellets from wood and other plant residues	NO	NO	NO	NO	85	139
Fuel wood	NO	3	1	1	15	4
Wood waste	147	16	1	3	2	26
Agricultural residues	NO	226	373	226	290	385

Source: NBS, Energy Balances of the RM

Activity data for *Briquettes and pellets from wood and other plant residues*, as well as *Fuel wood* are assigned to Class 2 Emission factors, whereas *Agricultural residues* are assumed to consist primarily of straw and for this reason are assigned to Class 3 Emission factors. Activity data on Wood waste is distributed to Class 1 Emission factors (see Table 3-8).

Table 3-12 Activity data for calculation of emissions from category 3b Biomass Power Plants, TJ

	2001	**2004**	**2008**	**2012**	**2016**	**2018**
1 Mixed biomass fired power boilers	147	16	1	3	2	26
2 Clean wood fired power boilers	NO	3	1	1	100	143
3 Straw fired boilers	NO	226	373	226	290	385

Calculation of Emissions

Table 3-13 PCDD/PCDF Emissions for category 3b Biomass Power Plants

		Annual Release, g TEQ/a				
		Air	Water	Land	Product	Residue
2001	**Biomass Power Plants**	**0.074**	**0**	**0**	**0**	**0.0**
	1 Mixed biomass fired power boilers	0.074				
	2 Clean wood fired power boilers	0.000				0.000
	3 Straw fired boilers	0.000				0.000
2004	**Biomass Power Plants**	**0.019**	**0**	**0**	**0**	**0.016**
	1 Mixed biomass fired power boilers	0.008				
	2 Clean wood fired power boilers	0.000				0.000
	3 Straw fired boilers	0.011				0.016
2008	**Biomass Power Plants**	**0.019**	**0**	**0**	**0**	**0.026**
	1 Mixed biomass fired power boilers	0.001				
	2 Clean wood fired power boilers	0.000				0.000
	3 Straw fired boilers	0.019				0.026
2012	**Biomass Power Plants**	**0.013**	**0**	**0**	**0**	**0.016**
	1 Mixed biomass fired power boilers	0.002				
	2 Clean wood fired power boilers	0.000				0.000
	3 Straw fired boilers	0.011				0.016
2016	**Biomass Power Plants**	**0.021**	**0**	**0**	**0**	**0.022**
	1 Mixed biomass fired power boilers	0.001				
	2 Clean wood fired power boilers	0.005				0.002
	3 Straw fired boilers	0.015				0.020
2018	**Biomass Power Plants**	**0.039**	**0**	**0**	**0**	**0.029**
	1 Mixed biomass fired power boilers	0.013				
	2 Clean wood fired power boilers	0.007				0.002
	3 Straw fired boilers	0.019				0.027

3.c Landfill Biogas Combustion

Landfill gas and biogas are both generated from anaerobic digestion of organic matter. The combustion of these gases for power generation takes place predominantly in either gas-fired boilers or gas motors/turbines. Both systems closely resemble to those firing natural gas. The combustion process is virtually residue-free[16].

Emission factors

One PCDD/PCDF emission factor for a single source class is listed in Table 3-10.

Table 3-14 PCDD/PCDF emission factors for source category 3c Landfill Biogas Combustion

3c	**Landfill Biogas Combustion**	**Emission Factors (µg TEQ/TJ gas burned)**				
Classification		**Air**	**Water**	**Land**	**Product**	**Residue**
1	Boilers, motors/turbines, flaring	8	ND	NA	NA	NA

Class 1 This class includes the combustion of biogas resulting from anaerobic digestion.

[16] Toolkit for Identification and Quantification of Releases of Dioxins, Furans and Other Unintentional POPs, CH. II.3 Power Generation

Activity Data

Statistical data on consumption of *Gas from organic waste* (Biogas) is available from the Energy Balance of the RM only starting the year 2013. Therefore, for the years 2001-2012, it is indicated as Not Occurring (NO).

Biodigesters of organic material are found at a few companies in Moldova: Südzucker sugar producing plant in Drochia city with a capacity of 3.6 MW/h; Garma Grup Ltd, in Firladeni village, Hincesti district, specialized in cereal and ethylic alcohol production, as well as animal raising; and "Rom-Cris" Ltd, in Tirnova village, Donduseni district, specialized in poultry raising.

Table 3-15 Biogas consumption in the RM, TJ

	2001	**2004**	**2008**	**2012**	**2016**	**2018**
Energy Generation	NO	NO	NO	NO	2	150
Energy and Heat Generation at CHP plants	NO	NO	NO	NO	359	163
Non-energetic consumption, from Waste	NO	NO	NO	NO	82	NO
Total	**NO**	**NO**	**NO**	**NO**	**443**	**313**

Source: NBS, Energy Balance for year 2017 and 2019

Calculation of Emissions

Table 3-16 PCDD/PCDF Emissions for category 3c Landfill Biogas Combustion

		Annual Release, g TEQ/a				
		Air	**Water**	**Land**	**Product**	**Residue**
2001	**Landfill Biogas Combustion**	**0.000**	**0**	**0**	**0**	**0.0**
	Boilers, motors/turbines, flaring	0.000				
2004	**Landfill Biogas Combustion**	**0.000**	**0**	**0**	**0**	**0.0**
	Boilers, motors/turbines, flaring	0.000				
2008	**Landfill Biogas Combustion**	**0.000**	**0**	**0**	**0**	**0.0**
	Boilers, motors/turbines, flaring	0.000				
2012	**Landfill Biogas Combustion**	**0.000**	**0**	**0**	**0**	**0.0**
	Boilers, motors/turbines, flaring	0.000				
2016	**Landfill Biogas Combustion**	**0.004**	**0**	**0**	**0**	**0.0**
	Boilers, motors/turbines, flaring	0.004				
2018	**Landfill Biogas Combustion**	**0.003**	**0**	**0**	**0**	**0.0**
	Boilers, motors/turbines, flaring	0.003				

Level of Confidence

The quality of the biogas (and potentially the variability of emissions) depends on the origin of the gas. Gas quality can be better controlled in dedicated installations e.g. for the digestion of agricultural residues. The assigned LoC is medium, due to limited number of datasets available.

3.d Household heating and cooking with biomass

Heating and cooking with biomass in residential households is a common practice in many countries. In most cases the fuel of preference is wood, however, other biomass fuels may be used such as straw, peat, etc. Six individual classes are defined within this category, with the main difference being the quality of the fuel and the appliances used.

PCDD/PCDF are formed as a result of incomplete combustion, typical in these small devices with no or limited combustion controls. Releases to water and product are negligible. Releases to land can occur only if the combustion process takes place directly on the ground or when residues are disposed of to the land. Thus, the only significant release routes are to air, land, and residue[17].

Emission factors

PCDD/PCDF emission factors for six source classes are listed in Table 3-17. Revised or newly added emission factors are highlighted in red.

Table 3-17 PCDD/PCDF emission factors for source category 3d Household Heating and Cooking with Biomass

3d	**Household Heating and Cooking with Biomass**	**Emission Factors (µg TEQ/TJ biomass burned)**				**Concentration (ng TEQ/kg ash)**
Classification		**Air**	**Water**	**Land**	**Product**	**Residue**
1	Contaminated biomass fired stoves	1500	ND	ND	NA	1000
2	Virgin biomass fired stoves (advanced technology)	100	ND	ND	NA	10
3	Straw fired stoves	450	ND	ND	NA	30
4	Charcoal fired stoves	100*	ND	ND	NA	0.1
5	Open-fire 3-stone stoves (virgin wood)	20**	ND	ND	NA	0.1
6	Simple stoves (virgin wood)	100	ND	ND	NA	0.1

* Preliminary expert estimate; Emissions from barbecuing are not included.
** Expert estimate derived from a field test in Mexico.

Class 1 includes all types of stoves firing contaminated biomass such as wood waste, painted wood, etc. The actual emissions will depend on the degree of contamination and the combustion conditions. **Class 2** includes ovens and stoves with controlled air supply and optimized combustion conditions firing virgin wood. This class applies usually to residential heating with biomass in modern appliances. Lower emissions are expected from automatic furnaces using wood chips or pellets. **Class 3** applies to all types of residential combustion using herbaceous biomass as a fuel such as straw. In case of mixed fuels (wood and straw) the class with the higher emission factor shall apply. **Class 4** applies to all types of residential combustion using charcoal as a fuel. **Class 5** applies to residential combustion of wood without control of combustion conditions and without ducts for the evacuation of flue gases. Traditional 3-stone stoves are a typical example. **Class 6** applies to simple stoves for heating or cooking with limited combustion control and with a duct for the evacuation of flue gases.

Activity Data

Heating systems used by dwellings in the Republic of Moldova

The dwellings in the Republic of Moldova are heated primarily with individual stove, their rate reaching a rate of 56,1% of total dwellings. Individual stoves are found in 83% of dwellings in Rural area and in 17.5% in Urban area. Collective type of heating system serves 22,4% of all dwellings. The dwellings with individual systems of all types constituted 20,4%. Autonomous systems (wood, coal) are used by 12.5% in Rural areas and 5.7% in Urban areas[18].

[17] Toolkit for Identification and Quantification of Releases of Dioxins, Furans and Other Unintentional POPs, CH. II.3 Power Generation
[18] Energy consumption in households, NBS, p. 15 https://statistica.gov.md/public/files/publicatii_electronice/Consum_energie_gospoda/Consum_energie.pdf

Note: Autonomous system (gas, electricity) – the apartment / house is considered equipped with heating from its own network (individual) when the heating source is connected to central gas pipe network or electricity. Autonomous system (wood, coal) – the apartment/ house is considered equipped with heating from its own network (individual) when the heating source is based on firewood, agricultural or wood waste, or coal. Individual stove – the dwellings equipped with stoves that provides heat by using solid or liquid fuels, or if they are connected to the central pipe-network of natural gas[19].

Cooking with Biomass

A rate of 7,6% of dwellings still prepare food on wood cooking stove or other agricultural waste. In Urban area this rate constitutes 0.8%, whereas in Rural area - 12,4%. Around 8,7% of dwellings use wood oven cooking: 1,5% - urban area; 13,7% - rural area[20].

Biomass consumption in households

During the period of April 01, 2015 – April 01, 2016, the household consumption of energy resources, including biomass, was registered part of a national survey conducted by the National Bureau of Statistics[21]. Collected data on biomass consumption is presented in Table 3-18 below.

Table 3-18 Biomass consumption by households in the RM, 1 April 2015 – 1 April 2016

Type of biomass	**Total household consumption**
Briquettes and pellets, tons	18966.4
Firewood, thousand m3	2405.7
Wood waste, thousand m3	747.4
Charcoal, tons	28.4
Animal waste, thousand m3	79.8
Agricultural waste, thousand m3	697.6

Source: NBS, 'Energy Consumption in Household' publication, p. 19, 43

The availability of renewable energy sources in our country make it possible to households to collect and produce of own biomass. According to the results of the NBS survey on domestic energy consumption, during the surveyed period the households collected: 1333.3 thousand m3 of agricultural waste, of which 1134.7 thousand m3 for energy purposes; 682.5 thousand m3 of wood waste, of which 652.9 thousand m3 for energy purposes; 131.1 thousand m3 of firewood and 145.5 thousand m3 – animal waste, of which 127.1 thousand m3 for energy purposes[22]. In the reference period, the survey shows, also, that households purchased: briquettes and pellets – 20.8 thousand tons, firewood – 2697.3 thousand m3 and wood waste – 338 thousand m3. This data suggests that the amount of biomass used for source category Household heating and cooking are in fact higher than the one available from official statistics (see Table 3-16 below).

Statistical data on Solid Biofuel consumption in TJ by households in the Republic of Moldova is available from the Energy Balance of the RM for the years 2001 - 2018. This data is presented below in Table 3-19.

Table 3-19 Consumption of biomass for Household heating and cooking in the RM, TJ

	2001	**2004**	**2008**	**2012**	**2016**	**2018**
Briquettes and pellets	NA	NA	NA	NA	62	142
Firewood	1555	1673	1942	8430	13131	27599

[19] Energy consumption in households, NBS, p. 51
[20] Energy consumption in households, NBS, p. 16
[21] Energy consumption in households, NBS, p. 19, 43
[22] Energy consumption in households, NBS, p. 41

Wood waste	587 (including agricultural waste)	320	312	273	89	2051
Charcoal				13	4	5
Agricultural waste		130	212	96	53	1030
Total Solid Biofuels	**2142**	**2123**	**2466**	**8812**	**13339**	**30827**

Source: NBS, Energy Balance of the RM for year 2009 and 2012; Energy Balance of the RM for year 2016, Excel Table as of 24.10.2017; Energy Balance of the RM for year 2019

It should be noted that the Energy Balance for year 2017 in pdf format available from NBS website provides a different value for *Biofuels and waste* for the year 2016 (27597 TJ) than the one provided in the Energy Balance of the RM for year 2016, Excel Table as of 24.10.2017 (13339 TJ). The explanation for this difference is offered in the Preface of the EB for year 2017, where it is mentioned that data on *Biofuels and waste* consumption in the Residential sector have been revised for years 2010-2016. The recalculation of data was performed with the support of experts from the Energetic community based on the data obtained within the „Study on energy consumption in individual households" carried out by the NBS for the reference year 2015. For the period before 2010 no revision was carried out by the NBS, for this reason extrapolation of data for the years 2001, 2004, 2008 by the author of the report is done based on revised data for years 2010-2016. For the year 2018, the data from Energy Balance for year 2019, is available already in revised format. Thus, the total amount of Biofuels used as activity data from category 3d Household heating and Cooking with Biomass is provided in Table 3-20.

Table 3-20 Total Consumption of Solid Biofuels based on revised data, TJ

	2001	**2004**	**2008**	**2012**	**2016**	**2018**
Total Solid Biofuels	5284	5237	6083	23444	27597	30827

Source: NBS, Energy Balance of the RM for year 2017 (revised data for 2012 and 2016); Energy Balance of the RM for year 2019

It should be noted, however, that distribution to different types of biofuels as presented in Table 3-20 is not available for the revised value for total *Biofuels and waste* consumption in the Residential sector. For this reason, allocation of activity data into various classed of emission factors is not so straightforward. The following assumptions are made for this purpose: 56% of total consumption of *Biofuels and waste* used in Individual households (rate of individual stoves in the country estimated at around 56% of total dwellings Energy consumption in households) are assigned to Class 6 Simple stoves (virgin wood) and the remaining 44% to Class 2 Virgin wood/biomass fired stoves (see Table 3-17). Distribution of data to classes 3 and 4 is not possible based on current availability of data.

For the year 2001, activity data for source category 3d is available from Republic of Moldova's National POPs Inventory, Interim report for period 1990-2001, Appendix 2, p. 39. However, part of this report revised data for 2001 from Table 3-20 is used.

Table 3-21 Activity data for source category 3d Household heating and Cooking with Biomass, TJ

	2001	**2004**	**2008**	**2012**	**2016**	**2018**
2 Virgin wood/biomass fired stoves	2325	2304	2677	10315	12143	17263
6 Simple stoves (virgin wood)	2959	2933	3406	13129	15454	13564

Calculation of Emissions

Table 3-22 PCDD/PCDF Emissions for category 3d Household Heating and Cooking with Biomass

		Annual Release, g TEQ/a				
		Air	**Water**	**Land**	**Product**	**Residue**
2001	**Household heating and cooking - Biomass**	**0.528**	**0**	**0**	**0**	**0.0**

	2 Virgin wood/biomass fired stoves	0.233				
	6 Simple stoves (virgin wood)	0.296				
2004	**Household heating and cooking - Biomass**	0.524				
	2 Virgin wood/biomass fired stoves	0.230				
	6 Simple stoves (virgin wood)	0.293				
2008	**Household heating and cooking - Biomass**	0.608				
	2 Virgin wood/biomass fired stoves	0.268				
	6 Simple stoves (virgin wood)	0.341				
2012	**Household heating and cooking - Biomass**	**2.344**	**0**	**0**	**0**	**0.0**
	2 Virgin wood/biomass fired stoves	1.032				
	6 Simple stoves (virgin wood)	1.313				
2016	**Household heating and cooking - Biomass**	**2.760**	**0**	**0**	**0**	**0.0**
	2 Virgin wood/biomass fired stoves	1.214				
	6 Simple stoves (virgin wood)	1.545				
2018	**Household heating and cooking - Biomass**	**3.083**	**0**	**0**	**0**	**0.0**
	2 Virgin wood/biomass fired stoves	1.726				
	6 Simple stoves (virgin wood)	1.356				

Level of Confidence

There are multiple sources of uncertainty associated with the emissions from the residential sector. Activity rates are uncertain due to incomplete coverage of statistical data (see above). PCDD/PCDF emissions are strongly dependent on fuel quality and combustion conditions. Both parameters are largely varying and are often unknown at the national level. Therefore, the level of confidence is estimated low for all classes of emission factors (due to limited data availability but wide range of values) except class 2 with clean fuel and controlled combustion conditions (confidence: medium). For the latter, emission factors are derived based on many studies available, including a wide range of values[23].

3.e Household heating and cooking with fossil fuels

Fossil fuel is used extensively for domestic heating, especially in developed countries and in countries with economies in transition. Coal, (light fuel) oil and (natural) gas are the main sources of fossil fuel used for domestic heating. Fossil fuel is burned in devices ranging from small stoker fired furnaces to large elaborate highly sophisticated boiler/burner systems for central heat generation in large multi unit residential buildings[24].

Emission factors

PCDD/PCDF emission factors for six source classes are listed in Table 3-23. Revised or newly added emission factors are highlighted in red.

Table 3-23 PCDD/PCDF emission factors for category 3e Household Heating and Cooking with Fossil Fuels

[23] Toolkit for Identification and Quantification of Releases of Dioxins, Furans and Other Unintentional POPs, CH. II.3 Power Generation
[24] Toolkit for Identification and Quantification of Releases of Dioxins, Furans and Other Unintentional POPs, CH. II.3 Power Generation

3e	Household Heating and Cooking with Fossil Fuels	Emission Factors (µg TEQ/TJ biomass burned)				Concentration (ng TEQ/kg ash)
Classification		**Air**	**Water**	**Land**	**Product**	**Residue**
1	High chlorine coal/ waste/biomass co-fired stoves	1700	ND	NA	NA	5000
2	Coal/waste/biomass co-fired stoves	200	ND	NA	NA	NA
3	Coal fired stoves	100	ND	NA	NA	5
4	Peat fired stoves	100	ND	NA	NA	NA
5	Oil fired stoves	10	ND	NA	NA	NA
6	Natural gas fired stoves	1.5	ND	NA	NA	NA

Class 1 applies to domestic stoves firing coal with high chlorine content (chlorine salt content above 0.5% mass). High chlorine salt contents are a specific property of certain domestic coals. Information on properties of coals marketed in a country for domestic use needs to be taken into account. **Class 2** applies to domestic stoves using mixed solid fuels. In most cases this category applies to the simultaneous or alternating firing of coal and biomass. Nevertheless, co-firing of waste in residential appliances is an illegal practice in many countries. **Class 3** applies to domestic stoves, ovens and boilers firing coal or coal briquettes with low chlorine content.

Class 4 applies to domestic stoves, ovens and boilers firing peat. The use of peat as a fuel in the residential sector is closely linked to its local availability. **Class 5** applies to domestic stoves, ovens and boilers firing light fuel oil. The use of heavy oil fractions in the residential sector is often banned. **Class 6** applies to domestic stoves, ovens and boilers firing natural gas. The same factor can be applied to light petroleum gas and similar fractions.

Activity data

The household consumption of fossil fuel resources, registered part of the national survey conducted by the National Bureau of Statistics[25] between the period of April 01, 2015 to April 01, 2016, is presented in Table 3-24 below.

Table 3-24 Fossil fuel consumption by households in the RM, 1 April 2015 – 1 April 2016

Type of fossil fuel	**Total household consumption**
Coal, thousand tons	58.8
Natural gas, thousand m3	279216.1
Liquefied Petroleum Gas (LPG), L	63245.5
Diesel, L	545.5

Source: NBS, 'Energy Consumption in Household' publication, p. 43

Statistical data on Fossil fuel consumption by households in the Republic of Moldova is available in TJ from the Energy Balance for the years 2001-2018[26]. This data is presented below in Table 3-25.

Table 3-25 Consumption of fossil fuel for Household heating and cooking in the RM, TJ

	2001	**2004**	**2008**	**2012**	**2016**	**2018**
Total Coal	734	1806	1169	2463	1282	1474

[25] Energy consumption in households, NBS, p. 19, 43

[26] Energy Balance of the RM for year 2009 for years 2001-2008 and Energy Balance for year 2017 for years 2012, 2016, 2018: https://statistica.gov.md/pageview.php?l=ro&idc=263&id=2197

Natural Gas	7775	10693	11240	10498	9899	12004
Liquefied Petroleum Gas	1232	2098	1982	2592	2912	2610
Total Fossil fuels	**9741**	**14597**	**14391**	**15553**	**14093**	**16088**

Source: NBS, Energy Balance of the RM for years 2009, 2017 and 2019

Data on Solid Biofuels presented in Table 3-21 is used in the calculation of emissions. In the 2013 version of the Toolkit, LPG is found under Class 6 together with Natural Gas. Hence, data on Liquefied Petroleum Gas and Natural Gas is distributed to Class 6 Natural Gas fired stoves. Information regarding the practice of coal burning by households is not available, that is why the assumption is made that majority of individual households uses mixed solid fuels and just in a small percentage of domestic stoves and boilers only coal is fired. Coal imported in the RM in the years 2001 – 2012 was mainly originating from the Ukraine (Donbass region), which has been shown to be with high in chlorine content[27], reaching values of 1100 ppm[28]. In 2016 and 2018, coal was imported predominantly from Russia, followed by Ukraine[29]. Coals with high Cl contents are known in Russia, thus average Cl content varies between 275 ppm in Vorkuta and 1500 ppm in Upper Rogov coalfields[30]. Exact origin of Russian coal is not known, for this reason the assumption is made that it is with high Cl content. Based on this information, data for year 2001 to 2018 is distributed to Class 1 High chlorine coal/ waste/biomass co-fired stoves (see Table 3-26).

For the year 2001, activity data for source category 3e is available from Republic of Moldova's National POPs Inventory, Interim report for period 1990-2001, Appendix 2, p. 40. At the same time the Energy Balance of the RM for year 2009 provides higher values for the use of coal and other fossil fuels (see Table 3-21 above). For this reason, data available from the Energy Balance is used part of this report.

Table 3-26 Activity data for source category 3e Household heating and Cooking with Fossil Fuels, TJ

	2001	2004	2008	2012	2016	2018
1 High chlorine coal/waste/biomass co-fired stoves	734	1806	1169	2463	1282	1474
6 Natural gas or LPG fired stoves	9007	12791	13222	13090	12811	14614

Calculation of Emissions

Table 3-27 PCDD/PCDF Emissions for category 3e Household Heating and Cooking with Fossil Fuels

		Annual Release, g TEQ/a				
		Air	Water	Land	Product	Residue
2001	**Household Heating and Cooking with Fossil Fuels**	**1.261**	**0**	**0**	**0**	**0.0**
	1 High chlorine coal/waste/biomass co-fired stoves	1.248				
	6 Natural gas or LPG fired stoves	0.014				
2004	**Household Heating and Cooking with Fossil Fuels**	**3.089**	**0**	**0**	**0**	**0.0**

27 Ivanova, A.V., Krivega, T.A., 1985. Saline Coals of Western Donbas. Naukova dumka [Scientific Thought Publ. House], Kiev. 124 pp. Cited in Yakov. E. Y., Ketris, M.P., 2006. Chlorine in Coal: A review, International Journal of Coal Geology 67(1):127-144.
28 Gulyaeva, L.A., Itkina, E.S., 1962. Halogens, vanadium, nickel and copper in coals. Geokhimiya [Geochemistry] 4, 345–355. Cited in Yakov. E. Y., Ketris, M.P., 2006. Chlorine in Coal: A review, International Journal of Coal Geology 67(1):127-144.
29 According to data on imports available from comtrade.un.org/data.
30 Chlorine in Coal: A review, International Journal of Coal Geology 67(1):127-144. URL: https://www.researchgate.net/publication/248517293_Chlorine_in_coal_A_review

	1 High chlorine coal/waste/biomass co-fired stoves	3.070				
	6 Natural gas or LPG fired stoves	0.019				
2008	**Household Heating and Cooking with Fossil Fuels**	**2.007**	**0**	**0**	**0**	**0.0**
	1 High chlorine coal/waste/biomass co-fired stoves	1.987				
	6 Natural gas or LPG fired stoves	0.020				
2012	**Household Heating and Cooking with Fossil Fuels**	**4.207**	**0**	**0**	**0**	**0.0**
	1 High chlorine coal/waste/biomass co-fired stoves	4.187				
	6 Natural gas or LPG fired stoves	0.020				
2016	**Household Heating and Cooking with Fossil Fuels**	**2.199**	**0**	**0**	**0**	**0.0**
	1 High chlorine coal/waste/biomass co-fired stoves	2.179				
	6 Natural gas or LPG fired stoves	0.019				
2018	**Household Heating and Cooking with Fossil Fuels**	2.528	**0**	**0**	**0**	**0.0**
	1 High chlorine coal/waste/biomass co-fired stoves	2.506				
	6 Natural gas or LPG fired stoves	0.022				

Level of Confidence

In this category, the level of uncertainty is directly linked with the fuel quality. The level of confidence is high in the case of natural gas combustion (class 6). This is due to the use of clean fuel and high stability of the process. Low confidence levels can be attributed to the combustion of mixed solid fuels in particular in the case of co-firing of waste (classes 1 and 2), due to the low stability of the process and wide range of data[31]. Medium level of confidence is assigned to activity data for year 2016 used in the emission calculations from this source category due to uncertainties related to chlorine content in coal originating from Russian Federation.

