



# Tajikistan Health and Pollution Action Plan



## Foreword

The negative impacts of environmental pollution on human health have been well documented since at least the start of the industrial revolution. The World Health Organization (WHO) reported in 2016 that 23% of all global deaths are attributable to living and working in an unhealthy environment; non-communicable diseases (NCDs), which are mostly attributable to air pollution, amount to as many as 8.2 million of these deaths. Consistent with this is the 2017 report by the Lancet Commission on Pollution and Health, which emphasized the continuing damage caused by pollution to people's health, despite all the pollution mitigation efforts that have been taken to date. It estimated that diseases caused by environmental pollution were responsible for an estimated 9 million premature deaths in 2015. To put that in perspective, this number constituted 16% of all deaths worldwide. The Commission further noted that pollution disproportionately kills poor and vulnerable populations. By its estimates, 9 out of every 10 pollution-related deaths occur in low-income and middle-income countries. The Commission finally noted that children are at high risk of pollution-related disease.



For more than 20 years, Tajikistan was working to address environmental risks to human health. In 2006, Tajikistan ratified the Stockholm Convention on Persistent Organic Pollutants. The Stockholm Convention provides general guidance on designing the measures to implement priority actions on environmental health issues, legislation, national development plans, political and strategic decisions of the Government of the Republic of Tajikistan.

The Committee for Environmental Protection (CEP) under the Government of the Republic of Tajikistan makes decisions under the leadership of Founder of Peace and National Unity, Leader of the Nation, the President of the Republic of Tajikistan Emomali Rahmon. The Committee builds capacity in solving environmental and health risk problems; works on environmental education and awareness; creates and develops health and environmental surveillance systems; ensures compliance with relevant international conventions and national regulations; conducts assessments of risks to human health and environment; and conducts awareness campaigns on health and environment issues targeting different institutions and local communities.

The Health and Pollution Action Plan (HPAP) is the collaborative effort of the Committee for Environmental Protection under the Government of Tajikistan (CEP), Blacksmith Institute/Pure Earth, the national Civil Society Organization "Peshsaf" and the Global Alliance on Health and Pollution (GAHP) to analyze pollution challenges and advance concrete actions to reduce their impacts on public health. Since 2006, the National Center on Implementation of the Stockholm Convention on Persistent Organic Pollutants (POPs) and Peshsaf" with support of Blacksmith Institute/Pure Earth, has assessed over 180 sites, contaminated with POPs. In order to expand and support this work the present HPAP was developed with support of the European Union and United States Agency for International Development (USAID).

This document is an important reference material for partners working on solving environmental and health risk issues, as well as implementation of the Stockholm Convention. We hope to improve the health of the nation by implementing HPAP activities to support the efforts of the government to achieve Millennium Development Goals, and ensure a safe and healthy environment for everyone.

**Chairman of the Committee on Environmental Protection  
under the Government of the Republic of Tajikistan  
Sheralizoda Bahodur Ahmadjon**



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## ACRONYMS

<i>ADB - Asian Development Bank</i>	
<i>CEP - Committee for Environmental Protection under the Government of the Republic of Tajikistan</i>	
<i>CHP - Combined heat and power</i>	
<i>CIS - Commonwealth of Independent States</i>	
<i>DDT - Dichlorodiphenyltrichloroethane</i>	
<i>EU - European Union</i>	
<i>FAO - Food and Agriculture Organization</i>	
<i>GBAO - Gorno-Badakhshan Autonomous Region</i>	
<i>GEF - Global Environment Facility</i>	
<i>HPAP - Health and Pollution Action Plan</i>	
<i>HPP - Hydro Power Plant</i>	
<i>ICSD - Interstate Commission on Sustainable Development</i>	
<i>IEC - The Interstate Environmental Council</i>	
<i>MAF – Ministry of Agriculture and Food</i>	
<i>MH – Ministry of Health</i>	
<i>MW - megawatt</i>	
<i>NCSK – National Center for Implementation of Stockholm Convention</i>	
<i>NGO – non-government organizations</i>	
<i>NIP - National Plan for the Implementation</i>	
<i>OJSC - Open joint-stock company</i>	
<i>OP – Obsolete Pesticides</i>	
<i>OSCE - Organization for Security and Co-operation in Europe</i>	
<i>POPs - persistent organic pollutants</i>	
<i>PRTR - Pollutant Release and Transfer Registers</i>	
<i>RRS - Region of Republican Subordination</i>	
<i>RT – Republic of Tajikistan</i>	
<i>SC - Stockholm Convention</i>	
<i>SDC – Swiss Agency for Development and Cooperation</i>	
<i>SSESS - State Sanitary and Epidemiological Surveillance Service</i>	
<i>TNP - Tajik National Park</i>	
<i>UNDP - United Nations Development Programme</i>	
<i>UNEP - United Nations Environment Programme</i>	
<i>UNESCO - United Nations Educational, Scientific and Cultural Organization</i>	

*UNIDO - United Nations Industrial Development Organization*

*USA – United States of America*

*USAID - United States Agency for International Development*

*USSR - Union of Soviet Socialist Republics*

*WB – World Bank*

*WHO - World Health Organization*

*WTO - World Trade Organization*

## Executive Summary

Before the collapse of the Soviet Union, pesticides and other chemicals were actively used in Tajikistan's agriculture. The application of various pesticides was often done without proper adherence to the existing rules and standards and without consideration of the climatic conditions in different areas. This resulted in some serious issues, including:

- poisoning people;
- death of wild and domestic animals;
- decrease of biodiversity;
- accumulation of pesticides in food chains;
- disruption of natural control of pests;
- decrease of the quality of soils due to accumulation of pesticides;
- water contamination.

The range of pesticides used in Tajikistan included the following POPs: aldrin, dieldrin, heptachlorine, endrin, hexachlorinebenzene, toxaphene, chlordane, DDT, endosulphane, and lindane. On average, about 14 thousand tons of pesticides were brought to Tajikistan every year. The share of DDT constituted from 33 to 80% of the total volume of pesticides. About 90 thousand tons of DDT were brought to Tajikistan during the period of active use of this insecticide.

In 1970, by the decree of the Minister of Health of the Soviet Union, application of DDT was banned in agriculture and, in 1987 DDT was banned for use to control vector-borne diseases. In the 1980s and through the early 1990s, the use of other pesticides- and POPs were also banned. Despite the ban, the remaining pesticides were still used, though in much smaller volumes.

Currently, the threat of obsolete pesticides to the health of people and the environment in Tajikistan still exists. During the Soviet time, the number of pesticides brought to Tajikistan exceeded actual application needs by 1.5-2 times. As a result, excessive volumes of pesticides accumulated in multiple storages and distribution centers of "Tajikselkhozkhimiya" Republican Service. Due to the large volumes of unused pesticides, various violations occurred: pesticides were distributed to individuals for uncontrolled use in their gardens, and some pesticides were dumped in municipal landfills or secretly buried. In the 2000s, amid small supplies of pesticides in Tajikistan, the existing volumes of obsolete pesticides were used again in agriculture. People particularly preferred using DDT and excavated the waste chemical from the Vakhsh polygon, where more than 9 thousand tons of DDT were buried.

According to the World Health Organization (WHO) / United Nations Environment Programme (UNEP) Global Human Milk Survey, the concentration of Dichlorodiphenyltrichloroethane (DDT) in breastmilk in Tajikistan is the highest in the world. This indicates very high levels of exposure of people to DDT – a toxic organochlorine persistent pollutant.

The Health and Pollution Action Plan (HPAP) is the collaborative effort of the Committee for Environmental Protection under the Government of Tajikistan (CEP), Blacksmith Institute/Pure Earth, national cso Peshsaf and the Global Alliance on Health and Pollution (GAHP) to analyze pollution challenges and advance concrete actions to reduce impacts on public health. This work is supported by USAID, the European Union and the Swiss Agency for Development and Cooperation. The HPAP program focuses on ways to reduce health risks from obsolete pesticides, as these persistent organic pollutants were identified as the main pollution issue in Tajikistan.

## **Goals and Outputs of the Health and Pollution Action Plan**

The HPAP program assists governments of low- and middle-income countries to develop and implement concrete actions to address pollution-related health challenges. The HPAP program aims to:

1. Assist governments to identify, evaluate and prioritize existing pollution challenges based on health impacts
2. Establish pollution as a priority for action within national agencies and development plans
3. Define and advance concrete interventions to reduce pollution exposures.

The present report presents the results of inventories of stocks of obsolete pesticides conducted in Tajikistan in 2014-2020. Further, the report provides an analysis of the legal and institutional framework of management of POPs and hazardous wastes in Tajikistan. Based on the collected data and the analysis of the legal and institutional framework, the recommendations made are actions that should be taken in order to reduce POPs pollution in Tajikistan. These recommendations can serve as the foundation for full proposals for national or international funding.

The highest priority recommendations include:

1. Create an agency on management of chemicals to replace the existing Commission on Chemical Safety. The agency would be responsible for the development of state policies, instructions, and regulations on handling hazardous substances and wastes.
2. Analyze and integrate activities for the implementation of the Stockholm Convention into short-, mid- and long-term national, sectoral and territorial plans and programs.
3. Increase funding from the state budget and other sources for the implementation of the Stockholm Convention.
4. Develop a system and build laboratory capacity to monitor hazardous pollutants in the environment.
5. Organize an exchange of information on the results of the inventory of obsolete pesticides and plans for POPs disposal.

## **Conclusions**

Due to the cotton industry having been developed during the Soviet era, independent Tajikistan is currently facing a legacy of a number of past unresolved issues related to pollution from obsolete pesticides. Currently, there are many private homes built in close proximity to former pesticides depots and large areas contamination. The use and storage of obsolete pesticides has become one of the priority environmental issues in the Republic of Tajikistan. The health effects of POPs are not well-studied and are also poorly documented. This situation must change and people should be protected from health risks. The HPAP should become the foundation for this work.



## Introduction

The management of hazardous wastes containing POPs in Tajikistan is based on the Stockholm Convention on Persistent Organic Pollutants (22<sup>nd</sup> of May 2001). Presently the Convention is ratified by 184 countries. The Republic of Tajikistan signed the Convention on May 21, 2002 and ratified it on December 6, 2006. Since May 9, 2007, the Republic of Tajikistan is a Party to the Stockholm Convention (hereinafter SC) on POPs.

To implement the provisions of the Convention in Tajikistan, by the Decree of the Government of the Republic of Tajikistan (February 27, 2009) No. 132, a state institution was created: "Center for the fulfillment of obligations of the Stockholm Convention on Persistent Organic Pollutants." The objectives of the Center's work are:

- facilitating the transition from POPs to safer alternatives;
- identification of additional POPs for taking appropriate management actions;
- disposal of old stocks and equipment containing POPs;
- working together for a POPs-free future.

In order to achieve these objectives, the National Plan for the Implementation (NIP) of the Obligations of the Republic of Tajikistan under the United Nations Stockholm Convention on Persistent Organic Pollutants was developed. The NIP was approved by the Resolution No. 502 of the Government of the Republic of Tajikistan on October 1<sup>st</sup>, 2007. In accordance with this resolution, the Government of the Republic of Tajikistan appointed the CEP as the coordinating agency for the implementation of the obligations under the SC on POPs.

Involving different partners in the management of hazardous chemicals is a prerequisite for strengthening the national capacity to address POPs issues.

### ***Projects implemented in the Republic of Tajikistan in 2009 - 2020***

After completing the initial NIP, Tajikistan has implemented the following POPs-related projects:

1. "Technical Survey of Obsolete Pesticides (OP) in the Republic of Kyrgyzstan, the Republic of Tajikistan and the Republic of Uzbekistan" (WB, Project No. 100020592), project funded by the Canadian Trust Fund, June 2009-November 2009.
2. GEF/WB project "Elimination of POPs pesticides, reduction of harmful effects and management of pollution hotspots" (WB, Project No. TF 095085), the project was funded by the GEF June 2010-May 2011.
3. FAO / Turkey Project "Inventory of Obsolete Pesticides in Central Asia, Caucasus and Turkey", funded by FAO-Turkey, 2012
4. Toxic Sites Identification Project by Blacksmith Institute, USA, funded by EU/UNIDO, 2010-2017.
5. WHO / UNEP project "Demonstrating and Scaling Up Sustainable Alternatives to DDT for the control of vector borne diseases in Southern Caucasus and Central Asia (Georgia, Kyrgyzstan, Tajikistan)" continues.
6. UNIDO / GEF project "Review and update of the national plan for the implementation of the obligations of the Stockholm Convention on POPs in the Republic of Tajikistan", 2012-2014.
7. EU project EuropeAid / 155023 / DD / ACT / TJ Strengthening the capacity of Tajik CSOs to be effective advocates for socially-excluded, vulnerable populations in rural areas, 2017-2020.

# Chapter 1. Background Information

## Geography and population

The Republic of Tajikistan is located in the southern part of Central Asia - between 36° 40' and 41° 05' north latitude and 67° 31' and 75° 14' east longitude. The area of Tajikistan is 143,100 sq. km. The country stretches from west to east for 700 km and from north to south for 350 km. The total length of the borders of the Republic of Tajikistan is 3000 km, of which 630 km fall on the border with the Republic of Kyrgyzstan, 910 km the border with Republic of Uzbekistan, 430 km - People's Republic of China, and 1030 km - Islamic Republic of Afghanistan. The complexity of the relief on some sections of the border makes it possible to smuggle forbidden substances, including POPs.



Figure 1. Map of Tajikistan

The Republic of Tajikistan is very unevenly populated. More than 85% of the population are concentrated in areas at altitudes less than 1500-1800 meters above sea level. The Tien Shan, Hisor-Alai and Pamir mountain systems together comprise about 93% of the country's area. The information about the main mountain ranges of the Republic of Tajikistan (RT) is presented in Table 1.

Table 1. Main mountain ranges of the Republic of Tajikistan

Name of the mountain range	Height above the sea level, meters	Name of the mountain range	Height above the sea level, meters
Academy of Sciences	7495	Northern Alichur	5929
Zalay	7134	Sarykul	5909
Yazghulom	6974	Southern Alichur	5706
Peter the Great	6785	Shughnon	5704

Muzkol	6233	Vanj	5584
Ishkoshim	6096	Turkestan	5510
Darvoz	6083	Zarafshon	5494
Rushon	6080	Alai	4626
Darvoz	6083	Hisor	4491

Most of the population of Tajikistan lives in valleys and plains between mountains. The population density in valleys exceeds 200 people per 1 sq. km (Hisor and Vakhsh valleys, northern regions of the country). In the capital of the republic, the population density exceeds 4000 people / sq. km. In the mountainous regions of the country, the population density decreases to 4-10 people per 1 sq. km. The least populated part of the country is the Eastern Pamir, where the population density is less than 1 person per 1 sq. km. The overall average population density of Tajikistan is 48.8 people per 1 sq. km.

Tajikistan is a major center of glaciation in Central Asia. Glaciers cover an area of 8.4 thousand square km, which is 6% of the entire country. The main ice masses are concentrated in the mountains of the Western Pamir. Glaciers are a huge treasure of Tajikistan, because they are not only reservoirs of freshwater, but also regulators of the river flow and climate. In recent years some studies confirmed the presence of POPs in the high mountain ecosystems of North America and the Himalayas, including glaciers. Glaciers are natural “cold” POPs traps and at the same time serve as channels for the rapid transport of POPs to the river systems fed by them, since the resulting melting water usually does not have direct contact with sorbing soils. The combination of climatic conditions in Tajikistan, including the presence of southwestern air currents with a significant vertical amplitude, can create favorable conditions for the accumulation of POPs in glaciers and alpine lakes of the Pamirs.

There are 947 rivers more than 10 km long in the Tajikistan Republic (Table 2).

Table 2. The largest rivers flowing through the territory of the Republic of Tajikistan

<b>River</b>	<b>Length, km</b>	<b>River</b>	<b>Length, km</b>
Syrdarya	21371	Kofarnihon	387
Amu Darya - Pyanj	921	Gund	313
Zarafshon	781	Kyzylsu (Alai)	262
Bartang - Murghab, Oksu	558	Obikhingou	196
Vakhsh	524	Yakhsu	150

A significant portion of the river network of Tajikistan belongs to the watersheds of the main rivers of Central Asia - the Amu Darya and the Syr Darya, which flow into the Aral Sea (Figure 2.). With the river flow, POPs could migrate out of Tajikistan by waterways and contaminate some internal drainage areas of Central Asia.

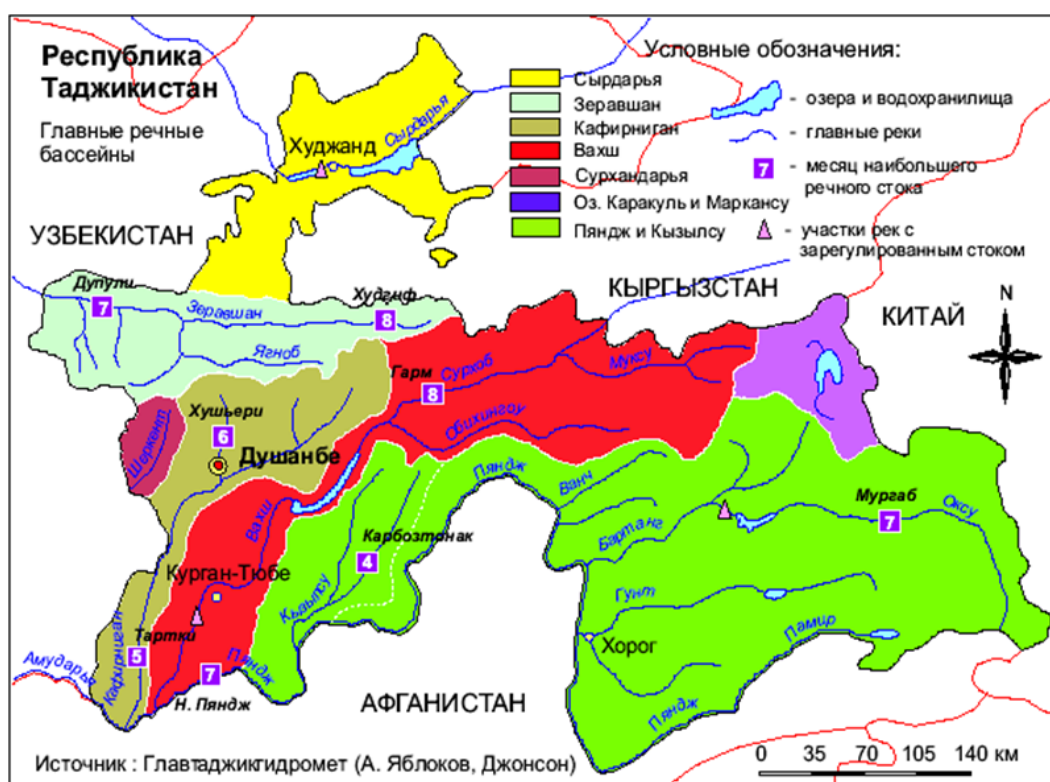


Figure 2. Main river watershed of Tajikistan

**Population.** The total population of the Republic of Tajikistan is 9.5 million people (estimated in September of 2020), of which 56.4% live in rural areas. The population density is 66.9 people / sq. km. The average size of households in rural areas is 6.5 people, in urban areas - 4.5 people. The average size of dekhkan (peasant) land plots is about 21 hectares. The population is distributed across four main regions (oblasts) and the capital as follows: Khatlon region- 35.1%, Sughd region - 30.5%, Region of Republican Subordination (RRS) - 22%, Dushanbe - 9.2%, Gorno-Badakhshan Autonomous Region (GBAO) - 3.4%.

The population of Tajikistan is rather young, as the average age within the republic is 22.4 years. People below the age of 15 comprise 42.7%, and more than 30% of the total population are children under the age of 9. The most vulnerable segments of the population for exposure to POPs are children under the age of 14, which in Tajikistan are about 37.1% and people of retirement age - 5.3%. The ratio of the female population to the male population is approximately the same and equals 0.97. Current life expectancy 66 years (63 years for men and 69.3 years for women).

**Climate.** The climate of Tajikistan is largely formed by the mountainous relief. The republic is located in the northernmost part of the subtropical zone. Tajikistan is situated far from the seas and oceans. This defines the strict continental climate: sharp seasonal and daily fluctuations of the air temperature; the intensity of solar radiation; dry air and few clouds. The average annual air temperature ranges from +17.20 °C (urban settlement Shahrituz, RRS) to -1.10 °C (Murgob, Eastern Pamir).

Tajikistan is divided into two large climatic zones: Near Eastern and Central Asian. Those zones differ by the amounts of annual precipitation. The average annual rainfall in the republic ranges from 73 mm in the Eastern Pamir to 1500 mm or more on the southern slopes of the Hisor Ridge. The total duration of sunshine on the territory of the republic ranges from 2097 to 3166 hours per year. The average annual amount of total solar radiation reaches 151-176 kcal / square centimeter.

**Flora and fauna.** Despite relatively small territory Tajikistan has a very diverse flora and fauna because of unique natural landscape complexes and soil-botanical vertical zoning. The various mountainous ecosystems occupy altitudes from 600 to 7,000 meters above the sea level and contain 90% of natural communities and up to 80% of the national biodiversity. Tajikistan is home to more than 13 thousand species of invertebrates, 49 species of fish, 2 species of amphibians, 44 species of reptiles, 346 species of birds, and 84 species of mammals.

**Specially protected natural areas.** There are 20 Specially Protected Areas in Tajikistan, including 4 nature reserves, 12 refuges, and 3 parks (Figure 3). The Tajik National Park (TNP), created in 2002, is located in the Gorno-Badakhshan Autonomous Region - the city of Khorugh, Jirgatal and Tavildara districts. The park area is 2,611,674 hectares. TNP was formed with the aim of preserving the unique landscapes of the Pamir Mountain Region, a variety of rare and endangered species of flora and fauna, historical, cultural and natural monuments, sustainable development of natural resources. In 2013, at the 37th session of United Nations Educational, Scientific and Cultural Organization (UNESCO) in Cambodia, the Pamir Mountains TNP was included in the UNESCO World Heritage List.