Emissions from Source group 3 Power Generation and Heating

Table 3-28 PCDD/PCDF Emissions for Source group 3 Power Generation and Heating

		Annual Release, g TEQ/a				
		Air	**Water**	**Land**	**Product**	**Residue**
2001	Fossil fuel power plants	0.033				0.001
	Biomass power plants	0.074				0.0
	Landfill biogas combustion	0.000				0.0
	Household heating and cooking - Biomass	0.338				0.0
	Domestic heating – Fossil fuels	1.261				0.0
	Power Generation and Heating	**1.706**	**0**	**0**	**0**	**0.001**
2004	Fossil fuel power plants	0.029				0.002
	Biomass power plants	0.019				0.016
	Landfill biogas combustion	0.000				0.0
	Household heating and cooking - Biomass	0.524				0.0

[31] Toolkit for Identification and Quantification of Releases of Dioxins, Furans and Other Unintentional POPs, CH. II.3 Power Generation

	Domestic heating – Fossil fuels	3.089				0.0
	Power Generation and Heating	**3.661**	**0**	**0**	**0**	**0.018**
2008	Fossil fuel power plants	0.057				0.043
	Biomass power plants	0.019				0.026
	Landfill biogas combustion	0.000				0.0
	Household heating and cooking - Biomass	0.608				0.0
	Domestic heating – Fossil fuels	2.007				0.0
	Power Generation and Heating	**2.692**	**0**	**0**	**0**	**0.069**
2012	Fossil fuel power plants	0.075				0.058
	Biomass power plants	0.013				0.016
	Landfill biogas combustion	0.000				0.0
	Household heating and cooking - Biomass	2.344				0.0
	Domestic heating – Fossil fuels	4.207				0.0
	Power Generation and Heating	**6.639**	**0**	**0**	**0**	**0.074**
2016	Fossil fuel power plants	0.037				0.004
	Biomass power plants	0.021				0.022
	Landfill biogas combustion	0.004				0.0
	Household heating and cooking - Biomass	2.760				0.0
	Domestic heating – Fossil fuels	2.199				0.0
	Power Generation and Heating	**5.021**	**0**	**0**	**0**	**0.026**
2018	Fossil fuel power plants	0.032				0.0
	Biomass power plants	0.039				0.029
	Landfill biogas combustion	0.003				0.0
	Household heating and cooking - Biomass	3.083				0.0
	Domestic heating – Fossil fuels	2.528				0.0
	Power Generation and Heating	**5.684**	**0**	**0**	**0**	**0.029**

Source Group 4: Mineral Products

This section summarizes high-temperature processes in the mineral industry. Raw materials or fuels that contain chlorides may potentially cause the formation of PCDD/PCDF at various steps of the processes, e.g., during the cooling phase of the gases or in the heat zone. Due to the long residence time in kilns and the high temperatures needed for the product, emissions of PCDD/PCDF are generally low in these processes[32].

4.a Cement Production

Principal raw materials for cement production are clay and limestone. There are four main process routes for the manufacture of cement: the dry, semi-dry, semi-wet and wet processes. Typical fuels used are coal, oil, gas or petroleum coke. In many cases a variety of alternative fuels derived from high calorific wastes are also used to supplement the fossil fuel. The wastes may include: waste oils, solvents, animal meals, certain industrial wastes, and in some cases hazardous wastes. Most of these will be fired at the burner (hot) end of the kiln. Tires are often used and may be added to the kiln as whole tires or chipped.

Emission Factors

PCDD/PCDF emission factors for four source classes are listed in Table 4-1. As can be seen, there is no emission factor for releases with residues. Typically cement kilns do not generate residues since the ESP dust is reintroduced and releases via this vector are negligible. Some cement kilns with a high input of chlorine (from wastes or raw materials) have a bypass installed to separate high chlorine containing Cement Kiln Dust (CKD; up to 10% chloride) before the first cyclone. Typically, this CKD is sent to specific landfills or underground mines.

Table 4-1 PCDD/PCDF emission factors for source category 4a Cement Production

4a	**Cement Production**	**Emission Factors (µg TEQ/t cement produced)**				
Classification		**Air**	**Water**	**Land**	**Product**	**Residue**
1	Shaft kilns	5	ND	NA	ND	ND
2	Old wet kilns, ESP temperature > 300°C	5	ND	NA	ND	ND
3	Rotary kilns, ESP/FF temperature 200-300°C	0.6	ND	NA	ND	ND
4	Wet kilns, ESP/FF temperature < 200°C Dry kilns preheater/precalciner, T< 200°C	0.05	ND	NA	ND	ND

Activity Data

Two cement producing plants are currently operating in the RM: Lafarge Cement (Moldova) J.S.C. in Rezina and Cement and Slate Combined Works in Ribnita (ATULBD)[33].

Activity data for year 2016 and 2018[34] is available for Lafarge Cement (Moldova) J.S.C. in Rezina has been provided directly by the producer. Since this data is regarded as confidential, it is presented in Table 4-2 in aggregated form together with data from Cement and Slate Combined Works in Ribnita. Data for year 2001 is presented in the National POPs Inventory from 2003 in Appendix 2, p. 40, amounting 159 000 tons. Additionally, data for year 2001 is available from the National GHG Inventory

[32] Toolkit for Identification and Quantification of Releases of Dioxins, Furans and Other Unintentional POPs, CH. II.4 Mineral Products, January 2013
[33] National Inventory Report: 1990 - 2016. Greenhouse Gas Sources and Sinks in the RM, p. 183
[34] Official letter fo reply from Lafarge no 514 as of 05.09/2019 to the official letter of request from MARDE

for 1990-2016 and presented in Table 4-2. This data for year 2001 is higher; hence, it was used for calculation of emissions from Cement Production in this report. Data for year 2004, 2008 and 2012 has been used from the National GHG Inventory for 1990-2016.

Table 4-2 Activity data on Cement production in the RM, tons

	2001	2004	2008	2012	2016	2018
Cement Production	402100	667600	1775900	1051400	900200	1174900

Source: Lafarge Cement (Moldova) J.S.C. in Rezina, ; Official Letter No. 514 dated 05.09.2019, as a response to the request of the Ministry of Agriculture, Regional Development and Environment No. 14-07/3118 dated 02.09.2019; Official Letter No. 780 dated 22.12.2017, as a response to the request of the Climate Change Office, the Ministry of Agriculture, Regional Development and Environment No. 601/2017-12-03 dated 14.12.2017; Official Letter No. 67 dated 06.02.2014, as a response to the request of the Climate Change Office, the Ministry of Environment No. 320/2014-01-01 dated 03.01.2014; Official Letter No. 74 dated 02.03.2011, as a response to the request of the Ministry of Environment No. 03-07/175 dated 02.02.2011; Official Letter No. 186 dated 18.04.2007, as a response to the request of the Institute of Ecology and Geography No. 84 dated 26.03.2007; Statistical Yearbooks of the ATULBD for 2002 (page 103), for 2009 (page 92), for 2013 (page 99), for 2017 (page 101) and for 2019 (page 99).

According to the letter (Annex 1 to Letter Nr 14-07/3118 from 02.09.2019) received from Lafarge company, CKD (Cement Kiln Dust), the amount of cement dust that is formed in the kiln which is not retained by electrostatic deposition is emitted in the atmosphere. Hence, it is inferred that CKD is not sent to specific landfills or underground mines but is emitted to atmosphere.

Calculation of Emissions

According to the First POPS Inventory Report from 2003 for the year 2001, the emission factors for Class *Wet kilns, ESP/FF temperature <200 °C and all types of dry kilns*, corresponding to Class 4 in the latest version of the Toolkit for Identification and Quantification of Dioxins, Furans and Other Unintentional POPs from 2013, were used. The same class of emission factors is used for the calculation of emissions in this report.

Table 4-3 PCDD/PCDF Emissions for category 4a Cement Production

		Annual Release, g TEQ/a				
		Air	Water	Land	Product	Residue
2001	**Cement Production**	**0.020**	0	0	0	0
	4 Wet kilns, ESP/FF temperature <200 °C and all types of dry kilns with preheater/precalciner, T<200 °C	0.020				
2004	**Cement Production**	**0.033**	0	0	0	0
	4 Wet kilns, ESP/FF temperature <200 °C and all types of dry kilns with preheater/precalciner, T<200 °C	0.033				
2008	**Cement Production**	**0.089**	0	0	0	0
	4 Wet kilns, ESP/FF temperature <200 °C and all types of dry kilns with preheater/precalciner, T<200 °C	0.089				
2012	**Cement Production**	**0.053**	0	0	0	0
	4 Wet kilns, ESP/FF temperature <200 °C and all types of dry kilns with preheater/precalciner, T<200 °C	0.053				
2016	**Cement Production**	**0.045**	0	0	0	0
	4 Wet kilns, ESP/FF temperature <200 °C and all types of dry kilns with preheater/precalciner, T<200 °C	0.045				
2018	**Cement Production**	**0.059**	0	0	0	0

	4 Wet kilns, ESP/FF temperature <200 °C and all types of dry kilns with preheater/precalciner, T<200 °C	0.059				

Level of Confidence

The emission factors are based on data available from various regions of the world, and are thus assigned a high confidence level. Activity data is assigned a high level of confidence.

4.b Lime Production

Lime is used in a wide range of products. Quicklime (or burnt lime) is calcium oxide (CaO) produced by decarbonization of limestone (CaCO3). Slaked lime is quicklime with water content and mainly consists of calcium hydroxide (Ca(OH)2). Major users of lime are the steel industry, construction, pulp and sugar industries.

The lime making consists of the burning of calcium and/or magnesium carbonate at a temperature between 900 and 1,500°C. The burned lime is either delivered to the end user in the form of quicklime or reacted with water in a hydrating plant to produce hydrated lime or slaked lime.

Emission factors

PCDD/PCDF emission factors for two source classes are listed in Table 4-4.

Table 4-4 PCDD/PCDF emission factors for source category 4b Lime Production

4b	**Lime Production**	**Emission Factors (µg TEQ/t lime produced)**				
Classification		**Air**	**Water**	**Land**	**Product**	**Residue**
1	No dust control or contaminated, poor fuels	10	NA	NA	ND	ND
2	Lime production using dust abatement	0.07	NA	NA	ND	ND

Activity data

Activity data on lime production for years 2001-2018 are available separately for the right and left bank of Dniester, in the Statistical Yearbooks of the Republic of Moldova and ATULBD. In addition, data on lime production at sugar mills in the RM has been estimated part of the National GHG Inventory for 1990-2016 and is presented in Table 4-5 below. For the year 2018, data on lime production at sugar mills in the RM has been estimated following the same approach used in the National GHG Inventory, based on the amount of granulated sugar produced from sugar beet in the RM and amount of lime used in the sugar production (250 kg CaO per ton of sugar).

Table 4-5 Activity data on Lime Production in the Republic of Moldova, tons

	2001	**2004**	**2008**	**2012**	**2016**	**2018**
RM: left bank of Dniester River	2000	1000	14000	6840	4020	24725
RM: right bank of Dniester River	3300	2100	340	130	50	89
Total RM (Comercial lime)	5300	3100	14344	6971	4075	24814
Lime produced at sugar mills	33150	27725	33492	20860	25000	18477
Total lime produced	**38450**	**30825**	**47835**	**27831**	**29075**	**43291**

Source: Statistical Yearbooks of the Republic of Moldova for 2003 (page 393), 2006 (page 310); Statistical Reports PRODMOLD-A „Total production, as a natural expression, in the Republic, by product type for 2005-2018"; Statistical Yearbooks of the ATULBD for 2002 (p. 103), 2005 (p. 94), 2009 (p. 92), 2013 (p. 99), 2017 (p. 101), 2019 (p. 99).

Calculation of Emissions

Emissions for year 2001 from the National POPs Inventory from 2003 is revised based on the data from the GHG Inventory for 1990-2016. Emission factors used in the First POPS Inventory is corresponding to Class 1. Cyclone/no dust control. The same class of emission factors are used in this report.

Table 4-6 PCDD/PCDF Emissions for category 4b Lime Production

		Annual Release, g TEQ/a				
		Air	**Water**	**Land**	**Product**	**Residue**
2001	**Lime Production**	**0.385**	**0**	**0**	**0**	**0**
	1 Cyclone/no dust control, contaminated or poor fuels	0.385				
2004	**Lime Production**	**0.308**	**0**	**0**	**0**	**0**
	1 Cyclone/no dust control, contaminated or poor fuels	0.308				
2008	**Lime Production**	**0.478**	**0**	**0**	**0**	**0**
	1 Cyclone/no dust control, contaminated or poor fuels	0.478				
2012	**Lime Production**	**0.278**	**0**	**0**	**0**	**0**
	1 Cyclone/no dust control, contaminated or poor fuels	0.278				
2016	**Lime Production**	**0.291**	**0**	**0**	**0**	**0**
	1 Cyclone/no dust control, contaminated or poor fuels	0.291				
2018	**Lime Production**	**0.433**	**0**	**0**	**0**	**0**
	1 Cyclone/no dust control, contaminated or poor fuels	0.433				

Level of Confidence

The way the kiln inputs are controlled and maintaining a stable kiln operation is an important factor impacting PCDD/PCDF releases. Emission factors for less controlled processes such as those of class 1 are assigned a medium level of confidence. The emission factor in class 2 is assigned a high level of confidence due to better control of the process and available data[35].

4.c Brick Production

Brick production with simple kilns, ranging from informal to industrial dimensions, is an important activity in developing and emerging countries. Various fuels are used, and especially in emerging economies traditional fuels (wood) are often replaced by wastes with high caloric values (oil, tires, plastic). These fuels may promote higher emissions of PCDD/PCDF, PCBs and HCB.

Emission Factors

PCDD/PCDF emission factors for two source classes are listed in Table 4-7. The air emission factors for PCDD/PCDF are the same as in the 2005 edition of the Toolkit. Revised or newly added emission factors are highlighted in red.

Table 4-7 PCDD/PCDF emission factors for source category 4c Brick Production

4c	**Brick Production**	**Emission Factors (µg TEQ/t brick produced)**				
Classification		**Air**	**Water**	**Land**	**Product**	**Residue***

[35] Toolkit for Identification and Quantification of Releases of Dioxins, Furans and Other Unintentional POPs, CH. II.4 Mineral Products, January 2013

1	No emission abatement in place and using contaminated fuels	0.2	-	NA	0.06	0.02
2	No emission abatement in place and using non-contaminated fuels Emission abatement in place and using any kind of fuel No emission abatement in place but state of the art process control	0.02	-	NA	0.006	0.002

* In countries with no waste management or no reuse of the residue for brick making, this often goes to Land.

Activity Data

Statistical Yearbooks of the Republic of Moldova and those of the ATULBD contain data regarding brick production (expressed in million conventional unit and thousand m3) (see Table 4-8). This activity data has been converted in kilotons within the National GHG Inventory for 1990-2016[36] with the use of the following conversion coefficients: the calculated average weight of 2.817 kg of a conventioanal brick and the volume of a conventional brick of 0.00195 m3[37]. For the year 2018, the same conversion coefficients were used to calculate the activity data in tons.

Table 4-8: Activity Data on Brick Production, million conventional units

	2001	2004	2008	2012	2016	2018
RM: right bank of Dniester River	38.100	54.900	53.000	28.325	34.571	33.007
RM: left bank of Dniester River	15.000	21.000	20.697	14.657	9.305	5.501
RM: total	**53.100**	**75.900**	**73.697**	**42.982**	**43.876**	**38.508**

Source: Statistical Yearbooks for 2005 (page 322), 2010 (page 305); Statistical Yearbooks of the ATULBD for 2002 (page 103), 2005 (page 94); 2009 (page 92), 2013 (page 99), 2017 (page 101), 2019 (page 99); Statistical Reports PRODMOLD-A „Total production, as a natural expression, in the Republic, by product type, for 2005-2018".

Total mass of bricks produced in the RM for 2001-2018 is presented below in Table 4-9.

Table 4-9: Activity data on Brick production in the RM, tons

	2001	2004	2008	2012	2016	2018
Total brick production	149571	213793	207588	121070	123589	108477

Calculation of Emissions

Emission factors used in the First POPs Report (2003) is Class 1 Cyclone/no dust control, corresponding to Class 1 No emission abatement in place and using contaminated fuels. However, it is assumed that contaminated fuels are not used in Brick production in our country. For this reason, Class 2 of emission factors are used in this report.

Emissions for year 2001 from the National POPs Inventory from 2003 is revised based on the data available from the GHG Inventory for 1990-2016 and Class 2 Emission factors.

Table 4-10 PCDD/PCDF Emissions for category 4c Brick Production

		Annual Release, g TEQ/a				
		Air	Water	Land	Product	Residue
2001	**Brick Production**	**0.003**	**0**	**0**	**0**	**0**
	2 No emission abatement in place and using non-contaminated fuels	0.003				
2004	**Brick Production**	**0.004**	**0**	**0**	**0**	**0**

[36] National Inventory Report: 1990 - 2016. Greenhouse Gas Sources and Sinks in the RMa, p. 191

[37] <http://aquagroup.ru/articles/ves-kirpicha.html>, <http://www.lucceram.ro/index.php/products>.

	2 No emission abatement in place and using non-contaminated fuels	0.004				
2008	**Brick Production**	**0.004**	**0**	**0**	**0**	**0**
	2 No emission abatement in place and using non-contaminated fuels	0.004				
2012	**Brick Production**	**0.002**	**0**	**0**	**0**	**0**
	2 No emission abatement in place and using non-contaminated fuels	0.002				
2016	**Brick Production**	**0.002**	**0**	**0**	**0**	**0**
	2 No emission abatement in place and using non-contaminated fuels	0.002				
2018	**Brick Production**	**0.002**	**0**	**0**	**0**	**0**
	2 No emission abatement in place and using non-contaminated fuels	0.002				

Level of Confidence

The level of confidence assigned to emission factors for class 2 is medium. The activity data are assigned a high to medium level of confidence due to the conversion in other units (from thousand m3, thousand m2 and pieces to kilotons).

4.d Glass Production

The raw materials used for glass manufacture are principally sand, limestone, dolomite, soda, and in some cases recycled glass. In addition a wide range of other materials may be used to achieve desired properties such as color, clarity, and for purification. Chlorinated and fluorinated compounds may be added [38] (SCEP 1994). In some modern glass furnaces, gases are cleaned with sorbents and electrostatic precipitators or fabric filters.

Emission factors

PCDD/PCDF emission factors for two source classes are listed in Table 4-11.

Table 4-11 PCDD/PCDF emission factors for source category 4d Glass Production

4d	**Glass Production**	**Emission Factors (µg TEQ/t product)**				
Classification		**Air**	**Water**	**Land**	**Product**	**Residue**
1	No dust control or contaminated, poor fuels	0.2	NA	NA	ND	ND
2	Glass production using dust abatement	0.015	NA	NA	ND	ND

Activity Data

Four glass plants used to produce glass in the RM: the SOE “Chisinau Glass Factory No.1” and “Glass Container Company” (since 1997) in Chisinau, “Cristal-Flor” Glass Factory in Floresti and the Glass Factory in Tiraspol (ATULBD), but the last two plants ceased their activity.

Statistical data on glass production (expressed in tons, thousand m2 or million conventional units) are available in the Statistical Yearbooks of the RM and of the ATULBD, as well as in the Statistical Reports PRODMOLD-A “Total production, as a natural expression, in the Republic, by product type” [39] (see Table 4-12). This activity data has been converted in kilotons within the National GHG Inventory for 1990-2016 with the use of a series of conversion coefficients: the specific density of flat glass for

[38] SCEP 1994. Determination of Requirements to Limit Emissions of Dioxins and Furans. Report of the Working Group of the Subcommittee Air/Technology of the State Committee for Emission Protection (SCEP). Germany.
[39] National Inventory Report: 1990 - 2016. Greenhouse Gas Sources and Sinks in the RM, p. 189

windows used in the construction sector[40] – 2.5 g/cm3; the average thickness of flat glass for windows used in the construction sector – 3.5 mm; the average thickness of multi-layer insulating glass used in construction – 6.75 mm[41]; the average weight of a conventional glass container – 0.43 kg; the average weight of a glass jar – 0.25 kg[42]. Activity data related to glass production in the Republic of Moldova for 2018 has been converted to tons by using the same conversion coefficients. Activity data expressed in tons for 2001 – 2018 is presented in Table 4-13.

Table 4-12 Statistical data on Glass production in the RM

	2001	2004	2008	2012	2016	2018
Multi-layer insulating glass, thousand m2	NO	NO	246.673	389.882	403.273	474.971
Glassware, t	NO	95.283	278.583	19.547	12.822	NA
Glass jars, mill. conventional units	148.800	98.900	80.700	145.204	307.229	NA
Glass containers and bottles, mill. units	228.300	308.000	284.707	223.109	218.546	235.067
Products from fiberglass, t	NO	NO	32.612	392.821	NA	NA
Other products not included elsewhere, t	NO	NO	87.905	63.127	150.750	6.884

Source: Statistical Yearbook of the RM for 2003 (page 393), 2005 (pages 321-322); Statistical Yearbooks of the ATULBD for 2002 (page 104), 2005 (page 94), 2010 (page 93); Statistical Reports PRODMOLD-A „Total production, as a natural expression, in the Republic, by product type, for 2005-2018".

Table 4-13 Activity data on Glass production in the RM expressed in tons (t)

	2001	2004	2008	2012	2016	2018
Multi-layer insulating glass	NO	NO	4163	6579	6805	8015
Glassware	NO	95	279	20	13	NA
Glass jars	37200	24725	20175	36301	76807	NA
Glass containers and bottles	98169	132440	122424	95937	93975	101079
Products from fiberglass	NO	NO	33	393	NA	NA
Other products not included elsewhere	NO	NO	88	63	151	7
Total glass production in the RM	**135369**	**157260**	**147161**	**139293**	**177751**	**109101**

Calculation of Emissions

Emission factors used in the First POPs Report (2003) correspond to Class 1 Cyclone/no dust control. The same class of emission factors are used in this report. Emissions for year 2001 from the National POPs Inventory from 2003 is revised based on the activity data available from the GHG Inventory for 1990-2016.

Table 4-14 PCDD/PCDF Emissions for category 4d Glass Production

[40] National Report of the Russian Federation on the Inventory of anthropogenic emissions by sources and removals by sinks of greenhouse gases not controlled by the Montreal Protocol for 1990-2014, developed and in accordance with the obligations of the Russian Federation under the UNFCCC and the Kyoto Protocol to the UNFCCC. Moscow, 2016. 476 p. Cited in National GHG Inventory Report: 1990 - 2016, p. 189

[41] Airapetov G.A., Bezrodnii O.C., Jolobov A.L. (2005), Building materials: teaching handbook. – Rostov-on-Don, Pheonix, 2005. Cited in National GHG Inventory Report: 1990 - 2016, p. 189

[42] Methodological recommendations for the voluntary inventory of Greenhouse Gas Emissions in the constituent entities of the Russian Federation. Appendix 1. Reference guide for conducting voluntary inventory of GHG emissions in the constituent entities of the Russian Federation. Part III. Industrial Processes and Product Use. Ministry of Natural Recourses and Ecology of the Russian Federation. Moscow 2015. <http://www.mnr.gov.ru/regulatory/detail.php?ID=140995>. Cited in National GHG Inventory: 1990-2016, p. 189

		Annual Release, g TEQ/a				
		Air	Water	Land	Product	Residue
2001	**Glass Production**	**0.027**	**0**	**0**	**0**	**0**
	1 Cyclone/no dust control or contaminated, poor fuels	0.027				
2004	**Glass Production**	**0.031**	**0**	**0**	**0**	**0**
	1 Cyclone/no dust control or contaminated, poor fuels	0.031				
2008	**Glass Production**	**0.029**	**0**	**0**	**0**	**0**
	1 Cyclone/no dust control or contaminated, poor fuels	0.029				
2012	**Glass Production**	**0.028**	**0**	**0**	**0**	**0**
	1 Cyclone/no dust control or contaminated, poor fuels	0.028				
2016	**Glass Production**	**0.036**	**0**	**0**	**0**	**0**
	1 Cyclone/no dust control or contaminated, poor fuels	0.036				
2018	**Glass Production**	**0.022**	**0**	**0**	**0**	**0**
	1 Cyclone/no dust control or contaminated, poor fuels	0.022				

Level of Confidence

Emission factors are provided with a medium level of confidence, based on the limited geographical scope of available data. The activity data are assigned a high to medium level of confidence due to the conversion in other units (from thousand m2 and million conventional pieces to kilotons), as well as due to use of an average value for glass containers within the conversion process from a specific unit to another type.