Table 3. List of protected areas in Tajikistan

No.	Protected area	Area, hectares	Creation year	Location
Refuges				
1.	"Lake Iskandarkul"	30 000	1969	Sughd region, Aini district
2.	"Zarafshon",	2300	1976	Sughd region, Panjakent district
3.	"Sai-Vota"	4200	1970	Sughd region, Aini district
4.	"Kusavli-Sai"	19 844	1959	Sughd region, Shahrison district
5.	"Almosi"	6 000	1983	RRS, Hisor district
6.	"Komaro"	9 000	1970	RRPS Rasht district
7.	"Ak-Tosh"	15000	1977	Sughd region, Asht district
8.	"Norak"	30 000	1984	Khatlon region, Nurek city
9.	"Sangvor"	50 900	1972	RRS Tavildara district
10.	"Chil-duhtaron"	14 500	1970	Khatlon region, Muminobod district
11.	"Karatav"	14 500	1972	RRS Farkhor district
12.	Oktosh	15000	1977	Sughd region, Asht district
13.	"Muzkul"	66 916	1972	GBAO, Murghob district
Nature Reserves				
14.	"Tigrovaya Balka"	49476	1938	Khatlon region. Jillikul, Qabodiyon and Qumsangir districts. Administrative center in Jillikul region
15.	"Romit"	49786	1938	RRS, Vahdat city, Jamoat Romit
16.	"Dashti-Jum"	19700	1983	Khatlon region, Shurobad district, Jamoat Dashti-Jum
17.	"Zorkul"	87700	2000	GBAO, Murghob district
Parks				



18.	Tajik National Park "Pamir Mountains"	2611674	2002	GBAO, Khorog city, Jirgital and Tavildara regions
19.	Historical and natural park "Shirkent"	3000	1991	RRS, Tursunzade district, Jamoat Rabot
20.	Natural Park "Sari-Khisor"	3805	2003	Khatlon region, Baljuvon district, Jamoat Sari-Khosor

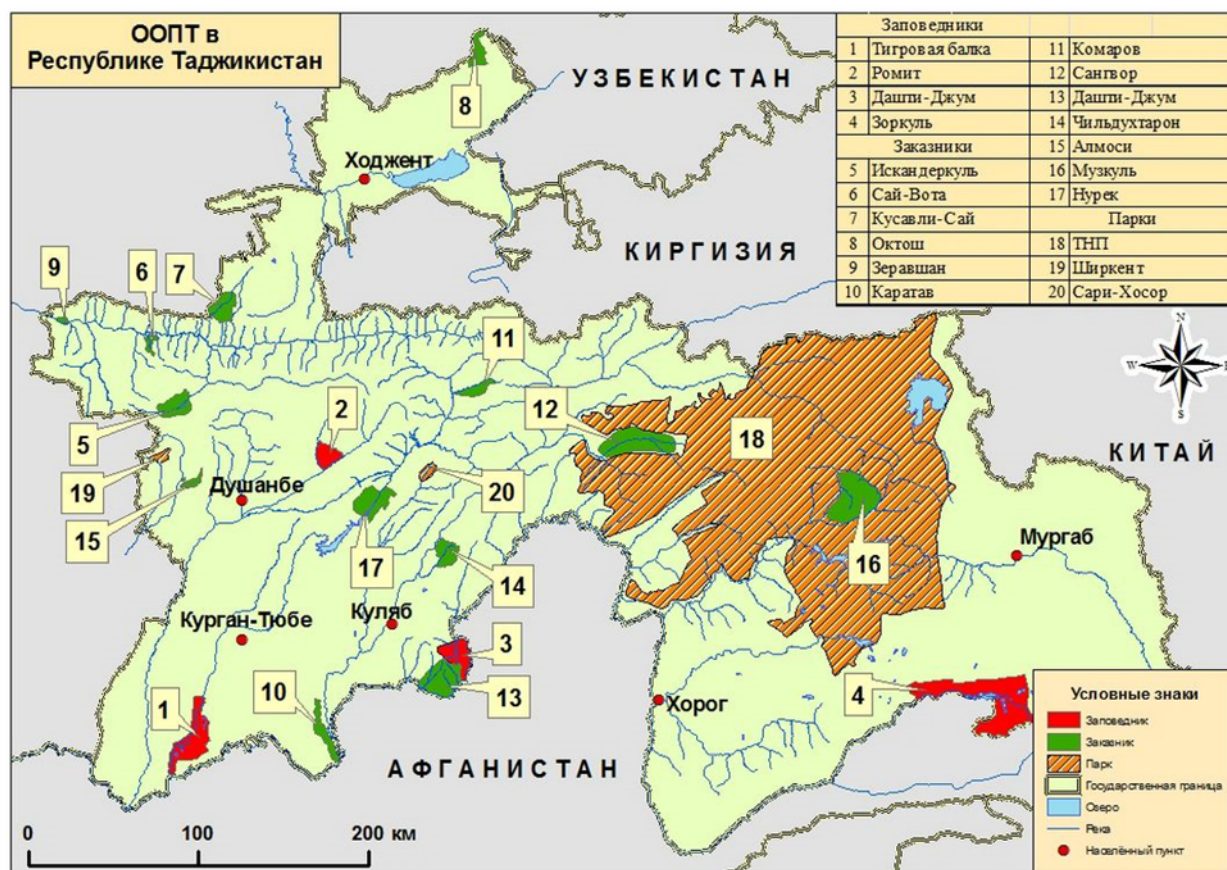


Figure 3. Locations of protected areas in the Republic of Tajikistan (2020)

**Agriculture.** Tajikistan is an agrarian-industrial republic. The area of agricultural crops is about 875 thousand hectares, including about 168.9 thousand hectares used to grow the leading crop - cotton (2019 data). The forested areas occupy about 1.3 million hectares. Irrigation is widely used in order to obtain two harvests of grain and vegetables a year. The development of agriculture, and, above all, cotton growing, in Tajikistan is closely related to the widespread use of pesticides to combat pests, plant diseases and weeds. The agroclimatic conditions of the republic are very favorable for the rapid reproduction of many agricultural pests. And there is a high degree of plant susceptibility to various diseases. Many agricultural crops also suffer from weeds, especially in irrigated areas, where the weed seeds get to the fields with irrigation water. It is estimated that without special agricultural protective measures the crop yield could be reduced by 30% or more.

**Industry.** The mining industry developed rapidly throughout the second half of the 20th century. These activities included the extraction of silver, mercury, antimony, lead, gold and rare earth elements, and this non-ferrous metallurgy still prevails in the structure of modern industry. In 1975, the Tajik Aluminum Plant was commissioned (presently the State Unitary Enterprise "Tajik Aluminum Company"). The Republic of Tajikistan has a number of developed industries



Including: mechanical engineering, chemical, cotton processing, food production, and construction (Diagram 2.1.3.1). Extractive industry - 12.9%, production and distribution of electricity, gas and water - 18.3%, manufacturing industry - 68.8%

**Energy.** Tajikistan has relatively small reserves of fossil fuels. There are 18 oil and gas deposits and about 40 coal deposits that were explored in the republic.

At the same time, Tajikistan has enormous hydropower potential almost evenly distributed throughout the republic. More than 60% of the Central Asian rivers originate in the mountains of Tajikistan. With regards to hydropower potential the Republic of Tajikistan ranks second in the Commonwealth of Independent States (CIS) (after Russia) and eighth in the world in terms of their total value and first - second in specific reserves (per capita and per unit of territory). It accounts for about 4% of the planet's hydropower potential. The share of hydropower in the total structure of energy resources in Tajikistan is about 95%.

The country is actively developing hydropower: in recent years, several new stations with a total capacity of about 1,000 megawatt (MW) were built in the republic, including: Sangtuda Hydro Power Plant (HPP-1), Sangtuda HPP-2, Pamir-1, more than 100 small HPPs with the total capacity of 28 MW, the Dushanbe heat and power plant, the Dushanbe combined heat and power plant (CHP-2) are operating, work continues on the completion of the Roghun HPP.

The total annual potential resources of hydropower in the republic is more than 527 billion kilowatts (kW), therefore hydropower is the backbone of the country's electricity industry. Tajikistan has small reserves of fossil fuels.

## **Chapter 2. Political, Institutional and Regulatory framework**

### ***General legal framework for the implementation of the Stockholm Convention***

The text of the Stockholm Convention on POPs was approved by the Decree No. 827 of the President of the Republic of Tajikistan on March 20, 2003. Three years later, on December 6, 2006, the Stockholm Convention was ratified by the Decree of the Majlisi Namoyandagon Majlisi Oli of the Republic of Tajikistan. This was the first international environmental agreement that passed the stages of coordination and approval in the parliament of Tajikistan.

The Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters (hereinafter the Aarhus Convention) had a significant impact on the development of the legal framework of Tajikistan regarding the safety of chemicals, including persistent organic pollutants. Aarhus Convention provided a wide range of rights to users of natural resources, the society and citizens. However, some international agreements related to the Stockholm Convention have not yet become a part of national legislation, including:

- Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal;
- Rotterdam Convention on the Advance Informed Consent Procedure in International Trade in Certain Hazardous Chemical Substances and Pesticides
- Protocol of Pollutant Release and Transfer Registers of the Aarhus Convention (the status of the document is still unclear despite the approval documents formed by all leading ministries of the country);
- The Convention on Long-range Transboundary Air Pollution;
- The Convention on Environmental Impact Assessment in a Transboundary Context (Espoo Convention).

An important factor in ensuring the fulfillment of the obligations assumed by the Republic of Tajikistan under the Stockholm Convention is the system of national and sectoral programs, concepts and strategies that set the priorities, goals and objectives of the state policy for improving environmental safety: Poverty Reduction Strategy, National Development Strategy, Concept of Environmental Protection of the Republic of Tajikistan, State Environmental Program for 2009-2019.

Fulfilling the obligations of the Stockholm Convention is based on: provisions of the Constitution of the Republic of Tajikistan, laws of the Republic of Tajikistan "On environmental protection", "On ecological expertise", "On fauna", "On hydrometeorological service", "On dekhkan (farmer) farms", "On the use of land", "On land reform", "On the subsoil", "On quarantine and plant protection", "On biological safety", "On production and consumption waste", "On the protection of atmospheric air", land, water, forest and criminal codes, and other legal acts of the Republic of Tajikistan. These laws ensure the observance of the rights of every citizen to environmental safety, availability of eco-friendly products, healthy environment, access to environmental information, opportunity of financing the improvement of the environmental situation.

The main objectives of the **Law of the Republic of Tajikistan "On Environmental Protection"** (No. 760, August 2, 2011) are:

- ensuring the supremacy of the Constitution and normative legal acts of the Republic of Tajikistan on environmental protection;
- the priority of protecting human life and health, observance of human right to a healthy environment;
- the presumption of environmental hazard of planned economic and other activities;

- the priority of preserving natural ecological systems, natural landscapes and natural complexes;
- inevitability of responsibility for violation of the environmental legislation.

According to Chapter 5 of the Law "On Environmental Protection" national standards are established to ensure the quality of the environment and regulation of the permissible environmental impacts. The list of standards includes: maximum permissible concentrations of chemical substances; maximum permissible physical impacts; maximum permissible concentrations of microorganisms; other environmental quality standards. The technological standards are established for stationary and mobile sources of pollution based on the best available technical methods and technologies that ensure compliance with environmental requirements with consideration to economic and social factors.

According to the Article 50 of the Law, the production and handling of hazardous chemicals are allowed in the Republic of Tajikistan after the necessary toxicological, hygienic and toxicological studies of these substances are conducted and the handling procedure established. The paragraph 3 of this article establishes a full ban on the use of toxic chemicals that do not decay (author's note - POPs) and have negative impacts on environment and human health. Unfortunately, the legislation does not impose requirements for the neutralization of hazardous chemicals. Such responsibility is imposed on the owners of hazardous wastes.

The Article 45 of the Law lists the requirements on environmental protection when using chemicals in agriculture and forestry. According to Articles 65 - 66 of the Law the State system for monitoring the environment in Tajikistan is established to obtain complete, reliable and timely environmental information, monitor the environment, assess and predict changes in the environment caused by natural and anthropogenic factors.

The law has provisions for economic mechanisms of environmental protection and use of natural resources, as well as state environmental control and liability for violation of environmental legislation.

One of the important omissions of the new edition of the Law of the Republic of Tajikistan "On Environmental Protection" is the lack of attention to the problems of hazardous waste management, no mentioning of collecting statistical data on waste generation and disposal, and no requirement on establishing and maintaining a cadaster on wastes.

According to article 12 of the **Law of the Republic of Tajikistan "On ensuring the sanitary and epidemiological safety of people"** (No. 49, December 8, 2003) ,epidemiological safety of the population" it is mandatory to certify sanitary and epidemiological safety of all substances, materials and products manufactured in the Republic of Tajikistan or imported. This includes products for industrial and technical purposes, goods for personal (household) needs, and raw food materials and food products. According to the Article 13, chemical and biological substances and certain types of products, potentially hazardous to humans, are subject to mandatory state registration at all stages of circulation: production, transportation, purchase, storage, sale and use.

In accordance with the Law of the Republic of Tajikistan "On State Ecological Expertise" (June 18, 1999), state ecological expertise (environmental impact assessment) is established and implemented based on the following principles:

- presumption of environmental hazard of the planned economic and other activity;
- state ecological expertise is obligatory;
- comprehensiveness of the environmental impact assessment of the planned economic and other activities;
- obligation to consider environmental safety during the assessment;
- reliability and completeness of information submitted for environmental impact assessment;

- independence of environmental experts;
- scientific validity, objectivity and legality of expert opinions;
- publicity, participation of public organizations, consideration of public opinion;
- responsibility of the participants of the environmental impact assessment and stakeholders for the organization, implementation and quality of the environmental impact assessment.

A separate **Resolution of the Government of the Republic of Tajikistan "Procedure for assessing environmental impact"** (No. 532, November 1, 2018), lists objects and types of activities that are subject to mandatory environmental impact assessment:

- plants of ferrous and non-ferrous metallurgy;
- places of storage or burial of toxic waste, including sludge collectors;
- waste processing facilities handling wastes of I and II hazard classes;
- manufacture of equipment or devices containing toxic substances regulated by international agreements;
- production of cement;
- reclamation of toxic waste tailings;
- warehouses of pesticides of republican significance;
- thermal power plants and other combustion plants with a thermal capacity of 300 MW or more;
- chemical complexes and factories, etc.

The **Law of the Republic of Tajikistan "On quarantine and plant protection"** (No. 1567, January 2, 2019) is one of the specialized laws that regulate handling pesticides and agrochemicals in order to protect environment and human health. Even though it is an important document, no changes were introduced in it regarding the definition of "persistent organic pollutants", "restriction on the circulation of POPs-containing pesticides" referring to Annexes A and B of the Stockholm Convention. According to the Article 6 of the law, the circulation of pesticides and agrochemicals in Tajikistan is allowed only after state registration and entry in the State Register of pesticides and agrochemicals. The state registration procedure includes registration tests at the expense of the person submitting the application (Article 20) with the involvement of legal entities that have the necessary scientific and material and technical base, specialists of the relevant profile and qualifications allowed to conduct these tests by a specially authorized state body.

The **Law of the Republic of Tajikistan "On the protection of atmospheric air"** (December 28, 2012) defines the legal and organizational basis for the protection of atmospheric air from emissions of pollutants and is aimed at maintaining and restoring the air quality and ensuring environmental safety.

The Law introduces the term "the best available technical methods - technological processes, methods, procedures for organizing the production of products and energy, performing work (rendering services), ensuring the reduction and (or) prevention of air emissions of pollutants as compared to previously used methods and which are the most effective to ensure air quality standards, subject to economic feasibility and technical feasibility of their application. "

The list of objects of the law includes air emissions of pollutants, stationary and mobile sources of emissions, sources of harmful physical effects, standards for the quality of atmospheric air, standards for permissible air emissions of pollutants, standards for permissible limits of harmful physical effects on the atmospheric air (Article 5). The subjects of the law are the state

bodies, operators of motor vehicles, legal entities and individuals that, in one way or another, produce air emissions.

Air pollution is regulated by economic planning mechanisms (Article 10) and the establishment of payments for emissions (Article 11). The maximum permissible standards are established by the Decree of the Council of Ministers of the Republic of Tajikistan No. 619 (December 23, 1993) and used in the "Procedure for determining payments for environmental pollution, waste disposal". According to the Decree No. 463 of the Government of the Republic of Tajikistan (October 4, 2013) the state body responsible for atmospheric air protection is the Committee for Environmental Protection under the Government of the Republic of Tajikistan. MPE of pollutants in the atmosphere is strictly limited. Special fees are established for exceeding the limits and emergency emissions. The Article 12 mentions the procedure for stimulating the reduction of air emissions, but this procedure was not yet developed.

Most of the provisions of Articles 17, 18, 19, and 20 of the Law presently could not be enforced due to lack of objective means of control by the responsible state body and weak mechanisms of penalties for exceeding pollutant emissions.

Article 1 of the **Law of the Republic of Tajikistan "On Production and Consumption Waste"** defines "hazardous waste - waste containing in its composition substances that have some hazardous properties or their combination, in such quantity and form that this waste itself or when coming into contact with other substances can pose an immediate or potential danger of causing harm to the environment, health of citizens, and property due to their harmful effects". The law does not provide a definition for "persistent organic pollutants", but lists POPs as hazardous waste.

According to Article 12 of the Law, any entity producing wastes must determine the degree of hazard and the hazard class of the wastes in accordance with the regulations established by the waste management state body. These regulations are: GOST 30774-2001, Guidelines for establishing the Maximum permissible concentration of chemicals in the soil (M., USSR Ministry of Health, 1982), SanPiN 42-128-4433-87, and SanPiN 42-128-5317-91. According to these regulations, Polychlorinated Biphenyls, Polychlorinated Diphenyls, Dioxins, Furans, etc. are included in the Red List of Wastes - the most dangerous kinds of hazardous wastes.

The law has separate requirements for the transportation of waste (Article 13) and transboundary movement. According to Article 14, the import of waste into the Republic of Tajikistan for burial is prohibited.

The law does not regulate the prohibition on the use of technologies for the neutralization of wastes that lead to the formation of persistent organic pollutants, while many CIS countries have such provisions in similar laws.

The development of technical regulations that include all stages of hazardous waste management could become one of the important steps to achieve positive experience in the legal regulation of waste management. But this is not yet done. According to the Decree No. 205 of the Government of the Republic of Tajikistan (April 30, 2012) the Committee for Environmental Protection under the Government of the Republic of Tajikistan is the responsible state body for the management of wastes.

The **Code of Administrative Offenses of the Republic of Tajikistan** (December 31, 2008) establishes administrative responsibility for the following violations:

- damage to the forest by sewage, chemicals, hazardous emissions, wastes and discharges (Article 191),
- violation of the rules for the storage of industrial and household waste, non-compliance with the requirements for the protection of atmospheric air when burning wastes (Article 231),
- violation of the rules and regulations for the transportation, storage and use of plant protection products and other preparations, which caused or may cause environmental pollution (Article 227),
- violation of the rules for the transportation, storage and use of plant protection products, stimulants of their growth, mineral fertilizers and other preparations, causing damage to the animal world (Article 210), etc.

The liability for crimes against ecological safety and natural environment is established in Chapter 24 of the **Criminal Code of the Republic of Tajikistan** (May 21, 1998). In particular, Article 228 establishes liability for damage; Article 223 - for violation of safety rules for production, storage, use, transportation, disposal or other handling of radioactive, bacteriological, chemical substances or production and consumption waste; article 226 - water pollution; article 227 - air pollution.

The **Law of the Republic of Tajikistan "On Food Safety"** (No. 890, August 1, 2012) among other things regulates concentrations of POPs in food and defines state control over the use of POPs containing agrochemicals.

The **State Ecological Program for 2009-2019** was approved by the Decree No. 123 of the Government of the Republic of Tajikistan (February 27, 2009). The State Ecological Program is recognized by the Republic of Tajikistan as the main legal basis for maintaining a balance between protection and use of natural resources, through rational use of natural resources and restoration of destroyed landscapes. The need for a special program was dictated by the need to solve existing environmental problems. The program includes sections on clean atmospheric air, water; strengthening control to reduce air emissions; strengthening interagency control for the implementation of environmental programs; creating environmentally friendly space. The State Program Among lists the following actions:

- constant monitoring of the water quality in rivers, main canals and reservoirs in order to identify heavy metals, pesticides and others;
- strict accounting and regulation of air emissions of pollutants from stationary sources in large cities;
- development and implementation of a warning system about the sudden contact of people with high doses of emitted toxic substances;
- development of methods for determining harmful substances in the air;
- creation of a unified system for the neutralization and deep processing of toxic wastes (industrial, agricultural, medical, household);
- analysis of the formation, disposal and utilization of industrial waste, and the development of recommendations for waste disposal;
- restoration of pesticide landfills;
- increase in payments for exceeding pollution limits 5-10 times;
- organization of the environmental customs service that would include state inspectors for environmental protection to control the import and export of equipment, technologies and other materials that may harm the environment;
- development of a program for the gradual replacement of environmentally hazardous out (technologies with new, modern and environmentally friendly technologies).

The listed measures to improve the environmental quality related to the management of chemicals, hazardous wastes and emissions should be financed both by the state budget and funds from users of natural resources. Some funds for the restoration of the environment may come from the privatization of state property. The program provides that there should be incentives to commercial companies for using zero-waste or low-waste technologies that produce environmentally friendly products. Institutionally, the State Program provides for the creation of a special Environmental Service for interdepartmental coordination to implement the program tasks. At the moment, many provisions of the State Program remain only on paper and require substantial funding in order to be implemented.

Despite some achievements in the country in the implementation of the provisions of the Stockholm Convention, there is sufficient reason to believe that many steps to implement the National Plan for the implementation of the obligations of the Stockholm Convention on POPs



were not yet implemented. For example, the NIP states that by 2008, a law of the Republic of Tajikistan on persistent organic pollutants should be adopted. This never came to fruition, and The same applies to many other provisions of the NIP.

Overall, the legislation of Tajikistan does not contain separate regulatory acts for POPs management. They are not mentioned in waste management legislation, however there are references to POPs in earlier regulatory acts adopted before the ratification of the Stockholm Convention: the definition of POPs is contained in the Decree No. 92 of the Government of the Republic of Tajikistan (March 3, 2003) "On the establishment of the Commission on Chemical Safety of the Republic of Tajikistan". The name of the Stockholm Convention was introduced as the basis for the regulatory framework into the Decree No. 464 of the Government of the Republic of Tajikistan (October 3, 2006) "Procedure for assessing environmental impacts." Interestingly this happened before the Convention was ratified by Tajikistan.

Analysis of other regulatory legal acts shows that POPs are mentioned in relation to program documents. For example, the Concept of Transition of the Republic of Tajikistan to Sustainable Development (October 1, 2007, No. 500) in paragraph 4.5.2 lists international agreements signed or ratified by the country, including the Stockholm Convention on POPs, and also gives a brief list of actions taken to fulfill the obligations under the Convention.

#### 2.2.1 Proposals to improve national legislation on POPs management.

The analysis of the current legislation on POPs management reveals a number of gaps. In particular:

- There is a need to ratify a number of international agreements, particularly the Rotterdam Convention on the Prior Informed Consent Procedure in the International Trade of Certain Types of Hazardous Chemicals and Pesticides and the Aarhus Convention Pollutant Release and Transfer Registers (PRTR) Protocol.
- Within the framework of national legislation, it is necessary to develop and adopt the Law "On persistent organic pollutants." This would become a specialized regulatory legal act on POPs management.
- Development of a separate technical regulation for the management of POPs containing wastes will help clarify some provisions of the legislation on waste management. It will also help to unite all the existing rules (GOSTs and Building regulations) into one piece.
- It is necessary to make changes, additions and amendments to the environmental legislation of the Republic of Tajikistan to introduce the definition POPs, the need to maintain state statistics on waste generation and disposal, create and maintain the Cadastre of Wastes. There should be separate legal act on the Cadastre of Wastes.
- It is necessary to introduce provisions on handling of obsolete pesticides and toxic chemicals in the Law of the Republic of Tajikistan "On Quarantine and Plant Protection".
- Development of the "Procedure for stimulating the reduction of air emissions" is listed in the Law of the Republic of Tajikistan "On the protection of atmospheric air". But this procedure was never developed.
- It is necessary to introduce the definition of POPs in national legislation. There should be a separate regulation and/or technical procedure adopted for determining the hazard class of produced wastes.
- An article prohibiting use of technologies producing POPs should be added to the Law of the Republic of Tajikistan "On Production and Consumption Waste"

- The National Implementation Plan includes creation of a United Database on Persistent Organic Pollutants. It is necessary to develop the procedure for creating this database.
- There are no legal acts regulating restoration of areas contaminated with POPs. The provisions on cleanup, safety and restoration of contaminated areas should be introduced in national legislation.
- The state registration of pesticides and chemicals requires creation of the State Catalogue of pesticides and chemicals. However, this catalogue was never created. It is necessary to assign an agency responsible for creating and maintaining such catalogue. It is also necessary to identify pesticides/chemicals that are officially prohibited/permitted for production and/or restricted use in accordance with the requirements of the Stockholm Convention on POPs.
- It is necessary to determine the procedure for implementing the inventory of POPs. Without such written and adopted procedure, inventory it is not possible to implement and finance inventory activities and take further actions on identified stocks of POPs.

Further, the Agency on Statistics under the President of the Republic of Tajikistan should adopt the act *"On approval of the form of state statistical reporting 1 – waste "Report on production waste management "and instructions for its filling."*

- It is necessary to develop a technical regulation defining the procedure for monitoring POPs in environment.
- It is necessary to adopt a legal act (procedure or regulations) for the import/export of equipment containing POPs.
- A technical regulation is necessary to define best available technical methods for reducing unintentional POPs emissions.

## ***General institutional framework for the implementation of the Stockholm Convention***

### **Interdepartmental coordination**

As part of the NIP implementation the Republic of Tajikistan managed to make some improvements in the institutional framework of chemicals management.

One of the important recommendations of the NIP was the creation of a special body for the Stockholm Convention implementation. On February 27, 2009 the Decree of the Government of the Republic of Tajikistan No. 132 established a State Institution “Center for the Implementation of the Commitments of the Stockholm Convention on Persistent Organic Pollutants”. As per amendments in the Statute of the Committee for Environmental Protection the Center is a non-profit organization within the Committee. The main task of the Center is to implement the provisions of the Stockholm Convention, including inventory of POPs, preparing reports on the progress of the country's implementation of the Stockholm Convention, attracting local and foreign funds to clean up contaminated areas, preparing proposals and providing recommendations on legislation regulating POPs management.

Despite the establishment of the Center, its potential at the moment is not great. There are problems due to of the lack of funding. The work of the Center is also complicated because of their status as a non-profit organization. This status was initially established in order to make it easier to seek additional funds for the implementation of programs for inventory of POPs, remediation of contaminated sites, renewal of NIP, etc.

The existing state management system is functional despite some problems in interdepartmental coordination and insufficient funding for the country's fulfillment of obligations under international agreements. The leading agencies responsible for supervision and management of POPs are: the Committee for Environmental Protection under the Government of the Republic of Tajikistan, the Ministry of Agriculture, the Ministry of Industry and New Technologies, the Ministry of Health and Social Protection of the Population, the Ministry of Defense, the Ministry of Energy and Water Resources, the Ministry of Foreign Affairs, Ministry of Finance, Ministry of Transport, Ministry of Economic Development and Trade, Ministry of Justice, Ministry of Internal Affairs, State Committee on National Security, State Committee on Investments and State Property Management, Agency on Statistics under the President of the Republic of Tajikistan. The State Attorney's Office of the Republic of Tajikistan and the judicial authorities also play an important role.

In the Republic of Tajikistan, there is a gradual weakening of environmental policy, giving way to the economic interests of the state. The conflict between the environmental legislation and economic development reflects upon the status of the environmental agency. Over the past 10 years, the environmental protection state body went through 4 reorganizations and diminished its status from the initial Ministry of Nature Protection to the current Committee for Environmental Protection under the Government of the Republic of Tajikistan.

The **Committee for Environmental Protection under the Government of the Republic of Tajikistan** was established by the Resolution No. 189 of the Government of the Republic of Tajikistan (April 24, 2008). The Committee for Environmental Protection (CEP) is responsible for state environmental policy, monitoring the rational use of natural resources, hydrometeorology, preventing of emergencies that could affect the environment, persistent organic pollutants, climate change, control over the protection and rational use of woodlands, water resources, handling hazardous waste, chemicals, etc. The CEP has the right to verify sources of air emissions, laboratory studies of emissions into nature, transit and import of hazardous materials into the country, create information resources of the state of the environment, develop and submit for approval guidance and methodological documents, environmental standards, national strategic documents, license activities, associated with hazardous emissions, create a register of polluting objects, etc. CEP is the agency responsible for the fulfillment of the obligations of the Republic of Tajikistan under the Stockholm Convention on POPs.

In addition to the “Center for the fulfillment of the obligations of the Stockholm Convention on Persistent Organic Pollutants”, the CEP Hazardous Waste and Emissions Management structure includes other departments (Table 4)

Table 4. CEP Hazardous Waste and Emissions Management Structure

Unit	Chemicals and hazardous waste management tasks
Monitoring and Environmental Policy Department	Organization and implementation of environmental monitoring, comprehensive assessment of environment, weather, glaciers, lakes and reservoirs, analysis of natural emergencies; Coordination of activities for the organization of the integrated system for environmental monitoring and use of natural resources; Implementation of the state environmental policy, persistent organic pollutants policy etc...
Department of State Control over the Use and Protection of Water Resources	State control over the protection and rational use of water resources, in particular, control over chemicals and hazardous waste pollution; Scientific research and study of water resources protection issues.

Department of state control over the use and protection of flora and fauna	State control over the protection and rational use of ... flora, including protection from POPs; protection, conservation and restoration of ecosystems plant species.
Department of State Control of the Use and Protection of Atmospheric Air	State control over the protection and rational use of ... atmospheric air, including protection from POPs; Verification of sources of air emissions; Licensing of activities related to hazardous emissions; Setting standards for maximum permissible air emissions.
Department of State Control over the Use, Protection of Lands and Waste Management	State control over hazardous wastes and chemical substances, including POPs; Environmental regulation of hazardous waste management, import, export, import and transit; Development of instructive, methodological and normative acts on the establishment and collection of fees for the release of pollutants into the environment, waste disposal, including hazardous emissions.
Sector of International Relations	Implementation of international cooperation on protection and use of natural resources; Fulfillment of the obligations assumed by the Republic of Tajikistan under the signed international environmental agreements.
Legal sector	Development and assistance in the implementation of national and regional programs, strategies and plans for environmental protection; Development and approval of regulatory and methodological documents; Development in accordance with the current established procedure draft laws, legal, regulatory, methodological documents for submitting to the Government of the Republic of Tajikistan and other relevant bodies.
State ecological expertise	Overseeing environmental impact assessment processes.
Agency of Hydrometeorology	Monitoring and control of air pollution.
State Institution Research Laboratory for Nature Conservation	Analytical, instrumental and laboratory diagnostics of water, soil, air, mineral fertilizers and pesticides.

The **Ministry of Agriculture** was established by the Decree No. 191 of the Government of the Republic of Tajikistan (April 26, 2008). The Ministry of Agriculture plays an important role as the leading government structure in the management of pesticides and agricultural chemicals.

According to the Statute "Of the Ministry of Agriculture of the Republic of Tajikistan" (adopted by the Resolution No. 191 of the Government of the Republic of Tajikistan (April 26, 2008) the Ministry performs the following tasks:

- Development of proposals on use of pesticides and other agricultural chemicals;
- Fulfillment of obligations assumed by Tajikistan under international conventions, agreements and treaties;
- Methodological and organizational assistance to agricultural enterprises ... in introduction of new and effective methods and techniques, usage of pesticides and other methods of plant protection;

The Ministry of Agriculture works in close in cooperation with other ministries and departments.

The State Inspection Service for Phytosanitary and Plant Quarantine is an important structural subdivision of the Ministry of Agriculture. The State Inspection was created by the Decree of the Government of the Republic of Tajikistan No. 372 (August 1, 2008). The main responsibilities of the Service include:

- Purchase of fumigants and other pesticides;
- Creation of specialized fumigation teams equipped with machinery and other means of plant protection to eliminate and prevent the spread of quarantine and other pests, plant diseases and weeds.

The functions of preventing the spread of quarantine and other pests used to be the responsibility of the Republican Production Association "Tajikselkhozkhimiya". The legislation does not directly mention the liquidation of this legal entity. But the Shahrituz and Bokhtar district divisions of "Selkhozkhimiya" were put on sale by the Decree No. 486 of the Government of the Republic of Tajikistan (November 7, 2003) "On the strategic plan for the privatization of medium and large enterprises and the restructuring of natural monopolies and especially large enterprises for 2003-2013". The property rights of the former "Tajikselkhozkhimiya" are important for determining the rights of ownership of warehouses, premises, airfields and other structures that used to belong to "Tajikselkhozkhimiya" and were intended for storage of pesticides. Most of these objects were privatized after the collapse of the USSR or are in distress and need cleaning up.

The **Ministry of Industry and New Technologies** was created by the Decree No. 147 of the Government of the Republic of Tajikistan (March 3, 2014) to be replaced by the former Ministry of Industry and Energy. This ministry plays a key role in the management of the production of POPs - containing substances, the incineration of hazardous waste, the regulation of the emissions of Polychlorinated dibenzodioxins / polychlorinated dibenzofurans (PCDD/PCDF), and the management of polybrominated diphenyl ethers (PBDE). Despite the existing economic difficulties, the Ministry tries to increase industrial development and outputs, even if it means environmental impacts.

Tajikistan's transition to a "green economy" remains a big problem. The latest review prepared by Tajikistan for the Rio + 20 conference received negative feedback from non-government organizations (NGOs). Particularly because the review makes conclusions that do not correspond to reality. For example, switching a refrigeration plant line to ozone friendly substances. But this line doesn't exist for many years. Also, the review does not discuss the development of coal production and the country's transition to use of coal instead of natural gas.

Another difficult is licensing. The Law No. 535 of the Republic of Tajikistan "On licensing certain types of activities" (April 29, 2004) has a collision with the norms of the Law No. 20 of the Republic of Tajikistan "On ecological expertise" (April 22, 2003).

According to the Law of the Republic of Tajikistan "On Environmental Expertise" (Article 7), the list of objects for which conducting environmental impact assessment is mandatory includes "... development plans for industries/sectors of national economy...". According to the law, the main objective of the environmental impact assessment is "to assess the effectiveness, validity and sufficiency of measures to protect public health, rational use of natural resources, environmental protection." According to Article 1 of the law the environmental impact assessment should be implemented for both planned and ongoing activities.

According to the Article 17 of the Law of the Republic of Tajikistan "On Licensing Certain Types of Activities" "... procurement, processing and sale of scrap ferrous and non-ferrous metals ..." is included in the list of activities for which a license is required. But the Article 9 of the law (listing documents required licensing) does not list environmental impact statement among required documents. The clause 2 of article 9 of the law says that "additional documents could be provided..." this could mean that the environmental impacts statement could be requested, but it is not directly mentioned in the law.

The Statute of **Tajikhydromet** (Hydro Meteorology Service) was approved by the Government Decree No. 485 (October 1, 2008). Tajikhydromet is the agency with capacity to

assess the levels of air pollution with POPs and conduct laboratory assessments of POPs in water resources. The agency has 33 meteorological stations, 6 hydrological stations and 57 hydrological posts in Tajikistan. Significant financial resources are needed to increase the role of the agency to conduct environmental monitoring.

The Statute of the **Ministry of Health and Social Protection of the Population of the Republic of Tajikistan** was approved by the Resolution No. 148 of the Government of the Republic of Tajikistan (March 3, 2014). The main responsibility of the Ministry is to protect public health. The work of the Ministry is regulated by the norms of the Constitution, national laws, and existing sanitary norms and rules. The latter are very important as they contain many standards and detailed technical instructions.

The State Sanitary and Epidemiological Surveillance Service (SSESS) is an important subdivision of the Ministry. SSESS is responsible for monitoring the sanitary and epidemiological situation in the republic. SSESS plays an important role in management of hazardous wastes, including POPs. For example, an assessment conducted by SSESS may reveal abandoned stocks or dumpsites of hazardous wastes (according to the Procedure for identifying and accounting for abandoned waste (Government Decree No. 626 of November 2, 2012). Representatives of both SSESS and CEP, according to the Procedure, are included in the work groups on abandoned wastes. These workgroups are not very effective as there are still a lot of unaccounted abandoned warehouses, dumps and burials that contain obsolete pesticides.

The **State Statistics Committee of the Republic of Tajikistan** (Goskomstat) acts according to the Law on State Statistics (No. 588, January 12, 2010). Goskomstat communicates with different ministries and departments to exchange various economic, environmental, and social statistical data. Goskomstat has committees and computing centers at the regional and district levels. Goskomstat collects, stores, analyzes, compiles, presents and publishes environmental data.

Goskomstat handles a sheer amount of data, but does not collect information on POPs. Since POPs are not produced in the republic, but only imported, the imports could be traced using customs statistics searching particular customs codes of imported goods.

The Statute of the **Customs Service under the Government of the Republic of Tajikistan**, was approved by the Decree of the Government of the Republic of Tajikistan No. 612 on December 28, 2006. The Customs Service plays an important role in controlling the import and export of substances and wastes containing POPs. In order to comply with the Stockholm Convention, the Customs Service must keep records on each imported/exported chemical, countries of origin and importing/exporting parties. The customs committee is required to collaborate with environmental protecting agencies on issues of chemicals and waste management. It would be helpful to develop detailed instructions for the identification of different chemicals and wastes containing POPs. The instructions should contain methods for identifying POPs prohibited/restricted for import and production. It is also important to equip the national laboratories so that they could conduct analyses to detect POPs.

### ***Cross-sectoral collaboration***

One of the main objectives of the legislative and institutional framework is ensuring interaction and collaboration of different sectors of the society on solving environmental problems. The main sectors include the authorities, business/industry and civil society. But presently in Tajikistan we observe that the development of economy is favored over the needs of environmental protection. And this has a negative effect on the interdepartmental coordination between government structures. The authority and role of the main environmental agency is declining. Over the past 10 years the status of the Ministry of Nature Protection was reduced to a committee. Some control functions are lost. For example, the control of natural protected areas was transferred to the Forestry Agency.

The creation of the Center for the implementation of the obligations of the Stockholm Convention on POPs could be considered a success. It is important for the organization of



interdepartmental coordination of public authorities on issues of POPs. But lack of funding remains the main obstacle to controlling the circulation of POPs in Tajikistan.

The Decree No. 299 of the Government of the Republic of Tajikistan (July 3, 2003) "On Approval of the Statute of the Commission on Chemical Safety in the Republic of Tajikistan" established the Commission on Chemical Safety as state workgroup to coordinate activities of ministries and departments on issues of chemical safety. But the work of the Commission so far is not very effective for the following reasons:

According to the Decree of the Government of the Republic of Tajikistan No. 92 of March 3, 2003, the Commission includes the Deputy Chairman of the Government (head) and heads of environmental protection and health authorities as his deputies. The other members of the commission are deputy heads of the ministries and departments. As a result, there are many high-ranking officials in the Commission, but not enough people who could do some actual work. The Commission is not responsive to changes in international legislation on chemicals.

This issue could be solved if instead of the Commission there would be a Chemical Control Service supervising all handling of chemicals, including hazardous waste. This Service could oversee the practical implementation of important environmental conventions - the Stockholm Convention on POPs, the Basel and Rotterdam Conventions (if signed), as well as other international agreements on handling hazardous chemicals and wastes. The new Service could include specialists from different ministries and departments.

Presently the intersectoral interaction is most effective in the cooperation of state bodies with the civil society organization and less effective with business. This situation may improve as more businesses participate in some non-profit organizations, such as the Association of Small and Medium Business, Unions of Entrepreneurs, etc.

Non-governmental non-profit organizations (NGOs) are often invited as experts to participate in the development of some government documents, including those on environmental protection and sustainable development. The list of such recent documents includes the "National Report on Sustainable Development", "National Communications" on the UN RC on Climate Change ", framework documents on biosafety in the Republic of Tajikistan, National Profile on the implementation of the Aarhus Convention, the National Plan for the implementation of the obligations of the Stockholm Convention, and so on.

Some NGOs implement projects that help fulfilling the obligations of the UN Stockholm Convention. The national NGO Peshsaf together with the international NGO Blacksmith Institute (USA) and the Center for the fulfillment of the obligations of the Stockholm Convention on POPs in 2014-2020 made an inventory of the warehouses, burials and dumpsites of obsolete pesticides.

At the same time in the Republic of Tajikistan, local communities and organizations of users of natural resources are not involved in POPs management. The legislation allows associations of farmers, water users, transport workers, etc. to participate in management of chemicals, but it does not happen.

Effective intersectoral interaction is possible under the following conditions:

- Real funding from the state budget of the development of national documents on the obligations on environmental conventions with the requirement to involve all stakeholders;
- Implementation of joint POPs management projects, including research;
- Involvement of all stakeholders in the process of developing national priorities for the Stockholm Convention on POPs;
- Organization of real information exchange between government structures and stakeholders. The information exchange could be led by the Center for Implementation of the obligations of the Stockholm Convention on POPs.

There are some problems that may compromise the effective intersectoral collaboration on POPs management:

At the system level:

- Absence of uniform policy on environmental protection, rational use of natural resources and sustainable development.
- Low priority of environmental issues for the government.
- Lack of coordination between government bodies

At the institutional level:

- Absence of legal acts regulating social partnership and opportunities of civil society involvement;
- Fragmentation of POPs monitoring in between different ministries and departments;
- Environmental statistical data are not collected and compiled separately from other data;
- Some monitoring results are not comparable because different methods were used for data collection;
- Low level of digitalization: most of the data are collected using paper and its processing requires more time;
- Difficulties in collecting information, because of fragmentation and reorganization of big companies;
- Lack of equipment in state laboratories.

At the individual level:

- Lack of common goals in sustainable development and environmental protection;
- Lack of procedures regulating intersectoral interaction;
- Weak information exchange;
- Low level of environmental education at all levels, including decision-makers;
- Ignorance of the different sectors' representatives of the potential of other stakeholders, social stereotypes;
- Lack of trust between sectors prevents combining and exchanging resources (intellectual, material, organizational, etc.)

**Conclusions:**

- The existing system of management of chemicals is ineffective. It is necessary to better divide the POPs management responsibilities between ministries and departments.
- There is a need for a comprehensive law on chemicals. The existing laws and regulations on POPs are ineffective.
- The existing decision-making is not uniform, because it is based on many different laws and regulations implemented by different ministries and departments.
- While there are many government agencies involved in POPs management, there are no effective mechanisms for their interaction, collaboration and information exchange.
- Several ministries and departments have control functions which causes duplication and inconsistency.
- There is no system of POPs data collection from businesses.
- There is no information system on POPs.
- The government is not doing POPs inventory.
- Insufficient financing of environmental monitoring, lack of capacity and certification of the existing laboratories does not help effective management and decision making.

- Poor awareness of general public and non-involvement of residents in POPs management.
- It is necessary to improve interagency and intersectoral partnership and communication on POPs management in order to reduce POPs health risks.

### **Recommendations:**

- Create an agency on management of chemicals to replace the existing Commission on Chemical Safety. The agency would be responsible for the development of state policies, instructions, and regulations on handling hazardous substances and wastes. Include specialists from different ministries and departments presently involved in POPs management in the new agency;
- Analyze and integrate activities for the implementation of the Stockholm Convention into short-, mid- and long-term national, sectoral and territorial plans and programs;
- Increase funding from the state budget and other sources for the implementation of the Stockholm Convention;
- Develop a system at the regional and national levels to record emissions and migration of hazardous pollutants;
- Organize exchange of information on the results of the inventory of obsolete pesticides and plans for POPs disposal;
- Include in all agencies' statute mechanisms of stakeholders' participation in the implementation of the Stockholm Convention;
- In the current legislation governing the conclusion of international treaties, introduce (strengthen) the norms of responsibility for non-compliance with procedures when taking appropriate international obligations for responsible officials.
- Introduce in national legislation responsibility of senior officials for violations of international conventions in decision making;
- Introduce in government agencies' statutes the responsibility of officials for the condition of managed resources (forest, biodiversity, water, land, air, etc.), including impacts from POPs pollution;
- For the agency responsible for the implementation of the Convention to constantly expand contacts with international organizations working on reducing POPs health risks, alternative farming techniques, introduction of environmentally friendly agricultural technologies.

### ***Relevant international treaties and obligations***

Tajikistan became a member of the UN in March 1992, right before the UN Conference on Environment and Development in Rio de Janeiro (Brazil). That conference defined the principles of sustainable development as the basis of the policy of international cooperation and partnership. Tajikistan uses international cooperation and partnership to help implementing national environmental policy and takes an active part in international, regional and bilateral cooperation on environmental issues.

Tajikistan has established cooperation with a number of UN bodies, including United Nations Economic Commission for Europe (UNECE), Food and Agriculture Organization (FAO), Economic and Social Commission for Asia and the Pacific (ESCAP), United Nations Environment Programme (UNEP), United Nations Development Programme (UNDP), with international

financial institutions – World Bank (WB), International Monetary Fund (IMF), European Bank for Reconstruction and Development (EBRD), Asian Development Bank (ADB), Inter-American Development Bank (IDB), Saudi and Kuwait funds, as well as with other international organizations, such as the European Union (EU), Organization for Security and Co-operation in Europe (OSCE), Organization for Economic Cooperation and Development (OECD), Global Environment Facility (GEF), and others. Tajikistan develops cooperation on environmental issues with Afghanistan, China, Iran, Japan, Armenia, Russia, and Central Asian countries. The Republic of Tajikistan is a member of several regional and sub-regional organizations, including Economic Cooperation Organization (ECO), Shanghai Cooperation Organisation (SCO), Eurasian Economic Community (EurAsEC), IFAS (International Fund for saving the Aral Sea), Interstate Commission for Water Coordination (ICWC) and Interstate Commission on Sustainable Development (ICSID).

The Republic of Tajikistan recognizes the priority of the widely accepted principles of international law and ensures the compliance of national legislation. The environmental policy of Tajikistan relates to international activities by:

- improving regional and global cooperation on environmental protection;
- bringing national legislation in line with international laws and agreements;
- developing national programs and introducing mechanisms for the implementation of international conventions;
- implementing bilateral and multilateral agreements and participating in regional programs.