4.e Ceramics Production

There is not enough information available to consider the production of ceramics as a source of PCDD/PCDF. As ceramics production is a thermal process, PCDD/PCDF will most likely be released to air. An estimate of these releases can be made by applying the emission factors developed for brick making.

Emission Factors

Table 4-15 PCDD/PCDF emission factors used for source category 4e Ceramics Production

4c	**Brick Production**	**Emission Factors (µg TEQ/t brick produced)**				
Classification		**Air**	**Water**	**Land**	**Product**	**Residue***
1	No emission abatement in place and using contaminated fuels	0.2	-	NA	0.06	0.02
2	No emission abatement in place and using non-contaminated fuels Emission abatement in place and using any kind of fuel No emission abatement in place but state of the art process control	0.02	-	NA	0.006	0.002

* In countries with no waste management or no reuse of the residue for brick making, this often goes to Land.

Activity Data

Activity data on Ceramics production in the RM for the years 2001 - 2016 has been published the National GHG Inventory for 1990-2016. Activity data regarding expanded clay production from 2001 to 2016 (expressed in thousand m3) was provided to the Climate Change Office by MACON J.S.C. (Table 4-15). For the year 2018, data on expanded clay production was not available at the time of drafting the present report. Data regarding the production of ceramics from 2005 to 2018 is available from the National Bureau of Statistics, in the Statistical Reports PRODMOLD-A "Total production, as a natural expression, by product type" (see Table 4-16).

Table 4-15 Amount of Clay used in Expanded Clay Production in the RM

	2001	**2004**	**2008**	**2012**	**2016**	**2018**
Expanded clay production, thousand m3	3.5958	55.05	64.963	38.15	28.7730	NA
Specific weight, kg/m3	390.1	371.1	376.2	403.5	387.3	NA
Expanded clay production, t	**1403**	**20431**	**24438**	**15394**	**11143**	**NA**

Table 4-16 Activity data regarding Ceramics Production in the RM

	2001	**2004**	**2008**	**2012**	**2016**	**2018**
Roof tiles, pieces	NA	NA	223355	NA	NA	NA
Non-refractory ceramics for construction, t	NA	NA	150.5	12.7	NA	NA
Table and ornamental ware (household ceramics), t	NA	NA	276.8	118.4	92.231	38.246
Wall and floor tiles, thousand m2	NA	NA	808.7	0.7	248.200	NA
Total ceramics produced, t	**NA**	**NA**	**1364**	**131**	**105**	**38**

Source: Statistical Reports PRODMOLD-A „Total production, as a natural expression, in the Republic, by product type, for 2005-2018".

Table 4-17 Activity data used for calculation of emissions from category 4e Ceramics Production, t

	2001	**2004**	**2008**	**2012**	**2016**	**2018**
Expanded clay production	1403	20431	24438	15394	11143	NA
Total ceramics produced (Household ceramics and Wall and Floor tiles)	NA	NA	1364	131	105	38
Total	**1403**	**20431**	**25802**	**15525**	**11248**	**38**

Calculation of Emissions

Emissions for source category 4e Ceramics Production were calculated based on the emission factors used for Brick production – Class 2 No emission abatement in place and using non-contaminated fuels.

Emissions for year 2001 from the National POPs Inventory from 2003 is revised based on the data available from the GHG Inventory for 1990-2016.

Table 4-18 PCDD/PCDF Emissions for category 4e Ceramics Production

		Annual Release, g TEQ/a				
		Air	**Water**	**Land**	**Product**	**Residue**
2001	**Ceramics Production**	**0.000**	**0**	**0**	**0**	**0**
	2 No emission abatement in place and using non-contaminated fuels Emission abatement in place and using any kind of fuel No emission abatement in place but state of the art process control	0.000				
2004	**Ceramics Production**	**0.000**	**0**	**0**	**0**	**0**

	2 No emission abatement in place and using non-contaminated fuels Emission abatement in place and using any kind of fuel No emission abatement in place but state of the art process control	0.000				
2008	**Ceramics Production**	**0.001**	**0**	**0**	**0**	**0**
	2 No emission abatement in place and using non-contaminated fuels Emission abatement in place and using any kind of fuel No emission abatement in place but state of the art process control	0.000				
2012	**Ceramics Production**	**0.000**	**0**	**0**	**0**	**0**
	2 No emission abatement in place and using non-contaminated fuels Emission abatement in place and using any kind of fuel No emission abatement in place but state of the art process control	0.000				
2016	**Ceramics Production**	**0.000**	**0**	**0**	**0**	**0**
	2 No emission abatement in place and using non-contaminated fuels Emission abatement in place and using any kind of fuel No emission abatement in place but state of the art process control	0.000				
2018	**Ceramics Production**	**0.000**	**0**	**0**	**0**	**0**
	2 No emission abatement in place and using non-contaminated fuels Emission abatement in place and using any kind of fuel No emission abatement in place but state of the art process control	0.000				

4.f Asphalt Mixing

Asphalt is generally used for road construction, and consists of rock chips, sand, fillers bound together in bitumen. Fillers can include fly ash from incineration or power plants. The first stage of the process is generally an air-drying unit for the minerals. The hot minerals are then mixed with hot bitumen to obtain asphalt. Asphalt mixing plants in industrialized countries may typically have gas cleaning such as fabric filters or wet dust control devices.

Emission Factors

PCDD/PCDF emission factors for two source classes are listed in Table 4-19.

Table 4-19 PCDD/PCDF emission factors for source category 4e Asphalt Mixing

4e	**Asphalt mixing**	**Emission Factors (µg TEQ/t asphalt mix)**				
Classification		**Air**	**Water**	**Land**	**Product**	**Residue**
1	Mixing plant with no gas cleaning, poor fuels	0.07	NA	NA	ND	ND
2	Mixing plant with fabric filter or wet scrubber	0.007	NA	NA	ND	0.006

Activity Data

The annual data related to asphalt production for roads and roofing are available from the National Bureau of Statistics for the years 2004-2018 and for the year 2001 from the Ministry of Transport and Roads Infrastructure upon the request of the Ministry of Ecology (Table 4-20). According to the data on asphalt roofing production provided by the NBS, until 2003, no domestic asphalt roofing production was recorded, the respective production being imported[43].

Table 4-20 Activity data on Road Paving with Asphalt and Asphalt Roofing, t

	2001	**2004**	**2008**	**2012**	**2016**	**2018**
Road paving with asphalt	67343	229300	209351	248191	155724	564387
Asphalt roofing	NO	6700	90500	39600	15000	NA
Total asphalt production	**67343**	**236000**	**299851**	**287791**	**170724**	**564387**

Source: Official Letter No. 04-02-3/101 dated 18.02.2004, as a response to the request of the Ministry of Ecology No. 257-01-07 dated 26.01.2004; National Bureau of Statistics of the RM, Official Letter No. 06-39/08 dated 23.02.2011, as a response to the request of the Ministry of Environment No. 03-07/175 dated 02.02.2011; Statistical Reports PRODMOLD-A „Total production, as a natural expression, in the Republic of Moldova, by product type, for 2005-2016"

Calculation of Emissions

Emission factors used in the First POPs Report from 2003 correspond to Class 1 Mixing plant with no gas cleaning. The same class of emission factors are used in this report. Emissions for year 2001 from the National POPs Inventory from 2003 is revised based on the data available from the GHG Inventory for 1990-2016.

Table 4-21 PCDD/PCDF Emissions for category 4e Asphalt Mixing

		Annual Release, g TEQ/a				
		Air	**Water**	**Land**	**Product**	**Residue**
2001	**Asphalt Mixing**	**0.005**	**0**	**0**	**0**	**0**
	1 Mixing plant with no gas cleaning	0.005				
2004	**Asphalt Mixing**	**0.017**	**0**	**0**	**0**	**0**
	1 Mixing plant with no gas cleaning	0.017				
2008	**Asphalt Mixing**	**0.021**	**0**	**0**	**0**	**0**
	1 Mixing plant with no gas cleaning	0.021				
2012	**Asphalt Mixing**	**0.020**	**0**	**0**	**0**	**0**
	1 Mixing plant with no gas cleaning	0.020				
2016	**Asphalt Mixing**	**0.012**	**0**	**0**	**0**	**0**
	1 Mixing plant with no gas cleaning	0.012				
2018	**Asphalt Mixing**	**0.040**	**0**	**0**	**0**	**0**
	1 Mixing plant with no gas cleaning	0.040				

Level of Confidence

Emission factors are provided with a medium level of confidence, based on the limited geographical scope of available data.

Total PCDD/PCDF emissions from source group 4 Mineral Products

		Annual Release, g TEQ/a				
		Air	**Water**	**Land**	**Product**	**Residue**
2001	Cement production	0.020	0	0	0	0
	Lime production	0.385	0	0	0	0

[43] National Inventory Report: 1990 - 2016. Greenhouse Gas Sources and Sinks in the RM, p. 212

	Brick production	0.003	0	0	0	0
	Glass production	0.027	0	0	0	0
	Ceramics production	0.000	0	0	0	0
	Asphalt mixing	0.005	0	0	0	0
	Mineral Products	**0.439**	**0**	**0**	**0**	**0**
2004	Cement production	0.033	0	0	0	0
	Lime production	0.308	0	0	0	0
	Brick production	0.004	0	0	0	0
	Glass production	0.031	0	0	0	0
	Ceramics production	0.000	0	0	0	0
	Asphalt mixing	0.017	0	0	0	0
	Mineral Products	**0.394**	**0**	**0**	**0**	**0**
2008	Cement production	0.089	0	0	0	0
	Lime production	0.478	0	0	0	0
	Brick production	0.004	0	0	0	0
	Glass production	0.029	0	0	0	0
	Ceramics production	0.001	0	0	0	0
	Asphalt mixing	0.021	0	0	0	0
	Mineral Products	**0.622**	**0**	**0**	**0**	**0**
2012	Cement production	0.053	0	0	0	0
	Lime production	0.278	0	0	0	0
	Brick production	0.002	0	0	0	0
	Glass production	0.028	0	0	0	0
	Ceramics production	0.000	0	0	0	0
	Asphalt mixing	0.020	0	0	0	0
	Mineral Products	**0.382**	**0**	**0**	**0**	**0**
2016	Cement production	0.045	0	0	0	0
	Lime production	0.291	0	0	0	0
	Brick production	0.002	0	0	0	0
	Glass production	0.036	0	0	0	0
	Ceramics production	0.000	0	0	0	0
	Asphalt mixing	0.012	0	0	0	0
	Mineral Products	**0.386**	**0**	**0**	**0**	**0**
2018	Cement production	0.059	0	0	0	0
	Lime production	0.433	0	0	0	0
	Brick production	0.002	0	0	0	0
	Glass production	0.022	0	0	0	0
	Ceramics production	0.000	0	0	0	0
	Asphalt mixing	0.040	0	0	0	0
	Mineral Products	**0.555**	**0**	**0**	**0**	**0**

Source Group 5: Transport

POPs emissions from transport (road and off-road vehicles) result from incomplete combustion of fuel in engines. Levels of PCDD/PCDF and other unintentional POPs in exhaust gases from vehicles depend on many factors including the type of engine, its maintenance condition and age, technologies of emission reduction applied (catalysts), type and quality of fuel, driving conditions, ambient conditions etc. For the purpose of developing a PCDD/PCDF emission inventory, a simple methodology can be used, where PCDD/PCDF emission rates are considered as a function of the type of engine and type of fuel. Thus, Toolkit emission factors are given according to the type of combustion engine, the type of fuel, and the emission reduction technology applied (catalysts).

Four source categories are included in this group: 4-stroke engines (gasoline fueled engines with spark ignition), 2-stroke engines (gasoline fueled engines with spark ignition), Diesel engines (Diesel fueled engines with compression ignition), and heavy oil fueled engines (mostly turbines).

The major fuels used in road transportation are gasoline and Diesel. In smaller volumes, other types of fuels such as liquefied petroleum gas (LPG), compressed natural gas (CNG), liquid biofuels (ethanol, methanol, biodiesel) and hydrogen are used. Their market is growing but, so far, no dioxin measurements are available. In order to accommodate releases from these fuels, the following hypotheses are proposed:

- For LPG-fuelled cars: take the emission factor for 4-stroke engines with catalyst (5a3);
- For oil/gas or oil/gasoline mixtures: the emission factor for Diesel (5c1) should be applied.

As for air transport, the occurrence of PCDD/PCDF has not been reported from aircrafts. Increases in concentrations or changes in patterns of PCDD/PCDF could not be detected in a biomonitoring program at the Frankfurt International Airport. Consequently, it was assumed that the combustion of kerosene in aircraft motors is not a source of PCDD/PCDF and this category is not addressed in the Toolkit[44,45].

5.d Heavy Oil Fired Engines – Not Estimated

Distribution of Gasoline consumption between 4-Stroke and 2-Stroke engines

There is no available data with regard to the type of engines of vehicles registered in the Republic of Moldova. It is generally assumed that vehicles with 2-Stroke engines in the Republic of Moldova are represented by Motorcyles and Mopeds, even though a small share of these type of vehicles can also be equiped with 4-stroke engines.

Data on the structure of vehicle fleet of the RM in the year 2017 (see Table 5-1) and the number of vehicles by type of used fuel provided in Table 5-2 below shows that the share of Motorcycles and Mopeds in the country is around 5% from the total number of vehicles and around 8% from the number of vehicles using Gasoline.

Table 5-1 The structure of vehicle fleet in the RM, as of 01.01.2017, units

Cars	Trucks	Trailers	Tractors	Motorcycles	Buses	Semitrailers	Other
546 794	177 575	50665	39518	37906	20968	16173	3143

Source: Public Services Agency**,** State Register of Transport (<http://www.registru.md/ro/registru-rst>).

[44] Fiedler, H., Rottler, H., Peichl, L., Knetsch, G., Basler, A. 2000a. Concentrations of PCDD/PCDF in Atmospheric Samples in Germany. Organohalogen Compd. 45: 264-268.
[45] Buckley-Golder, D., Coleman, P., Davies, M., King, K., Petersen, A., Watterson, J., Woodfield, M., Fiedler, H., Hanberg, A. 1999. Compilation of EU Dioxin Exposure and Health Data. Report produced for European Commission DG Environment and UK Department of the Environment Transport and the Regions (DETR).

Table 5-2 Number of transport units registered in the RM, by type of fuel used, year 2017 (end of year)

Category of transport units	Gasoline	Diesel	Gasoline - LPG	Gasoline - CNG (methane)	Hybrid	Other	Not identified	**Total**
Cars	362248	144585	41963	7102	5669	260	26291	**588118**
Trucks	28971	139982	1718	931	1	326	8044	**179973**
Minibuses, buses	4026	14850	63	36	0	55	1945	**20975**
Motocycles	31160	35	0	2	0	5	3369	**34571**
Mopeds	4738	3	0	0	0	3	170	**4914**

Source: Public Services Agency, Transport State Register

Data on the consumption of fuels by vehicle categories such as cars, light trucks and heavy trucks is available for the years 2013-2014 from the Informative Inventory Report (IIR) of the RM to the LRTAP Convention[46]. Data on fuel consumption by Motocycles and Mopeds has not been estimated part of IIR report.

Based on the data on vehicle fleet presented above it is expected, however, that a certain amount of gasoline is consumed by this vehicle category in the country. For this reason, a rough estimate is made regarding the share of gasoline consumption by 2-stroke engines in the RM. Part of the National POPs Inventory Report from 2003[47], for the year 2001, 480 tons gasoline were allocated to category 2-Stroke engines and 126000 tons to category 4-Stroke engines. Thus, the estimated share of gasoline consumption by 2-stroke engines represented around 0.4% in 2001. For the purpose of calculation of PCDD/PCDF emissions from this category for the year 2016, the same percentage of 0.4% from total gasoline consumption is applied for 2-stroke engines.

Use and import of tetraethyl lead and tetra methyl lead in petroleum products is banned in the Republic of Moldova[48]. Therefore, it is considered that gasoline imported in 2016 was lead free. In 2001, the emissions were calculated using Emission factors for Class 1 Leaded gasoline.

5.a 4-Stroke engines

Most gasoline powered internal combustion engines used today in cars, light trucks, motorcycles and other vehicles are 4-stroke engines. Like all combustion processes, internal combustion engines produce PCDD/PCDF as an unwanted byproduct. Higher emissions have been associated with the use of chlorinated scavengers in leaded gasoline. However, when unleaded gasoline is used and a catalytic converter is installed for the removal of NOx and unburned hydrocarbons, the emissions of PCDD/PCDF are negligible. The only release vector is to air. Other release vectors are not present.

Emission Factors

PCDD/PCDF emission factors for four source classes are listed in Table 5-3. Revised or newly added emission factors are highlighted in red.

Table 5-3 PCDD/PCDF emission factors for source category 5a 4-Stroke Engines

5a	**4-Stroke Engines**	**Emission Factors (µg TEQ/t fuel burned)**				
Classification		**Air**	**Water**	**Land**	**Product**	**Residue**
1	Leaded fuel*	2.2	NA	NA	NA	NA

[46] Informative Inventory Report (IIR) of the RM to the LRTAP Convention for the years 1990-2015 accesed on 08.05.2020 on web page: ceip.at (Centre on Emission Inventories and Projections)
[47] The Republic of Moldova's National POPs Inventory Report, 1990-2001, Chisinau, 2003
[48] Law no. 1422 of 17.12.1997 on atmospheric air protection, Art. 17, para (3), letter b). Published in Official Monitor no. 44-46, art. 312, https://www.legis.md/cautare/getResults?doc_id=108699&lang=ro.

2	Unleaded gasoline without catalyst*	0.1	NA	NA	NA	NA
3	Unleaded gasoline with catalyst*(**)	0.001	NA	NA	NA	NA
4	Ethanol with catalyst	0.0007	NA	NA	NA	NA

* If consumption data are given in liters (L), note that 1 L of gasoline has a mass of 0.74 kg; thus a conversion factor of 0.00074 must be used to convert liters into tons.
** Emissions from engines with inadequate or out-of-order catalyst should be calculated using class 2 emission factor.

Class 1 includes all types of gasoline 4-stroke vehicles which are fueled with leaded (ethylated) gasoline (gasoline with a content of lead of more than 0.15 / 0.013 g/l).
Class 2 includes all types of 4-stroke vehicles which are fueled with gasoline excluding ethylated gasoline or LPG, and are not equipped with catalyst or where the catalyst is not adequate or out of order. Euro class 1 vehicles and lower (or their equivalent in other countries) belong to this class.
Class 3 includes all types of 4-stroke vehicles which are fueled with gasoline excluding ethylated gasoline, or LPG and equipped with proper catalyst. Euro class 2 vehicles and higher (and their equivalent in other countries) belong to this class.
Class 4 includes all types of 4-stroke vehicles with catalyst which are powered by ethanol or fuel mix (gasoline-ethanol such as E85), where the share of ethanol is of more than 50%.

Activity Data

Data on the share of Euro class 1 vehicles and lower, corresponding to Class 2 4-Stroke vehicles, and of Euro class 2 vehicles and higher, corresponding to Class 3 4-Stroke vehicles, in the total structure of vehicle fleet in the Republic of Moldova is not readily available, however an estimation is made part of this report. Statistical data from the State Register on Vehicles was provided at the request of the EPPO office in 2018 on the number of vehicles registered in the RM until the year 2017 along with their production year, by fuel type. Considering the fact that Euro class 2 standards for vehicles were applied in the EU during 1997-1999, it is assumed that production of Euro class 1 vehicles has ceased in the period 2000-2004. Hence, the assumption is made that number of vehicles manufactured after year 2004 belong to the Euro class 2 vehicles and higher.

Based on the information summarized from the data on number of vehicles registered until 2017, by production year and by fuel type (see Table 5-4 below), the share of vehicles produced until 2004 and after 2004 was calculated. Thus, it is concluded that around 73% of vehicles running on gasoline, gasoline/LPG and gasoline/CNG mixtures registered in the RM can be attributed to Euro class 1 vehicles. Respectively, for the years 2008, 2012 and 2016, 73% of gasoline consumption is distributed in Class 2 4-Stroke vehicles and 27% in Class 3 4-Stroke vehicles. For the year 2004, all gasoline consumption is assigned to Class 2. However for year 2001, gasoline consumption is assigned to Class 1 Leaded fuel, as in the National POPs Inventory of the RM from 2003. Whereas, data on LPG for 2001 is assigned to Class 2 Unleaded fuel without catalyst.

Table 5-4 Distribution of vehicles running on gasoline to Euro class 1 and 2, in 2017

	Gasoline engines	Gasoline – Liquefied gas	Gasoline – CNG	**Total Gasoline engines**	**Share**
Total number of vehicles	**432 162**	**43 754**	**8080**	**483 996**	**100 %**
Number of vehicles produced until 2004 (Euro class 1 vehicles and lower)	332 123	27 347	2000	354 610	0.73
Number of vehicles produced after 2004 (Euro class 2 vehicles and higher)	100 039	16 407	6080	129 386	0.27

Source: Agency of Public Services, State Register of Vehicles

Data on gasoline consumption for 2004-2018 is available in natural units from the Energy Balances of the RM. Data for the year 2001 is used from the National POPs Inventory of the RM from 2003[49]. Data on gasoline consumption in Transport sector is not available for the ATULBD region, therefore in the estimation of emissions only data from the Republic of Moldova (Right Bank of Dniestr Region) is used.

Table 5-5 Gasoline consumption in the Republic of Moldova, tons

	2001	**2004**	**2008**	**2012**	**2016**	**2018**
Gasoline	126000	210000	208000	168000	166000	169000

Source: Energy Balance of the RM for 2012, 2014, 2016, 2018; Republic of Moldova's National POPs Inventory, Appendix 4 - data for year 2001

The 2013 Toolkit methodology proposes to take the emission factor for 4-stroke engines with catalyst (5a3) for LPG-fuelled cars. For this reason, data on the consumption of LPG are, additionally, taken into consideration in the estimates of PCDD/PCDF emissions from *category 4-Stroke engines*. Activity data on LPG for years 2001 - 2016 is provided in the National GHG Inventory Report (see Table 5-6)[50]. For the year 2018, data on LPG is available from the Energy Balance of the RM for 2018.

Table 5-6: Consumption of Liquefied Petroleum Gases in the RM, tons

	2001	**2004**	**2008**	**2012**	**2016**	**2018**
Liquefied Petroleum Gases (LPG)	800	5000	10000	13000	13000	12000

Source: Energy Balance of the RM for 2002-2018

Using the estimated 99.6% share of gasoline and LPG consumption by 4-stroke engines and the share of gasoline and LPG consumption in Class 2 (73%) and Class 3 (27%), the amount of fuel attributed to category 5a 4-Stroke engines is calculated and the results are presented in Table 5-7 below.

Table 5-7 Activity data used in the calculations of emissions for category 5a 4-Stroke engines, tons

		Gasoline	Liquefied Petroleum Gases	**Total**
2001	4-Stroke engines:	126000	797	**126797**
	Class 1	126000	0	126000
	Class 2	0	797	797
2004	4-Stroke engines:	209160	4980	**214140**
	Class 2	209160	4980	214140
2008	4-Stroke engines:	207168	9960	**217128**
	Class 2	151232	7271	158503
	Class 3	55936	2689	58625
2012	4-Stroke engines:	167328	12948	**180276**
	Class 2	122149	9452	131601
	Class 3	45179	3496	48675
2016	4-Stroke engines:	165336	12948	**178284**
	Class 2	120695	9452	130147
	Class 3	44641	3496	48137
2018	4-Stroke engines:	168324	11952	**180276**
	Class 2	122877	8725	131602
	Class 3	45447	3227	48674

[49] Republic of Moldova's National POPs Inventory, Interim report, 1990-2001, Chisinau, 2003
[50] National Inventory Report: 1990 - 2016. Greenhouse Gas Sources and Sinks in the RM, p. 128

Calculation of emissions

Table 5-8 PCDD/PCDF Emissions for category 5a 4-Stroke engines

		Annual Release, g TEQ/a				
		Air	**Water**	**Land**	**Product**	**Residue**
2001	**4-Stroke engines**	**0.277**	**0**	**0**	**0**	**0**
	1 Leaded fuel	0.277				
	2 Unleaded gasoline without catalyst	0.000				
2004	**4-Stroke engines**	**0.021**	**0**	**0**	**0**	**0**
	2 Unleaded gasoline without catalyst	0.021				
2008	**4-Stroke engines**	**0.016**	**0**	**0**	**0**	**0**
	2 Unleaded gasoline without catalyst	0.016				
	3 Unleaded gasoline with catalyst	0.000				
2012	**4-Stroke engines**	**0.013**	**0**	**0**	**0**	**0**
	2 Unleaded gasoline without catalyst	0.013				
	3 Unleaded gasoline with catalyst	0.000				
2016	**4-Stroke engines**	**0.013**	**0**	**0**	**0**	**0**
	2 Unleaded gasoline without catalyst	0.013				
	3 Unleaded gasoline with catalyst	0.000				
2018	**4-Stroke engines**	**0.013**	**0**	**0**	**0**	**0**
	2 Unleaded gasoline without catalyst	0.013				
	3 Unleaded gasoline with catalyst	0.000				

Level of Confidence

The confidence in PCDD/PCDF emission factors for this source category depends on the source class. Taking into account the levels of PCDD/PCDF concentrations in emissions and their variation according to the source class, a medium confidence level is assigned to class 2 and class 3 emission factors, and a high confidence level to class 1 emission factor[51]. Level of confidence of activity data is high, however uncertainties persist with regard to percentage of vehicles with and without catalyst as it is based on assumptions and not real data. For this reason, distribution of data to classes 2 and 3 is assigned a medium level of confidence.