The Regional Environmental Action Plan for Central Asia was prepared by ICSID with support of ADB, UNEP and UNDP. The Action Plan includes five environmental priorities with short-term (2002-2007) and long-term (2007-2012) implementation. The Republic of Tajikistan has signed several regional agreements:

- Agreement on interaction on ecology and environmental protection in CIS (February 8, 1992). The agreement includes: harmonization of adopted environmental legislation, regulations and standards; joint development and implementation of international programs and projects on nature management and environmental protection and safety, including programs on safe destruction and neutralization of chemical and nuclear weapons, highly toxic and radioactive waste (Article 3);
- Agreement on information cooperation on ecology and environmental protection (September 11, 1998). The agreement includes cooperation on exchange and dissemination of environmental information among CIS member states; creation of an environmental data bank to collect information on environment, hazardous objects, environmental scientific and technical advances (Article 1);
- The Agreement on CIS Environmental Monitoring Cooperation (January 13, 1999);
- Memorandum on the development of cooperation between the government of the Republic of Tajikistan and the government of the Kyrgyz Republic on environmental safety (May 26, 2004);
- Framework Convention on Environmental Protection for Sustainable Development of Central Asia, signed in Ashgabat (Turkmenistan) on November 22, 2006.
- "Agreement between the governments of the Republic of Kazakhstan, the Kyrgyz Republic and the Republic of Uzbekistan on cooperation on environmental protection and rational use of natural resources" (1998). The parties of the Agreement cooperate on neutralization, neutralization, safe destruction and disposal of toxic and radioactive waste (Article 2).

The Interstate Environmental Council (IEC) of CIS member states was created in May 1993 to help coordination of environmental policy in CIS. The IEC as part of implementing the

Agreement on Cooperation on Environmental Monitoring developed the Interstate Scientific and Technological Program for the Creation and Development of Environmental Monitoring in CIS member states". The Interstate Center for Environmental Monitoring (ICEM) was created to help integration and development of national and regional environmental monitoring systems. As part of Interstate Scientific and Technological Program work it is necessary for Tajikistan to develop a system of monitoring POPs pollution.

The existing legal framework ensures Tajikistan's full participation in international cooperation.

## Chapter 3. Assessment of POPs problems in Tajikistan

### *Pesticides overview*

In 2017, The World Health Organization (WHO) defined a pesticide as “a chemical compound that is used to kill pests, including insects, rodents, fungi and unwanted plants (weeds).” The Food and Agriculture Organization (FAO) of the United Nations defined a pesticide as “any substance or mixture of substances intended for preventing, destroying, or controlling any pest, including vectors of human or animal diseases, unwanted species of plants or animals causing harm during, or otherwise interfering with, the production, processing, storage, or marketing of food, agricultural commodities, wood and wood products, or animal feedstuffs, or which may be administered to animals for the control of insects, arachnids or other pests in or on their bodies.”

Pesticides can be classified by target groups as acaricides, avicides, bactericides, herbicides, fungicides, insecticides, repellents, virucides, and so on. According to the chemical compositions of the active ingredients, pesticides can be categorized into four main groups: carbamates, organochlorines, organophosphorus, and pyrethrin and pyrethroids. WHO (2009) classified pesticides by hazard as an extremely hazardous pesticide, a highly hazardous pesticide, a moderately hazardous pesticide, a slightly hazardous pesticide, and a pesticide which is unlikely to present an acute hazard. In addition, based on the mode of formulation, pesticides can be classified as emulsifiable concentrates, wettable powders, granules, baits, dust, and fumigants.

Organochlorine pesticides are chlorinated hydrocarbons used extensively from the 1940s through the 1960s in agriculture and mosquito control. Representative compounds in this group include DDT, methoxychlor, dieldrin, chlordane, toxaphene, mirex, kepone, lindane, and benzene hexachloride. Due to the complex chemical structures and the chemical complexity of these pesticides and their active ingredients, these pesticides are often regulated by their trade names instead of the chemical nomenclature conventions. For example, the National Institute of Standards and Technology (NIST) (2011)<sup>4</sup> listed 120 names for the pesticide “Lindane”, which include 30 chemical nomenclature names and 90 other trade names. Even global jurisdictions have regulated pesticides by their local trade names in foreign languages, which has made it difficult to identify pesticides by their “original names”. The Chemical Abstracts Service Registry Number (CAS No.) developed by the NIST and the common name developed by the International Union of Pure and Applied Chemistry (IUPAC) are commonly used as reference. Unfortunately, the CAS No. is not available for most worldwide jurisdictions beyond Europe and North America.

### *Exposure to Pesticides*

The impact of pesticide residues on human health is a worldwide problem, as human exposure can occur through ingestion, inhalation, and dermal contact. Regulatory jurisdictions have promulgated the standard values for pesticides in residential soil, air, drinking water, and agricultural commodity for years. Until now, more than 19,400 pesticide soil regulatory guidance values (RGVs) and 5,400 pesticide drinking water maximum concentration levels (MCLs) have been regulated by 54 and 102 nations, respectively.

Pesticides are broadly applied in numerous agricultural, commercial, residential, and industrial applications to control and kill pests. They help society fight disease and increase agricultural productivity; however, pesticides can be transported into the air, water, soil, and biomass after numerous applications and can cause risks to the ecosystem and to human health. The impact of pesticide residues on human health is a worldwide problem, as human exposure to pesticides can occur through the ingestion of pesticide-contaminated water, food, or residential surface soil, the inhalation of pesticide-contaminated air, soil dust, or industrial vapor, and dermal contact with pesticide-contaminated water (e.g., swimming, showering, or raining), air, agricultural commodities, or soil. Bioaccumulation, for example, is the gradual accumulation of



substances, such as pesticides (e.g., DDT), or other chemicals in an organism. Bioaccumulation occurs when an organism absorbs a substance at a rate faster than that at which the substance is lost by catabolism and excretion.

Worldwide jurisdictions have been working on regulating pesticide standard values for residential surface soil, residential air, drinking water, surface water, groundwater, and food for years.

Pesticide soil regulatory guidance values (RGVs) are applied by worldwide soil jurisdictions to control pesticide pollution in residential surface soil. Pesticide soil RGVs specified the maximum amount of a pesticide which might be present in the soil without prompting regulatory responses, such as surface or groundwater contamination by the transport of pesticides from surface soil, ecological risk, and adverse human health effects by exposure to soil pesticides. The most concerned and conservative pesticide soil RGVs are provided for residential surface soil, where children can be exposed to soil pesticides by the ingestion of soil, the inhalation of soil dust, or dermal contact. Children are especially vulnerable to pesticides because their bodies are still developing, and their diets and activities - such as playing on pesticide-treated lawns or eating a lot of fruits with pesticide residue - can result in high exposures.

Pesticides can exist in residential air by the evaporation of volatile and semi-volatile pesticides, such as organochlorine pesticides, from crops and residential surface soil. In addition, pesticides can be blown away from agricultural fields by the wind, and some fumigants (e.g., bromomethane) are released into the air in a gaseous form. Therefore, the regulation of pesticide standard values in the residential air is necessary to control human health risks through inhalation and dermal contact exposures, especially for volatile and semi-volatile pesticides. However, few worldwide jurisdictions have regulated pesticide air standard values, which means that people around the world are probably not protected by the pesticide air regulations, especially for some farmers and workers who frequently work in the agricultural field.

### ***DDT – General Description***

Organochlorine pesticides are chlorinated hydrocarbons used extensively from the 1940s through the 1960s in agriculture and mosquito control. Representative compounds in this group include DDT, methoxychlor, dieldrin, chlordane, toxaphene, mirex, kepone, lindane, and benzene hexachloride. The term DDT refers to p,p'-DDT, or p,p'-dichlorodiphenyltrichloroethane. DDT, prepared by the reaction of chloral with chlorobenzene in the presence of sulfuric acid, was first made in 1874; and its insecticidal properties were discovered in 1939 by a Swiss chemist, Paul Hermann Müller. DDT (dichloro-diphenyl-trichloroethane) is considered one of the first of the modern synthetic insecticides.

DDT is applied as a dust or by spraying its aqueous suspension. The compound's structure permits several different isomeric forms, such as o,p'-DDT. The term DDT is also applied to commercial products consisting predominantly of p,p'-DDT, but also containing smaller amounts of other compounds, including p,p'- and o,p'-DDD (dichlorodiphenyldichloroethane) and p,p'- and o,p'-DDE (dichlorodiphenyldichloroethene)<sup>13</sup>. Its CAS No. is 107917-42-0 and has a molecular formula of C<sub>14</sub>H<sub>9</sub>Cl<sub>5</sub>. All DDT isomers are tasteless, almost odorless solids. Its physicochemical properties include:

- Physical state White, crystalline solid
- Melting point 108.5–109 °C
- Vapor pressure  $2.53 \times 10^{-5}$  Pa at 20 °C
- Solubility in water Highly insoluble (1 µg/liter)
- Log octanol–water partition coefficient 7.48

DDT is a non-systemic contact insecticide with a broad spectrum of activity. Growers used DDT on a variety of food crops in the United States and worldwide. Some of the crops were beans,

cotton, soybeans, sweet potatoes, peanuts, cabbage, tomatoes, cauliflower, brussel sprouts, corn, and other crops. DDT was also used in buildings for pest control.

It was banned in several countries in the early 1970s because of ecological considerations, and many other countries have more recently restricted or banned its use except when it is needed for the protection of human health. Despite a ban on sales, organochlorines may still be found in storage in many countries such as Tajikistan; thus, exposure is still possible. DDT is still used in some countries for the control of vectors that transmit yellow fever, sleeping sickness, typhus, malaria and other insect-transmitted diseases.

DDT was designated as a persistent organic pollutant (POP) in 1997 by the Governing Council of the United Nations Environment Programme<sup>14</sup>. Pesticide applicators are exposed primarily to p,p'-DDT, whereas it is the p,p'-DDE metabolite to which the general population is exposed in the diet or drinking-water.

DDT and its metabolites are persistent in the environment and resistant to complete degradation by microorganisms, although photochemical degradation does occur. The persistence of DDT is substantially lower in tropical climates than in temperate ones (a few months compared with years)<sup>13</sup>. DDT and its metabolites are readily adsorbed onto sediments and soils, which can act both as sinks and as long-term sources of exposure. Due to its strong tendency to be adsorbed onto surfaces, most DDT that enters water is and remains firmly attached to soil particles. If it does find its way into water, it is gradually lost by adsorption onto surfaces<sup>13</sup>.

In soils, DDT is immobile under aerobic conditions with a mean half-life ranging from 2 to 15 years<sup>15,16,17,18,19</sup>. DDT is metabolized by microbial systems in soils and is broken down into DDE and DDD. Significant degradation has been demonstrated in soils under anaerobic conditions, while little or no degradation was observed under aerobic conditions<sup>20</sup>. Biodegradation, however, is highly variable and influenced by the populations of required microorganisms. Various amendments to soils such as energy and carbon sources, were shown to increase degradation under anaerobic but not aerobic conditions<sup>20,21</sup>. DDT has been shown to readily degrade in certain flooded soils<sup>22</sup>. DDT is apparently co-metabolized by microorganisms and is not used as a sole carbon source. Products of biodegradation include DDD and DDE and occasionally DBP (4,4'-dichlorobenzophenone).

The physical and chemical properties of DDT and its metabolites enable these compounds to be taken up readily by organisms from the surrounding medium and from food. In aquatic organisms, uptake from water is generally more important, whereas food is the major source for terrestrial fauna. High lipid solubility and low water solubility lead to the retention of DDT and its stable metabolites in fatty tissue. In general, organisms at higher trophic levels tend to contain more DDT-type compounds than those at lower ones. These compounds can be transported around the world in the bodies of animals, as well as in ocean and air currents.

In the United States, populations of bald eagles and other raptors crashed when DDT thinned their eggs, killing their embryos. The pesticide, known for accumulating in food webs and persisting in soil and river sediment, was banned in the United States in 1972. Studies in animals have also shown that oral exposure to DDT can cause liver cancer.

DDT is classified as "moderately toxic" by the US National Toxicology Program (NTP) and "moderately hazardous" by WHO, based on the rat oral LD<sub>50</sub> of 113 mg/kg. Indirect exposure is considered relatively non-toxic for humans. The International Agency for Research on Cancer (IARC) classified DDT as Group 2A "possibly carcinogenic to humans". EPA has determined that DDT, DDE, and DDD are probable human carcinogens as of January, 2015.

Current concerns surrounding DDT are due to it being an endocrine disruptor. Endocrine disruptors are chemicals that can interfere with endocrine (or hormone) systems at certain doses. These disruptions can cause cancerous tumors, birth defects, and other developmental disorders. Any system in the body controlled by hormones can be derailed by hormone disruptors. A wide and varied range of substances are thought to cause endocrine disruption. Chemicals that are known endocrine disruptors include diethylstilbestrol (the synthetic estrogen DES), dioxin and dioxin-like compounds, polychlorinated biphenyls (PCBs), DDT, and some other pesticides.

### ***DDT in Breastmilk in Tajikistan***

In 2015, the International Agency for Research on Cancer classified DDT as Group 2A "probably carcinogenic to humans". Previous assessments by the U.S. National Toxicology Program classified it as "reasonably anticipated to be a carcinogen" and by the EPA classified DDT, DDE and DDD as class B2 "probable" carcinogens.

The health risks of DDT and related compounds (DDE, DDD) were not studied in detail in Tajikistan. But there were studies measuring DDT in breastmilk – this is the best way to assess human exposure to fat soluble substances. The WHO/UNEP human milk global surveys showed that **breastmilk DDT levels in Tajikistan were the highest in the world** and nearly a factor of three higher than in India where the breastmilk DDT levels are second highest. Figure 4 shows

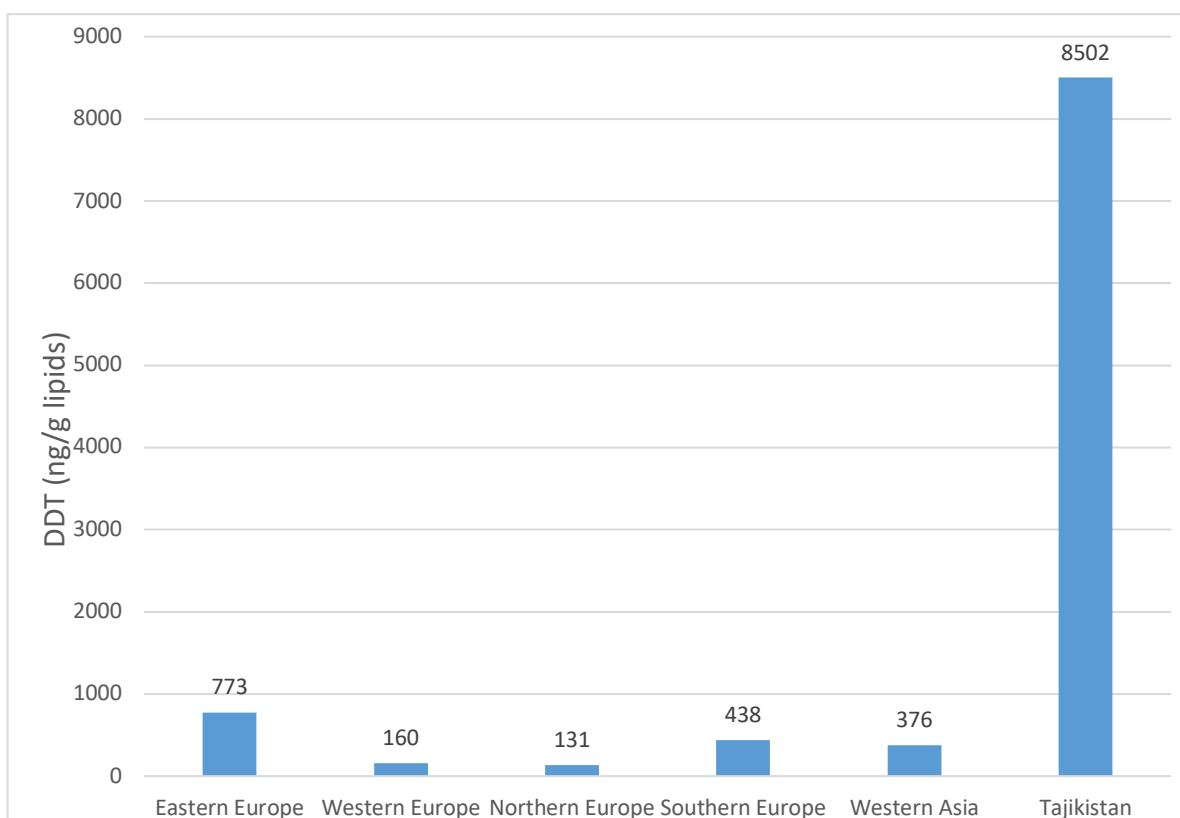


Figure 4. DDT levels in breastmilk in Tajikistan and other countries (data from WHO & UNEP 2013)

## ***Assessment of chemical substances listed in Annex A, Part I (POPs – pesticides): production, use, import and export in the past present and future***

According to Article 3 of the Stockholm Convention:

*“1. Each Party shall:*

*Prohibit and/or take the legal and administrative measures necessary to eliminate:*

*(i) Its production and use of the chemicals listed in Annex A; and*

*(ii) Its import and export of the chemicals listed in Annex A*

*Any Party that has a specific exemption in accordance with Annex A or a specific exemption or an acceptable purpose in accordance with Annex B shall take appropriate measures to ensure that any production or use under such exemption or purpose is carried out in a manner that prevents or minimizes human exposure and release into the environment. For exempted uses or acceptable purposes that involve intentional release into the environment under conditions of normal use, such release shall be to the minimum extent necessary, taking into account any applicable standards and guidelines.”*

This means that the following POPs listed in Annex A must be eliminated:

*aldrin, alpha-hexachlorocyclohexane, beta-hexachlorocyclohexane, chlordecone, dieldrin, endrin, heptachlor, gamma-hexachlorocyclohexane (lindane), pentachlorobenzene, toxaphene and endosulfan*

The following substances could be produced under certain circumstances and if registered as exemptions:

*chlordane, hexachlorobenzene and mirex*

The following substances could be used under certain circumstances and if registered as exemptions:

*aldrin, chlordane, heptachlor, hexachlorobenzene, lindane, mirex and dieldrin may be included in the register of use for a specific exemption*

Tajikistan is an agrarian republic. The area of cultivated crops is about 1.1 million hectares, including about 200 thousand hectares used for growing cotton. In most fields, crops are harvested twice a year. Pesticides are widely used in Tajikistan to combat pests, plant diseases and weeds. The agro-climatic conditions of the republic favor rapid reproduction and dissemination of many pests on agricultural crops. Many crops in Tajikistan are susceptible to various diseases. In most fields irrigation water is used every year and the irrigation water brings seeds of weeds. Pesticides were widely used in the past and will be still used in the foreseeable future to combat these threats.

In the Soviet times Tajikistan used big volumes of various agricultural chemicals, including pesticides. The excessive use of pesticides without proper observation application rules, safety precautions and without proper consideration of the climatic conditions, creates serious problems, including:

- poisoning;
- reduction of biodiversity;
- death of wild and domestic animals;
- interference with natural pest control;
- water pollution;
- accumulation of pesticides in the food chain;
- decrease of the soil quality as the result of pesticides contamination;
- accumulation of stocks of obsolete pesticides.

Large-scale use of pesticides, particularly POPs, led to environmental pollution and disruption of the dynamic balance of the biosphere.

Tajikistan does not produce pesticides, so the industry is fully composed of imports. From 2005-2007, the Favz commercial agriculture company started a small production (formulation) of some pesticides. The company installed two production lines imported from China in the Vahdat district. which were One line produced powdered pesticides, the other line produced suspensions and concentration emulsions. The produced analogues of pesticides were inferior in quality to original products of well-known companies such as Sengenta, DuPont and others. , which kept Favz's sales low and ultimately limited its operation to two years. In the Republic of Tajikistan, pesticides and their mixtures listed in the "List of chemical and biological preparations permitted for use in the Republic of Tajikistan", approved by the Interdepartmental Commission on Chemical Safety of the Republic of Tajikistan (June 11, 2004) are permitted. According to the State Service for Plant Protection and Chemicalization of Agriculture of the Ministry of Agriculture, the import of pesticides is permitted for companies that win special tender. The companies must have manufacturers' certificates for all imported pesticides. It is also necessary to obtain "Certificate of Analysis" from the Institute of Chemistry of the Academy of Sciences of the Republic of Tajikistan for each imported pesticide. Using those documents the Agency for Standardization, Metrology, Certification and Trade Inspection issues a Certificate of Conformity for the imported pesticide. Only after this procedure, the State Institution for Plant Protection and Chemicalization of Agriculture registers imported pesticides. All imported pesticides have labels in Russian with pictograms, written information, the country of origin and the address of the manufacturer. However, the pesticides do not necessarily have a technical safety manuals.

OJSC "SUGHDAGROSERV" is one of the largest companies importing and selling pesticides in Tajikistan. The company has direct contracts with big foreign companies: "Sengenta" "DuPont" and others. OJSC "SUGHDAGROSERV" receives the documents from manufacturers, including safety technical manuals, labels and marks. OJSC "SUGHDAGROSERV" receives pesticides packaged by manufacturers and protected by trademarks. The pesticides are transported by special vehicles marked with hazard signs.

There are also many small firms in Tajikistan that import pesticides. Their activities are insufficiently controlled. Some of these companies may import pesticides of poor quality or expired. Some smaller quantities of pesticides could be brought to Tajikistan illegally such as cases of dichlorodiphenyltrichloroethane dust smuggled from China and Uzbekistan and sold in the local markets in small bags.

The Republic of Tajikistan became a member of the World Trade Organization (WTO) in 2012. In the same year the Law of the Republic of Tajikistan "On Food Safety" (July 19, 2012, No. 389) was adopted. According to the rules of WTO and the requirements of the Law on Food Safety all agricultural products sold in the domestic and foreign markets must undergo laboratory analyses for pesticides content. The toxicological laboratory assigned to conduct such analyses belongs to the State Service for Plant Protection and Chemicalization of Agriculture. But the laboratory has very old equipment and presently does not function. It is necessary to create and equip a modern toxicological laboratory and train laboratory personnel.

The list of formerly used pesticides includes the following POPs: aldrin, dieldrin, heptachlor, endrin, hexachlorobenzene, toxaphene, chlordane, dichlorodiphenyltrichloroethane (DDT), lindane and endosulfan. In the past DDT comprised up to 90% of all used pesticides. Another popular insecticide was endosulfan (thiodan). Regrettably now Thiodan 35% and Thiodan 50% are included in the "List of chemicals and biological products approved for use in the Republic of Tajikistan." It is legal to import and use endosulfan (thiodan). Therefore, it is allowed to be imported into the republic and used to protect agricultural crops from pests. Chlordecone was never used in Tajikistan. The gamma isomer of hexachlorocyclohexane (lindane) was used in the 1960s, e.g. 10.7 tons were used in 1967. The inventories of 2005 and 2014 did not identify any stocks of this insecticide. In 1970 the order of the Minister of Health of the Union of Soviet Socialist Republics (USSR) use of DDT in agriculture was prohibited, and in 1987 it was prohibited to use for vector disease control. In 1980s and early 1990s, the use of other POPs

pesticides was banned, but some stocks of obsolete pesticides (mainly DDT) remained and were used for a long time.

### ***Inventory results***

Obsolete pesticides are still used in agriculture and it remains a big health risk problem. Many old warehouses still contain some remaining obsolete pesticides. The warehouses and surrounding soil are often contaminated with pesticides. In many cases pesticides were buried near the warehouses and some local residents dig up the pesticides for use in the fields and sale. This problem was particularly big for the specially designated landfills storing big volumes of obsolete pesticides. In 1991-2004 there was practically no information about the condition of those landfills and the remaining volumes of pesticides. An inventory of those landfills and storage areas was done as part of the implementation of the GEF / UNEP project No. GFL -23-27-4708 "Implementation of activities for the preparation of the National Implementation Plan for the Stockholm Convention on POPs in the Republic of Tajikistan" in 2004-2005. The inventory data were used for the development of the NIP approved by the Government of the Republic of Tajikistan on October 01, 2007.

The efforts on inventory of pesticides storages and contaminates areas were continued with support of the European Union, FAO and United States Agency for International Development (USAID). As the result more than 150 sites were assessed in all regions of the country. The inventory showed that most of the former warehouses of pesticides are privatized and actively used. In only about 10% of assessed sites the remaining stocks of obsolete pesticides were preserved and require clean up action.

The Fourth and Fifth Conferences of the Parties to the Stockholm POPs Convention agreed to amend the Convention by adding 10 new POPs to Annexes A, B, and C, including pesticides: Chlordecone, Lindane and Endosulfan.

### ***Methodology for conducting an inventory of pesticides***

The purpose of the inventory was:

- comparative assessment of the use of pesticides from 2005 until present;
- identification of obsolete pesticides (POPs) on farms;
- assessment of existing volumes of obsolete pesticides (OP);
- assessment of existing mixed pesticides;
- assessment of the soil contamination with OP;
- comparative assessment of condition of the pesticide warehouses since 2005;
- comparative assessment of the condition of agricultural airfields since 2005;
- assessment of the technical condition of the Vakhsh Polygon and the Kanibadam Polygon storage areas for pesticides.

The inventory of pesticides was implemented under supervision of the Work Group, which included specialists from the State Institution for Plant Protection and Chemicalization of Agriculture of the Ministry of Agriculture of the Republic of Tajikistan and the Service of State Sanitary and Epidemiological Surveillance of the Ministry of Health and Social Protection of the Population of the Republic of Tajikistan.

The pesticide inventory was conducted using Toxic Site Identification Protocol (TSIP) developed by the Blacksmith Institute (USA) and entered into the database <https://www.contaminatedsites.org/>.

### ***Results of Pesticides Inventory***

In the Soviet time pesticides were supplied in large quantities. The import of pesticides in the republic was 1.5-2 times higher than the actual demand. As a result, pesticides were accumulating in warehouses and distribution centers of "Tajikselkhozkhimiya". Other factors also contributed to the accumulation of pesticides, including:

- prohibition by health authorities to use some previously acquired chemicals because of health concerns;
- insufficient effectiveness of chemicals against the pests;
- expiration of shelf life of pesticides;
- improper containers and packaging materials;
- improper formulation;
- improper storage conditions;
- mistakes and poor organization of accounting of pesticide stocks.

The accumulated obsolete pesticides were supposed to be transported to specially designated hazardous storage areas, such as Vakhsh Polygon. However, many stocks were not transported. Instead the pesticides were distributed to farmers; secretly buried or dumped; disposed at municipal solid waste landfills. After the collapse of the Soviet Union the import of pesticides in Tajikistan has decreased. People responded by starting to use remaining stocks of obsolete pesticides.

The main sources of pesticide health and environmental risks are:

- warehouses of pesticides with remaining OP stocks, contaminated packaging, equipment and materials;
- soil contaminated with pesticides;
- former agricultural airfields;
- Vakhsh landfill for burial of pesticides;
- unauthorized burials of pesticides.

***Pesticide warehouses.*** The initial inventory identified 143 warehouses located in Khatlon and Sughd regions and RRS. The next inventory showed that only 40% of those warehouses remained intact. Most of the warehouses were partially or completely demolished for the purposes of using the land or parts of the warehouses as construction materials. In many cases the warehouse buildings do not have roofs, doors, windows, etc. Very often there is only a wall or two standing. These warehouses could not be repaired but remain to be the sources of contamination and health risks.



Figure 5. Typical former warehouses for storing pesticides





Figure 6. Food for animals is stored in former pesticide warehouses

The inventory conducted with the support of the EU, USAID and FAO in 2014-2020 identified 160 former warehouses of pesticides. Only 10% of the buildings were in good condition. Most of the former warehouses were privatized and used as commercial properties or for construction of residential houses. Most warehouses are located in Khatlon region (Figure 6.).

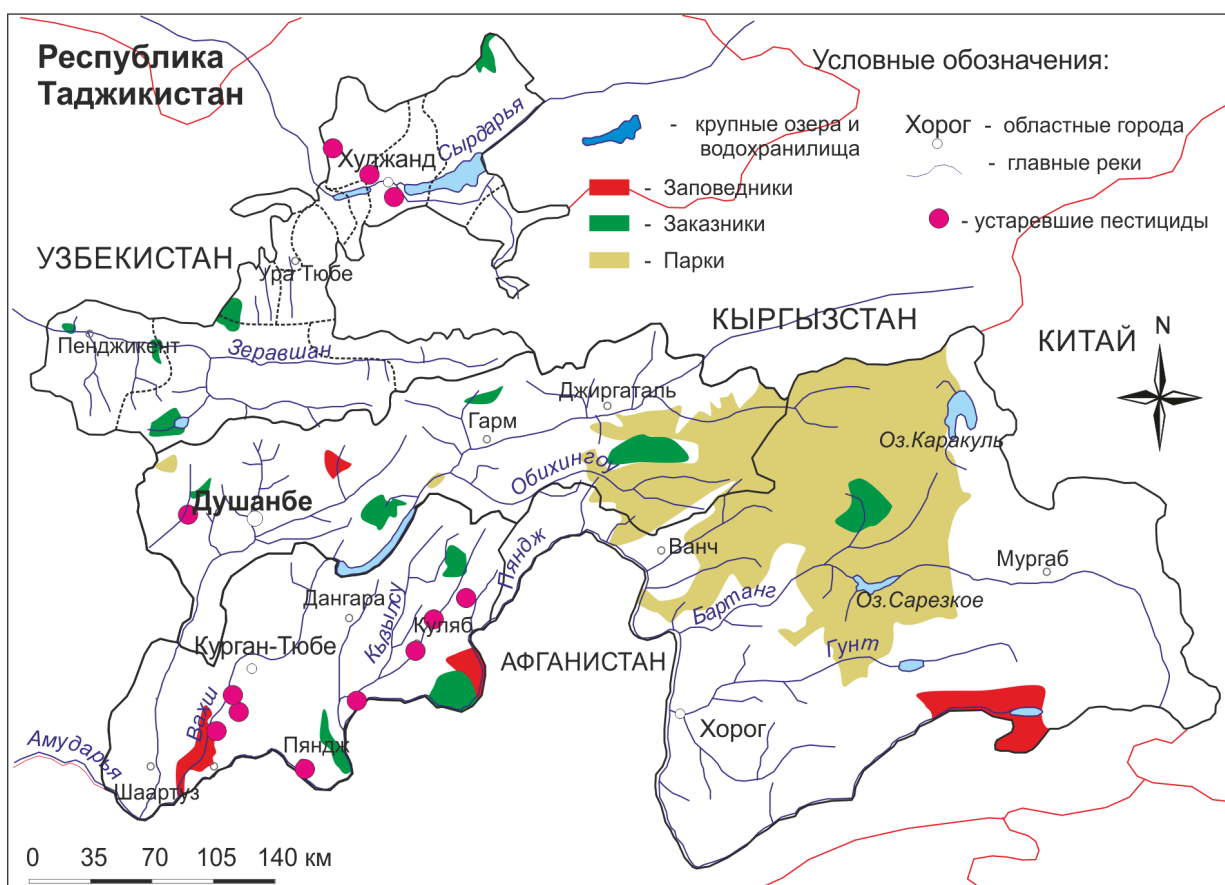


Figure 7. Locations of warehouses of obsolete pesticides in Tajikistan

In most cases people live and work right near or in the former warehouses of pesticides. Some obsolete pesticides remained dumped or buried near the warehouses and people are exposed to contaminated dust, vapors and through consumption of local foods.

#### ***Agricultural airfields.***

In the Soviet time there are 96 agricultural airfields in Tajikistan. None of them are presently operating. Presently most former airfields are used for growing crops or grazing livestock. If the airstrip is paved or made of concrete local residents used it for organizing local markets to sell raw and processed food (meat, cottage cheese, milk, dairy products), cattle, different goods. Very often the food is cooked right within the area contaminated with pesticides. For example, the Bagara site is located in the Vakhsh region, Jamoat Oq-Gaza. There used to be an airfield with paved airstrip, two warehouses, pesticide solutions preparing area, access roads, a weighing ramp and ramps for unloading / loading pesticides. Now there it has become an open air market (Figure 8 and 9).



Figure 8. A market at the Bagara site located on the former agricultural airfield.



**Pesticide containers.** There is a problem with disposal of pesticide containers and packaging materials (Figure 10). In the past when pesticides were supplied in big volumes, the pesticides were packed in steel 100-200 liters drums or aluminum 20-40 liters cans. Most empty container were returned to the suppliers. Today pesticides are supplied mainly in small plastic containers 1, 5 or 10 liter volumes. Such containers are never returned to suppliers of pesticides and are used by rural residents for storing liquids or just dumped with other solid household waste. There are cases of using the population using these same containers for storing water, milk, vegetable oil and other food products. High transportation costs have kept suppliers from shipping used containers back to the manufacturers, and they do not have any obligation to do so. The inventory revealed that there are about 7.45 tons of various containers for pesticides piled in different locations.



Figure 9. Pesticide container in Ziraki

### **Illegal Burials of Obsolete Pesticides**

In 1970-80s the supply of pesticides in Tajikistan was 1.5-2 times higher than the actual demand, which led to accumulation of pesticides in the warehouses of "Tajikselkhozkhimiya". Over the years, Tajikistan has accumulated thousands of tons of obsolete pesticides, often not safeguarded properly.

Before the hazardous waste storages in Vakhsh and Kanibadam were constructed many farms got rid of their obsolete pesticides by burying them somewhere near the warehouses. Sometimes after a fire the remaining agricultural chemicals including pesticides were buried. After the warehouses were privatized in 1990 the new owners either used the remaining stored pesticides

or dumped or buried them. Now there are many unauthorized burials of pesticides across the country. The exact locations of the burials are often unknown.

## **Chapter 4. Plan Implementation Strategy**

### ***Political statement in support of Tajikistan's obligations under the Stockholm Convention on Persistent Organic Pollutants***

Along with the approval of the Stockholm Convention on POPs National Implementation Plan the Government of the Republic of Tajikistan issued a political statement to declare support of the NIP activities and fulfillment of Tajikistan's obligations under the Stockholm Convention (Decree No. 502, October 01, 2007).

“As part of this implementation plan, Tajikistan, in addition to the first statement, accepts the following:

- Participation in international environmental agreements is essential for the nation aiming to achieve Millennium Goals in 21<sup>st</sup> century.
- Sharing the concern of the international community on the use of POPs, on December 6, 2006, the Republic of Tajikistan ratified the Stockholm Convention on POPs. The Government of the Republic of Tajikistan approved the National Implementation Plan for the United Nations Stockholm Convention on Persistent Organic Pollutants on October 01, 2007. In the NIP the Government of the Republic of Tajikistan assumed the responsibility to properly implement and comply with all provisions of the Convention. The Government would take actions to implement the NIP and current Health and Pollution Action Plan to reduce the health impacts of POPs and protect the rights of citizens of the republic to a healthy environment.
- This policy statement supports the Health and Pollution Action Plan, which will be implemented with active participation of ministries, departments, agencies, research and educational institutions, society and media. The action plan would help coordinating all activities.
- In order to achieve the NIP goals and implement the HPAP, the Committee for Environmental Protection under the Government of the Republic of Tajikistan will collaborate with international partners and use all available national expertise and technical resources. It is important to provide appropriate technical and financial assistance to the Republic of Tajikistan, as a Party with an economy in transition, considering the country's needs in building capacity to fulfill obligations under the Stockholm Convention on POPs for the successful and timely implementation of the HPAP.
- Participation of Tajikistan in the Stockholm Convention on POPs is a real step forward on the road to integrating the country into the process of international cooperation to eliminate hazardous chemical compounds.

### ***Implementation strategy***

This section contains a description of Stockholm Convention NIP activities, including coordination of actions, reporting, assessments and updating inventory of contaminated areas (Table 5)

Table 5. Proposals and priorities for implementing the strategy and capacity building

<b>Proposals and priorities for the implementation of the Management and Capacity Building Plan</b>	<b>Responsible parties</b>
Creation of the coordination center based on the National Center for the implementation of the Stockholm Convention on POPs and the public	Committee for Nature Protection
Building technological capacity for disposal of POPs (obsolete pesticides), wastes and soils contaminated with POPs	Committee for Nature Protection
Assessment of POPs health and environmental impacts using international standards	Committee for Nature Protection
Revision and update of the current Plan.	Committee for Nature Protection
Distribution of responsibilities of national partners	Committee for Nature Protection

### ***Implementation principles***

The implementation of NIP and HPAP activities will be based on the following principles:

- Community involvement. Effective implementation of the Stockholm Convention on POPs needs effective coordination between the government, industry and non-governmental organizations and communities.
- Transparency and providing general public information about POPs issues.
- Compliance with international criteria, standards and regulations, updates of existing national standards.
- Support to research on chemicals - alternatives to POPs.
- Clear distribution of responsibilities between national partners reflected in a separate detailed agreement.
- Timely compliance with undertaken obligations to avoid having exemptions on POPs.
- Cost-effectiveness of the action plan.
- Consideration of the real economic capacity of enterprises.
- Compliance with Best Available Techniques (BAT) / Best Environmental Practices (BEP) principles.

### ***Approval of national priorities***

Initially an inventory of POPs was done and the NIP of the Convention was prepared with international support. The creation of the Center for the Implementation of the Stockholm Convention on POPs helped coordination of the implementation of the Stockholm Convention on POPs. The situation has changed significantly since the adoption of NIP. New substances were added to the list of POPs. This may require changes in national priorities. According to Article 7.1 of the Stockholm

Convention on POPs regular updates and revision of NIP is the obligation of all Parties of the Convention.

HPAP contains summary of the work done until now and the analysis of possible changes in priorities based on the most recent inventory.

### ***Selection and justification of priority criteria***

The criteria for assessing the priority of tasks in NIP (2007) could be used in HPAP. Presently there is no need to revise the main national priorities as they are consistent with long-term National Programs. But it is necessary to analyze the effectiveness of the implemented actions.

The main criteria for prioritizing activities could include:

1. The environmental and health impacts, including short term and long term impacts, the potential of exposure of people and impacts on vulnerable ecosystems.
2. Compliance with the conditions of the Stockholm Convention on POPs. Any planned activity must comply with the requirements and priorities of the Convention.
3. Cost-efficiency is important considering the economic situation of the country.
4. Cross-cutting effect on all categories of POPs. The HPAP implementation should have an effect on as many POPs as possible. For example, building analytical capacity of laboratories or adopting/amending legislation and regulations.
5. The influence on the economic development of the country. It is necessary to assess the economic effect of planned activities. Some may cause an increase of prices or stop some production. Or some actions may stimulate the economic development (introduction of new and better technologies);
6. The feasibility of monitoring. It is necessary to be able to monitor the progress and obtain tangible and measurable results. For example, it is much easier to control the concentrations of pesticides in soils or food products compared to measuring concentrations of dioxins and furans.

These criteria correspond to the main priorities of the National Environmental Policy of the Republic of Tajikistan.

### **Priority directions**

*Development and adoption of the Law "On persistent organic pollutants in the Republic of Tajikistan".*

This law was included in the list of priorities but never adopted. Adoption of the law would have a significant impact on the development of the legislative and regulatory framework for new POPs. There are two main options: either adopt the law, or modify relevant existing laws and regulations.

*Repackaging and disposal of obsolete and banned pesticides.*

According to the latest inventory there are significant stocks obsolete pesticides in warehouses and buried underground. The previously planned projects on repackaging and destruction of pesticides were not implemented. The problem remains one of the main priorities requiring urgent actions. The



list of obsolete pesticides needed to be repackaged and destroyed now would include one more substance (endosulfan).

*Elimination of potential health and environmental threats by improving Kanibadam and Vakhsh landfills.*

The Kanibadam landfill was improved which reduced potential health and environmental risks by isolating and securing obsolete pesticides. Several research projects were implemented at the Vakhsh landfill, but the general condition of the landfill did not see much improvement. More work is needed, particularly at the Vakhsh landfill.

*Eliminate sources of malaria using methods alternative to DDT.*

There are plans to destroy stocks of DDT in Vakhsh as part of the UNEP-GEF project.

*Creation of POPs Monitoring System including a certified chemical analytical laboratory.*

Proper multilevel monitoring of POPs requires creation of an internationally accredited chemical analytical laboratory equipped with modern equipment and staffed with qualified personnel. It would take significant funding but it is a high priority.

*New pesticides.*

The conducted inventories identified only endosulfan as one of the newly listed POPs in Tajikistan. It is important to register new pesticides, create a list of chemicals prohibited or permitted for import and use.

## ***Implementation Strategy Review***

The implementation strategy includes mechanisms for reporting and progress monitoring. It is also necessary to determine the relationship between NIP results and the HPAP. There should be a timeframe established for the implementation of activities under the Stockholm Convention.

*Activity: Strengthening legal and institutional mechanisms for the implementation of the Stockholm Convention on POPs.*

According to the analysis of the current legislation of the Republic of Tajikistan, it is proposed to improve the regulatory framework on chemical safety. It will involve introducing changes in national legislation, development of new laws. A number of international agreements supplementing the Stockholm Convention Considerable should be ratified to ensure safe and effective hazardous waste management.

Since the ratification of the Stockholm Convention till the present moment, a tremendous amount of work was done to amend the national legislation. However, the reality requires from government agencies to work constantly on updating the legal framework reacting to changing situation and particularly the addition of new POPs in the Convention. The work on the legal framework should be actively supported by political decisions.

Undoubtedly the Republic of Tajikistan should actively participate in international processes on circulation of chemicals and hazardous waste and respond by adopting important international legal agreements. These include the Rotterdam Convention and the PRTR Protocol.

The implementation of the Convention and the inventory of POPs at the national level should be based on national legislation reflecting the responsibilities of private and public institutions and businesses to provide necessary information and data. It is necessary to introduce the amendments to the legislation of the Republic of Tajikistan to require mandatory tests to assess the potential threat of produced or imported chemicals to human health.

The following priorities are proposed:

1. Within the framework of national legislation, it is necessary to develop and adopt the law "On persistent organic pollutants", which will become a specialized regulatory legal act on management and handling POPs.

2. Development of a separate technical regulation on the management of wastes containing POPs would help clarify the legislation on waste management. It would also help to unify the rules scattered in GOSTs and Building regulations into a single piece.

3. It is necessary to make changes, additions and amendments in the environmental legislation of the Republic of Tajikistan regarding the introduction of the definition of the term POPs, collection of statistical data on waste generation and disposal, creating and maintaining the Unified Waste Cadastre.

4. It is necessary to make additions and amendments in the Law of the Republic of Tajikistan "On quarantine and plant protection" in order to introduce provisions on handling obsolete pesticides and toxic chemicals. It will be necessary to develop a regulation on such procedures. According to the Law of the Republic of Tajikistan "On the protection of atmospheric air" it is also necessary to develop the "Procedure for stimulating the reduction of atmospheric emissions. "

5. It is necessary to make additions and amendments in the legislation of the Republic of Tajikistan on waste management. It is necessary to introduce a definition for the term "persistent organic pollutants" in Article 1. To determine the hazard class, it is necessary to introduce an entire article, and for detailed regulation - development of a separate Procedure for determining the hazard class of wastes or refer to special technical regulations. It is necessary to add a separate article prohibiting the use of waste disposal technologies that result in producing POPs;

6. As part of NIP it is planned to create a Unified Database on POPs. But the procedure for creating and maintaining such database was not yet developed. So it is necessary to adopt a legal act on such procedure.

7. There are no normative legal acts regulating the procedures of restoration of the areas contaminated with POPs. It is proposed to introduce additions and amendments to the legislation on hazardous waste management, to establish and regulate activities of restoration of the territories contaminated with POPs.

8. The state registration of pesticides and toxic chemicals requires creation of the State Catalogue of pesticides and toxic chemicals. But the Catalogue was never created. It is necessary to develop the "Procedure for maintaining the State Catalogue of Pesticides and Toxic Chemicals." This document should define which government agency would establish and maintain the Catalogue and define which pesticides and toxic chemicals are officially banned for production and/or restricted in use in accordance with the requirements of the Stockholm Convention on POPs, including the list of new POPs;

9. The regulation on POPs inventory was not yet developed. The development of such regulation, including a methodology, is extremely necessary for financing the work related to the identification, description, inventory, and management of POPs.

10. A special procedure for registration, import, storage, use, and disposal of new pesticides and agrochemicals on the territory of Tajikistan does not exist and must be developed.

11. The Agency on Statistics under the President of the Republic of Tajikistan should adopt the normative act "On approval of the form of state statistical reporting 1-waste "Report on production waste management "and instructions for filling it out."

12. It is necessary to develop a technical normative act defining the procedure for monitoring the concentrations of POPs in natural environment.

13. It is necessary to adopt a normative legislative act (provision or regulations) for import and (or) export of equipment containing POPs through the customs border of the Republic of Tajikistan.

14. It is necessary to adopt a technical normative document defining the procedures of sampling and measuring concentrations of new POPs in natural environment.

15. A separate Resolution of the Government of the Republic of Tajikistan should establish the authorized state body for control over the circulation of pesticides and agrochemicals. The body should replace the existing Commission on Chemical Safety. Include specialists from different ministries and agencies institutions in the new state body. Use the Center for the implementation of the provisions of the Stockholm Convention on POPs to coordinate this work.

16. Introduce appropriate amendments and changes in the Customs Code of the Republic of Tajikistan on the control over the import and export of hazardous waste, on the identification and responsibility of individuals for customs violations. It is necessary to include experts from environmental protection institutions and the Ministry of Health and Social Protection of the Population in the commissions on POPs identification.

17. Amendments in the Tax legislation to stimulate activities to reduce use of POPs in all sectors of the economy;

18. Ensure that the planned actions fulfill the obligations under all environmental conventions on hazardous substances and wastes. This would allow uniting the efforts and reduce the impact of hazardous chemicals/waste on environment and human health.

19. Seek an increase in budgetary/extrabudgetary resources to implement the Convention

20. Develop a system to register the emissions and migrations of hazardous pollutants at the regional and national levels;

21. Organize the information exchange on the results of inventory of stocks of prohibited and obsolete pesticides, plans for their disposal and elimination, based on the results of monitoring and control between government agencies and non-governmental organizations participating in activities to identify unauthorized storage of obsolete pesticides.