5.b 2-Stroke engines

Most small gasoline powered internal combustion engines used today in boats, jet-skis, mopeds, small motorcycles, lawnmowers, chain saws, and other vehicles are 2- stroke engines. Lubrication is usually by oil added with the fuel. Therefore, higher amounts of pollutants may be released and the efficiency may be lower than 4-stroke engines. The only release vector is to the air. All other release vectors are not present.

Emission Factors

PCDD/PCDF emission factors for two source classes are listed in Table 5-9.

Table 5-9 PCDD/PCDF emission factors for source category 5b 2-Stroke Engines

5b	**2-Stroke Engines**	**Emission Factors (µg TEQ/t fuel burned)**				
Classification		**Air**	**Water**	**Land**	**Product**	**Residue**
1	Leaded fuel*	3.5	NA	NA	NA	NA
2	Unleaded fuel*	2.5	NA	NA	NA	NA

[51] Toolkit for Identification and Quantification of Releases of Dioxins, Furans and Other Unintentional POPs, CH.II.5 Transport, p. 89

* if consumption data are given in liters (L), note that 1 L of gasoline has a mass of 0.74 kg; thus a conversion factor of 0.00074 must be used to convert liters into tons.

Activity Data

Using the estimated 0.4% share of gasoline and LPG consumption by 2-stroke engines, the amount of fuel attributed to category 5b 2-Stroke engines, is calculated and the results are presented in Table 5-10 below. In the calculation of estimations for 2001, data on LPG is assigned to Class 1 Leaded fuel. Data for 2004-2016 is assigned to Class 2 Unleaded fuel.

Table 5-10 Activity data used in the calculations of emissions for category 5b 2-Stroke engines, tons

	2001	**2004**	**2008**	**2012**	**2016**	**2018**
Gasoline	480	840	832	672	664	676
Liquefied Petroleum Gases	3	20	40	52	52	48
Total	**483**	**860**	**872**	**724**	**716**	**724**

Calculation of emissions

Table 5-11 PCDD/PCDF Emissions for category 5b 2-Stroke engines

		Annual Release, g TEQ/a				
		Air	**Water**	**Land**	**Product**	**Residue**
2001	**2-Stroke engines**	**0.002**	**0**	**0**	**0**	**0**
	1 Leaded fuel	0.002				
2004	**2-Stroke engines**	**0.002**	**0**	**0**	**0**	**0**
	2 Unleaded fuel	0.002				
2008	**2-Stroke engines**	**0.002**	**0**	**0**	**0**	**0**
	2 Unleaded fuel	0.002				
2012	**2-Stroke engines**	**0.002**	**0**	**0**	**0**	**0**
	2 Unleaded fuel	0.002				
2016	**2-Stroke engines**	**0.002**	**0**	**0**	**0**	**0**
	2 Unleaded fuel	0.002				
2018	**2-Stroke engines**	**0.002**	**0**	**0**	**0**	**0**
	2 Unleaded fuel	0.002				

Level of Confidence

PCDD/PCDF emission measurements from this source category are limited; taking into account the heterogeneity of this source group, a low level of confidence is assigned to these emission factors. Activity data used for this category is not based on real data, therefore a low level of confidence is assigned to them.

5.c Diesel Engines

Diesel engines are used in heavy trucks, light trucks, passenger cars, locomotives, heavy construction equipment, boats, Diesel generators, pumps, and farm equipment including tractors and other large equipment. These engines use Diesel (light oil) and a 4-stroke cycle. Particulate emissions from Diesel engines are well known to contain high concentrations of polycyclic aromatic hydrocarbons (PAH). However, data on PCDD/PCDF concentrations in Diesel soot are not available. As for other unintentional POPs, no data or almost zero emission for recent diesel engines with after-treatment of emissions have been reported[52].

Emission Factors

PCDD/PCDF emission factors for two source classes are listed in Table 5-12. Revised or newly added emission factors are highlighted in red.

Table 5-12 PCDD/PCDF emission factors for source category 5c Diesel Engines

5c	**Diesel Engines**	**Emission Factors (µg TEQ/t diesel)**				
Classification		**Air**	**Water**	**Land**	**Product**	**Residue**
1	Regular Diesel*	0.1	NA	NA	NA	ND
2	Biodiesel	0.07	NA	NA	NA	ND

* if consumption data are given in liters (L), note that 1 L of Diesel has a mass of 0.83-0.86 (depending on brand of Diesel); thus appropriate conversion factor (in the range 0.00083-0.00086) must be used to convert liters into tons.

Class 1 includes all mobile machinery (heavy trucks, light trucks, passenger cars, locomotives, heavy construction equipment, boats, Diesel generators, pumps, farm equipment etc.) fueled with regular Diesel.
Class 2 includes Diesel vehicles (heavy duty, passenger cars, etc.) fueled with Diesel including 20% or more biofuel.

Activity Data

Data on Diesel consumption for the year 2004-2018 is available from the Energy Balances of the RM. Data for the year 2001 is used from the National POPs Inventory of the RM from 2003. Data on gasoline consumption in Transport sector is not available for the ATULBD region, therefore in the estimation of emissions only data from the Republic of Moldova (Right Bank of Dniestr Region) is used.

Table 5-13 Diesel oil consumption in the Republic of Moldova, t

	2001	**2004**	**2008**	**2012**	**2016**	**2018**
Diesel oil, tons	201000	323000	367000	339000	459000	467000

Source: National POPs Inventory, Appendix 4 (data for year 2001); Energy Balances of the RM for 2012 to 2018

The 2013 Toolkit methodology proposes to take the emission factor for Diesel (5c1) for oil/gas mixtures. For this reason, data on the consumption of CNG are, also, taken into consideration in the estimates of PCDD/PCDF emissions from *category 2-Stroke engines*. Activity data on CNG, including LBRD, for years 2001 to 2016 is provided in the National GHG Inventory Report (see Table 5-14)[53]. For year 2018, activity data on CNG is provided only for the RBDR from the Energy Balance of the RM corresponding to data on natural gas. To convert volume of CNG from million m3 to tons, the following ratio was used: 1 m^3 = 128.2 kg[54].

Table 5-14 Compressed Natural Gases (CNG) consumption in the Republic of Moldova

	2001	**2004**	**2008**	**2012**	**2016**	**2018**
Compressed Natural Gas, million m3	12.7	12.0	7.1	4.2	29.0	23.0

[52] Laroo, C.A., Schenk, C.R., Sanchez, L.J., McDonald, J. 2011. Emissions of PCDD/Fs, PCBs, and PAHs from a Modern Diesel Engine Equipped with Catalyzed Emission Control Systems. Environ. Sci. Technol. 45: 6420–6428.
[53] National Inventory Report: 1990 - 2016. Greenhouse Gas Sources and Sinks in the RM, p. 128
[54] https://www.aqua-calc.com/calculate/volume-to-weight/substance/compressed-blank-natural-blank-gas accessed 08.05.2020

Compressed Natural Gas, t	1628140	1538400	910220	538440	3717800	2948600

Source: "Moldovagaz" J.S.C. through Letter No. 02-156 dated 06.02.2004 (for 2001); No. 06-1253 dated 27.09.2006 (for 2004) and No. 02/1-476 dated 23.02.2011 (for 2008) provided to the Climate Change Office; Energy Balances of the RM for 2012-2018

Total amount of fuel used in the calculation of PCDD/PCDF emissions is presented in Table 5-15.

Table 5-15 Activity data for calculation of emissions from category 5c Diesel engines, t

	2001	**2004**	**2008**	**2012**	**2016**	**2018**
Diesel oil	201000	323000	367000	339000	459000	467000
Compressed Natural Gas (CNG)	1628140	1538400	910220	538440	3717800	2948600
Total fuel	**1829140**	**1861400**	**1277220**	**877440**	**4176800**	**3415600**

Calculation of emissions

Emission factors selected to calculate emissions are those for Class 1 Regular Diesel since statistical data provided in the Energy Balance of the RM does not provide any data on Biodiesel.

Table 5-15 PCDD/PCDF Emissions for category 5c Diesel engines

		Annual Release, g TEQ/a				
		Air	**Water**	**Land**	**Product**	**Residue**
2001	**Diesel engines**	**0.183**	0	0	0	0
	1 Regular Diesel	0.183				
2004	**Diesel engines**	**0.186**	0	0	0	0
	1 Regular Diesel	0.186				
2008	**Diesel engines**	**0.128**	0	0	0	0
	1 Regular Diesel	0.128				
2012	**Diesel engines**	**0.088**	0	0	0	0
	1 Regular Diesel	0.088				
2016	**Diesel engines**	**0.418**	0	0	0	0
	1 Regular Diesel	0.418				
2018	**Diesel engines**	**0.342**	0	0	0	0
	1 Regular Diesel	0.342				

Level of Confidence

PCDD/PCDF emission measurements from regular diesel engines are limited; also, emission may vary widely according to the engine technology, mileage and maintenance conditions. A medium level of confidence is assigned to class 1 emission factor[55]. Level of activity assigned to activity data is high since it is based on official statistical data.

Total PCDD/PCDF emissions from source group 5 Transport

		Annual Release, g TEQ/a				
		Air	**Water**	**Land**	**Product**	**Residue**
2001	4-Stroke engines	0.277	0	0	0	0
	2-Stroke engines	0.002	0	0	0	0
	Diesel engines	0.183	0	0	0	0
	Transport	**0.462**	**0**	**0**	**0**	**0**
2004	4-Stroke engines	0.021	0	0	0	0

[55] Toolkit for Identification and Quantification of Releases of Dioxins, Furans and Other Unintentional POPs, CH.II.5 Transport, p. 92

	2-Stroke engines	0.02	0	0	0	0
	Diesel engines	0.186	0	0	0	0
	Transport	**0.210**	**0**	**0**	**0**	**0**
2008	4-Stroke engines	0.016	0	0	0	0
	2-Stroke engines	0.002	0	0	0	0
	Diesel engines	0.128	0	0	0	0
	Transport	**0.146**	**0**	**0**	**0**	**0**
2012	4-Stroke engines	0.013	0	0	0	0
	2-Stroke engines	0.02	0	0	0	0
	Diesel engines	0.088	0	0	0	0
	Transport	**0.103**	**0**	**0**	**0**	**0**
2016	4-Stroke engines	0.013	0	0	0	0
	2-Stroke engines	0.002	0	0	0	0
	Diesel engines	0.418	0	0	0	0
	Transport	**0.433**	**0**	**0**	**0**	**0**
2018	4-Stroke engines	0.013	0	0	0	0
	2-Stroke engines	0.002	0	0	0	0
	Diesel engines	0.342	0	0	0	0
	Transport	**0.357**	**0**	**0**	**0**	**0**

Source Group 6: Open Burning Processes

This source group comprises two source categories of open burning (i.e., combustion with no equipment or containment present) of the following materials:

- Biomass (forests, savannahs, grasslands, agricultural crop residues), and
- Waste (mainly domestic or municipal solid waste burned in official landfills, other dumps or private backyards; vehicles, buildings and factories burned in accidental fires; and construction/demolition waste).

None of these combustion processes and fires occurs under defined or optimized conditions. Aeration occurs by natural ventilation. In the first source category, burning conditions vary from poor to highly efficient depending on the type of fuel, fuel arrangement and the ambient conditions such as humidity, temperature, fuel moisture and wind speed. In the second group, burning conditions are commonly poor due to heterogeneous composition, compacted and poorly mixed fuel materials. Further, moisture and lack of oxygen may contribute to additional complexity. Typically, there is no intervention to select the fuels or to improve the combustion conditions. In certain jurisdictions, some of these processes are not authorized and are therefore un-documented. Consequently, the releases from these processes tend to be underestimated because of difficulties in assessing the overall national activity.

Throughout this source group, releases of unintentional POPs with solid residues such as combustion ashes are regarded as releases to land rather than release to residue, since due to the lack of containment, the ashes are disposed on land and are typically not collected for further disposal. Therefore, an EF_{Land} is provided. Subsequently, to avoid double-counting, no EFR_{esidue} is provided, although the release vector is ash.

6.a Biomass burning

This category covers the burning of biomass where it occurs in the open. It includes all fires in natural and managed ecosystems including forests, woodlands, shrublands, grasslands, savannah, plantations, and all fires in agricultural lands. This section does not address any process that converts biomass into another form of energy such as steam, controlled combustion in appliances such as stoves, furnaces and boilers.

Fires in natural and managed ecosystems include wildfires regardless of the ignition source and all fires conducted for land management including fuel reduction for wildfire mitigation, biodiversity management, forest slash removal and seed bed preparation following logging operation, and the removal of forest biomass following land clearing for conversion to agriculture and other land uses. Ignition sources include lightning, deliberate arson, accidental ignitions (e.g., burning cigarettes, glass, welders, power transmission lines) and authorized ignitions for management purposes.

Fires are also commonly used in agriculture. Post-harvest field burning is practiced to remove residues prior to soil preparation and sowing, to control weeds, and release nutrients for the next crop cycle, however, also negative effects on soil may occur and, ideally, this practice is used judiciously. It is applied extensively, but not exclusively, in cereal production (wheat, rice, maize, and coarse grains) in many regions. Pre-harvest burning is used in some crops, to remove debris and pests and to facilitate manual and mechanical harvesting.

Emission Factors

Emission from this source category will vary depending on ambient atmospheric conditions, fuel type and structure, composition, and contamination with PCDD/PCDF precursors. When biomass fuels are wet or compacted, burning efficiency is poor, combustion temperature is low, and consequently, PCDD/PCDF emissions are high. PCDD/PCDF emissions are also assumed to be high when the biomass has been treated with pesticides that act as PCDD/PCDF precursors or as catalysts for PCDD/PCDF formation, in these cases the biomass is said to be “impacted”. At the other extreme, burning of dry, virgin biomass of small size would burn efficiently and have small emission factors.

PCDD/PCDF Emission factors for activities relevant to the Republic of Moldova are listed in Table 6-1. Revised or newly added PCDD/PCDF emission factors are highlighted in red. Emission factors for dioxin-like PCB are given in Table 6-2 below.

Table 6-1 PCDD/PCDF emission factors for source category 6a Biomass Burning

8.e	**Biomass Burning**	**Emission Factors (µg TEQ/t biomass burned)**				
Classification		**Air**	**Water**	**Land**	**Product**	**Residue**
1	Agricultural residue burning in the field, impacted, poor burning conditions	30	ND	10	NA	NA
2	Agricultural residue burning in the field, not impacted	0.5	ND	0.05	NA	NA
4	Forest fires	1	ND	0.15	NA	NA

Table 6-2 Dioxin-like PCB emission factors for source category 6a Biomass Burning

8.e	**Biomass Burning**	**Emission Factors (µg TEQ/t biomass burned)**				
Classification		**Air**	**Water**	**Land**	**Product**	**Residue**
1	Agricultural residue burning in the field, impacted, poor burning conditions	3*		0.3*		
2	Agricultural residue burning in the field, not impacted	0.05		0.01		
4	Forest fires	0.1		0.1		

* Based on expert judgment and analogy to PCDD/PCDF data

Class 1 includes the open burning of agricultural biomass in the field under conditions that may favor increased PCDD/PCDF formation and release. Although little experimental data exist, it is assumed that prior application of chlorinated pesticides to crops would increase PCDD/PCDF formation and release. Other contributing factors include unfavorable burning conditions such as large piles or humid materials. In general, the biomass may be cereal, legume oilseed or fibre crops and can be burned as stubble, cut and left in the field or bundled into piles. This class potentially includes a wide range of fire intensity from relatively cool, low-intensity fires with mostly smouldering combustion to hot, high intensity, fast-moving fires with efficient combustion.

Class 2 addresses the same type of biomass and geometry of the fuel; however, the fuel and the burning conditions would constitute best environmental practices such as the absence of precursors or other conditions that favor PCDD/PCDF formation. These fires also range from cool to hot fires.

Class 4 includes all types of forest fires, including those in which whole trees are burned, canopy fires and forest litter burns.

The Toolkit emission factors for open burning were significantly revised since the 2005 edition, and new source classes added to the respective categories. These two factors will most likely trigger the need to revise baseline estimates in most cases. Data on open burning is very limited at the country level, and expert judgment will be needed to fill such gaps. Checking the assumptions made in the baseline inventory to estimate activity rates and applying the same assumptions in the updated inventory equally enables obtaining consistent results and coherent trends in releases over time.

Activity rates

The activity for this source category is the mass of fuel consumed as tons dry matter. National data are not available in this form, and therefore the activity is calculated using other information, such as the total area in each emission class multiplied by the density of combustible fuel (e.g., tons dry matter consumed per hectare burned). Combustible fuel density is determined from measurements of above ground biomass of potential fuel classes and the fraction of this mass that is actually burned. Consequently combustible fuel density varies with vegetation class, fire class and season. A compilation of average fuel densities for vegetation classes relevant to the Toolkit classes is provided in Table 6-3.

Table 6-3 Summary of information on biomass fuel consumed in open fires applicable to the RM (compiled from IPCC 2006[56], Volume 4, Chapter 2, Tables 2.4 and 2.5)

Ecosystem	Fire category	Fuel burned (t dm/ha)
Natural Ecosystems		
Temperate forest	Wildfire	11
	Post logging slash	48
	Land clearing	25
Shrublands		10
Agricultural Systems		
Wheat		3.6
Maize		8

Table 6-3 should be supplemented with country-specific data where available.

For estimating the releases of PCDD/PCDF from biomass fires, countries may wish to apply the approach as shown for France for calculation of the amount of material expected to be involved in a biomass fire based on the land area involved. In the French inventory, the following approaches have been used to estimate the PCDD/PCDF releases from forest fires[57]:

- In the temperate zone, forests typically have 20 kg of biomass per square meter (20 kg/m²) corresponding to 200 t/ha;
- In the temperate zone on average, 20% of the vegetation is removed by the fires hence the fuel burned is 40 t/ha.

<u>Forest Fires</u>

Activity data on forest land affected by fires are available in Statistical Yearbooks of the RM and those of the ATULBD[58] (Table 6-4).

Table 6-4 Forest Land Areas Affected by Fires in the RM, ha

	2001	2004	2008	2012	2016	2018
Right bank of Dniestr River	41.60	42.0	31.0	460.0	173.0	17.3
Left bank of Dniestr River	15.40	46.0	24.0	35.8	59.8	5.9
Total in the RM	**57.0**	**88.0**	**55.0**	**495.8**	**232.8**	**23.2**

[56] IPCC 2006. Guidelines for National Greenhouse Gas Inventories. Prepared by the National Greenhouse Gas Inventories Programme. Eggleston, H.S., Buendia, L., Miwa, K., Ngara, T. and K. Tanabe (eds.). IGES, Japan.
[57] Béguier, S. 2004. Information submitted to UNEP Chemicals by CITEPA, Paris, France. Cited in Toolkit for Identification and Quantification of Releases of Dioxins, Furans and Other Unintentional POPs, 2013, CH. II.6
[58] http://mer.gospmr.org/gosudarstvennaya-sluzhba-statistiki/informacziya/ezhegodnik-gosudarstvennoj-sluzhby-statistiki.html

Source: Statistical Yearbooks of the RM for 2009 (p. 22), for 2017 (p. 26), for 2019 (p. 27) Table 1.3.6 Forest Fires, as of November 1; Statistical Yearbooks of the ATULBD for 2005 (p. 82), for 2013 (p. 88), for 2017 (p. 91), for 2019 (p. 89).

Calculated amount of biomass burned in forest fires

According to the information presented in the National Inventory Report of GHG from 1990 to 2016, most fires are located in young forests or stands, in particular in the vicinity of croplands. Taking into account this information, it is expected that the amount of biomass in this forests is lower than 20 kg of biomass per m^2 typical for temperate forests. Therefore, it is assumed that around 1/3 or 7 kg of biomass per m^2 is involved in such fires, corresponding to 70 t/ha.

Using, also, the assumption that 20% of the vegetation is removed by the fires, it is estimated that around 14 t of forest biomass is burned per 1 ha. The same assumptions are used for the ATULBD territory.

The activity data used in the calculation of PCDD/PCDF emissions from this source is presented in Table 6-5 below.

Table 6-5 Activity data on Forest Fires in the RM, tons

	2001	**2004**	**2008**	**2012**	**2016**	**2018**
Total amount of forest biomass burned	798	1232	770	6941	3259	325

Post-Harvest Field Burning of Agricultural Residues (Stubble Fields Burning)

Crop residues are burnt in fields to clear the stubble fields from the straw left after reaping (in the RM, stubble fields are most often burnt after reaping of wheat and barley) and to prepare the fields for the next agricultural cycle[59]. It should be noted that though burning of stubble fields is prohibited by law, this practice still persists in the RM.

The main sources of reference for the activity data used: National Environment Reports of the Republic of Moldova: areas where the stubble fields were burnt and Statistical Yearbooks of the Republic of Moldova and those of the ATULBD: forestlands that suffered from fires[60].

The information on post-harvest field burning of crop residues (stubble fields burning) cases in the RM is reported annually by the State Ecological Inspectorate's territorial inspectors and it is provided in the Table 6-6[61].

Table 6-6: Stubble Fields Burning in the Republic of Moldova

	2001	**2004**	**2008**	**2012**	**2016**	**2018**
Burnt stubble fields, ha	9500	400	4465	106	321	110

Source: State Ecological Inspectorate (2014), SEI Yearbook - 2013 "„Environment Protection in the Republic of Moldova"/ State Ecological Inspectorate; editorial board: V. Curari [et al.]. - Ch.: Pontos, 2014 (Publishing house "Europres"). - 300 p. (page 107, Figure 5, data regarding 2000-2013 time series); SEI Yearbook -2016 „Environment Protection in the Republic of Moldova"/ Ministry of Environment, State Ecological Inspectorate, Chisinau, 2016 (page 79); State Ecological Inspectorate (2019), IEP Yearbook - 2018 "„Environment Protection in the Republic of Moldova"/ Ministry of Agriculture, Regional Development and Environment, Inspectorate for Environment Protection, Chisinau, 2019.

The mean arithmetic value of 5.8 t d.m/ha (tons dry matter consumed per hectare burned) for density of combustible fuel for wheat and maize provided in Table 6-2 above are used in the calculations for Stubble Fields Burning.

[59] National Inventory Report: 1990 - 2016. Greenhouse Gas Sources and Sinks in the RM, p.353
[60] National Inventory Report: 1990 - 2016. Greenhouse Gas Sources and Sinks in the RM, p. 336
[61] National Inventory Report: 1990 - 2016. Greenhouse Gas Sources and Sinks in the RM, p. 358-359

Calculated amount of biomass burned in the field

To calculate the amount of crop residues burned, the combustion factor (Cf) provided by the 2006 IPCC Guidelines of 0.90 (default value) was used. The equation used for calculation of total amount of field vegetation burned is: Burnt stubble fields, ha * Density of combustible fuel, t d.m/ha * Cf 0.90. The results of calculations are presented in Table 6-7.

Table 6-7 Crop residues burned in the field in the RM, tons

	2001	2004	2008	2012	2016	2018
Agricultural residue burning in the field of cereal and other crops stubble	55100	2320	25897	615	1861	638

Statistical data on fodder burned in fires in 2016 is available from the General Inspectorate for Emergency Situations[62]. Similar information could not be found for the year 2001. The available information is presented in Table 6-8.

Table 6-8 Amount of forage destroyed by fires in the RM

	2001	2004	2008	2012	2016	2018
Fodder destroyed in fire accidents, t	NA	NA	NA	458	713	6617

Source: General Inspectorate for Emergency Situations, Statistical data on number of exceptional situations and fires produced in the RM during 2011-2012; Statistical data on number of fires produced in the RM in the period 01.01 - 31.12 in 2015, 2016 and 2018

Calculation of Emissions

The amount of forage destroyed in fires has been assigned to the amount of *Agricultural residue burning in the field of cereal and other crops stubble.*

Table 6-9 Activity Data used in the calculation of emissions for category 6a Biomass Burning, tons

	2001	2004	2008	2012	2016	2018
Agricultural residue burning in the field of cereal and other crops stubble	55100	2320	25897	1073	2574	7255
Forest Fires	798	1232	770	6941	3259	325

The Class 2 Emission Factors for *Agricultural residue burning in the field of cereal and other crops stubble* were chosen due to the lack of information with regard to the degree that burned crops may be impacted by the use of chlorinated pesticides, as well as difficulty to estimate the burning conditions.