22. Include mechanisms of stakeholders' participation in the statutes of government agencies.

23. Introduce (strengthen) the norms of responsibility for officials for non-compliance with procedures of international agreements;

24. Ensure personal responsibility (administrative, criminal) for senior officials for their decisions, implementation and consequences.

25. Introduce into the statutes of the relevant ministries and departments a clause on the responsibility of officials for the condition of the regulated resources (forest, biodiversity, water, land, air, etc.), including pollution of the resources with POPs;

26. The specially authorized body for the implementation of the Convention should constantly expand contacts with international organizations working on the impact of pesticides on health, alternative farming, and the introduction of environmentally friendly agricultural technologies.

Table 6. Action plan for legislative, institutional and regulatory capacity building.

Activities	Responsible parties	Deadlines	Indicators	Costs, USD
1	2	3	4	5
Ratification of international agreements	CEP, Customs Committee, Ministry of Health and Social Protection of the Population	2020-2025	Ratification of an international agreement and bringing national legislation in line with the requirements of the Convention	500.000,00
Development and adoption of a package of regulatory legal acts, including the Law of the Republic of Tajikistan "On Persistent Organic Pollutants"	CEP, the Ministry of Agriculture, the Ministry of Health, the Ministry of Industry and Innovation	2020-2026	Adoption of the Law of the Republic of Tajikistan "On Persistent Organic Pollutants" A package of normative legal acts, including changes and additions to the current legislation	200.000,00
Creation of a state catalog of pesticides and pesticides, including NLA	CEP, Ministry of Agriculture	2020-2023	State catalog of pesticides and toxic chemicals, Government Decree and the Procedure for catalog maintaining	500.000,00
Development of a technical regulatory document on inventory and monitoring of POPs in the Republic of Tajikistan	CEP	2020-2023	Technical documentation on POPs inventory and monitoring	100.000,00
Development of regulations (instructions) for the detection of POPs in goods passing the customs.	CEP, Customs Committee	2020-2026	Regulation (instruction) for the detection of POPs	50.000,00
Establishment of an interdepartmental coordinating body under the Government of the Republic of Tajikistan for the organization of environmental conventions regulating the handling of chemicals and hazardous wastes on the basis of the Center for the implementation of the Stockholm Convention obligations on POPs	Government of the Republic of Tajikistan, CEP	2020-2025	Abolition of the Chemical Commission and the creation of a new interdepartmental body	100.000,00

Revision and implementation of concepts, legal regulation of POPs circulation in environmental strategies	Center for the Implementation of the Commitments of the Stockholm Convention on POPs	2020-2026	Integration of POPs management issues into environmental documents	150.000,00
TOTAL:				1.600.000,00

*Activities: Production, import, export, use, stocks and wastes of POPs listed in Annex A (chemicals listed in Annex A, Part I)*

The Stockholm Convention on POPs prohibits import and export of all pesticides listed in Annex A, except for environmentally sound disposal purposes and purposes that are listed as exceptions.

Article 3 of the Convention, Annex A, forbids production of aldrin, dieldrin, endrin, heptachlor and toxaphene. The production of chlordane, hexachlorobenzene and mirex could be permitted as an exception. Aldrin, Chlordane, Dieldrin, Heptachlor, Hexachlorobenzene and Mirex could be included in the “Registry for a Specific Exception”. The specific exemptions for these chemicals expired on 17 May 2009 but could be extended upon request of an interested Party at the Conference of Parties. There are no exceptions for toxaphene and endrin, which means that those substances could only be disposed of in an environmentally safe manner. DDT is included in a separate Annex B of the Convention and deserves special attention. If a Party of the Convention intends to use DDT for vector disease control, it must:

- register an acceptable target;
- develop and implement an action plan to: ensure use only for vector disease control; introduce alternative products, methods and strategies for disease control; reduce the incidence of disease.

The specific exemptions for DDT expired on 17 May 2009, but they can be extended upon request of interested Parties at the Conference of the Parties.

In 2014- 2020, international organizations and donors (GEF, EU, UNIDO, UN FAO, UNDP, OSCE, UNEP) supported inventory of obsolete pesticides in Tajikistan. As a result of this work 218 warehouses were assessed. The inventory identified more than 14 097 tons of obsolete pesticides in different locations, including 4 022.74 tons of DDT and 7.0 tons of thiodane (endosulfan). The amount of soil mixed with pesticides – 55 720.1 tons. In Vakhsh Polygon TAUW company identified over 33.3 thousand tons of pesticides, including at least 3.3 thousand tons of DDT.

The main reasons for the accumulation of obsolete pesticides include:

- ineffective system of purchasing and supplying pesticides;
- long-term storage of pesticides with short shelf life;
- unsatisfactory organization of storage and accounting;
- improper packaging;

During the latest inventory in 2014, 202 soil samples were collected in Khatlon region and RRS. The analyses of those samples were conducted in a certified laboratory of Analitfaktor LLC in St. Petersburg, Russia. The analyses had to be done abroad because there are no internationally accredited laboratories in Tajikistan capable of analyzing soil for concentrations of substances listed in the Stockholm Convention. The inventory was also conducted in the Sughd region with support of FAO, but soil analyses were not done because of lack of funding.

The issue of disposal of containers from pesticides requires a solution. According to the preliminary data from the national inventory, there are over 130 thousand pieces of used pesticide containers in Tajikistan. These containers are a real health threat, as they are often used for household purposes, including storage of food and water. The general population health risk awareness of pesticides is very low. The number of used pesticide containers is growing every year, especially plastic containers. Simple burning is an undesired disposal method because of emissions of combustion products into the air.

Table 7. Action Plan for the Elimination of POPs Stocks and Wastes (Appendix A, Part 1)

Activities	Responsible parties	Indicators	Deadlines	Total cost in \$USD	Potential sources of funding
Training for members of the working groups of Sughd and Khatlon regions and RRS (40 people from plant protection specialists) in methods of conducting a detailed inventory, using the latest FAO standard forms	CEP, NCSK, public organizations	Training program. Certificates of training completion	2020-2022	40,0	GEF, international donor assistance, republican budget
Detailed assessments of contaminated sites	CEP, NCSK, public organizations	Working group reports	2021- 2023	216,0	GEF, international donor assistance, republican budget
Identification of pesticide samples taken at pesticides warehouses and landfills	CEP, Ministry of Agriculture, NCSK AS	Analytical data	2021-2023	432,0	GEF, international donor assistance, republican budget
Construction of new warehouses for temporary storage of pesticides to be destroyed	CEP, NCSK, public organizations	Warehouse acceptance certificates	2022-2024	250,0	International donor assistance, republican budget
Cleaning, repackaging of obsolete and prohibited pesticides, provision of safe storage until the commencement of destruction activities	CEP, NCSK, public organizations	Acceptance certificates for cleaning, repackaging pesticides.	2022- 2023	4125,0	International donor assistance, republican budget
Ensuring safety of repackaging and transportation of obsolete and	CEP, NCSK, public organizations	Instruction approved by specially	Constantly in the process of work.	150,0	International donor assistance, republican budget

prohibited pesticides and their mixtures, including those containing POPs		authorized bodies.			
Development of a program for the destruction of obsolete and banned pesticides, the program would include the timeframe, locations and methods of destruction	CEP, NCSK	Program approved by specially authorized bodies.	2023- 2025	40,0	GEF, international donor assistance, republican budget
Transportation of repackaged pesticides to the place of destruction on the territory of the Republic of Tajikistan or beyond	CEP, NCSK	Acts of acceptance of pesticide waste by the destruction organization.	2020- 2027	340,0	GEF, international donor assistance, republican budget
Total:				5593,0	

Comprehensive environmental studies include:

- Study of the geological and hydrological conditions of the sites;
- Justification and construction of a regime network of observation wells for groundwater;
- Identification of possible routes of migration of pesticides in the environment;
- Analytical studies of pesticides in natural ecosystems;
- Public health risk assessment;
- Justification and organization of monitoring at each disposal site.

Based on the results of the studies, develop a monitoring program for burial grounds.

- a) Transportation of repackaged pesticides to the place of destruction;
- b) Construction/acquisition of an enterprise for the destruction of obsolete and banned pesticides;
- c) Cleanup, restoration, destruction of warehouses / storages, soils contaminated with pesticides, including the territory of landfills.

### ***Activity: Facilitation of information exchange and stakeholder engagement***

It is necessary to develop a specially organized system for collection, storage, processing, analyzing and presenting the data to decision-makers. This system would benefit from the involvement of national and local non-governmental organizations of the coalition of NGOs "Tajikistan without toxic waste".

The effective management of chemicals needs a system of information exchange, which would allow all partners involved in the process of chemicals management and issues of chemical safety to have access to all necessary information. One of the steps in the process of creating such information

system is creation of a database (electronic) that would supply and exchange information for all stakeholders in all regions of the country. The following steps are proposed:

- Create an Information Exchange National Agency as part of the NCSC;
- Develop and use networking strategies for exchange, collection and dissemination of information;
- Subscribe to online resources containing data on national inventories;
- Support the existing information mechanisms of the NCSK;
- Attract stakeholders in the discussion of chemical management problems;
- Appoint a National Coordinator on information exchange;
- Define what information is needed;
- Provide information to government agencies, academia, businesses and NGOs using the Internet, printed publications, emails, etc.;
- Purchase and install necessary equipment: computers, communication devices, etc.;
- Train the personnel to work with information – collection, dissemination, stakeholders' involvement;
- Build national capacity in collection and use of multi-sectoral information;
- Develop educational materials and programs;
- Organize trainings.

Defining partners' obligations:

- Identification of relevant partners and partner organizations;
- Establishment of relationships with partners;
- Exchange of information with partners;
- Involvement of partners in the programmatic activities.

It is possible to exchange information with other Parties of the Convention if an effective international network is created. There should be a system in place including software and hardware systems for storing, processing and maintaining primary databases, including automatic quality control and increase of technical potential of information and analytical centers.

Table 8. Facilitating communication and stakeholder engagement

Activities	Responsible parties	Deadlines	Total costs \$USD	Potential sources of funding
Establishment of the Exchange of Information National Agency as part of the NCSC	CEP, NCSC	2020-2023	55,0	International donor assistance, state budget
Train personnel	CEP, NCSC, NGOs	2020-2022	15,0	International donor assistance, state budget
Increase the national capacity in collection and use of information from various sectors	CEP, NCSC, NGOs	2021-2024	20,0	International donor assistance, state budget
Define responsibilities of partners	CEP, NCSC	2021	No funds required	
Discussion of health issues	MAF, NCSK MH	2022- 2024	10,0	International donor assistance, state budget
Total:			100,0	



### ***Activity: Public awareness, information and training (Article 10)***

According to Article 10 of the Convention, “Each Party shall, within its capabilities, ensure that the public has access to information on POPs; raises awareness on POPs among the policymakers and governing bodies.”

Successful implementation of the Stockholm Convention on POPs in Tajikistan can only be achieved if the society knows about the problem of POPs and understands the impacts of POPs on environment and human health. It is necessary to raise the public awareness by providing information on POPs and conducting trainings. For this purpose, the following must be done:

- Prepare and implement a program to increase public awareness of POPs;
- Develop and publish educational materials (brochures, posters, newsletters) about POPs;
- Prepare TV and radio materials;
- Prepare articles and brochures;
- Organize workshops for vulnerable groups.

The policy and decision-making to increase the awareness of managers of POPs:

- Identify the managers/decision-makers.

Implementation of education programs for general public:

- Feeding information through media;
- Identifying backup people for the implementation of the public education process (ministries, local governments and NGOs);
- Training of backup people;
- Liaising with educational institutions dealing with POPs issues.

Support of educational activities:

- Highlighting the benefits of using alternatives to POPs;
- Organization of TV and radio programs;
- Development of a mini grant program for NGOs.

Compilation of information on POPs:

- Establishment of information centers;
- Development of mechanisms for POPs data collection.

Support for the dissemination of information:

- Updating the website and issuing newsletters;
- Support of the process of preparation and dissemination of information on POPs by ministries, institutions and other stakeholders.

Training of workers, teachers, technical and management staff in the relevant institutions:

- Organization of trainings for trainers;
- Production of training materials;
- Organization of practical seminars.

Table 9. Action plan on education and public awareness

Activities	Responsible parties	Deadlines	Indicators of fulfilment	Total cost in \$USD	Potential sources of funding
Development of a program to raise public awareness	CEP, NCSC, NGOs	2021	Program approved by a specially authorized body	25,0	GEF, international donor assistance, state budget
Implementation of education programs for general public	CEP, NCSC, NGOs	2022-2025	Public education plan	240,0	International donor assistance, state budget
Raising public awareness about the effects of POPs on environment and human health	CEP, NCSK, NGOs	Constantly	Special information in the media (printed, electronic), seminars, trainings, etc.	50,0	International donor assistance, state budget
Collection and analysis of data on POPs. Creation of a data collection team	CEP, NCSK, NGOs	Constantly	Aggregated information presented to the public and stakeholders.	300,0	International donor assistance, state budget
Establishing a process for dissemination of information	CEP, NCSK, NGOs	2016-2017	Seminars, round tables, information in printed and electronic media.	280,0	GEF, International donor assistance, state budget
Trainings for workers, teachers, technical and management staff in the respective institutions.	CEP, NCSK, NGOs	According to the approved schedule	Training schedule. Reports on the conducted trainings.	150,0	GEF, state budget
Total:				1045,0	

### ***Activities: research, development and monitoring (Article 11)***

Article 11 of the Stockholm Convention on POPs “Obliges the Parties, to promote and / or undertake appropriate research on POPs (their alternatives and potential POPs), development, monitoring and cooperation at the national and international levels.” The inventory revealed that the infrastructure and institutional capacity for conducting research, development and monitoring of POPs is not sufficiently developed in Tajikistan. This section presents the planned activities on research, development and monitoring of POPs in Tajikistan.

- Building capacity of the institutional structure of POPs research.
- Identification of institutions with potential for POPs research.
- Building the national capacity for scientific and technical research and infrastructure for exchange of data and analytical results.
- Establishing cooperation between research institutions.
- Development of procedures for public awareness about research and development results.
- Conducting research to identify alternatives to POPs.
- Inventory of appropriate laboratories to monitor all activities related to POPs.
- List the existing laboratories.

- Develop the criteria for assessing laboratory capacity for analyzing POPs.
- Assessment and selection of laboratories
- Modernization of laboratory / laboratories that are able to test chemicals.
- Research of POPs effects on human health
- Monitoring and evaluation of POPs effects on pregnant women, milk of lactating mothers and other human tissues.
- Research to assess the potential exposure to POPs and human health risks related to consumption of food consumed, early development, mothers' nutrition.
- Research of reducing reproductive health risks of POPs.
- Environmental protection studies.
- Research of POPs life cycle and migration in the environment.
- Development of new, improved technologies for the detection of POPs in components of natural environment.
- Identification of POPs concentrations in components of natural environment.
- Determine sampling and analysis methods.
- Sampling.
- Tests of soil, air, water, breast milk and media for POPs concentrations.
- Establishing a data management process.
- Data collection and monitoring, considering the necessity to minimize duplication of activities.
- Establishment of procedures for management test results.
- Development of guidelines for analysis of monitoring results and reporting in accordance with international standards.
- Creation of a mechanism to ensure monitoring quality.
- Creation of an effective system of quality control and assurance.
- Creation of a committee to evaluate the obtained data.

Table 10. Research, development and monitoring

Activities	Responsible parties	Deadlines	Indicators	Cost, \$USD	Potential sources of funding
Creation of a mechanism to ensure the quality of POPs monitoring.	CEP, MAF, NCSK	2021-2023	National POPs monitoring system approved by a special authorized body	100,0	International donor assistance, state budget
Identification of appropriate laboratories. Creation of a working group.	CEP	2020-2021	Conclusion of the working group	20,0	International donor assistance, state budget
Modernization of toxicological analytical laboratories for testing for chemicals classified as POPs	CEP, NCSC	2021-2025	Obtaining a certificate for laboratory accreditation from the Agency for Standardization, Metrology, Certification and Trade Inspection	1000,0	International donor assistance

Detection of levels of POPs in environmental media and biosubstrates.	CEP, NCSC	Constantly	Research program. Sampling schedule. Documented data.	500,0	International donor assistance, GEF, state budget
Establishment of proper data management.	CEP, NCSC	Every three years	Data Management Guide (Results and Reporting) National registries.	250,0	GEF, international donor assistance, state budget
Total:				1870,0	

## **APPENDIX A: Toxic Site Identification Program in Tajikistan**



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## **Acknowledgements**

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## **Introduction**

Pure Earth/ Blacksmith Institute (BI) is an international non-profit organization dedicated to solving pollution problems in low- and middle-income countries. Pure Earth has been implementing the Toxic Sites Identification Program (TSIP), which is an effort to identify and screen contaminated sites in low- and middle-income countries where public health is at risk. TSIP has been supported by The United Nations Industrial Development Organization (UNIDO), European Commission, Asian Development Bank (ADB), World Bank and Green Cross Switzerland. The contaminated sites are identified by trained consultants/investigators drawn from universities in respective countries using the Initial Site Screening (ISS) protocol. The ISS helps to understand the risks posed by pollution, types of pollutants, size of the polluted site, population at risk, magnitude of health risk and possible remediation measures. In Tajikistan, Pure Earth's main partner has been the NGO Peshsaf, and its staff member Umidjon Ulugov, who also serves as Pure Earth's country coordinator. Pure Earth's New York and regional staff have trained Peshsaf staff in conducting various types of assessments, which has allowed them to collect samples, and investigate various types of toxic sites across Tajikistan.

## **Project Background**

The Toxic sites identification program (TSIP) is designed to identify contaminated sites all over the world and to assess their potential impact on human health. To the date over 4600 sites in 99 countries have already been identified and downloaded into the database. This is probably only a small part of all contaminated sites in the world. Therefore, it is very important to continue studying toxic pollution and its impact on health. Specifically,

trained investigators work for Pure Earth/Blacksmith Institute in low- and middle income countries using the Initial Site Screening (ISS protocol) to implement this task. A special program developed by Pure Earth/ Blacksmith Institute called the ISS protocol helps stakeholders and governments to understand the risks associated with contamination, to identify types of contaminants, to estimate the size of contaminated area, to count the number of people at risk, and to develop a preliminary plan for rehabilitation and clean-up of sites.

The main result of this work is creating an exhaustive list of toxic sites that pose a risk to human health in each country.

### **Toxic Site Identification Program (TSIP)**

The Toxic Sites Identification Program aims to assess sites that have:

- Toxic pollution from a “point-source” (a fixed location, not air pollution from cars and trucks),
- In concentrations or levels that can cause adverse human health impact
- Where there is a migration route and exposure pathway to humans
- In low- and middle-income countries as designated by the World Bank

Mostly obsolete pesticide sites have been inspected in Tajikistan during the TSIP process, Central to Pure Earth’s approach is the model of Pollution-Migration-Pathway-People as the basis for understanding and assessing risks at a particular site. This model is consistent with risk screening approaches used internationally (by U.S. EPA, WHO and others) but is simplified for the purpose of conducting rapid risk screenings. Pure Earth is focused on people’s health. However, many health impacts from pollution are chronic and are difficult to attribute directly to one source. In the context of an Initial Site Screening (ISS) it is unusual to be able to demonstrate clearly the health consequences of a particular site. What can be done is to show that there is a credible risk attached to the site and that this risk deserves further investigation, as part of the design of an intervention.

In simple terms, the health impact of a compound on an individual is a function of its toxicity and the dose received by people. The dose is a function of the concentration of the toxic compound, the time that people are exposed, and the pathway into the body. There are three basic pathways: inhalation – entry into the body through breathing;

ingestion – entry through eating or drinking; and dermal – entry through skin contact and absorption.

The existence of a public health risk at a site depends on three components:

- 1) There must be a source of pollution with a severe enough toxicity and a high enough level or concentration to be hazardous;
- 2) There must be a migration route for the pollution get to an area used or occupied by people; and
- 3) There must be a pathway into the body whereby people have the contaminant in their bodies for a long enough time for a significant dose to occur.

The ISS is the process by which these components are identified and assessed at a site.

## **TSIP Training in Tajikistan**

A number of both TSIP and safety trainings had been held in Tajikistan, the first being a TSIP training in 2012. A seminar was held on March 30, 2012 in Dushanbe. At that date 17 people were trained in TSIP methods (which have since been updated). Four of the 17 were government representatives.

The next series of trainings were held in the years 2016-2018. On May 2-3, 2016 a safety training of 8 members of a cleanup crew was held on the territory of Yakkatut Jamoat, Jami, Tajikistan. The training program included safety issues, collection of pesticides, transportation and storage of them to the Vakhsh landfill. This is the standard safety course for all workers who work with Peshsaf—Pure Earth's partner in Tajikistan.

On May 4, 2016 Pure Earth and Peshsaf conducted an outreach program for the population of the Yakkatut Jamoat of the Jamiy region. This project reached up to 500 people. Among these persons are the staff of the mahalla council - 3 people and the jamoat - 8 people. Also 1 representative of the Khukumat district. The main task of this program was to explain the danger of obsolete pesticides on the human body, including to children. The goal was ultimately to prevent the use of building materials from the warehouse, and show local residents the methods for preventing toxic chemicals from entering the body. This initiative was meant to protect the health of the local population. As part of the project supported by the European Union, Pure Earth and Peshsaf co-hosted an educational seminar on improving the capacity of public organizations of Tajikistan in the field of environmental protection and human health. This took place on July 17 to July 22 2018. In all 22 Tajik NGO representatives, 5 staff from Peshsaf, 4 people from Pure Earth and 1 person from USAID attended. (Agenda and draft are attached in



annex). This seminar also included a TSIP training, showed participants how to use the TSIP online database, and ended with a site visit.

On October 16, 2018, a safety training was held for 5 cleanup workers in Southern Kyrgyzstan (Vakhsh). One safety expert from Peshaf, and 4 other Peshsaf staff and 3 Pure Earth staff including one Technical Advisory Board member were present. In attendance was also the head of the Vakhsh landfill, as well as the head of the environmental protection department of the Vakhsh district. The main task as in all training workshops was an emphasis on worker safety, proper PPE use, behavior during the action, first-aid kit, procedures for cleaning, transportation and temporary storage of obsolete pesticides at the Vakhsh landfill.

Peshsaf hosted a seminar on the TSIP Database from November 12 to November 28, 2018. A total of 20 people attended as well as 3 Peshsaf staff. All NGO representatives from the July 2018 meeting were present. The main objective of this seminar was to further familiarize participants with Pure Earth's new TSIP database.

## **Country Background - Tajikistan**

Tajikistan is a small country located in Central Asia. Tajikistan shares borders with Afghanistan and China in the south and east, and with Kyrgyzstan and Uzbekistan in the north and west. The climate of Tajikistan is dry continental, with significant fluctuations in temperature and precipitation, depending on the absolute height of the terrain, and seasons.