Emissions for source category 6a Biomass Burning

Table 6-10 PCDD/PCDF Emissions for source category 6a Biomass Burning

		Annual Release, g TEQ/a				
		Air	**Water**	**Land**	**Product**	**Residue**
2001	**Biomass burning**	0.028	0.000	0.003	0.000	0.000
	Agricultural residue burning in the field of cereal and other crops stubble	0.028		0.003		
	Forest Fires	0.001		0.000		
2004	**Biomass burning**	0.002	0.000	0.000	0.000	0.000

[62] General Inspectorate for Emergency Situations, Statistical data on number of fires produced in the RM http://dse.md/ro/date_statistice

	Agricultural residue burning in the field of cereal and other crops stubble	0.001		0.000		
	Forest Fires	0.001		0.000		
2008	**Biomass burning**	0.014	0.000	0.001	0.000	0.000
	Agricultural residue burning in the field of cereal and other crops stubble	0.013		0.001		
	Forest Fires	0.001		0.000		
2012	**Biomass burning**	0.007	0.000	0.001	0.000	0.000
	Agricultural residue burning in the field of cereal and other crops stubble	0.001		0.000		
	Forest Fires	0.007		0.001		
2016	**Biomass burning**	0.004	0.000	0.001	0.000	0.000
	Agricultural residue burning in the field of cereal and other crops stubble	0.001		0.000		
	Forest Fires	0.003		0.000		
2018	**Biomass burning**	0.004	0.000	0.000	0.000	0.000
	Agricultural residue burning in the field of cereal and other crops stubble	0.004		0.000		
	Forest Fires	0.000		0.000		

Table 6-11 Dioxin-like PCB Emissions for source category 6a Biomass Burning

		Annual Release, g TEQ/a				
		Air	**Water**	**Land**	**Product**	**Residue**
2001	**Biomass burning**	0.003	0.000	0.000	0.000	0.000
	Agricultural residue burning in the field of cereal and other crops stubble	0.003		0.000		
	Forest Fires	0.000		0.000		
2004	**Biomass burning**	0.000	0.000	0.000	0.000	0.000
	Agricultural residue burning in the field of cereal and other crops stubble	0.000		0.000		
	Forest Fires	0.000		0.000		
2008	**Biomass burning**	0.001	0.000	0.000	0.000	0.000
	Agricultural residue burning in the field of cereal and other crops stubble	0.001		0.000		
	Forest Fires	0.000		0.000		
2012	**Biomass burning**	0.001	0.000	0.001	0.000	0.000
	Agricultural residue burning in the field of cereal and other crops stubble	0.000		0.000		
	Forest Fires	0.001		0.001		
2016	**Biomass burning**	0.000	0.000	0.000	0.000	0.000
	Agricultural residue burning in the field of cereal and other crops stubble	0.000		0.000		
	Forest Fires	0.000		0.000		
2018	**Biomass burning**	0.000	0.000	0.000	0.000	0.000
	Agricultural residue burning in the field of cereal and other crops stubble	0.000		0.000		
	Forest Fires	0.000		0.000		

Level of Confidence

Uncertainties related to annual activity data on forest areas affected by fires and on areas occupied by cereals and average yield per hectare are considered relatively small. At the same time uncertainties related to estimation the areas of stubble fields actually burnt are considered to be medium[63].

Level of confidence of Emission Factors[64]:

6a	**Biomass Burning**	**Level of Confidence**	
Classification			
1	Agricultural residue burning in the field, impacted poor burning conditions	Medium	Value is extrapolated from common knowledge of the processes
2	Agricultural residue burning in the field, *e.g.*, cereal crops, not impacted	High	Relatively large number of consistent results in narrow range, relatively wide geographic coverage
4	Forest fires	High	Relatively large number of consistent results in narrow range, relatively wide geographic coverage

6.b Open burning of Waste and Accidental Fires

This source category includes the deliberate combustion of waste materials for disposal where no furnace or similar is used – for example the burning of domestic waste and other waste in piles in the open, the burning of waste in dumps – both deliberate or accidental, and fires in buildings, cars and other vehicles.

As with the source classes under category 6a, releases of unintentional POPs in solid residues such as combustion ashes are regarded as releases to Land rather than release to Residue since the ashes are disposed on land and are typically not collected for further disposal. Therefore, to avoid double-counting, an EF_{Land} is provided instead of an $EF_{Residue}$.

Emission Factors

Emission factors for PCDD/PCDF are available for five classes as shown in Table 6-13. Revised or newly added emission factors are highlighted in red. Dioxin-like PCB emission factors are provided in Table 6-14.

Emission factors to air were calculated as ng TEQ per kg of carbon burned (ng TEQ/kg C_{burned}). Emission of PCDD/PCDF per ton of waste (µg TEQ/t waste) is calculated by multiplying EF_{Air} (ng TEQ/kg C_{burned}) by the carbon content of the waste and the experimental carbon oxidation factor (COF)[65].

A new practical approach has been developed to allow inventory developers to better characterize the activity, i.e., estimate the mass of waste, which is burned in the open air. The new method takes the whole amount of waste present for the burn event into account. The new method is based on the fact that not all organic carbon that is present in the original waste will be burned; of the carbon burned, the majority is converted to carbon dioxide and carbon monoxide; a much smaller portion to

[63] National Inventory Report: 1990 - 2016. Greenhouse Gas Sources and Sinks in the RM, p.362
[64] Toolkit for Identification and Quantification of Releases of Dioxins, Furans and Other Unintentional POPs, CH. II.6
[65] Fiedler, H., Zhang, T., Yu, G., Solorzano Ochoa, G., Marklund, S., Gullett, B.K., Touati, D., Carroll, W. 2009. Emissions of PCDD/PCDF from burning of waste in developing countries. Organohalogen Compd. 71: 2691-2695. Cited in Toolkit for Identification and Quantification of Releases of Dioxins, Furans and Other Unintentional POPs, 2013, Annex 46.

PCDD/PCDF and other organic hydrocarbons. From experimental data, it was concluded that approximately only 40% by weight of the waste is combustible carbon. In line with global climate calculations of biomass combustion, a carbon oxidation factor of 58% was applied, meaning that only 58% of the 40% combustible carbon burns, resulting in an estimated 23% of the original carbon weight is actually combusted. When the carbon content in the waste is higher and better burn-out is obtained, the overall COF resulted in 42%.[66]

Table 6-12 PCDD/PCDF emission factors for source category 6b Open Burning of Waste and Accidental Fires

6b	**Open Burning of Waste and Accidental Fires**	**Emission Factors (µg TEQ/t material burned)**				
Classification		**Air**	**Water**	**Land**	**Product**	**Residue**
1	Fires at waste dumps (compacted, wet, high organic carbon content)	300	ND	10*	NA	NA
2	Accidental fires in houses, factories	400	ND	400	NA	NA
3	Open burning of domestic waste	40	ND	1*	NA	NA
4	Accidental fires in vehicles (µg TEQ per vehicle)	100	ND	18	NA	NA
5	Open burning of wood (construction/ demolition)	60	10	10	NA	NA

* Based on a few field measurements and consistent with the biomass burn E_{FLand} where the release in the ashes is 5%-10% of the EF_{Air}.

Table 6-13 Dioxin-like PCB emission factors for source category 6b Open Burning of Waste and Accidental Fires

6b	**Open Burning of Waste and Accidental Fires**	**Emission Factors (µg TEQ/t material burned)**				
Classification		**Air**	**Water**	**Land**	**Product**	**Residue**
1	Fires at waste dumps (compacted, wet, high organic carbon content)	30				
2	Accidental fires in houses, factories					
3	Open burning of domestic waste	2				
4	Accidental fires in vehicles (µg TEQ per vehicle)					
5	Open burning of wood (construction/ demolition)					

Class 1 refers to spontaneous or intentional fires occurring in a municipal or domestic waste repository. In some cases, these fires have the purpose of reducing the volume of waste in the repository. Typically, the waste will be relatively high in organic carbon. The combustible material will tend to be compacted and moist, and will burn poorly and slowly; hence the higher emission factor than for class 3.

Class 2 includes accidental fires involving buildings, such as homes and factories. Consequently, emission factors must be given per event and they depend strongly on the materials burned and on the nature of the fire. There is limited information on releases from these fires and a single indicative figure is given to cover all accidental fires excluding fires in vehicles. Chemical fires may lead to very high releases where certain precursor chemicals are involved. However there is insufficient

[66] Toolkit for Identification and Quantification of Releases of Dioxins, Furans and Other Unintentional POPs, 2013, Annex 46, p. 299. URL: http://toolkit.pops.int/Publish/Annexes/A_46_Annex46.html

information to assess releases from chemical fires as a distinct category so releases are included in this class of accidental fires. It should be noted that specific incidents may give rise to local contamination and potential "hot spots".

Class 3 includes burning of domestic waste in open piles, pits, barrels, with no pollution controls. The waste is typically characterized by a large fraction of organic/agricultural waste and is loosely arranged (not compacted).

Class 4 includes fires that involve cars and other vehicles. Limited data are available for deriving emission factors for such events and vehicles involved can vary considerably so emissions are expected to vary as well. Consequently the emission factors here are for rough estimates only.

Class 5 includes open burning of wood and other materials used in construction and remaining after demolition. Such wood may be painted or treated with preservatives and plastics, including PVC, or may be present in the other materials burned.

Activity Data

Fires at waste dumps

Fires at waste dumps in the Republic of Moldova are registered on continued basis at several large dumps such as Balti and Cahul cities and occasionally at numerous small dumps in rural areas. The amount of waste that burns annually at these waste dumps is not known, however an estimate is made part of this report based on the amount of MSW disposed on land in the Republic of Moldova[67] (see Table 6-14 below).

Table 6-14 Activity data on the amount of Municipal Solid Waste (MSW) disposed on land in the RM

	2001	**2004**	**2008**	**2012**	**2016**	**2018**
MSW, t	475490	575440	1003420	1117940	1263090	1303630

Source: National Bureau of Statistics of the Republic of Moldova

Amount of MSW burned at waste dumps is calculated using the following assumptions:

- estimated fraction of waste deposited to burning dumps relative to the total amount of waste disposed on land in the country – 0.1 (based on expert judgement);
- estimated fraction of combustible waste disposed to dumps in the RM – 0.15[68];
- estimated fraction of waste that is actually combusted - 0.2[69].

Estimated fraction of waste burned is the following: 0.1 * 0.15 * 0.2 = 0.003.

Table 6-15 Estimated amount of MSW burned in fires at waste dumps in the RM, t

	2001	**2004**	**2008**	**2012**	**2016**	**2018**
MSW, t	1427	1726	3010	3354	3789	3911

Accidental fires in houses, factories and vehicles

Total number of accidental fires is provided in the Statistical Yearbooks of the RM for 2002-2013. For year 2016 and 2018, statistical data on number and category of accidental fires is available from website of the General Inspectorate for Emergency Situations. Similar data on categories of accidental fires for the years 2001-2012 was not found. For this reason, estimation of emissions from this sub-category was carried out only for year 2016 and 2018.

[67] National Inventory Report of GHG: 1990 - 2016, Ch. 7.2 Solid Waste Disposal (Category 5A), p. 401-402
[68] National Inventory Report: 1990 - 2016. Greenhouse Gas Sources and Sinks in the RM, p. 409
[69] According to the information presented in Annex 46 of the Toolkit, an estimated 23% of the original carbon weight present in waste is actually combusted.

Table 6-16 Number of accidental fires in houses, factories and vehicles in the RM

	2001	2004	2008	2012	2016	2018
Total number of accidental fires	**2706**	**2493**	**2217**	**1984**	**1664**	**1650**
Vehicles	NA	NA	NA	NA	231	238
Housing sector	NA	NA	NA	NA	1246	1233
Industrial buildings	NA	NA	NA	NA	29	34
Deposits and stores	NA	NA	NA	NA	28	36
Agricultural objects	NA	NA	NA	NA	23	17
Destroyed objects	**NA**	**NA**	**NA**	**NA**	**108**	**273**
Fires of proportions	**NA**	**NA**	**NA**	**NA**	**91**	**104**
Fires of big proportions	**NA**	**NA**	**NA**	**NA**	**9**	**NA**

Source: Statistical Yearbook of the RM for 2002, Table 10.14 Registered fires, p. 232; Statistical Yearbook of the RM for 2007, Table 12.9 Registered fires, p. 246; Statistical Yearbook of the RM for 2009, Table 12.9 Registered fires, p. 242; Statistical Yearbook of the RM for 2013, Table 12.10 Registered fires, p. 253; General Inspectorate for Emergency Situations, Statistical data on number of fires produced in the RM in the period 01.01 - 31.12 in 2015 and 2016 http://dse.md/sites/default/files/pdf/tab%201%2012%20luni%202016.pdf

Number of *Accidental fires in houses, factories* is assumed to be the number of accidental fires in the Housing sector, Industrial buildings, Deposits and stores and Agricultural objects.

To calculate emissions from *Accidental fires in houses, factories*, it is necessary to estimate the amount of material burned in these fires. Such data is not available; therefore, only rough estimations can be made based on the size of fires. Amount of material burned in Small fire accidents (number of *Accidental fires in houses, factories* minus *Fires of proportions* and *Fires of big proportions*) is assumed to be around 100 kg, in Fires of Proportions around 1 ton and in Fires of big proportions around 10 tons.

The activity data used to estimate emissions for *Accidental fires in houses, factories* is presented in Table 6-17 below.

Table 6-17 Activity data for Accidental fires in houses, factories

	2001	2004	2008	2012	2016		2018	
					Number of fires	**Total amount burned, t**	**Number of fires**	**Total amount burned, t**
Accidental fires in houses, factories:	**NA**	**NA**	**NA**	**NA**	**1326**	**304**	**1320**	**226**
Small fires	NA	NA	NA	NA	1226	123	1216	122
Fires of proportions	NA	NA	NA	NA	91	91	104	104
Fires of big proportions	NA	NA	NA	NA	9	90	0	0

Open burning of domestic waste

The amount of waste open-burned each year was estimated using Equation 5.7 from the 2006 IPCC Guidelines (Vol. 5, Chapter 5.3.2, page 5.16)[70]:

$MSW_B = P \bullet P_{frac} \bullet MSWP \bullet B_{frac} \bullet 365 \bullet 10^{-6}$

Where:

MSW_B – total amount of municipal solid waste open-burned, kt/yr;

P – population, capita;

[70] 2006 IPCC Guidelines, Vol. 5, Chapter 5.3.2, page 5.16

P_{frac} – fraction of population burning waste (fraction);
MSWP – per capita waste generation, kg waste/capita/day;
B_{frac} – fraction of the waste amount that is burned relative to the total amount of waste treated;
365 – number of days per year; 10^{-6} – conversion factor from kg to kt.

According to the 2006 IPCC Guidelines, in developed countries, P_{frac} can be assumed the rural population for a rough estimate. In a region where urban population exceeds 80 per cent of total population, one can assume no open burning of waste occurs. In a developing country, mainly in urban areas, P_{frac} can be roughly estimated as being the sum of population whose waste is not collected by collection structures and population whose waste is collected and disposed in open dumps that are burned[71].

In the Republic of Moldova, it is assumed that in Chisinau city no open burning of waste occurs, while in the rest of the country it is occurring. The incineration of waste practice is predominantly characteristic to rural areas, both in households and on landfills in order to reduce the volume of solid waste disposed, mainly by burning organic waste (paper, cardboard, plastics and vegetable waste). In the case of the RM, the share of population that burns waste in open-air (P_{frac}) is formed by the rural population ($P_{frac\ rural}$) plus the urban population that do not benefit from sanitation services ($P_{frac\ urban}$) minus population of Chisinau city ($P_{frac} = P_{frac\ rural} + P_{frac\ urban} - P_{Chisinau}$)[72].

The total urban and rural population in the country, including Left Bank of Dniestr River, as well as population of Chisinau city, is presented below in Table 6-18.

Table 6-18 Total urban and rural in the RM, million people

	2001	2004	2008	2012	2016	2018
Republic of Moldova, Total	**4.2863**	**4.2306**	**3.9579**	**3.9260**	**3.8436**	**3.7990**
Rural population (P_{rural})	2.3375	1.9192	1.7225	1.7214	2.1322	2.0935
Total urban population	1.9488	2.3115	2.2354	2.2046	1.7114	1.7055
Population of Chisinau city	0.6620	0.6620	0.6631	0.6676	0.6811	0.6900
Urban population used in the calculations (P_{urban})	1.2868	1.6495	1.5723	1.537	1.0303	1.0155

Source: Draft National Inventory Report: 1990 - 2017. Greenhouse Gas Sources and Sinks in the RM; National Bureau of Statistics, Stable Population by Cities and Years, at the beginning of the year, data for Chisinau City.

It is worth mentioning that specialized waste collection and disposal services exist in the municipalities of the country as well as in the district centres, but this system covers only about 60-90 per cent of the total urban population generating solid municipal waste. Therefore, the share of the population that does not benefit from waste collection services is about 10-30 per cent, or on average about 20 per cent.

In the absence of official data on per capita waste generation, for rural population of the Republic of Moldova an estimated value of 0.5 kg/capita/day was used for year 2001 to 2012 and 0.6 kg/capita/day for year 2016 and 2018. For the urban population, respectively, an estimated value of 0.9 kg/capita/day was used for year 2001 to 2012 and 1.0 kg/capita/day for year 2016 and 2018.

It was considered that circa 20 per cent of the urban population that does not benefit from waste disposal services uses to burn in open-air the organogenic solid waste, while the fraction for solid waste burned (B_{frac_urban}) from the total amount of treated waste in urban areas represents 0.15 (15

[71] 2006 IPCC Guidelines, Vol. 5, Chapter 5.3.2, page 5.16
[72] National Inventory Report: 1990 - 2016. Greenhouse Gas Sources and Sinks in the RM, p. 406

per cent of the total). In rural areas, it was considered that 40 per cent of the population uses to burn in open-air the organogenic solid waste, and the $B_{frac\text{-}rural}$ represents 0.2 (20 per cent of the total) [73].

The total amount of municipal solid waste (MSW) burned in open-air by the population was estimated using the following equation:

$MSW_B = MSW_{B\ urban} + MSW_{B\ rural}$

Where:

$MSW_{B\ urban}$ (t) = P_{urban} (inhabitants) • P_{frac_urban} • $MSWP_{urban}$ • B_{frac_urban} • 365 • 10^{-3}

$MSW_{B\ rural}$ (t) = P_{rural} (inhabitants) • P_{frac_rural} • $MSWP_{rural}$ • B_{frac_rural} • 365 • 10^{-3}

Table 6-19: Activity Data used to estimate PCDD/PCDF Emissions from sub-category Open burning of domestic waste, tons

	2001	**2004**	**2008**	**2012**	**2016**	**2018**
P_{urban} (inhabitants)	1286800	1649500	1572300	1537000	1030300	1015500
P_{rural} (inhabitants)	2337500	1919200	1722500	1721400	2132200	2093500
$P_{frac\ urban}$	0.2	0.2	0.2	0.2	0.2	0.2
$P_{frac\ rural}$	0.4	0.4	0.4	0.4	0.4	0.4
$MSWP_{urban}$ (kg/capita/day)	0.9	0.9	0.9	0.9	1.0	1.0
$MSWP_{rural}$ (kg/capita/day)	0.5	0.5	0.5	0.5	0.6	0.6
$B_{frac\ urban}$	0.15	0.15	0.15	0.15	0.15	0.15
$B_{frac\ rural}$	0.2	0.2	0.2	0.2	0.2	0.2
MSW open-burnt in urban areas, t	12681	16256	15495	15147	11282	12232
MSW open-burnt in rural areas, t	34128	28020	25149	25132	37356	42791
Total amount of MSW open-burnt, t	**46809**	**44276**	**40644**	**40279**	**48638**	**55023**

Open burning of wood was not estimated due to lack of data.

Calculation of Emissions

Table 6-20 PCDD/PCDF Emissions for source category 6b Open Burning of Waste and Accidental Fires

		Annual Release, g TEQ/a				
		Air	**Water**	**Land**	**Product**	**Residue**
2001	**Waste burning and accidental fires**	**2.300**	**0.000**	**0.061**	**0.000**	**0.000**
	Fires at waste dumps	0.428		0.014		
	Accidental fires in houses, factories	0.000		0.000		
	Open burning of domestic waste	1.872		0.047		
	Accidental fires in vehicles	0.000		0.000		
2004	**Waste burning and accidental fires**	**2.289**	**0.000**	**0.062**	**0.000**	**0.000**
	Fires at waste dumps	0.518		0.017		
	Accidental fires in houses, factories	0.000		0.000		
	Open burning of domestic waste	1.771		0.044		
	Accidental fires in vehicles	0.000		0.000		
2008	**Waste burning and accidental fires**	**2.529**	**0.000**	**0.071**	**0.000**	**0.000**
	Fires at waste dumps	0.903		0.030		
	Accidental fires in houses, factories	0.000		0.000		
	Open burning of domestic waste	1.626		0.041		
	Accidental fires in vehicles	0.000		0.000		

[73] National Inventory Report: 1990 - 2016. Greenhouse Gas Sources and Sinks in the RM, p. 409

2012	**Waste burning and accidental fires**	**2.617**	**0.000**	**0.074**	**0.000**	**0.000**
	Fires at waste dumps	1.006		0.034		
	Accidental fires in houses, factories	0.000		0.000		
	Open burning of domestic waste	1.611		0.040		
	Accidental fires in vehicles	0.000		0.000		
2016	**Waste burning and accidental fires**	**3.227**	**0.000**	**0.212**	**0.000**	**0.000**
	Fires at waste dumps	1.137		0.038		
	Accidental fires in houses, factories	0.122		0.122		
	Open burning of domestic waste	1.946		0.049		
	Accidental fires in vehicles	0.023		0.004		
2018	**Waste burning and accidental fires**	**3.488**	**0.000**	**0.189**	**0.000**	**0.000**
	Fires at waste dumps	1.173		0.039		
	Accidental fires in houses, factories	0.090		0.090		
	Open burning of domestic waste	2.201		0.055		
	Accidental fires in vehicles	0.024		0.004		

Table 6-21 Dioxin-like PCB Emissions for category 6b Open Burning of Waste and Accidental Fires

		Annual Release, g TEQ/a				
		Air	**Water**	**Land**	**Product**	**Residue**
2001	**Waste burning and accidental fires**	**0.137**	**0.000**	**0.000**	**0.000**	**0.000**
	Fires at waste dumps	0.043				
	Open burning of domestic waste	0.094				
2004	**Waste burning and accidental fires**	**0.140**	**0.000**	**0.000**	**0.000**	**0.000**
	Fires at waste dumps	0.052				
	Open burning of domestic waste	0.089				
2008	**Waste burning and accidental fires**	**0.172**	**0.000**	**0.000**	**0.000**	**0.000**
	Fires at waste dumps	0.090				
	Open burning of domestic waste	0.081				
2012	**Waste burning and accidental fires**	**0.182**	**0.000**	**0.000**	**0.000**	**0.000**
	Fires at waste dumps	0.101				
	Open burning of domestic waste	0.081				
2016	**Waste burning and accidental fires**	**0.211**	**0.000**	**0.000**	**0.000**	**0.000**
	Fires at waste dumps	0.114				
	Open burning of domestic waste	0.097				
2018	**Waste burning and accidental fires**	**0.228**	**0.000**	**0.000**	**0.000**	**0.000**
	Fires at waste dumps	0.117				
	Open burning of domestic waste	0.110				

Level of Confidence

Through recent studies, more data have been generated including results from developing countries, targeted to generate emission factors which are closer to real country situations. These studies and results cover a larger geographic area than before, and have been published in peer-reviewed literature. On the other hand, extrapolation still needs to be done to estimate the activity and the processes, which especially for source category 6b are not stable. Therefore, although the studies are of good scientific quality, the results are scattered due to heterogeneity of the processes, fuels, and other variables[74].

[74] Toolkit for Identification and Quantification of Releases of Dioxins, Furans and Other Unintentional POPs, 2013, Ch. 6 Open Burning of Waste and Accidental Fires, p. 99

A new practical approach has been developed to allow inventory developers to better characterize the activity rate, i.e., estimate the mass of waste that is burned in the open air.

6a	Biomass Burning	Level of Confidence	
Classification			
1	Fires at waste dumps (compacted, wet, high Corg content)	Medium	Few studies, consistently large range of results, published in peer-review literature
2	Accidental fires in houses, factories	Low	Very few results, large range of data; process is not stable
3	Open burning of domestic waste	Medium	Few studies, consistently large range of results, published in peer-review literature
4	Accidental fires in vehicles (µg TEQ per vehicle)	Low	Very few results, large range of data; process is not stable
5	Open burning of wood (construction/ demolition)	Low	Value is extrapolated from common knowledge the processes

Uncertainties associated with the activity data on the estimated amount of waste open-burnt by the rural and urban population could reach to ± 40 per cent[75]. Thus, the level of confidence is estimated to be medium.

Total Emissions for Source Group 6 Open Burning Processes

Table 6-22 Total PCDD/PCDF Emissions for source category 6 Open Burning Processes

		Annual Release, g TEQ/a				
		Air	**Water**	**Land**	**Product**	**Residue**
2001	Biomass burning	0.010	0	0.001	0	0
	Waste burning and accidental fires	2.300	0	0.061	0	0
	Open Burning Processes	**2.310**	**0**	**0.062**	**0**	**0**
2004	Biomass burning	0.001	0	0.000	0	0
	Waste burning and accidental fires	2.289	0	0.062	0	0
	Open Burning Processes	**2.290**	**0**	**0.062**	**0**	**0**
2008	Biomass burning	0.006	0	0.001	0	0
	Waste burning and accidental fires	2.529	0	0.071	0	0
	Open Burning Processes	**2.535**	**0**	**0.071**	**0**	**0**
2012	Biomass burning	0.007	0	0.001	0	0
	Waste burning and accidental fires	2.617	0	0.074	0	0
	Open Burning Processes	**2.625**	**0**	**0.075**	**0**	**0**
2016	Biomass burning	0.004	0	0.001	0	0
	Waste burning and accidental fires	3.230	0	0.215	0	0
	Open Burning Processes	**3.234**	**0**	**0.216**	**0**	**0**
2018	Biomass burning	0.004	0		0	0
	Waste burning and accidental fires	3.488	0		0	0
	Open Burning Processes	**3.492**	**0**	**???**	**0**	**0**

Table 6-23 Total PCB Emissions for source category 6 Open Burning Processes

		Annual Release, kg				
		Air	**Water**	**Land**	**Product**	**Residue**
2001	Biomass burning	0				

[75] National Inventory Report: 1990 - 2016. Greenhouse Gas Sources and Sinks in the RM, p. 409

	Waste burning and accidental fires	0				
	Open Burning Processes	**0**	**0**	**0**	**0**	**0**
2004	Biomass burning	0				
	Waste burning and accidental fires	0				
	Open Burning Processes	**0**	**0**	**0**	**0**	**0**
2008	Biomass burning	0				
	Waste burning and accidental fires	0				
	Open Burning Processes	**0**	**0**	**0**	**0**	**0**
2012	Biomass burning	0				
	Waste burning and accidental fires	0				
	Open Burning Processes	**0**	**0**	**0**	**0**	**0**
2016	Biomass burning	0				
	Waste burning and accidental fires	0				
	Open Burning Processes	**0**	**0**	**0**	**0**	**0**
2018	Biomass burning	0				
	Waste burning and accidental fires	0				
	Open Burning Processes	**0**	**0**	**0**	**0**	**0**

Source Group 7: Production and Use of Chemicals and Consumer Goods

This source group addresses chemicals and consumer goods that are associated with potential formation and release of PCDD/PCDF during their production and/or use. PCDD/PCDF formation takes place only in processes that involve some form of chlorine. However, PCDD/PCDF may be found in other processes in which PCDD/PCDF-contaminated feedstocks and raw materials are used[76].

The production and use of chemicals and consumer goods is divided into eight source categories that have the potential for PCDD/PCDF releases to air, water, land, residues, and products.

In the Republic of Moldova, no pulp and paper are produced, respectively the category *7.a Pulp and Paper Production* is reported as Not Occurring (NO). Also, chlorinated and non-chlorinated chemicals referred to in source categories 7.b – 7.e are not produced or were produced in the past in the country.

In the RM are monitored the NMVOC emissions from the following sources: polyethylene production, acrylonitrile butadiene styrene (ABS) resins and polystyrene production. Other chemicals production is not occurring. Between 1990 and 2016, no emissions were registered part of GHG inventorying in the Republic of Moldova under the categories 2B1-2B9, including 2B6 "Titanium Dioxide Production"[77].

Source categories *7.g Textile Production* and *7.h Leather Refining* have not been estimated part of this Inventory report due to missing data regarding technologies applied in production processes and use of chemicals in the finishing of textiles and leather goods. However, in the overall context this route cannot be regarded as significant.

Estimates have been made for source category 7*.f Petroleum Production.*

Category 7.f Petroleum Production

The petroleum refining industry converts crude oil into refined products, including liquefied petroleum gas, gasoline, kerosene, aviation fuel, diesel fuel, fuel oils, lubricating oils, bitumen and feedstock for the petrochemical industry.

Petroleum refining processes that have been identified as PCDD/PCDF sources include:

- Coking units use heat to thermally crack heavy hydrocarbon streams to form lighter, more useful distillates such as heating oils or gasoline. Traditional fluid coking units are one of the largest vent emissions sources at a refinery.
- Catalytic reforming units are a series of catalytic reactors that turn naphtha into high-octane gasoline. The catalyst accumulates carbon (coke) so that it must be regenerated. In the continuous process, aged catalyst is continuously moved from the reactor to the regenerator where the carbon is burned from the catalyst with hot air/steam. Chlorine or organochlorines, such as tri- or perchloroethylene, are added to retain catalytic activity. While the catalytic reactors have no direct process vents, the catalyst regenerators do have such vents.
- Flares are compulsory safety equipment used both for safety reasons during upsets, start-up, shut down, and system blow-down and for managing the disposal of waste gases from routine operations.

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[76] Toolkit for Identification and Quantification of Releases of Dioxins, Furans and Other Unintentional POPs, CH. II.7 Production and Use of Chemicals and Consumer Goods, p. 101
[77] National Inventory Report: 1990 - 2016. Greenhouse Gas Sources and Sinks in the RM, p. 199

PCDD/PCDF may be released to air from vent stacks and flares, captured in scrubbing systems and released to water in treated effluents, and released in residues such as exhausted catalysts and wastewater treatment sludge[78].

Emission Factors

Emission factors for calculating releases of PCDD and PCDF from petroleum refineries are presented below for the following processes:

- Flaring of gases released from the petroleum industry
- Catalytic reforming unit (including catalyst regenerator)
- Coking unit
- Refinery-wide wastewater treatment.

PCDD/PCDF emission factors are listed in Tables 7-1 and 7-2. Revised or newly added emission factors are highlighted in red.

Table 7-1 PCDD/PCDF emission factors for source category 7f Petroleum Refining (flaring of gases)

7f	**Petroleum Refining (flares)**	**EFAir µg TEQ/TJ fuel burned**
Classification		
1	Flares	0.25

Table 7-2 PCDD/PCDF emission factors for source category 7f Petroleum Refining (production processes)

7f	**Petroleum Refining (production processes)**	**Emission Factors**				
Classification		**Air mg TEQ/t oil[A]**	**Water pg TEQ/L**	**Land**	**Product**	**Residue mg TEQ/t residue**
1	Catalytic reforming unit (including catalyst regenerator)	0.017	NA	NA	NA	14
2	Coking unit	0.41	NA	NA	NA	ND
	Refinery-wide wastewater treatment	ND	5	ND	ND	ND

[A] Mass of oil specific to each processing unit.

Activity Data

In the Republic of Moldova there are two operational companies in this sector: the first („Valiexchimp" LTD) is involved in oil extraction on the oil fields near Valeni village, Cahul district, and the second one (Arnaut Petrol J.S.C.) owns an oil refinery with a small capacity in the city of Comrat (ATUG)[79].

Data on production of petroleum products in the RM are published in the Energy Balances of the RM since 2003 in PDF format. Data for 2016 and 2018 is available from the Energy Balance of the RM (MS Excel format) in natural units within Chapter „Transformation", category „Petroleum installations". Available data is presented in Table 7-3 below.

Table 7-3 Total Production of petroleum products in the Republic of Moldova, TJ

[78] Toolkit for Identification and Quantification of Releases of Dioxins, Furans and Other Unintentional POPs, CH. II.7 Production and Use of Chemicals and Consumer Goods, p.121
[79] National Inventory Report: 1990 - 2016. Greenhouse Gas Sources and Sinks in the RM, p. 106

	2001	2004	2008	2012	2016	2018
Petroleum products	NO	347	1098	888	607	354

Source: NBS, Energy Balance of the RM for year 2009, 2013, 2017 and 2019

Table 7-4 Production of petroleum products in the Republic of Moldova, tons natural units

Production type		2001	2004	2008	2012	2016	2018
Primary	Petroleum	NO	8000	15000	11000	7000	
Secondary	Diesel oil	NO		4000	3000	6000	2000
	Residual fuel oil	NO		7000	12000	3000	6000
	Other petroleum products	NO			1000	1000	1000
	Lubricants	NO			2000		
	Other hydrocarbons	NO					
	Gasoline	NO					

Source: NBS, Energy Balance of the RM for year 2009, 2013, 2017 and 2019

Calculated emissions

In the calculation of emissions, the total amount of Petroleum products in TJ is assigned to Flares, while the amount in tons as natural units – to Production processes. The amount assigned to Catalytic reforming unit is total amount of petroleum products including Primary plus Secondary production, and the amount assigned to Coking unit is the amount of fuel reaching the secondary production where heavy hydrocarbon streams are thermally cracked to form lighter distillates.

Table 7-5 PCDD/PCDF Emissions for category 7f Petroleum Production

		Annual Release, g TEQ/a				
		Air	Water	Land	Product	Residue
2001	**Petroleum refining**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
	Flares	0.000	0.000	0.000	0.000	0.000
	Production process – 1 Catalytic reforming unit	0.000	0.000	0.000	0.000	0.000
2004	**Petroleum refining**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
	Flares	0.000	0.000	0.000	0.000	0.000
	Production process - 1 Catalytic reforming unit	0.000	0.000	0.000	0.000	0.000
2008	**Petroleum refining**	**0.005**	**0.000**	**0.000**	**0.000**	**0.000**
	Flares	0.000	0.000	0.000	0.000	0.000
	Production process - 1 Catalytic reforming unit	0.005	0.000	0.000	0.000	0.000
2012	**Petroleum refining**	**0.008**	**0.000**	**0.000**	**0.000**	**0.000**
	Flares	0.000	0.000	0.000	0.000	0.000
	Production process - 1 Catalytic reforming unit	0.008	0.000	0.000	0.000	0.000
2016	**Petroleum refining**	**0.004**	**0.000**	**0.000**	**0.000**	**0.000**
	Flares	0.000	0.000	0.000	0.000	0.000
	Production process - 1 Catalytic reforming unit	0.004	0.000	0.000	0.000	0.000
2018	**Petroleum refining**	**0.004**	**0.000**	**0.000**	**0.000**	**0.000**
	Flares	0.000	0.000	0.000	0.000	0.000
	Production process - 1 Catalytic reforming unit	0.004	0.000	0.000	0.000	0.000

Level of confidence

Emission factors for this source category are associated with a medium level of confidence for all classes, as they are based on a low data range, but not based on expert judgment, and are derived based on a limited geographical coverage. Level of confidence for the activity data is estimated to be medium, since it is not really known the amount of fuel reaching the Coking unit from the total amount of fuel reported.

Total PCDD/PCDF Emissions for category 7 Production and use of chemicals and consumer goods

		Annual Release, g TEQ/a				
		Air	**Water**	**Land**	**Product**	**Residue**
2001	**Production and use of chemicals and consumer goods**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
2004	Petroleum refining	0.000	0.000	0.000	0.000	0.000
	Production and use of chemicals and consumer goods	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
2008	Petroleum refining	0.000	0.000	0.000	0.000	0.000
	Production and use of chemicals and consumer goods	**0.005**	**0.000**	**0.000**	**0.000**	**0.000**
2012	Petroleum refining	0.005	0.000	0.000	0.000	0.000
	Production and use of chemicals and consumer goods	**0.008**	**0.000**	**0.000**	**0.000**	**0.000**
	Petroleum refining	0.008	0.000	0.000	0.000	0.000
2016	**Production and use of chemicals and consumer goods**	**0.004**	**0.000**	**0.000**	**0.000**	**0.000**
	Petroleum refining	0.004	0.000	0.000	0.000	0.000
2018	**Production and use of chemicals and consumer goods**	**0.004**	**0.000**	**0.000**	**0.000**	**0.000**
	Petroleum refining	0.004	0.000	0.000	0.000	0.000

Source Group 8: Miscellaneous

This category comprises five processes that were not placed in other source groups for various reasons. These are: Drying of biomass, Crematoria, Smoke houses, Dry cleaning residues and Tobacco smoking. Source categories *8.a Drying of biomass* and *8.c Smoke houses* have not been estimated part of this Inventory report due to lack of available activity data for these processes. Also, it is expected that scale of potential activities within these categories is small and therefore emissions insignificant. Source category *8.b Crematoria* is not occurring in the Republic of Moldova. Estimates have been made for source categories *8.d Dry cleaning* residues and *8.e Tobacco smoking*.

8.d Dry Cleaning residues

PCDD/PCDF have been detected in the distillation residues from dry cleaning (cleaning of textiles with organic solvents, not washing with water). The PCDD/PCDF sources have been identified as the use of contaminated biocides, such as PCP, to protect textiles or raw materials – wool, cotton, etc. – and the use on textiles of PCDD/PCDF-contaminated dyes and pigments. The dry cleaning process itself does not generate PCDD/PCDF, but rather redistributes PCDD/PCDF already present in the textiles via prior contamination.

During the dry cleaning process, PCDD/PCDF are extracted from the textiles and transferred into the cleaning solvent. When the solvent is distilled for recovery and reuse, PCDD/PCDF are concentrated in distillation residues, which normally are disposed of. Detailed research has shown that PCDD/PCDF concentrations in the distillation residues do not depend on the solvent present in the dry cleaning process [80, 81]. Therefore, the influence of the solvent used is negligible; typical solvents are perchloroethylene, petrol, or fluorocarbons[82].

Emission factors

PCDD/PCDF emission factors for two source classes are listed in Table 8-1.

Table 8-1 PCDD/PCDF emission factors for source category 8d Dry Cleaning Residues

8.d	**Dry Cleaning Residues**	**Emission Factors (µg TEQ/t)**				**Concentration in distillation residues (µg TEQ/t)**
Classification		**Air**	**Water**	**Land**	**Product**	**Residue**
1	Heavy textiles, PCP treated, etc.	NA	NA	ND	ND	3,000
2	Normal textiles	NA	NA	ND	ND	50

Activity rates

As an indication, 15g of residues are formed per kilogram of treated clothes (data from the French Technical Center on Cleaning - CTTN)[83].

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80 Fuchs, R., Towara, J., Hutzinger, O., Kurz, J., Klein, P. 1990. PCDD/F in the dry cleaning process. Organohalogen Compounds. 3: 441-445.
81 Towara, J., Hiller, B., Hutzinger, O., Kurz, J., Klein P. 1992. PCDD/F in distillation residues from dry cleaners. Chemosphere. 25(7-10): 1509-1516.
82 Toolkit for Identification and Quantification of Releases of Dioxins, Furans and Other Unintentional POPs, CH. II.8 Production and Use of Chemicals and Consumer Goods, p. 128
83 Toolkit for Identification and Quantification of Releases of Dioxins, Furans and Other Unintentional POPs, CH. II.8 Production and Use of Chemicals and Consumer Goods, p. 129

As shown in the Toolkit, a ton of residue from a dry cleaning machine may contain from 50 µg TEQ to 3000 µg TEQ of PCDD/PCDF depending on the nature of the cloths and tissues treated and the amount of contamination they contain.

To evaluate emissions of PCDD/PCDF from the dry cleaning industry at a country level using the Toolkit method, one has to estimate the amount of residues generated and the relative nature of the tissues cleaned (heavy or contaminated textiles/normal textiles). In nearly all countries it is difficult to find such data to complete the inventory.

In case of lacking data, the following considerations may help in the estimation of these values:

- The ratio of heavy textiles to normal textiles treated in dry cleaning laundries is varying from country to country; an expert judgment is needed according to local practices;
- Last generation dry cleaning processes use less than 10 kg of solvent per ton of textiles;
- Residues of dry cleaning contain less than 1% of solvent (new dry cleaning processes).

In case there is no data concerning the production rate and the residues generation for the dry cleaning category, another option is to find from official statistics, the average annual imported quantities of solvent for use in dry cleaning (perchloroethylene, Stoddard solvent, other brand names) and make calculations based on this information[84].

Collected data

Information on amount of residues formed from Dry Cleaning are not found in the Report on Waste Formation and Use of the National Bureau of Statistics of the Republic of Moldova, although detailed information on other types of waste formed at enterprises are listed. Hence, the approach chosen to estimate emissions from this category is based on the consumption of solvents used for dry cleaning. Statistical data on the use of solvents is missing, however data on imports of solvents in the RM can be used. Internal production of solvents is very small.

In addition to dry cleaning, other possible uses of these solvents are possible, such as metal degreasing. Therefore, assumptions are made regarding the share of dry cleaning from total amount consumed. In the National Inventory Report of GHG from 1990 to 2016 it is assumed that 35% of total solvents are used for dry cleaning (Table 8-2)[85]. Also, it was assumed that such substances are not re-exported. The same assumptions and activity data are used for the year 2018 in this report.

Table 8-2 Consumption of Solvents Used in Degreasing and Dry Cleaning of Textiles in the RM, tons

Year		Cyclic and Acyclic Hydrocarbons	Alcohols	**Total solvents**
2001	Total use of solvents (Total - 100%)	60.4	225.1	285.4
	Dry Cleaning (35%)	21.1	78.8	**99.9**
2004	Total use of solvents (Total - 100%)	190.7	115.8	306.4
	Dry Cleaning (35%)	66.7	40.5	**107.2**
2008	Total use of solvents (Total - 100%)	111.5	264.9	376.4
	Dry Cleaning (35%)	39.0	92.7	**131.7**
2012	Total use of solvents (Total - 100%)	931.8	427.7	1359.6
	Dry Cleaning (35%)	326.1	149.7	**475.9**
2016	Total use of solvents (Total - 100%)	117.3	425.3	542.5
	Dry Cleaning (35%)	41.0	148.8	**189.9**

[84] Toolkit for Identification and Quantification of Releases of Dioxins, Furans and Other Unintentional POPs, Example Inventory 9 Source Group 8 Miscellaneous http://toolkit.pops.int/Publish/Annexes/E_09_Example09.html

[85] National Inventory Report: 1990 - 2016. Greenhouse Gas Sources and Sinks in the RM, p. 219

2018	Total use of solvents (Total - 100%)	453.2	537.7	990.9
	Dry Cleaning (35%)	158.6	188.2	**346.8**

Source: Custom Service, Official Letter No. 28/07-1893 dated 23.02.2011, as a response to the request No. 03-07/175 dated 02.02.2011, from the Ministry of Environment; Customs Service, Official Letter No. 15-03-05 dated 24.01.2014, as a response to the request No. 320/2014-01-01 dated 03.01.2014, from the Climate Change Office of the Ministry of Environment; Customs Service, Official Letter No. 28/07-612 dated 12.01.2018, as a response to the request No. 601/2017-12-03 dated 14.12.2017, from the Climate Change Office of the Ministry of Agriculture, Regional Development and Environment; Customs Service response by email to the request No. 14-07/15 dated 03.01.2019 from the Ministry of Agriculture, Regional Development and Environment.

Calculation of Emissions

Assuming an average consumption of 10 kg of solvent per ton of textiles treated in dry cleaning processes and that 15 g of residues are formed per kilogram of treated clothes, the production rate of textiles and amount of resulting residues is estimated for the years 2001-2018 (see Table 8-3).

Table 8-3 Estimated amount of Dry-Cleaning treated textiles and resulting residues in the RM

	2001	**2004**	**2008**	**2012**	**2016**	**2018**
Estimated rate of treated textiles, t	9900	10720	13170	47590	18990	34680
Estimated amount of formed residues, t	149	161	198	714	285	520

The ratio between the two categories of textiles treated is not known, but it is assumed that it may be about 1/1. Hence, the activity data used for 8d subcategory is provided in Table 8-4 below.

Table 8-4 Activity data for sub-category 8d Dry Cleaning Residues

	2001	**2004**	**2008**	**2012**	**2016**	**2018**
1 Heavy textiles, PCP-treated, etc	74	80	99	357	142	260
2 Normal textiles	75	81	99	357	143	260

PCDD/PCDF releases in residues are in the Table 8-5 below.

Table 8-5 PCDD/PCDF Emissions for sub-category 8d Dry Cleaning Residues

		Annual Release, g TEQ/a				
		Air	**Water**	**Land**	**Product**	**Residue**
2001	**Dry Cleaning**	**0.000**	**0**	**0**	**0**	**0.226**
	Heavy textiles, PCP-treated, etc.					0.222
	Normal textiles					0.004
2004	**Dry Cleaning**	**0.000**	**0**	**0**	**0**	**0.244**
	Heavy textiles, PCP-treated, etc.					0.240
	Normal textiles					0.004
2008	**Dry Cleaning**	**0.000**	**0**	**0**	**0**	**0.302**
	Heavy textiles, PCP-treated, etc.					0.297
	Normal textiles					0.005
2012	**Dry Cleaning**	**0.000**	**0**	**0**	**0**	**1.089**
	Heavy textiles, PCP-treated, etc.					1.071
	Normal textiles					0.18
2016	**Dry Cleaning**	**0.000**	**0**	**0**	**0**	**0.433**
	Heavy textiles, PCP-treated, etc.					0.426
	Normal textiles					0.007
2018	**Dry Cleaning**	**0.000**	**0**	**0**	**0**	**0.793**
	Heavy textiles, PCP-treated, etc.					0.780
	Normal textiles					0.013

Level of confidence

The emission factors for this source category have been assigned a low level of confidence due to changes and complexity in the textile and leather manufacturing. The uncertainties associated to activity data is high since it is not known exactly the ratio of use of solvents for dry cleaning to other uses and because ratio of the two categories of textiles treated is not really known.

8.e Tobacco Smoking

As any other thermal process, "combustion" of cigarettes and cigars produces PCDD/PCDF. The quantity of tobacco in cigarettes varies but is commonly less than 1 gram per cigarette. Cigars vary both in their size and their tobacco load. Large cigars may contain as much tobacco as an entire pack of 20 cigarettes, while small cigars (cigarillos) may be similar in size and tobacco content to that of one cigarette.

Emission Factors

PCDD/PCDF emission factors for two source classes are listed in Table 8-6. Revised or newly added emission factors are highlighted in red.

Table 8-6 PCDD/PCDF emission factors for source category 8e Tobacco Smoking

8.e	**Tobacco Smoking**	**Emission Factors (µg TEQ/ million cigars or cigarettes)**				
Classification		**Air**	**Water**	**Land**	**Product**	**Residue**
1	Cigar	0.3	NA	ND	ND	0.3
2	Cigarette	0.1	NA	ND	ND	0.1

NB: The emission factors for tobacco smoking are applied to total cigarette numbers, not to the weight of tobacco.

Activity rates

The activity rate can be assessed by the following mass-balance equation: Production - Export + Import. While cigarette data are available as numbers of cigarettes, loose tobacco and cigars are usually reported in weight. A conversion factor of 1 g of tobacco per cigarette may be used to estimate the number of cigarettes, i.e. 1 ton of loose tobacco is equivalent to 1,000,000 cigarettes[86]. According to the EMEP/EEA Air Pollutant Emission Inventory Guidebook (2016) (2.D.3.i „Other solvent and product use", SNAP 060602, page 21), one cigar contains 5 g of tobacco. Therefore, 1 ton of tobacco is equivalent to 200,000 cigars.

Collected Data

Statistical data regarding cigars and cigarettes production are available in the Statistical Yearbooks of the RM, the Statistical Report PRODMOLD-A 'Total production, as a natural expression, in the Republic of Moldova, by product type, for 2005-2016', as well as in the statistical database of the National Bureau of Statistics.

Table 8-7 Tobacco production in the Republic of Moldova

	2001	**2004**	**2008**	**2012**	**2016**	**2018**
Cigars and Cigarettes (Total), million units	9421	7050	3990	4656	1839	660
Fermented tobacco, tons	19300	7600	6300	5700	1100	700

Source: NBS, Statistical Yearbook for 2002; Production of main industrial products, 1997-2004 at statbank.statistica.md; Statistical Report PRODMOLD-A 'Total production, as a natural expression, in the RM, by product type, for 2005-2016".

[86] Toolkit for Identification and Quantification of Releases of Dioxins, Furans and Other Unintentional POPs, CH. II.8 Production and Use of Chemicals and Consumer Goods, p. 129

The number of cigarettes equivalent to fermented tobacco is calculated using the conversion factor of 1 g of tobacco per cigarette mentioned above. Hence, the amount of 1 ton fermented tobacco is equivalent to 1 million cigarettes.

The data on number of cigars and cigarettes is aggregated in the national statistical reports, for this reason the assumption from the National Inventory Report of GHG from 1990 to 2016 is used with regard to the share of cigars and cigarettes from the total. Thus, it is considered that cigarettes represent 95 per cent of the total market, while cigars – 5 per cent of the total[87]. In the Table 8-8 below is presented the activity data on production of cigars and cigarettes in million units.

Table 8-8 Activity data on Production of Cigars and Cigarettes, million units

	2001	**2004**	**2008**	**2012**	**2016**	**2018**
Cigars	**471**	**353**	**200**	**233**	**92**	**33**
Cigarettes	8950	6697	3790	4423	1747	627
Cigarettes (equivalent to fermented tobacco)	19300	7600	6300	5700	1100	700
Total Cigarettes	**28250**	**14297**	**10090**	**10123**	**2847**	**1327**

Data on import and export of Cigars and cigarettes is available in kg from comtrade.un.org/data. Using the conversion factor of 1 g of tobacco per cigarette, this data has been converted in million units of cigarettes and presented in Table 8-9. According to the EMEP/EEA Air Pollutant Emission Inventory Guidebook (2016) (2.D.3.i „Other solvent and product use", SNAP 060602, page 21), one cigar contains 5 g of tobacco.

Table 8-9 Activity data on Import and Export of Cigars and Cigarettes in the RM

Year		Cigars, kg	**Total Cigars, million units**	Cigarettes, kg	**Total Cigarettes, million units**
2001	Import	301	0.06	2516371	2517
	Export			49665	50
2004	Import	90	0.018	2082698	2083
	Export			19477	19
2008	Import	1724	0.344	5163990	5164
	Export	4		464319	464
2012	Import	1228	0.246	4663596	4664
	Export	20	0.004	1280406	1280
2016	Import	5147	1.029	4960944	4961
	Export	1269	0.254	455405	455
2018	Import	6297	1.259	4511311	4511
	Export	1795	0.359	1433307	1433

Total activity data that is used in the calculation of emissions represents the Total Consumption of Cigars and Cigarettes in the RM (Production + Import – Export) presented in Table 8-10 below.