The country suffers from a number of legacy and contemporary environmental problems. Clean, surface waters are polluted by human activity. The Varzob River, which supplies drinking water to the capital of the country, Dushanbe, is polluted upstream by household and industrial wastewater. The Kafirnigan River is another important source of drinking water, but it receives drainage water, and industrial and domestic wastewater, which leads to pollution. The Vakhsh River, which crosses all of Tajikistan is polluted with industrial wastewater containing mainly salts and organic fertilizers, toxic chemicals and pesticides that are washed away from the fields. The Syr Darya River (one of the rivers which went into the Aral sea) is so polluted with irrigation water that the water in it is practically unsuitable for drinking. Groundwater is also polluted after human activities (industrial, agricultural and domestic wastewater).

Waste management issues are also very prominent in Tajikistan. Currently, there is no reliable information on the volumes and types of waste, including toxic waste (such as

pesticides). Wastewater treatment in the country does not follow the international rules of transfer and storage of toxic goods and chemicals intended for use in agriculture and industrial facilities.

Air pollution is another serious pollution issue in Tajikistan. The main sources of air pollution in urban areas are metallurgical plants, chemical production plants, and cotton processing plants. Many of the pollutants in the air are suspended solids.

Thus, the anthropogenic causes that have a negative impact on the health of the population in the Republic of Tajikistan are:

- Air pollution in major cities of the country;
- Low provision of the population with drinking water
- Low water quality where water is present
- The storage of household and industrial waste in water protection zones
- Unsatisfactory storage of all types of waste, including toxic and radioactive waste

The environmental monitoring system at the state level is poorly developed for a number of reasons, including lack of funding. This makes it impossible to know the scope of the problem across the country, as well as the full variety of environmental issues. No state centralized system of information is available to the government which makes it possible to make management decisions to reduce health risks for people living in polluted areas. All of these issues contribute to the continued problems related to health risks from pollution in Tajikistan.

## **Implementation Strategy**

### ***Coordination with the government***

Joint work was carried out by Pure Earth and Peshsaf with the Committee for Environmental Protection under the Government of the Republic of Tajikistan (Chairman of the Committee - Ibodzoda Khairullo), as well as the Center for the Implementation of the Stockholm Convention on POPs (Head of the Center - Khairullayev Rakhmatullo). In their work, coordinators and researchers work closely with government agencies, and begin by considering the sites from afar, and ending with a trip to the sites.

The Committee on Nature protection is interested in clearing the sites investigated, but because of a lack of funding it cannot do it on its own.

## **Pollution Sources and Key Pollutants**

### ***Total Sites Surveyed in Tajikistan***

Since 2009 217 contaminated sites in Tajikistan have been investigated and entered into the database.

The main source of pollution in the surveyed areas is agriculture (stores of obsolete pesticides). About 87% of all sites are polluted with toxins from the agriculture industry. The remaining sites are polluted from mining, landfills, chemical manufacturing, heavy industries.

The distribution of plots by type of industry is shown in Table 1 and Figure 1.

Table 11. The number of sites as categorized by pollution source assessed by Pure Earth's investigators in the TSIP Database

<b>Industry</b>	<b>Number of Sites</b>
Agriculture	188
Industrial/Municipal Dump Site	6
Mining and Ore Processing	5
Chemical Manufacturing (acids, organics, base chemicals)	2
Petrochemical Industries (refineries)	2
Lead - Battery Recycling	2
Heavy Industry (casting, rolling, stamping)	1
Nuclear Fuel Processing	1
Product Manufacturing (electronics, equipment, clothing)	1
Industrial Estate (mixed industries)	1
Lead Smelting (with ingot production)	1
Unknown	7
<b>Total</b>	<b>217</b>

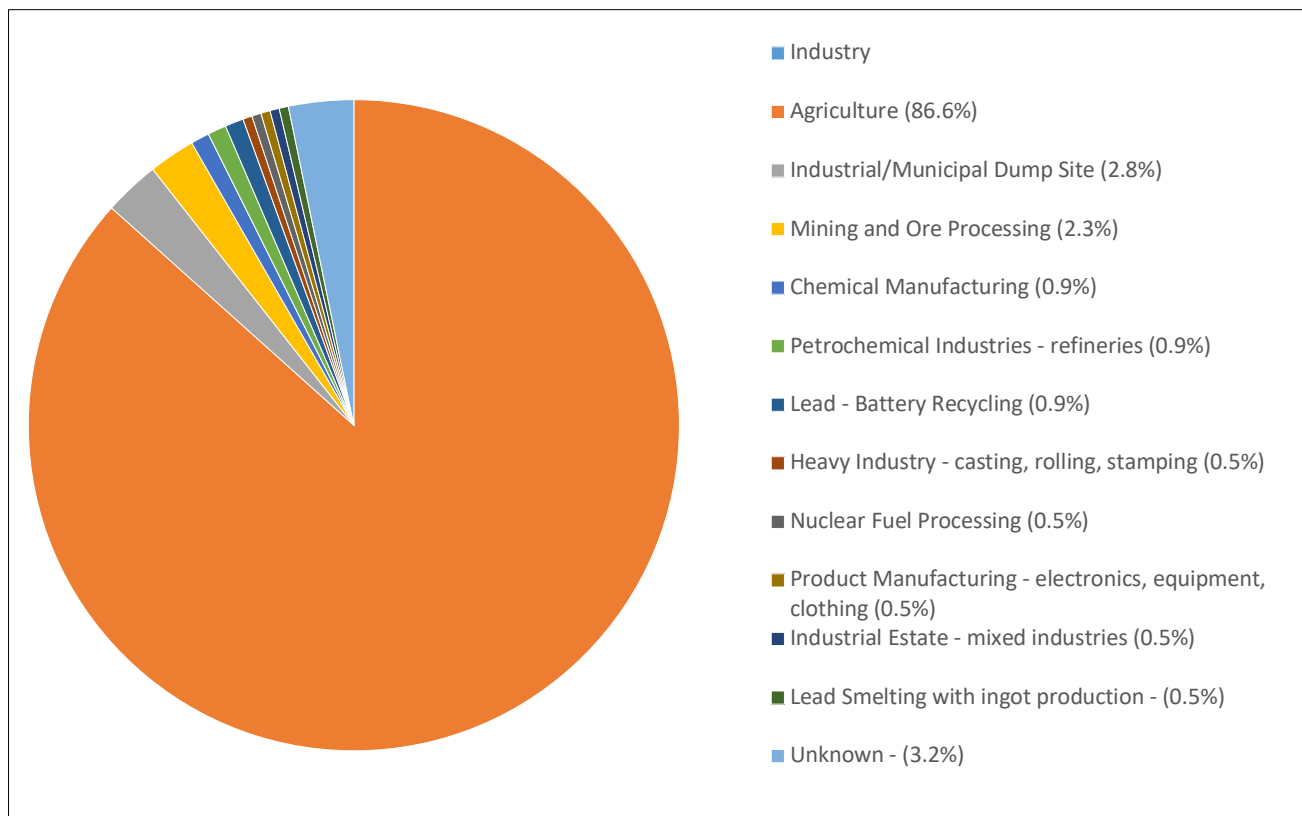


Figure 1. Segmentation of sites as categorized by pollution source assessed by Pure Earth's investigators in the TSIP Database

Based on the analysis of the obtained data, it was found that the vast majority of sites (87.1%) of the estimated sites were contaminated with pesticides (including DDT, lindane, aldrin, heptachlor). Figure 2 shows the geographical distribution of pollution sources in Tajikistan.

The types of pollutants that were found at the sites are shown in Table 2 and Figure 3. Figure 4 shows the geographical distribution of sites ranked by type of pollutants in Tajikistan.

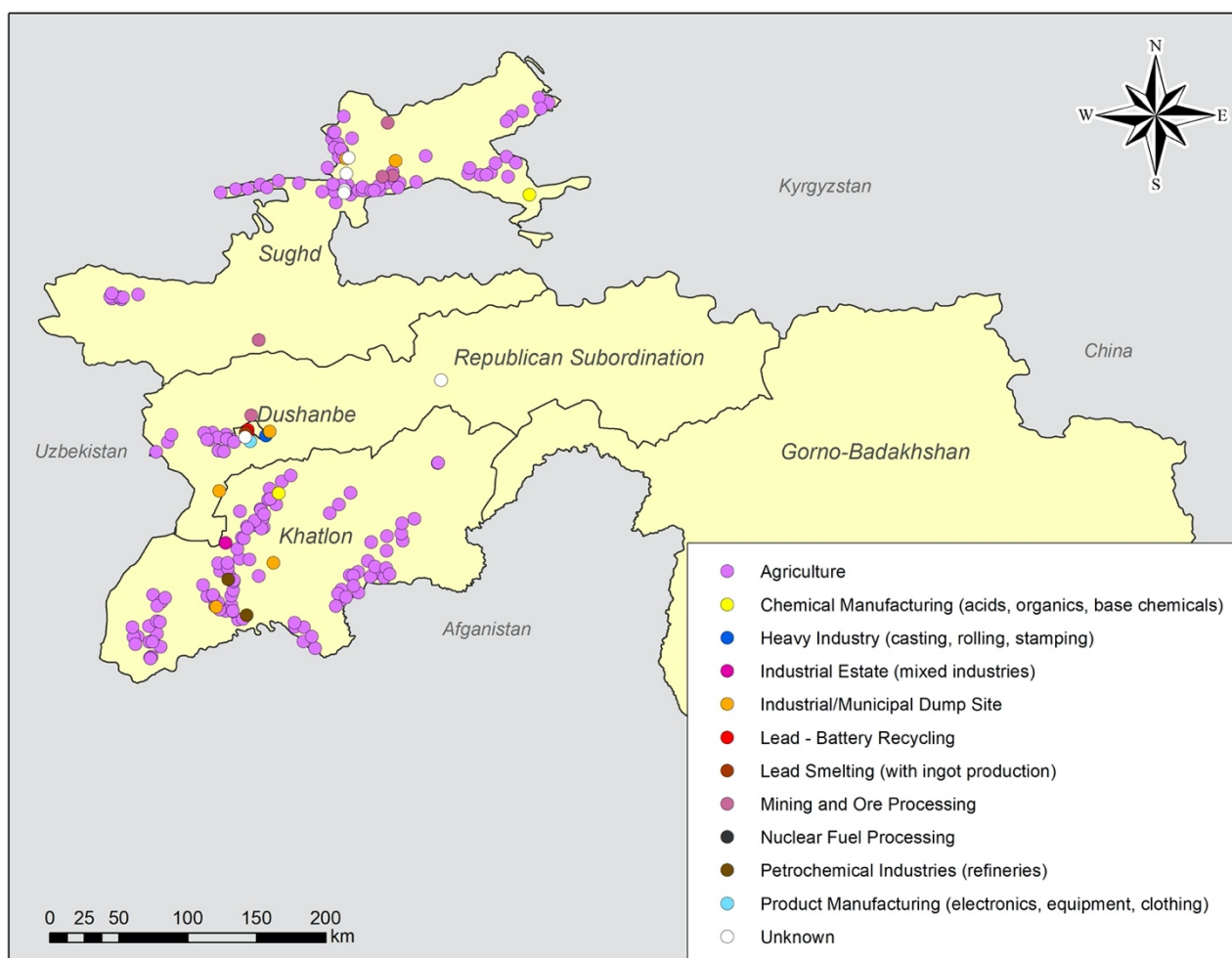


Figure 2. Geographical Distribution of pollution sources in Tajikistan

Table 2: The number of sites as categorized by contaminant assessed by Pure Earth's investigators in the TSIP Database

Key Pollutant	# of sites
DDT	156
Pesticides (unidentified)	16
Lindane (Hexachlorocyclohexane all forms)	13
Unknown	10
Uranium	5
Radiation	4
Aldrin	2
Asbestos	2
Heptachlor	2
Other	2
Bromacil	1
Chromium (Hex)	1

Mercury - elemental	1
PCBs (PolyChlorinated Biphenyls)	1
Phenol (0.5%)	1
<b>Total</b>	<b>217</b>

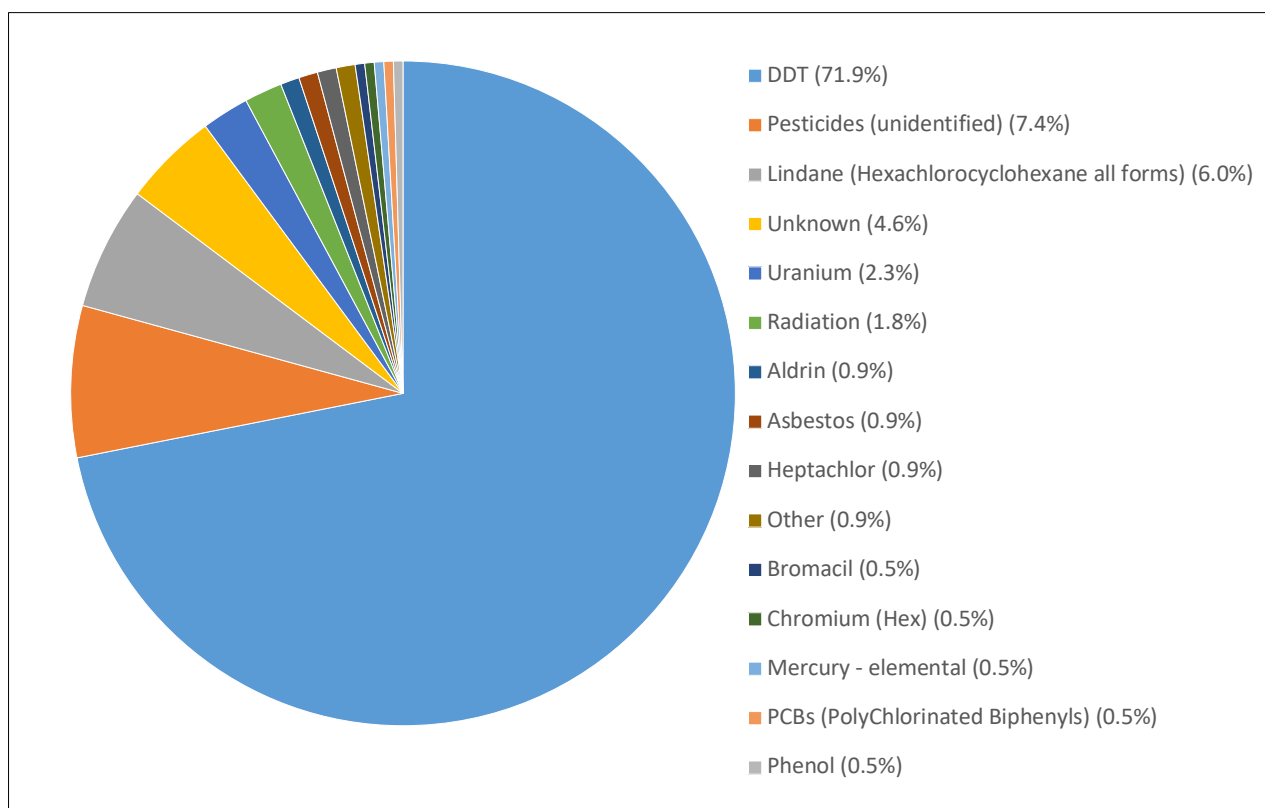


Figure 3. Polluted sites in Tajikistan broken down by type of pollutant

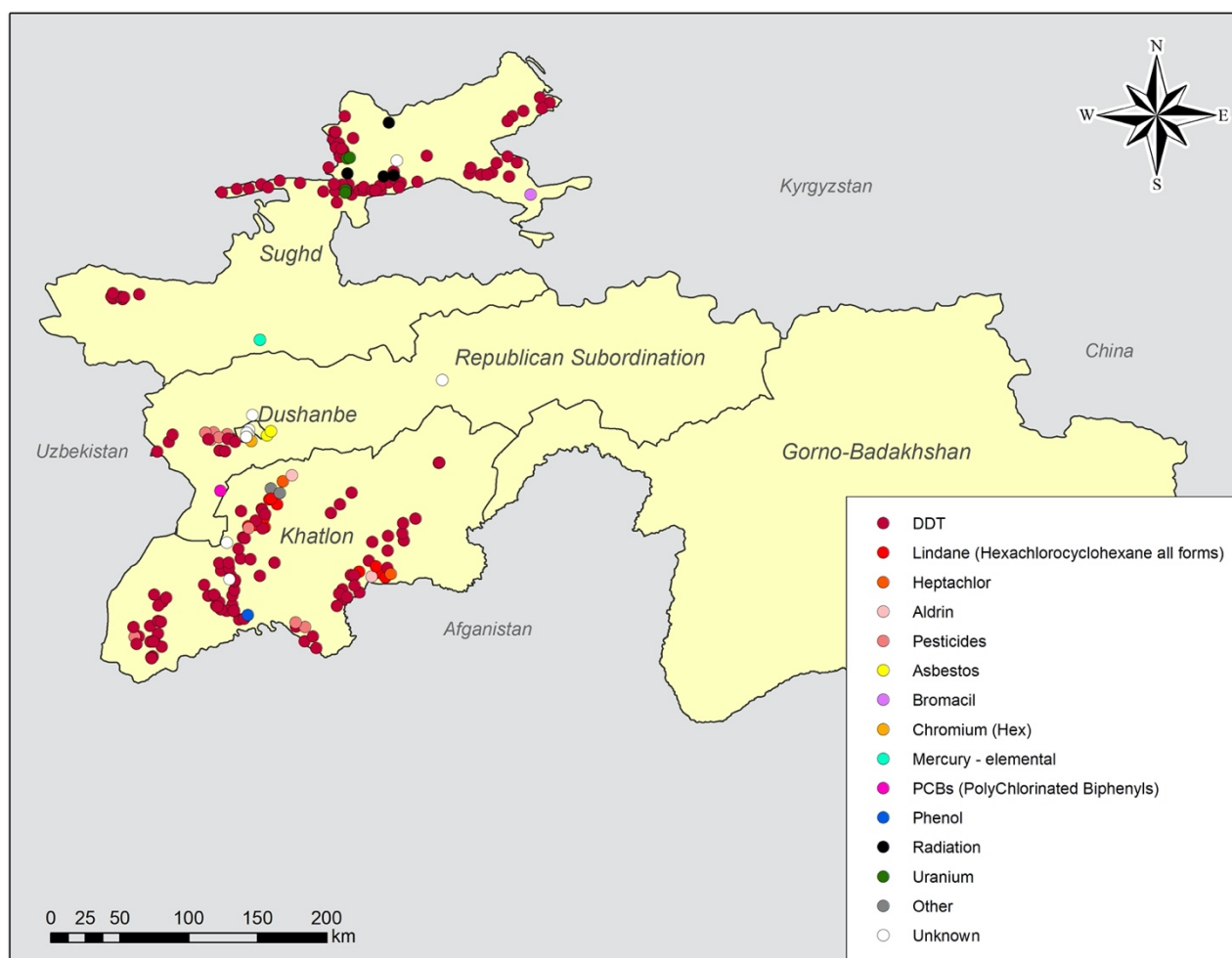


Figure 4. Map of contaminated sites in Tajikistan

## ANNEX 1. List of TSIP sites in Tajikistan

Site ID	Site name	Source of Industry	Key Pollutant	Maximum test result	Units
TJ-437	Chkalovsk hydrometallurgical plant tailing pond	Mining and Ore Processing	Radiation	0,00048	mg/kg or ppm
TJ-754	Degmai (or Degmay) Radioactive Storage Site, Degmai Village, Sughd Region	Mining and Ore Processing	Radiation	0,0025	mg/kg or ppm
TJ-786	Taboshar Uranium Tailing Dump	Mining and Ore Processing	Radiation	950	
TJ-2086	Anzob Mining and Beneficiation Complex	Mining and Ore Processing	Mercury - elemental	0	
TJ-2889	Kanibadamsky POPs Landfill	Agriculture	DDT	1074	mg/kg or ppm
TJ-2904	Vahsh pesticide burial ground	Industrial/Municipal Dump Site	DDT	1074	mg/kg or ppm
TJ-2957	Landfill of solid domestic waste in Rudaki	Industrial/Municipal Dump Site	PCBs (PolyChlorinated Biphenyls)	0	mg/kg or ppm
TJ-2964	Javanese Chemical Plant - JSC	Chemical Manufacturing (acids, organics, base chemicals)	Other	0	
TJ-2966	Solid domestic waste ground in Khudjand	Industrial/Municipal Dump Site			
TJ-2986	JSC	Chemical Manufacturing (acids, organics, base chemicals)	Bromacil		
TJ-3148	Mini Lead Processing Workshop in Dushanbe				
TJ-3149	Lead processing company, Sino Dushanbe				
TJ-3208	Pesticides Burial Site, Village 1, Kumsangir Region	Agriculture	DDT	107,41	mg/kg or ppm
TJ-3240	Village Bagara of Vahsh region (Ҷамоати деҳаи Бағараи Ҷамоати деҳаи Ваҳш)	Agriculture	DDT	8,7	mg/kg or ppm
TJ-3241	Village Oikamar of Khuroson region (Ҷамоати деҳаи Ойкамари Ҷамоати деҳаи Хуросон)	Agriculture	DDT	6,13	mg/kg or ppm
TJ-3242	POPs Landfill in djamoat Kirov, Vahsh region	Industrial/Municipal Dump Site	DDT	0	



TJ- 3248	Kishlak Sogdiana, Vahsh region	Agriculture	DDT	5,93	mg/kg or ppm
TJ- 3272	Bitumen Plant of Rumi Region	Petrochemical Industries (refineries)			
TJ- 3328	LLC	Heavy Industry (casting, rolling, stamping)	Asbestos	0	mg/kg or ppm
TJ- 3329	Landfill of solid domestic waste in Dushanbe	Industrial/Municipal Dump Site	Asbestos	0	mg/kg or ppm
TJ- 3424	School <sup>1</sup> 5, Istiklol (Taboshar)	Industrial/Municipal Dump Site	Uranium	0,003287	ug/m3
TJ- 3451	Former Building of KIP Automatics (uranium production adit), Sarymsakli, Istiklol (Taboshar)		Radiation	0,00084	mg/kg or ppm
TJ- 3452	Gozien Settlement near Digmay Tailings	Nuclear Fuel Processing	Uranium	0,00272	mg/kg or ppm
TJ- 3462	Chkalovsk Tailing Dump		Uranium	0,00048	mg/kg or ppm
TJ- 3466	A Former Garment Factory, village Old Taboshar, Istiklol town (Taboshar)		Uranium	0,00098	mg/kg or ppm
TJ- 3469	Former uranium mine <sup>1</sup> 3, Khujand		Uranium	0,00049	mg/kg or ppm
TJ- 3609	Tannery - Tojik Intikol LLC, Firdavsi District, Dushanbe	Product Manufacturing (electronics, equipment, clothing)	Chromium (Hex)	140	ug/l or ppb
TJ- 3640	Private Enterprise for the Production of Lime	Industrial Estate (mixed industries)			
TJ- 3651	Petroleum Refinery LLC	Petrochemical Industries (refineries)	Phenol	0	
TJ- 4067	Ӣаёиӡа иӧаӑиӧеыӧеӒа иӣиӧаӧаӓиӧеӒа нӕиӧиӦуӧӧ аӗеӧиӧеыӧиӧиӦа	Lead Smelting (with ingot production)			
TJ- 4068	Ӣоииӧб иӧеӒаӒа нӕиӧиӦуӧӧ аӗеӧиӧеыӧиӧиӦа аиӧиаӒа АӧӧаӒаӒа	Lead - Battery Recycling			
TJ- 4139	ӚӐӐӐеuiue чӐӐиӦ аиӧиаӒа АӧӧаӒаӒа	Lead - Battery Recycling			
TJ- 4154	Ӗ̂ai̇ioĩıúé çàâĩä ìà Â̈ðçíaă	Mining and Ore Processing			
TJ- 4420	ӢӧаӑиӧеыӧеӒа иӣиӦуӧ÷Ӕ çiei̇iòà "Ӥ̄e̊ṑò"				
TJ- 4690	Ziratkor	Agriculture	DDT	7	mg/kg or ppm
TJ- 4691	Kalinin	Agriculture	Pesticides (Total)	7	mg/kg or ppm