Table 8-10 Total Consumption of Cigars and Cigarettes in the RM, million units

	2001	**2004**	**2008**	**2012**	**2016**	**2018**
Cigars	471	353	200	233	93	34
Cigarettes	30717	16361	14790	13507	7353	4405

[87] National Inventory Report: 1990 - 2016. Greenhouse Gas Sources and Sinks in the RM, p.259

Calculated emissions

Table 8-11 PCDD/PCDF Emissions for category 8e Tobacco Smoking

		Annual Release, g TEQ/a				
		Air	**Water**	**Land**	**Product**	**Residue**
2001	**Tobacco smoking**	**0.003**	**0.000**	**0.000**	**0.000**	**0.003**
	Cigar (per million items)	0.000	0.000	0.000	0.000	0.000
	Cigarette (per million items)	0.003	0.000	0.000	0.000	0.003
2004	**Tobacco smoking**	**0.002**	**0.000**	**0.000**	**0.000**	**0.002**
	Cigar (per million items)	0.000	0.000	0.000	0.000	0.000
	Cigarette (per million items)	0.002	0.000	0.000	0.000	0.002
2008	**Tobacco smoking**	**0.002**	**0.000**	**0.000**	**0.000**	0.002
	Cigar (per million items)	0.000	0.000	0.000	0.000	0.000
	Cigarette (per million items)	0.001	0.000	0.000	0.000	0.001
2012	**Tobacco smoking**	**0.001**	**0.000**	**0.000**	**0.000**	0.001
	Cigar (per million items)	0.000	0.000	0.000	0.000	0.000
	Cigarette (per million items)	0.001	0.000	0.000	0.000	0.001
2016	**Tobacco smoking**	**0.001**	**0.000**	**0.000**	**0.000**	**0.001**
	Cigar (per million items)	0.000	0.000	0.000	0.000	0.000
	Cigarette (per million items)	0.001	0.000	0.000	0.000	0.001
2018	**Tobacco smoking**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
	Cigar (per million items)	0.000	0.000	0.000	0.000	0.000
	Cigarette (per million items)	0.000	0.000	0.000	0.000	0.000

Level of confidence

The level of confidence assigned to these emission factors is low due to limited data available and difficult experimental design. The level of confidence assigned to the activity data is medium due to uncertainties related to the share of cigars and cigarettes in the total amount presented by NBS.

Total PCDD/PCDF Emissions for category 8 Miscellaneous

		Annual Release, g TEQ/a				
		Air	**Water**	**Land**	**Product**	**Residue**
2001	**Dry Cleaning**	0.000	0	0	0	0.226
	Tobacco smoking	0.003	0	0	0	0.003
	Miscellaneous	**0.003**	**0.000**	**0.000**	**0.000**	**0.229**
2004	**Dry Cleaning**	0.000	0	0	0	0.244
	Tobacco smoking	0.002	0	0	0	0.002
	Miscellaneous	**0.002**	**0.000**	**0.000**	**0.000**	**0.246**
2008	**Dry Cleaning**	0.000	0	0	0	0.302
	Tobacco smoking	0.002	0	0	0	0.002
	Miscellaneous	**0.002**	**0.000**	**0.000**	**0.000**	**0.303**
2012	**Dry Cleaning**	0.000	0	0	0	1.089
	Tobacco smoking	0.001	0	0	0	0.001
	Miscellaneous	**0.001**	**0.000**	**0.000**	**0.000**	**1.090**
2016	**Dry Cleaning**	0.000	0	0	0	0.433
	Tobacco smoking	0.001	0	0	0	0.001
	Miscellaneous	**0.001**	**0.000**	**0.000**	**0.000**	**0.434**
2018	**Dry Cleaning**	0.000	0	0	0	0.793
	Tobacco smoking	0.000	0	0	0	0.000
	Miscellaneous	**0.000**	**0.000**	**0.000**	**0.000**	**0.793**

Source Group 9: Disposal

Non-thermal waste disposal processes are addressed in this source group. Except in certain cases, these processes are only routes of PCDD/PCDF release, not sources of PCDD/PCDF formation and release. PCDD/PCDF that are already present in the wastes being treated become concentrated or released to one or more vectors by these treatment and disposal processes.

These processes are used to dispose of PCDD/PCDF-contaminated wastes, many of which are residues of processes that have been addressed in other source groups. The management of these residues can result in PCDD/PCDF releases to the environment.

9a Landfills, Waste Dumps and Landfill Mining

In landfills and dumps, biodegradable wastes decompose with the formation of gases and leachate. The passage of rain and other water through the waste in landfills and dumps generates contaminated leachate and runoff. Where no collection systems are installed, landfill gases and leachate escape from the dump in an uncontrolled manner. While PCDD/PCDF have not been quantified/reported in landfill gases, they are known to occur in landfill leachate or seepage and, in some cases, nearby soils.

Landfill mining and reclamation, or excavation/remediation of landfills is a process whereby solid wastes which have previously been landfilled are excavated and processed. The quantity of PCDD/PCDF in landfills being excavated is site specific and needs to be individually assessed in each case. The excavation and remediation activities of landfills containing wastes highly contaminated with PCDD/PCDF must also consider the risks of occupational exposure to PCDD/PCDF[88].

Emission Factors

PCDD/PCDF emission factors for three source classes are listed in Table 9.1. Revised or newly added emission factors are highlighted in red.

This category covers wastes generated at national level that are landfilled. It does not include municipal or hazardous waste that is accounted for in other source groups or source categories, especially in: Source Group 1: 1a Incineration of municipal solid waste, 1b Incineration of hazardous waste and 1c Medical waste incineration.

Table 9-1 PCDD/PCDF emission factors for category 9a Landfills, Waste Dumps and Landfill Mining

9a	**Landfills and Waste Dumps**	**Emission Factors (µg TEQ/t waste disposed of)**				
Classification		**Air**	**Water**	**Land**	**Product**	**Residue**
1	Hazardous wastes	NA	5	NA	NA	NA*
2	**Mixed wastes**	NA	0.5	NA	NA	50
3	Domestic wastes	NA	0.05	NA	NA	5

*The residues of wastes from category 1 to 8 are accounted in the respective categories.

Class 2 applies to landfilling of waste which may contain some hazardous components. A typical situation is in cases when no waste management is in place. This class is most representative for the Republic of Moldova since there is no separate collection of hazardous wastes in place and therefore end up mixed with the domestic wastes.

Activity Data

88 Toolkit for Identification and Quantification of Releases of Dioxins, Furans and Other Unintentional POPs, CH. II.9 Disposal/Landfill, p.130

In the Republic of Moldova only municipal solid waste is being transported to dumps by means of sanitation services, while other organic types of waste such as waste from food processing industry, from animal breeding and phytotechnical waste are transported to the landfills through beneficiary transport units. For this reason, the amounts reported are presented separately for Municipal Solid Waste (MSW) and Industrial Waste (IW). It should be noted that data on MSW refers only to the urban landfills were sanitation services are in place. The amount of solid municipal waste disposed in rural areas are not subject to statistical evidence, as no sanitation services exist there[89].

In the Table 9-2 are presented the data on Municipal Solid Waste (MSW) Disposed on Land and Industrial Waste (IW) estimated part of the Draft National Inventory Report of GHG for 1990 – 2018, based on the data reported by sanitation services and industrial enterprises to the National Bureau of Statistics.

Table 9-2 Amount of Municipal Solid Waste (MSW) Disposed on Land and Industrial Waste (IW) Disposed on Land in the Republic of Moldova

	2001	**2004**	**2008**	**2012**	**2016**	**2018**
MSW, t	475490	575440	1003420	1117940	1263090	1303630
IW, t	391770	465960	756990	472890	555280	592080
Total, t	**867260**	**1041400**	**1760410**	**1590830**	**1818370**	**1895710**

Calculation of Emissions

In the Table 9-3 below are presented the calculated emissions from the Excel Calculation sheet for source category 9a Landfills, Waste Dumps and Landfill Mining.

Table 9-3 Emissions for category 9a Landfills, Waste Dumps and Landfill Mining

		Annual Release, g TEQ/a				
		Air	**Water**	**Land**	**Product**	**Residue**
2001	**Landfills, Waste Dumps and Landfill Mining**	**0**	**0.434**	**0**	**0**	**43.363**
	Mixed wastes		0.434			43.363
2004	**Landfills, Waste Dumps and Landfill Mining**	**0**	**0.521**	**0**	**0**	**52.070**
	Mixed wastes		0.521			52.070
2008	**Landfills, Waste Dumps and Landfill Mining**	**0**	**0.880**	**0**	**0**	**88.021**
	Mixed wastes		0.880			88.021
2012	**Landfills, Waste Dumps and Landfill Mining**	**0**	**0.795**	**0**	**0**	**79.542**
	Mixed wastes		0.795			79.542
2016	**Landfills, Waste Dumps and Landfill Mining**	**0**	**0.909**	**0**	**0**	**90.919**
	Mixed wastes		0.909			90.919
2018	**Landfills, Waste Dumps and Landfill Mining**	**0**	**0.948**	**0**	**0**	**94.786**
	Mixed wastes		0.948			94.786

Level of Confidence

There are multiple sources of uncertainty associated with the PCDD/PCDF levels in waste and the emissions from landfills. Emission factors are thus assigned by the Toolkit authors a medium to low level of confidence. The same level of confidence applies to Activity Data, since it is estimated that

[89] National Inventory Report of GHG: 1990 - 2016, Ch. 7.2 Solid Waste Disposal (Category 5A), p. 403

some types of waste (ex., waste from food processing industry), are not fully covered in the official reports[90].

9b. Sewage and Sewage (Wastewater) treatment

This category addresses municipal sewage that is collected and transported to sewage treatment facilities. Untreated sewage that is collected and discharged directly to surface water, such as rivers, lakes and oceans, is addressed in source category 9c Open Water Dumping. Wastewater and wastewater treatment from industrial production is addressed in Source Group 7 – Production and Use of Chemicals and Consumer Goods.

PCDD/PCDF concentrations in treated effluent are ordinarily low. However, when chlorine is used to disinfect treated effluent, PCDD/PCDF concentrations can increase, in some cases, by as much as 50-fold [91]. Most of the PCDD/PCDF found in sewage and, subsequently, in treated effluent and sewage sludge originate in other processes or products[92]. For example, PCDD/PCDF may occur in sewage because they have been washed from clothing and other textiles treated with PCDD/PCDF-contaminated biocides or dyes and pigments, due to the entry into sewers of runoff of atmospheric deposition of PCDD/PCDF from combustion sources[93], or due to discharges into sewers of untreated industrial wastewater.

For many years, PCDD/PCDF have been reported in sewage sludge of many countries [94].The management of sludge can also result in releases of PCDD/PCDF. For example, land application of sludge can lead to increased PCDD/PCDF in soils[95], in certain vegetation grown on sludge-treated soils[96], and in the tissues and other products of animals that forage on PCDD/PCDF-contaminated soils[97],[98]. Likewise, sludge buried in landfills may contribute to PCDD/PCDF in landfill leachates[99].

Untreated sewage from remote, undeveloped and non-industrialized areas is expected to have relatively low PCDD/PCDF concentrations. Low concentrations may be also expected in countries with stringent controls on discharges of industrial wastewater to sewers, effective controls on the use of PCP, other biocides and dyes and pigments on textiles, and bans on the use of chlorine-bleached toilet paper. Higher levels can be expected in urban areas with mixed industry and use of PCDD/PCDF-

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[90] National Inventory Report of GHG: 1990 - 2016, Ch. 7.2 Solid Waste Disposal (Category 5A), p. 403

[91] Pujadas, E., Diaz-Ferrero, J., Marti, R., Broto-Puig, F., Comellas, L., Roriguez-Larena, M. 2001. Application of the new C18 speedisksTM to the analysis of polychlorinated dibenzo-p-dioxins and dibenzofurans in water and effluent samples. Chemosphere 43: 449-454.

[92] Biogenic formation of PCDD/PCDF from dioxin precursors like chlorophenols has been reported in sewage sludge by some authors. However, biological transformation cannot be quantified in terms of emission factors. Since the use of chlorophenol (including PCP) has decreased the last decades, this source can be considered as not relevant. PCDD/PCDF may also be produced where sludge is thermally dried.

[93] Gihr, R., Kloppfer, W., Rippen, G., Partscht, H. 1991. Investigations on Potential Sources of Polychlorinated Dibenzo-p-dioxins and Dibenzofurans in Sewage Sludges. Chemosphere 23: 1653-1659. Cited in Toolkit for Identification and Quantification of Releases of Dioxins, Furans and Other Unintentional POPs, CH. II.9 Disposal/Landfill, p. 133

[94] Clarke, B., Porter, N., Symons, R., Blackbeard, J., Ades, P., Marriott, P. 2008. Dioxin-like compounds in Australian sewage sludge – Review and national survey. Chemosphere 72: 1215-1228.

[95] Molina, L., Diaz-Ferrero, J., Coll, M., Martí, R., Broto-Puig, F., Comellas, L., Rodríguez-Larena, M.C. 2000. Study of evolution of PCDD/F in sewage sludge-amended soils for land restoration purposes. Chemosphere 40: 1173-1178.

[96] Engwall, M., Hjelm, K. 2000. Uptake of dioxin-like compounds from sewage sludge into various plant species-- assessment of levels using a sensitive bioassay. Chemosphere 40: 1189-1195.

[97] Schuler, F., Schmid, P., Schlatter, C. 1997. The transfer of polychlorinated dibenzo-p-dioxins and dibenzofurans from soil into eggs of foraging chicken. Chemosphere 34: 711–8.

[98] Rideout, K., Teschke, K. 2004. Potential for Increased Human Foodborne Exposure to PCDD/F When Recycling Sewage Sludge on Agricultural Land. Environ Health Perspect. 112: 959–969.

[99] De la Torre, A., Alonso, E., Concejero, M., Sanz, P., Martinez, A. 2011. Sources and behaviour of polybrominated diphenyl ethers (PBDEs), polychlorinated dibenzo-p-dioxins and dibenzofurans (PCDD/Fs) in Spanish sewage sludge. Waste Management 31: 1277–1284.

contaminated consumer goods. Discharges of untreated industrial wastewater to public sewers can cause very high levels of PCDD/PCDF in sewage sludge.

With more advanced treatment – such as biological and chemical treatment - most PCDD/PCDF are likely to be concentrated in the sludge. The amount of PCDD/PCDF in the effluent is likely to be influenced by the amount of suspended solids remaining in the effluent[100].

Emission Factors

PCDD/PCDF emission factors for three source classes are listed in Table 9-4. Revised or newly added emission factors are highlighted in red.

Table 9-4 PCDD/PCDF emission factors for source category 9b Sewage and Sewage Treatment

9b	**Sewage and Sewage Treatment**	**Emission factors**			
Classification		**Air**	**Water (pg TEQ/L)**	**Land***	**Product = Residue (µg TEQ/t d.m.)**
1	Mixed domestic and specific industrial inputs**	NA NA	**10**a **1**b		**NA**a **200**b
2	Urban and industrial inputs	NA NA	**1**a **0.2**b		**NA**a **20**b
3	Domestic inputs	NA NA	**0.04**a **0.04**b		**NA**a **4**b

[a]no sludge removal, [b]with sludge removal
*Use EFProduct when residue (sludge) is applied to land.
** for those emissions which are not covered in source group 7.
Note: the emission factors are given in pg TEQ/L of treated effluent and in µg TEQ per ton of sewage sludge (dry matter = d.m.) generated.

Class 1 should be applied where, besides normal domestic effluents, industrial effluents with a potential to contain PCDD/PCDF as described for categories 1 to 8 are collected in the same sewer system.
Class 2 should be applied for urban, industrial areas without specific potential to contain PCDD/PCDF.
Class 3 should be applied to remote areas with no known PCDD/PCDF sources and urban areas with only domestic inputs.

Activity Data

At national level, there are no centralized records of data regarding the population connected to sewage services. The National Bureau of Statistics gathers data only for centralized sewage systems, while official information on access to other individual sources are not available. The connection rate of the population to centralized sewage systems differs across the country. In urban areas (large cities such as Chisinau and Balti), the percentage of population connected reaches up to 90 per cent, in small towns – up to 58 per cent, while in rural areas circa 9-10 per cent have access to sewage systems. The country-wide connection rate is estimated at 22.2 per cent [101].

[100] Toolkit for Identification and Quantification of Releases of Dioxins, Furans and Other Unintentional POPs, CH. II.9 Disposal/Landfill, p. 133
[101] Government Decision No. 1063 as of 16.09.2016 on the approval of the National Programme for the implementation of the Protocol on Water and Health in the Republic of Moldova for 2016-2025.

Data on the amount of treated waste water in the Republic of Moldova is available from the National Bureau of Statistics of the RM[102]. This data does not cover, however, the territory on the Left Bank of River Dniestr (LBRD). Data for this region has been collected from the State Statistical Service of ATULBD. Total amount of waste water conveyed in the country has been calculated by summing up the data on waste water discharged to surface water reservoirs on the Right Bank of River Dniestr (RBRD) with the data on waste water discharged on the LBRD. The obtained results are used as the activity data for estimating releases for source category 9b Sewage and Sewage Treatment (see Table 9-5 below).

Table 9-5 Sufficiently treated water discharged into Surface Waters, million m3

	2001	2004	2008	2012	2016	2018
RBRD: Treated water according to normative requirements	138	85	115	113	94	123
LBRD: Treated water according to normative requirements	NA	NA	NA	22.9	17.9	17.3
Total RM:	**138**	**85**	**115**	**135.9**	**111.9**	**140.3**

Source: NBS of the RM Statistical Data Bank, Discharge of wastewater in surface waters 2001-2018; Statistical Service of ATULBD, State of housing and communal services for the year 2012, 2016 and 2018

Until the 90's of the last century, in the Republic of Moldova over 580 plants for wastewater biological treatment (WBTP) were built, but by 2001, only 330 were operational, the rest being demolished[103]. In 2002, 106 WBTP[104] operated. In recent years, a clear trend of increasing the number of operational wastewater treatment plants was recorded as new wastewater treatment plants were constructed. In 2015, 97 wastewater treatment plants had project documentation, 21 units operated according to normative requirements, 143 units performed insufficient treatment[105]. During the same year, the discharged water from wastewater treatment plants in Calarasi, Edinet, Floresti, Criuleni and Orhei districts followed the DLA norm.

Currently, untreated wastewater is discharged from Cantemir town into Prut river, from Cimislia town into Cogalnic river, from Rezina town into Dniester river, from Straseni town into Bic river, from Tvardita village, Taraclia district into Chirghij-Chitai river, as well as from Soroca town into Dniester river. Since 2002, the wastewater treatment plant in Soroca is inoperable due to the deterioration of Soroca-Tekinovca (Ukraine) pressure manifold, therefore, the Soroca wastewater, accounting for circa 1000 m3/day, are discharged to the main pumping plant through the sewage system and without treatment is subsequently discharged into the Dniester river.[106]

Most of the existing plants offer only mechanical treatment, while the biological systems with higher energy consumption are not used due to higher costs. Also, there is a lack of modern sludge processing facilities within the wastewater plants. Due to insufficient functioning of wastewater treatment plants, the amount of pollutants in the wastewater discharged from managed sources, as well as the maximum allowable concentration permitted by current standards, are above the limit established by the environmental authority.

[102] National Bureau of Statistics, Statistical Data Bank, Discharge of wastewater in surface waters 2001-2018 https://statbank.statistica.md/pxweb/pxweb/ro/10%20Mediul%20inconjurator/10%20Mediul%20inconjurator__MED020/MED020200.px/table/tableViewLayout1/?rxid=b2ff27d7-0b96-43c9-934b-42e1a2a9a774
[103] State of the Environment in the Republic of Moldova in 2002: (National Report): [addressed to users working or studying in the field] – Ch.: Mediul Ambiant, 2003, - 116 p. (see page 55)
[104] State of the Environment in the Republic of Moldova in 2003: (National Report): [addressed to users working or studying in the field] – Ch.: National Institute of Ecology, 2004, - 130 p. (see page 49).
[105] State Ecological Inspectorate (2016), SEI Yearbook – 2015 „Environment Protection in the Republic of Moldova"/ editorial board.: I. Talmazan [et al.]; coord.: D. Osipov. – Ch. : Pontos, 2016. – 348 p. (see p. 63-64)
[106] National Inventory Report of GHG: 1990 - 2016, Ch. 7.2 Solid Waste Disposal (Category 5A), p. 415

The usual method used for sludge treatment across the country is to deposit it on sludge platforms. Majority of treatment stations have enough capacity to store the formed sludge, except the stations in Chisinau, Balti and Cahul[107]. To address this issue, the Wastewater Treatment station in Chisinau (ACC) has implemented since 2009 the Geotube technology by which the sludge is dehydrated. The Geotubes generate aprox. 87.000 m3 /year of sludge. At a degree of 20% drying, this equals 17.400 t/year[108].

Since 2012, the Water Treatment Station in Chisinau excluded totally use of chlorine in the treatment of drinking water by replacing it with sodium hypochlorite[109]. The volume of wastewater received by ACC In 2016 constituted 40.325 million m3 and in 2017 it decreased to 40.273 million m3[110]. Based on the amount of sludge generated annually at ACC, it is estimated that approx. 216 kg of sludge is formed per year per 1000 m3 of wastewater. This result is in concordance with literature data[111] and the assumption used in the 2015 National Mercury Inventory Report that on average 220 kg of waste sludge is produced per 1 ML = 1000 m3 of waste water treated in the RM. Hence, the same value of 220 kg/ML is used in the present report for the estimation of total amount of sludge generated in the country.

Table 9-6 Amount of sludge production in the RM, tons

	2001	2004	2008	2012	2016	2018
Total amount of sludge generated	30360	18700	25300	29898	24618	30866

Calculation of Emissions

Due to the fact that industrial production is little developed in the Republic of Moldova, it is expected that industrial effluents with a potential to contain PCDD/PCDF as described for categories 1 to 8 are limited. For this reason, Wastewater described as Treated water according to normative requirements in the Table 9-5 has been assigned to *Class 2 Emission factors, With sludge removal*.

Table 9-7 Estimated emissions for category 9b Sewage and Sewage Treatment

		Annual Release, g TEQ/a				
		Air	Water	Land	Product	Residue
2001	**Sewage/sewage treatment**	**0**	**0.028**	**0**	**0**	**0.607**
	2 Urban and industrial inputs - No sludge removal - With sludge removal		0.028 0.000 0.028			0.607 0.607
2004	**Sewage/sewage treatment**	**0**	**0.017**	**0**	**0**	**0.374**
	2 Urban and industrial inputs - No sludge removal - With sludge removal		0.017 0.000 0.017			0.374 0.374
2008	**Sewage/sewage treatment**	**0**	**0.023**	**0**	**0**	**0.506**
	2 Urban and industrial inputs		0.023			0.506

107 Government Decision No. 1063 as of 16.09.2016 on the approval of the National Program for the implementation of the Protocol on Water and Health in the Republic of Moldova for 2016-2025

108 Drinking Water Supply and Sewage Treatment in Chişinău (Moldova) Feasibility Study, Report on sewage treatment, BCI - Seureca – Water Engineering, March 2012, p. 42 https://acc.md/mmedia/2017/03/14-epurarea_apelor_uzate.pdf

109 Activity Report „Apă-Canal Chișinău" for the year 2012. https://acc.md/mmedia/2017/03/raport_acc_2012.pdf

110 Activity Report „Apă-Canal Chișinău" for the year 2017. https://acc.md/mmedia/2018/10/ACC-Raport-activitate-2017.pdf

111 Wastewater engineering: treatment and reuse (4th ed.). Metcalf and Eddy, Inc. McGraw Hill, USA. 2003. p. 1456.

	- No sludge removal - With sludge removal		0.000 0.023			 0.506
2012	**Sewage/sewage treatment**	**0**	**0.027**	**0**	**0**	**0.598**
	2 Urban and industrial inputs - No sludge removal - With sludge removal		0.027 0.000 0.027			0.598 0.598
2016	**Sewage/sewage treatment**	**0**	**0.022**	**0**	**0**	**0.492**
	2 Urban and industrial inputs - No sludge removal - With sludge removal		0.022 0.000 0.022			0.492 0.000 0.492
2018	**Sewage/sewage treatment**	**0**	**0.028**	**0**	**0**	**0.617**
	2 Urban and industrial inputs - No sludge removal - With sludge removal		0.022 0.000 0.028			0.617 0.000 0.617

The data for year 2001 on Treated water according to normative requirements has been reallocated from source category 9c Open Water Dumping to category 9b Sewage and sewage treatment. Hence, resulted emissions part of this Inventory differ significantly than the results presented in the first POPs Inventory Report of the RM from 2003 for the year 2001.

Level of Confidence

The emission factor values are assigned a high confidence level, based on the geographic coverage of available datasets and consistency among the results of the various studies[112].

9.c Open Water Dumping

Open water dumping is the practice of discharging untreated wastewater or other wastes directly into surface waters, i.e. rivers, ground water, lakes or oceans.

Emission Factors

PCDD/PCDF emission factors for three source classes are listed in Table 9-8.

Table 9-8 PCDD/PCDF emission factors for source category 9c Open Water Dumping

9c	**Open Water Dumping**	**Emission Factors (µg TEQ/m³)**				
Classification		**Air**	**Water**	**Land**	**Product**	**Residue**
1	Mixed domestic and industrial wastewater	NA	0.005	NA	NA	NA
2	Urban and peri-urban wastewater with little or no industrial input	NA	0.0002	NA	NA	NA
3	Remote environments	NA	0.0001	NA	NA	NA

Class 1 should be applied, if the wastewater being discharged includes both domestic and industrial wastewater with a potential to contain PCDD/PCDF or stormwater runoff from urban, peri-urban or industrialized areas.
Class 2 should be applied for urban and peri-urban areas with little or no industries.
Class 3 includes remote areas with no known PCDD/PCDF sources.

[112] Toolkit for Identification and Quantification of Releases of Dioxins, Furans and Other Unintentional POPs, CH. II.9 Disposal/Landfill

Activity Data

Table 9-9 Untreated and insufficiently treated wastewater discharged into Surface Water Basins in 2001 and 2016, million m3[113]

	2001	2004	2008	2012	2016	2018
RBRD: Polluted wastewater	13	42	14	9	28	9
..untreated	0.3	1	1	1	2	2
..insufficiently treated	12.6	41	13	7	26	7
LBRD: Polluted wastewater	NA	NA	NA	0.7	1.0	1.0
..untreated	NA	NA	NA	0	0.1	0.1
..insufficiently treated	NA	NA	NA	0.7	0.9	0.9
Total RM: Polluted wastewater	**13**	**42**	**14**	**9.7**	**29**	**10**

Source: **Source:** NBS of the RM Statistical Data Bank, Discharge of wastewater in surface waters 2001-2018; Statistical Service of ATULBD, State of housing and communal services for the year 2012 and 2016

Calculation of Emissions

Polluted untreated and insufficiently treated wastewater has been assigned to Class 2 Emission factors.

Table 9-10 Estimated emissions for category 9c Open Water Dumping

		Annual Release, g TEQ/a				
		Air	Water	Land	Product	Residue
2001	**Open Water Dumping**	**0**	**0.003**	**0**	**0**	**0.000**
	2 Urban and peri-urban wastewater		0.003			
2004	**Open Water Dumping**	**0**	**0.008**	**0**	**0**	**0**
	2 Urban and peri-urban wastewater		0.008			
2008	**Open Water Dumping**	**0**	**0.003**	**0**	**0**	**0**
	2 Urban and peri-urban wastewater		0.003			
2012	**Open Water Dumping**	**0**	**0.002**	**0**	**0**	**0**
	2 Urban and peri-urban wastewater		0.002			
2016	**Open Water Dumping**	**0**	**0.006**	**0**	**0**	**0**
	2 Urban and peri-urban wastewater		0.006			
2018	**Open Water Dumping**	**0**	**0.002**	**0**	**0**	**0**
	2 Urban and peri-urban wastewater		0.002			

The data for year 2001 on Treated water according to normative requirements has been reallocated from source category 9c Open Water Dumping to category 9b Sewage and sewage treatment. Hence, resulted emissions part of this Inventory differ significantly than the results presented in the first POPs Inventory Report of the RM from 2003 for the year 2001.

Total Emissions for Source Group 9 Disposal

		Annual Release, g TEQ/a				
		Air	Water	Land	Product	Residue
2001	Landfills, Waste Dumps and Landfill Mining	0	0.434	0	0	43.363
	Sewage/sewage treatment	0	0.028	0	0	0.607
	Open Water Dumping	0	0.003	0	0	0.000
	Disposal/Landfill	**0**	**0.464**	**0**	**0**	**43.970**
2004	Landfills, Waste Dumps and Landfill Mining	0	0.521	0	0	52.070

[113] National Bureau of Statistics, Statistical Data Bank, Discharge of wastewater in surface waters 2001-2018 https://statbank.statistica.md/pxweb/pxweb/ro/10%20Mediul%20inconjurator/10%20Mediul%20inconjurator__MED020/MED020200.px/table/tableViewLayout1/?rxid=b2ff27d7-0b96-43c9-934b-42e1a2a9a774

	Sewage/sewage treatment	0	0.017	0	0	0.374
	Open Water Dumping	0	0.008	0	0	0
	Disposal/Landfill	**0**	**0.546**	**0**	**0**	52.444
2008	Landfills, Waste Dumps and Landfill Mining	0	0.880	0	0	88.021
	Sewage/sewage treatment	0	0.023	0	0	0.506
	Open Water Dumping	0	0.003	0	0	0
	Disposal/Landfill	**0**	**0.906**	**0**	**0**	88.527
2012	Landfills, Waste Dumps and Landfill Mining	0	0.795	0	0	79.542
	Sewage/sewage treatment	0	0.027	0	0	0.598
	Open Water Dumping	0	0.002	0	0	0
	Disposal/Landfill	**0**	0.825	**0**	**0**	80.139
2016	Landfills, Waste Dumps and Landfill Mining	0	0.909	0	0	90.919
	Sewage/sewage treatment	0	0.022	0	0	0.492
	Open Water Dumping	0	0.006	0	0	0
	Disposal/Landfill	**0**	**0.937**	**0**	**0**	**91.411**
2018	Landfills, Waste Dumps and Landfill Mining	0	0.948	0	0	94.786
	Sewage/sewage treatment	0	0.028	0	0	0.617
	Open Water Dumping	0	0.002	0	0	0.000
	Disposal/Landfill	**0**	**0.978**	**0**	**0**	**95.403**

Source Group 10: Contaminated Sites and Hot-spots

Article 6 of the Stockholm Convention encourages parties to develop strategies to identify sites contaminated with unintentional POPs. This source group includes an indicative list of activities that might have resulted in the contamination of soils and sediments with PCDD/PCDF and other unintentional POPs, including related deposits.

The procedure comprises three tasks:

1. Identifying historical activities that could have caused contamination and identifying the potentially contaminated sites;
2. Assessing these sites for the likely magnitude of the contamination and ranking by their exposure risk;
3. Assessing the degree of contamination of the most significant sites by detailed analysis.[114]

The following source groups were considered when assessing sites potentially contaminated with PCDD/PCDF and other unintentional POPs, as well as (historic) stockpiles of contaminated wastes in the Republic of Moldova:

- Use or application sites of organochlorine compounds known to contain PCDD/PCDF or having PCDD/PCDF precursor potential (production sites of PCB-filled equipment, PCP use in wood preservation, *application areas of pesticides containing PCDD/PCDF*).
- End-of-life storage and disposal/dumping sites of organochlorine compounds known to contain PCDD/PCDF or having PCDD/PCDF precursor potential *(obsolete pesticide storage/burial, PCB storage).*

10.c Application sites of PCDD/PCDF containing pesticides and chemicals

These sites include locations where pesticides and other chemicals containing PCDD/PCDF have been applied.

Historical activities that could have caused contamination

Dioxin-containing herbicides/pesticides such as DDT, HCCH (hexachlorocyclohexane), Heptachlor and Toxaphene have been applied extensively in agriculture in the Republic of Moldova before they have been banned for use in the country (Heptachlor was banned in 1986 and Toxaphene in 1991).

Very high amounts of pesticides were used in agriculture of the Republic of Moldova between 1970 and 1990, amounting over 800 thousand tons and the mean ratio of active substance reached 19.7 kg/ha, which was several times the average level in the former Soviet Union. This level decreased significantly by the year 2001, which was only 2 kg/ha of active substance[115]. Hence, it is expected that this practice has resulted in large contaminated areas.

In the past, stocks of unused pesticides were accumulated over the years across the country in numerous warehouses without proper supervision. As a result, pesticides from these warehouses were stolen, buried without control or leaked due to damaged packaging and improper storage. Hence, due to this practice, during the period from 1995 to 2003 it was estimated that stocks of banned and unusable pesticides from these warehouses decreased by 600 tons, including Heptachlor and Toxaphene. Also, during this period around 60% of storehouses have been destroyed and demolished.

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[114] Toolkit for Identification and Quantification of Releases of Dioxins, Furans and Other Unintentional POPs, CH. II.10 Contaminated Sites and Hotspots, January 2013

[115] National POPs Inventory of the Republic of Moldova, Chisinau, 2003, page 34

Identifying potentially contaminated sites

Part of the First POP National Inventory from 2003, around 1712 tons of unusable and banned pesticides were identified in the remaining storehouses. From them, the composition of only 777 tons could be identified, which included also POP pesticides such as Heptachlor - 0.08 t and Toxaphene – 1.6 tons[116].

Cartography of POP contaminated sites was carried out with external financial assistance and a public database (http://pops.mediu.gov.md) was created with 1600 locations of the pesticide warehouses mentioned above and other facilities associated to the application of pesticides. Studies carried out in the proximity of the deposits indicated that the soil and surface water are contaminated with POP[117].

Among the identified contaminated sites, territory of the warehouse and the facility chemicals mixing in village Varatic, district Ricani, was shown to be highly contaminated with residues of DDT (16592.5 µg/kg in the 0-60 cm soil layer) and HCH (125,7 µg/kg in the 0-20 cm soil layer). Also, aquatic sediments in the surrounding area were found to be contaminated[118].

Another potential contaminated site is the secured landfill for burial of unusable and banned pesticides built in 1978 near village Cismichioi in UTA Gagauzia. During 1978-1988 there were buried 3.94 thousand tons of pesticides, including 654.1 t of DDT and 1303 t of HCCH[119]. Analysis of POP content in the soil on top of the landfill indicated that residues of chloro-organic pesticides were present in a concentration exceeding the MAC, but the soil outside the landfill had residues within the permissible concentrations in the soil. It has shown, also, that waters around the landfill were free of residues[120].

Earlier studies performed by the Institute of Experimental Meteorology of the former Soviet Union revealed that DDT concentration in almost 60% of soil samples in the period 1979 -1985 was higher than the Maximum Allowable Concentration (MAC), even though DDT had been banned since 1970. Also, surface water pollution with DDT and HCCH was established during that time by the State Hydrometerological Service (SHS) of the Republic of Moldova, with values of DDT residues in 1980 reaching 8.8-9.7 ppm.

After 1989, analyses performed by the Agrochemical Service of the RM reflected that in the majority of soil samples the concentration of DDT, DDE and HCCH did not exceed the MAC. Residues of HCCH were detected in water until 1993, but analyses from 1994-1995 did not show any DDT and HCCH residues in surface or underground water. Measured data from 2002 by SHS detected DDT residues at the level of 0.0-0.1 ppm. Also, monitoring results of soil and water quality performed in the period 1999-2003[121] showed that evaluated soils and water sources such as wells, rivers and lakes did not contain residues of organochlorine pesticides. Nevertheless, studied performed by the National Institute of Ecology highlighted the presence of DDX compounds in the mud of lake Colonita and river Ciuhur[122].

Analysis of the degree of contamination with PCDD/PCDF of pesticide application sites has not been so far initiated in the Republic of Moldova. An indirect assessment of human exposure to PCDD/PCDF and other POP can be made based on the results of the WHO/UNEP survey on PCDDs, PCDFs, PCBs

[116] National POPs Inventory of the Republic of Moldova, Chisinau, 2003, p. 31
[117] Information from the official website of the Implementation unit of POP projects in Moldova URL: http://www.moldovapops.md/info/ retrieved on 01.05.2020
[118] National POPs Inventory of the Republic of Moldova, Chisinau, 2003, p. 36
[119] National POPs Inventory of the Republic of Moldova, Chisinau, 2003, p. 34
[120] Data of investigations performed within the TACIS Program for "Environment Protection of Danube Basin" in 1999 cited in National POP Inventory, Chisinau, 2003.
[121] Studies conducted by ONG BIOS in 1999-2000 and Societe Generale de Surveillance (SGS Moldova) in 2000-2003 cited in the National POPs Inventory of the Republic of Moldova, Chisinau, 2003, page 36.
[122] National POPs Inventory of the Republic of Moldova, Chisinau, 2003, page 38

and DDT in human milk carried out between 2000 and 2003. It showed that levels of PCDDs and PCDFs were around 7.5 pg/kg lipid in pooled human milk sampled from women in the Republic of Moldova, which is above the calculated safe level of these compounds for the breastfed infant. Also, Republic of Moldova ranked among the highest with values above 7 pg/kg lipid of DL-PCBs in pooled human milk, which is high above the calculated safe level of these compounds for the breastfed infant. Results for the sum of DDT-like compounds indicated the presence of high ΣDDTs levels above 1000 µg/kg lipid[123].

It should be noted that three sites contaminated with POPs pesticides from village Congaz (UTAG), village Bujor in district Hincesti and village Step-Coci in Orhei district have been remediated during 2007-2008 and the best available techniques for remediation of POP contaminated sites have been evaluated.

During the period 2006-2010, several projects were implemented in the country aiming at addressing the issue of accumulated POP stockpiles. Thus, a total of 1292 tons of pesticides contaminated with POP were evacuated abroad and destroyed. From 2013 to 2014, other 200 tons of pesticide wastes were collected from the RBRD and 105 tons from the LBRD[124].

Present use

2,4-D (2,4-Dichlorophenoxyacetic acid) and other chlorinated pesticides are still applied in agriculture in RM. Several pesticides confirmed or suspected to contained dioxins, listed in a Technical Report from 2000 on Dioxin Flow in Denmark[125], were found as being used in the Republic of Moldova in 2016. These are: **2,4 D, Dicamba, Diflubenzuron, Imazalil, MCPA (2-methyl-4-chlorophenoxyacetic acid).** Also, Bromoxynil is currently allowed for use in the RM, however no recorded use has been reported for it in 2016.[126]

Chlorinated pesticides can contain impurities of dibenzo-*p*-dioxins and dibenzofurans (PCDD/Fs), and their precursors, as a result of various manufacturing processes and conditions. **2,4-D**, a chlorophenol derivative, is commonly believed to be free of dioxins. However, dioxin levels ranging from 195 to 915 parts per trillion (ppt) TEQ were found in 2,4-D manufactured in the U.K., Russia and Western Europe[127]. Elevated levels of dioxins were found in 2013 in a generic version of 2,4-D, one of Australia's most widely used herbicides.[128] Moreover, a study which investigated whether PCDD/Fs are formed when 2,4-dichlorophenoxyacetic acid (2,4-D) is exposed to sunlight observed considerable formation of PCDD/PCDFs in the 2,4-D formulation (to a maximum concentration of 140 µg ∑PCDD/ PCDF kg^{-1}). Thus, high concentrations of dioxins may thus be formed via this pathway after pesticide use[129].

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123 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5225187/ WHO/UNEP global surveys of PCDDs, PCDFs, PCBs and DDTs in human milk and benefit–risk evaluation of breastfeeding. Archives of Toxicology. 2017; 91(1): 83–96

124 Information from the official website of the Implementation unit of POP projects in Moldova URL: http://www.moldovapops.md/management/ retrieved on 01.05.2020

125 Substance Flow Analysis for Dioxins in Denmark, Technical Report, Erik Hansen, COWI, 2000, p. 26 URL: https://www.researchgate.net/publication/299470057_Substance_Flow_Analysis_for_Dioxins_in_Denmark

126 Report on the stocks and the use of plant protection products from 16 December 2016 of the NBS of the RM.

127 Schecter, A., Papke, O., Isaac, J., Hrimat, N., Neiroukh, F., Safi, J., El-Nahhal, Y. 1997. 2,3,7,8 Chlorine Substituted Dioxin and Dibenzofuran Congeners in 2,4 - D, 2,4,5-T and Pentachlorophenol. Organohalogen Cpds. 32: 51-55 cited in Costner P (1999). Dioxin elimination - a global imperative. Greenpeace Int., Amsterdam.

128 Four Corners By Janine Cohen (22 July 2013). "Four Corners investigation finds dangerous dioxins in widely used herbicide 2,4-D". Abc.net.au. Retrieved 07.04.2020 https://www.abc.net.au/news/2013-07-22/four-corners-dangerous-dioxins/4833848

129 Formation of dioxins during exposure of pesticide formulations to sunlight. Eva Holt, Roland Weber, Gavin Stevenson, Caroline Gaus. Chemosphere. Volume 88, Issue 3, July 2012, Pages 364-370. https://www.sciencedirect.com/science/article/pii/S0045653512004109?via%3Dihub

Estimated amount of 2,4-D (active substance) used in RM in 2016 is about 32 000 kg[130]. Possible emissions arising from this activity are not estimated due to lack of relevant Emission factors.

The extent of use in the Republic of Moldova of other organochlorine chemicals such as tetrachlorethene or trichlorethene, which can be contaminated with HCB (hexachlorobenzene) and PeCB (pentachlorobenzene)[131], is not well documented. According to the import data retrieved from comtrade.un.org website, Republic of Moldova imported 2,362 kg of Mixtures containing halogenated derivatives of methane, ethane and propane; containing 1,1,1-trichlorethane (methyl chloroform) only in 2013. It is generally used for cleaning metal parts or as a solvent for paints and adhesives. Tetrachloroethene, also known as tetrachloroethylene or perchloroethylene, is used for degreasing of metal parts and in dry cleaning. In 2015 and 2016 the amount imported annually constituted on average 9 300 kg, in 2017 and 2018 it increased over 13 000 kg[132].

10. f Use of PCB

The use of PCB has generated a large number of sites and hotspots contaminated with PCDF and dioxin-like PCB via production, use in industries, releases from equipment and open applications. Commercial mixtures of PCB contain dioxin-like PCB, non-dioxin-like PCB and PCDF, with a major TEQ contribution (> 90%) from dioxin-like PCB[133]. PCDF releases can only be estimated based on of the ***amount of PCB leaked***. For this assessment, the total TEQ of PCDF and dioxin-like PCB needs to be considered. With the increasing age of the equipment and longer time of operation, PCDF concentrations in equipment fillings increase, and in the case of high thermal stress (fire event, short circuit) PCDF become the main TEQ contributor.

The open uses of PCB, largely as sealants and paints in buildings and in industrial installations, can be considered as hotspots.

If the transformers and capacitors are in a good condition and well maintained, with no leakage, PCB and PCDF are not released into the environment. Once the equipment is leaking, PCDF together with PCB and possibly PeCB will subsequently be released into the surroundings, in soils and sediments. PCB can serve as an indicator for PCDF contamination.

Sites with PCB-containing equipment in use or storage should be treated as potential hotspots.

The main tasks for inventorying PCB-contaminated sites and hotspots are:

- Identification/localization of sites where PCB-containing transformers and capacitors are in use or stored, including damaged equipment and PCB waste and sites of open PCB application;
- Identification of PCB leakage;
- Development of the hotspot list;
- Assessment of volumes of PCB leakage and releases of PCDD/PCDF;
- Assessment of PCDD/PCDF concentrations in: PCB transformers/capacitors from producers where PCDF levels are currently unknown; and Sites where transformer fires, short circuits or other fires involving PCB have occurred.

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130 Data calculated based on weight of individual pesticides applied (t/year) and mass of active substance in the pesticide (g/l) available from the Report on the stocks and the use of plant protection products of 16 December 2016 of the National Bureau of Statistics of the RM.

131 Toolkit for Identification and Quantification of Releases of Dioxins, Furans and Other Unintentional POPs, CH. II.10 Contaminated Sites and Hotspots, January 2013

132 Import data for Tetrachloroethylene retrieved from comtrade.un.org/data/ on 30/04/2020.

133 Takasuga, T., Kumar, K.S., Noma, Y., Sakai, S. 2005. Chemical Characterization of Polychlorinated Biphenyls, -Dibenzo-p-Dioxins, and -Dibenzofurans in Technical Kanechlor PCB Formulations in Japan. Arch. Environ. Contam. Toxicol. 49: 385–395.

The identification and assessment can be performed based on a tiered approach as presented below.

To differentiate between lower and higher chlorinated PCB congeners, as needed for estimating PCDD/PCDF releases, it can generally be assumed that capacitors are filled with lower chlorinated PCB, while transformers include higher chlorinated PCB with associated PCDD/PCDF levels (Table 10-1). Using data on the volumes of lower and higher chlorinated PCB and PCDD/PCDF content in PCB liquids (Table 10-2), it is possible to estimate PCDD/PCDF and dioxin-like PCB content in PCB equipment and their environmental releases[134].

Table 10-1 PCB release factors from electrical equipment

10f	PCB Filled Transformers and Capacitors	PCB release, kg/t dielectric fluid	Country or region
1	Transformers	0.06	Europe
		0.3	North America
		0.3	CIS countries
2	Capacitors	1.6	Europe
		4.2	North America
		2.0	CIS countries

Table 10-2 Concentrations of PCDD/PCDF and dioxin-like PCB in unused commercial PCB

PCB type	PCDD/PCDF in unused commercial PCB (µg TEQ/t product)	Dioxin-like PCB (µg TEQ/t product)*
Low chlorinated, *e.g.*, Clophen A30, Aroclor 1242	7000 - 15 000	1,900,000-3,500,000
Medium chlorinated, *e.g.*, Clophen A40, Aroclor 1248; KC-400; KC-500	23000 - 70 000	12,000,000-16,000,000
Medium chlorinated, *e.g.*, Clophen A50, Aroclor 1254	300 000	12,000,000-16,000,000
KC-600; KC-1000	22,000	4,100,000 - 10,000,000
High chlorinated, *e.g.*, Clophen A60, Aroclor 1260	1 500 000	4,100,000 - 10,000,000

* Data for dioxin-like TEQ in low, medium and high chlorinated PCB are derived from PCB mixtures[135].

If the results of the PCB inventory contain detailed PCB data per site and a clear indication of sites, the list of potential hotspots should be compiled. It should contain the details of the location, coordinates, facility name, type and number of PCB-containing equipment, volume of PCB and the state of the equipment. This list can then serve as a basis for further investigation of hotspots.

Current situation of PCB use in the country

The country has already made an Inventory of 28 000 units of PCB filled electrical equipment and eliminated 18 660 PCB filled capacitors (934 tons) from 13 stations of ”Moldelectrica” electricity supply company[136]. In 2006, 216 t of PCB containing equipment was evacuated abroad and 718 t in 2007 in the framework of Project "Persistent Organic Pollutants Stockpiles Management and Destruction" GEF project.

[134] Toolkit for Identification and Quantification of Releases of Dioxins, Furans and Other Unintentional POPs, CH. II.10 Contaminated Sites and Hotspots, January 2013
[135] Takasuga, T., Kumar, K.S., Noma, Y., Sakai, S. 2005. Chemical Characterization of Polychlorinated Biphenyls, -Dibenzo-p-Dioxins, and -Dibenzofurans in Technical Kanechlor PCB Formulations in Japan. Arch. Environ. Contam. Toxicol. 49: 385–395.
[136] Information available on the website of Moldova POP Office: http://www.moldovapops.md/management/

According to the data from the 2003 National POP Inventory, in the national energetic system there are 26 311 transformers with the average oil content of 23 920.1 tons. The volume of oil in the distribution transformers of the enterprises from the Left Bank of Dniestr River represent approx. 3914.6 tons[137]. Also, part of the same report, it has been estimated that losses of PCB containing oil constitute 9.611 tons/year, and PCB releases from transformers of the energetic system of the RM represent 4.537 kg/year[138].

Visits to a number of power companies in the country, in order to clarify the availability of PCB type dielectric oils found that none of the power companies had records of the type of oil contained in the installations, what type of oil was originally poured and with what type of oil it was later changed. Therefore, in order to identify the installations containing PCB oils, to evaluate the quantity of PCB oil available in the country, it was established the need to carry out the testing of the installations, to collect oil samples from each installation and to carry out the subsequent chemical analysis[139].

According to the PCB inventory carried out by the Moldova POPs Office, as per June 2017, the following quantities of PCB contaminated oil were identified:

Total contaminated oil	**kg 113553.5**
Contaminated oil 50-500 ppm	kg 90207.5
Contaminated oil 500-1000 ppm	kg 11705
Contaminated oil> 1000 ppm	kg 11641

On September 28, 2018, the electricity supply company ISC Red Union Fenosa SA has announced the tender for elimination of the dielectric waste oil contaminated with the PCB. The quantities announced for tendering are as follows: the total mass of the PCB contaminated equipment equals 29755 kg, the mass of oil is 8139 kg. According to the sampling results of the State Hydrometeorological Service Laboratory, the concentration of PCB in oil varies from 56.56 to 428.64 mg/kg. A qualified company was expected to transport the mentioned above quantifies for treatment abroad[140].

Due to missing information on the type of PCB filled in Transformers and Capacitors located in the country it is not possible to estimate part of this report possible PCDD/PCDF and dioxin-like PCB content in PCB equipment and their environmental releases.

[137]National Inventory of Persistent Organic Pollutants in the Republic of Moldova, Ministry of Ecology, Construction and Territorial Development, Chisinau, July 2003, p. 46
[138] National Inventory of Persistent Organic Pollutants in the Republic of Moldova, Ministry of Ecology, Construction and Territorial Development, Chisinau, July 2003, p. 47
[139] Inventarul National POP iulie 2003, p. 49
[140] Primier Energy Distribuition.