TJ-4692	Moscow	Agriculture	Pesticides (Total)	8	mg/kg or ppm
TJ-4693	Storage Khaidar Mirov	Agriculture	Pesticides (Total)	5,5	mg/kg or ppm
TJ-4694	Sumbula	Agriculture	Pesticides (Total)	8	mg/kg or ppm
TJ-4695	Jdanov	Agriculture	Pesticides (Total)	6,5	mg/kg or ppm
TJ-4696	Dzerjinskiy	Agriculture	DDT	7,5	mg/kg or ppm
TJ-4698	Marks	Agriculture	Lindane (Hexachlorocyclohexane all forms)	8	mg/kg or ppm
TJ-4699	Selknozhimiya	Agriculture	Pesticides (Total)	7	mg/kg or ppm
TJ-4700	Latif Murodov	Agriculture	Pesticides (Total)	5	mg/kg or ppm
TJ-4940	Bakhor, Djami	Agriculture	Lindane (Hexachlorocyclohexane all forms)	0,087	mg/kg or ppm
TJ-4956	Zarnissor (former Engels)	Agriculture	Lindane (Hexachlorocyclohexane all forms)	0,067	mg/kg or ppm
TJ-4958	Djovidon, F. Saidov	Agriculture	Lindane (Hexachlorocyclohexane all forms)	82,51	mg/kg or ppm
TJ-4963	Tursunzoda or Tursunzade, Djami	Agriculture	Lindane (Hexachlorocyclohexane all forms)	1,373	mg/kg or ppm
TJ-4971	Ozodii Sharq (former Lenin)	Agriculture	Lindane (Hexachlorocyclohexane all forms)	0,125	mg/kg or ppm
TJ-4972	State Farm 6, (Sovhoz 6) Yavan	Agriculture	Lindane (Hexachlorocyclohexane all forms)	6,94	mg/kg or ppm
TJ-4973	Davlatobod, Khamadoni	Agriculture	DDT	0,263	mg/kg or ppm
TJ-4981	Vakhdat, Khamadoni	Agriculture	Lindane (Hexachlorocyclohexane all forms)	0,106	mg/kg or ppm
TJ-4982	Turdyev, Khamadoni	Agriculture	Aldrin	0,358	mg/kg or ppm
TJ-4984	State Farm 5, (Sovhoz 5) Yavan	Agriculture	Heptachlor	5,291	mg/kg or ppm
TJ-4985	State farm 4, (Sovhoz 4)Yavan	Agriculture	Lindane (Hexachlorocyclohexane all forms)	0,359	mg/kg or ppm
TJ-4986	Imomberdyev, Yavan	Agriculture	Other	0,499	mg/kg or ppm

TJ-4987	50 years of USSR, Yavan	Agriculture	Lindane (Hexachlorocyclohexane all forms)	0,066	mg/kg or ppm
TJ-4988	State Farm 1, (Sovhoz 1) Yavan	Agriculture	Aldrin	0,073	mg/kg or ppm
TJ-4989	10 years of Independence, Khamadoni	Agriculture	Lindane (Hexachlorocyclohexane all forms)	18,89	mg/kg or ppm
TJ-4990	Dekhkan and Farming Entity Saidov, Khamadoni	Agriculture	Lindane (Hexachlorocyclohexane all forms)	13,75	mg/kg or ppm
TJ-4991	Khamidov, Khamadoni	Agriculture	Lindane (Hexachlorocyclohexane all forms)	0,099	mg/kg or ppm
TJ-4992	Ittifoq, Khamadoni	Agriculture	DDT	30,074	mg/kg or ppm
TJ-4993	Sarhadchi, Khamadoni	Agriculture	Heptachlor	0,214	mg/kg or ppm
TJ-5404	Pesticide Warehouse, Darkat, Muhojirobod, Farhor	Agriculture	DDT	12,66	mg/kg or ppm
TJ-5413	Pesticide Storage Ziraki, Kulyab	Agriculture	DDT	13,82	mg/kg or ppm
TJ-7309	Former Pesticides Warehouse, Bulbul Chashma jamoat	Agriculture	DDT	5,29	mg/kg or ppm
TJ-7310	Former pesticides warehouse named after Dzerzhinsky, jamoat Durbat	Agriculture	DDT	4,38	mg/kg or ppm
TJ-7395	Former pesticides warehouse, "Agriculture", Sharora jamoat	Agriculture	DDT		
TJ-7398	Former pesticides warehouse, "Moscow", jamoat Mirzo Rizo	Agriculture	Pesticides		
TJ-7400	Former pesticides warehouse "Sambula" jamoat Dehati Gissor	Agriculture	DDT	7,3	mg/kg or ppm
TJ-7414	Former pesticides warehouse, Jamoat G. Gulmurodov	Agriculture	DDT	373	mg/kg or ppm
TJ-7417	Warehouse in Khatlon-1, Jamoat Zarbdor	Agriculture	DDT	14,6	mg/kg or ppm
TJ-7420	Warehouse of obsolete pesticides in Lagmon, Kulyab	Agriculture	DDT	34,4	mg/kg or ppm
TJ-7423	Former pesticides warehouse, Jamoat Mirzo Tursunzoda	Agriculture	DDT		
TJ-7425	Former pesticides warehouse, Sayod village, Jamoat named after T. Sadriddinov	Agriculture	DDT	0,88	mg/kg or ppm
TJ-7426	Former pesticides warehouse, Takhti Sangin jamoat, Farogat area	Agriculture	DDT	437	mg/kg or ppm

TJ-7427	Former warehouse of pesticides of the former state farm "Komsomol", jamoat "Navzamin", village Pakhtakor	Agriculture	DDT	0,44	mg/kg or ppm
TJ-7432	Former pesticides warehouse, Yangiabad village (Navabad), Nuri Vakhsh jamoat	Agriculture	DDT	0,15	mg/kg or ppm
TJ-7434	Warehouse of the former collective farm "Umed" in the village of "Umed", jamoat "Navzamin"	Agriculture	DDT	0,24	mg/kg or ppm
TJ-7436	Burial of pesticides at former airfield, jamoat Navobod, deha Navobod	Agriculture	DDT	309	mg/kg or ppm
TJ-7437	Burial of pesticides, jamoat Navobod, Navobod site, Dehkan Farm "Ibod"	Agriculture	DDT	34,5	mg/kg or ppm
TJ-7438	Former pesticides warehouse, regional agricultural chemistry, Seshanbe jamoat Tursunzade	Agriculture	DDT	29,7	mg/kg or ppm
TJ-7440	Burial of pesticides, jamoat Navobod, Navobod area	Agriculture	DDT	5,55	mg/kg or ppm
TJ-7441	Warehouse of obsolete pesticides in Vatan Jamoat, Farkhor District	Agriculture	DDT	18,5	mg/kg or ppm
TJ-7442	Buriev Former Pesticides Warehouse, Regar Jamoat, Tursunzade	Agriculture	DDT	2,63	mg/kg or ppm
TJ-7443	Former pesticide warehouse in the Namuna Village, G. Gulmurodova Jamoat	Agriculture	DDT	6,21	mg/kg or ppm
TJ-7445	Former pesticides warehouse, Mekhnatobod village, Jamoat 20 years of Independence	Agriculture	DDT	73	mg/kg or ppm
TJ-7447	Pesticides warehouse in Farhor District, Chorgul Village	Agriculture	DDT	1,83	mg/kg or ppm
TJ-7448	Former warehouse of pesticides, Bolshevik-1, jamoat Zargar	Agriculture	DDT	1051	mg/kg or ppm
TJ-7481	Former central pesticide warehouse of the Margedar state farm in the village of Bahor Jamoat Loik Sherali	Agriculture	DDT	8,54	mg/kg or ppm
TJ-7483	Former Pesticides Warehouse, Jamoat	Agriculture	DDT	6,94	mg/kg or ppm

	Pahtaobod, Vakhdat area (former Pervomaiskii)				
TJ-7484	Former Pesticides Warehouse, Dusti collective farm, jamoat Karatog	Agriculture	DDT	2,04	mg/kg or ppm
TJ-7485	Former Pesticides Warehouse, Kumshok area, jamoat H. Kholmatov	Agriculture	DDT	2731	mg/kg or ppm
TJ-7486	Burial of pesticides, Aini Village, Navbahor Jamoat	Agriculture	DDT	433	mg/kg or ppm
TJ-7487	Former warehouse of pesticides, Jamoat Bokhtarien	Agriculture	DDT	3,65	mg/kg or ppm
TJ-7488	Former warehouse of pesticides, village of Rohi socialism, jamoat Kalinin	Agriculture	DDT	5,91	mg/kg or ppm
TJ-7490	Former pesticides warehouse, Khuramzamin vllage, Farohor Jamoat	Agriculture	DDT	0,58	mg/kg or ppm
TJ-7522	Former Pesticides Warehouse, Jamoat Istiklol, the village of Beshkent (Komsomol)	Agriculture	DDT	599	mg/kg or ppm
TJ-7523	Бывший склад ядохимикатов село Бешкапа , джамоат "Наврӯз" Носири Хусравский район.	Agriculture	Pesticides		
TJ-7524	Старый аэропорт для химической обработки хлопковых полей. Село Чупон кишлок, джамоата "Истиклол" Носири Хусравского района	Agriculture	DDT		
TJ-7527	Former Pesticides Warehouse, Rakhmonov, Chuibor Village, Kumsangir Jamoat	Agriculture	DDT	1664	mg/kg or ppm
TJ-7528	Former Pesticides Warehouse, Emamadov, Vahdati Milli Jamoat	Agriculture	DDT	190	mg/kg or ppm
TJ-7529	Former Pesticides Warehouse, Khasanov, Telman Village, Istiklol Jamoat	Agriculture	DDT	0,73	mg/kg or ppm
TJ-7530	Former Pesticides Warehouse, Eshkhonov, the village of Kirov, jamoat Yakkodin	Agriculture	DDT	3,07	mg/kg or ppm
TJ-7531	Former Pesticides Warehouse, Geranium, Zarnisor village, Jamoat Dusti	Agriculture	DDT	0,73	mg/kg or ppm

TJ-7533	Former Pesticides Warehouse, Esankulova, the village of Kizil-October, jamoat Madaniyat	Agriculture	DDT	1,46	mg/kg or ppm
TJ-7534	Former Pesticides Warehouse, 40 Solag, Michurin village, Jamoat Frunze	Agriculture	DDT	1,53	mg/kg or ppm
TJ-7536	Former Pesticides Warehouse, Yangiturmush, the village of Yangiturmush, jamoat Frunze	Agriculture	DDT	1,83	mg/kg or ppm
TJ-7538	Former Pesticides Warehouse, Jamoat Overpass Deha Vatan	Agriculture	DDT	0,73	mg/kg or ppm
TJ-7539	Former warehouse of pesticides, Surkhob Village, Jamoat Galaba	Agriculture	DDT	0,26	mg/kg or ppm
TJ-7545	Former pesticide warehouse, Sinov Street, center of Farhor District	Agriculture	DDT	2,34	mg/kg or ppm
TJ-7547	Former Pesticides Warehouse, Jamoat U. Nazarov, Mehnatobod area, Dekhan farm Shermat Bobo	Agriculture	DDT	4,02	mg/kg or ppm
TJ-7551	Former pesticide warehouse, Archa Village, Dekhkon Aryk Jamoat	Agriculture	DDT	36,5	mg/kg or ppm
TJ-7553	Former Pesticides Warehouse, Eshmurod Niyozov Jamoat, Ziraki, dekhan farm Tour Sohib	Agriculture	DDT	0,52	mg/kg or ppm
TJ-7554	Former warehouse of pesticides of the agricultural airfield of Jamoat Takhti Sangin, Navobod site No. 2	Agriculture	DDT	0,93	mg/kg or ppm
TJ-7556	Former pesticide warehouse, the village of Pravda, Uzun jamoat	Agriculture	DDT	3,36	mg/kg or ppm
TJ-7558	Former Pesticides Warehouse in Pushkin Village, Navobod Jamoat	Agriculture	DDT	2,92	mg/kg or ppm
TJ-7559	Former warehouse of pesticides, Khaidarova Street, Balkh Village	Agriculture	DDT	2,92	mg/kg or ppm
TJ-7561	Former Pesticides Warehouse, 20 years of Independence Jamoat, Sangoba area	Agriculture	DDT	1580	mg/kg or ppm

TJ-7562	Former pesticides warehouse in Gulshan Jamoat, Farkhor District	Agriculture	DDT	8,76	mg/kg or ppm
TJ-7563	Former Pesticides Warehouse, Jamoat "U. Nazarov", the village of Guliston (Bugama)	Agriculture	DDT	0,44	mg/kg or ppm
TJ-7567	Former Pesticides Warehouse, Jamoat "20 of the Istikloliyat", the village of Doki (former Kalinin)	Agriculture	DDT	47,3	mg/kg or ppm
TJ-7575	Burial of pesticides on the bank of Mazor Creek, Bahor Village, Jamoat of L. Sherali	Agriculture	DDT	0,22	mg/kg or ppm
TJ-7576	Field camp of the brigade No. 4 of the former state farm "Margedar" of the Gusar Village, L. Sherali Jamoat	Agriculture	DDT	0	mg/kg or ppm
TJ-7577	Burial of pesticide residues near Ogilak Creek, Navobod Village, L. Sheral Jamoat	Agriculture	DDT	3,94	mg/kg or ppm
TJ-7579	Former Pesticide Warehouse, Kalinin State Farm, Kuibyshevsky District	Agriculture	DDT	2,56	mg/kg or ppm
TJ-7580	Former Pesticide Warehouse, Hovaling Jamoat	Agriculture	DDT	8,76	mg/kg or ppm
TJ-7582	Burial of pesticides in the village of Sherobod, Dusti jamoat	Agriculture	DDT	2245	mg/kg or ppm
TJ-7583	Former pesticides warehouse in the village of Chorsad, Lolazor jamoat, Dangara District	Agriculture	DDT	1,9	mg/kg or ppm
TJ-7584	Former pesticides warehouse, Nurali Mirali street, center of Dangara District	Agriculture	DDT	0,07	mg/kg or ppm
TJ-7586	Former pesticide warehouse, Dilnishin village, Pushing Jamaat, Dangary District	Agriculture	DDT	2,92	mg/kg or ppm
TJ-7587	Burial of pesticides in the village of Ozodia Shark, Jamoat K. Giyosov	Agriculture	DDT	29,2	mg/kg or ppm
TJ-7588	Former Pesticide Warehouse, Khovaling state farm, Khovaling Jamoat	Agriculture	DDT	0,88	mg/kg or ppm
TJ-7592	Former Pesticide Warehouse, jamoat Khudoyor Rajabova, Pakhtakor Village	Agriculture	DDT	10,3	mg/kg or ppm

TJ-7594	The former pesticide warehouse in Navobod Village, Sherali Jamoat	Agriculture	DDT	9,86	mg/kg or ppm
TJ-7595	The former warehouse of pesticides in Navobod Village, Loik Sharoli Jamoat, Pejikent District	Agriculture	DDT	1545	mg/kg or ppm
TJ-7596	The former pesticide warehouse, LLC Resanda in Khatlon Region, Kushoniyon District	Agriculture	DDT	5,11	mg/kg or ppm
TJ-7597	A former pesticides warehouse in Bakhor Jamoat, Nosiri-Khursav District	Agriculture	DDT	634	mg/kg or ppm
TJ-7598	Burial place of pesticides in the farm "E. Sultonov", Jilikul Jamoat	Agriculture	DDT	129	mg/kg or ppm
TJ-7599	Former Pesticide Warehouse, Sadam LLC, A. Jami District	Agriculture	Pesticides		
TJ-7606	Former agricultural aerodrome pesticide warehouse, Jilikul jamoat	Agriculture	DDT	18	mg/kg or ppm
TJ-7607	Former pesticides warehouse of Agricultural chemistry of the Dusti district, Garauti jamoat	Agriculture	DDT	449	mg/kg or ppm
TJ-7616	Former agricultural airport and pesticides burial site, Lolazor 4	Agriculture	DDT	62	mg/kg or ppm
TJ-7625	Household of Dustov Khujamurod, a resident of Kishlak Navobod, Jamoat L. Sherali	Agriculture	DDT	1,61	mg/kg or ppm
TJ-7626	Warehouse of pesticides and a garage of dekhkan farm "Zarafshon", village Ruknobod jamoat Voru	Agriculture	DDT	0,37	mg/kg or ppm
TJ-7627	Field camp of the brigade No. 1 of the farm Margidar, Jamoat L. Sherali	Agriculture	DDT	0,51	mg/kg or ppm
TJ-7632	Former pesticides warehouse of the collective farm named after Lenin, the village of Ohchar	Agriculture	DDT	513	mg/kg or ppm
TJ-7634	Former pesticides warehouse, collective farm Tomin, Sulkhobod village, jamoat Tugarak	Agriculture	DDT	234	mg/kg or ppm



TJ-7635	Former pesticides warehouse, collective farm of Communism, Kaduchi village, Vaysov jamoat	Agriculture	DDT	62,8	mg/kg or ppm
TJ-7650	Former pesticides warehouse, Halevard jamoat, Yesleninchi village	Agriculture	DDT	46,6	mg/kg or ppm
TJ-7765	Склад селение "АНОРЗОР" ХДФ Рахмонова района Кумсангир (Джайхун)	Agriculture	DDT	1,9	mg/kg or ppm
TJ-7767	Склад типовая ХДФ Рахмонов селение Чуйбор-1(ИСМОИЛ) джамоат Кумсангир район Джайхун	Agriculture	Pesticides		
TJ-7768	Склад типовая, ДХФ имени Мехвар (СЕЛЬХОЗХИМИЯ)-район Пяндж	Agriculture	DDT	1,39	mg/kg or ppm
TJ-7769	Склад типовая, ДХФ имени Мехвар ДЕХИ БАЛАНД-район Пяндж	Agriculture	DDT	4,89	mg/kg or ppm
TJ-7770	Склад типовая, ДХФ имени "НАМУНА" селение ПЕШКАДАМ -1 -район Пяндж	Agriculture	Pesticides		
TJ-7771	Склад типовой, ДХФ имени "НУРИ ВАХДАТ", район Пяндж	Agriculture	DDT	16,5	mg/kg or ppm
TJ-7772	Склад типовая, ДХФ имени ОЗОДАГОН совхоз ПАНЧ-район Пяндж	Agriculture	Pesticides	6,57	mg/kg or ppm
TJ-7773	Склад типовая, ДХФ имени ОЗОДАГОН (ЭМОММАШРАБ)-район Пяндж.	Agriculture	Pesticides	7,15	mg/kg or ppm
TJ-7774	Склад типовая ХДФ Намуна селение ПЕШКАДАМ-2 район Пяндж	Agriculture	Pesticides		
TJ-7775	Pesticide Warehouse HDF Kabud Sayfiddin in the village Rohi Lenin, Pyanj district	Agriculture	DDT	4,16	mg/kg or ppm
TJ-7776	Склад типовая ХДФ НАМУНА селение ПЕШКАДАМ-1 РАЙОН ПЯНДЖ	Agriculture	Pesticides	2,92	mg/kg or ppm
TJ-7777	Pesticide Warehouse HDF Sayfidin Kabud in the village of Pravda	Agriculture	DDT	123,1	mg/kg or ppm
TJ-8176	АО им. Назарова - AS name of Nazarova	Agriculture	DDT		

TJ-8178	АО "Таджикистан" - AS "Tajikistan"	Agriculture	DDT		
TJ-8179	АО "Дусти" - AS "Dusti"	Agriculture	DDT		
TJ-8180	АО "Асор" - AS "Asor"	Agriculture	DDT		
TJ-8181	АО им "Бойматова" - AS "Boymatova"	Agriculture	DDT		
TJ-8182	АО "Сельхозхимия" - AS "Selhozhimiya"	Agriculture	DDT		
TJ-8183	ДФХ им "Карабаева" - "Karabayeva"	Agriculture	DDT		
TJ-8184	Пр. КООП "Таджикистан" - "Tajikistan"	Agriculture	DDT		
TJ-8185	АО "Ирам" - "Iram"	Agriculture	DDT		
TJ-8186	АО "Андарсой" - "Andarsoy"	Agriculture	DDT		
TJ-8187	ПКОП "Бобоев" - "Boboev"	Agriculture	DDT		
TJ-8188	АО "Саторов" - "Satorov"	Agriculture	DDT		
TJ-8189	АО "Улчабоев" - "Uljaboev"	Agriculture	DDT		
TJ-8190	Хозяйство им Р. Набиев - Hothiaystvo im R. Nabiev	Agriculture	DDT		
TJ-8191	АО "Саидкургон" - "Saidkurgon"	Agriculture	DDT		
TJ-8192	АПК "Гулистон" - "Guliston"	Agriculture	DDT		
TJ-8193	ПК им П. Бобокалонова - РК im P. Bobokalonova	Agriculture	DDT		
TJ-8194	ДХ им. "Алиева" - "Alieva"	Agriculture	DDT		
TJ-8195	АДХ "Узбекистан" - "Uzbekistan"	Agriculture	DDT		
TJ-8196	Хозяйство им Дж. Расулова - Hothiaystvo im J. Rasulova	Agriculture	DDT		
TJ-8197	АО им А. Джумаева - AO in A. Jumaiva	Agriculture	DDT		
TJ-8198	АО им "Урунходжаев" - "Urunhojaev"	Agriculture	DDT		
TJ-8199	АХД "Сомониен" - AHD "Smonien"	Agriculture	DDT		
TJ-8200	АО им Кушатова - Kushatov	Agriculture	DDT		
TJ-8201	АО Убайдуллоев - Ubayduloev	Agriculture	DDT		

TJ-8202	ДФХ "Таджикистан" - "Tajikistan"	Agriculture	DDT		
TJ-8203	АДХ им Д. Азизов - D. Azizov	Agriculture	DDT		
TJ-8204	Хозяйство им А. Самадова - Hoziaistvo im. A. Samadova	Agriculture	DDT		
TJ-8205	АО им Б. Турдыбаева - Turdieva	Agriculture	DDT		
TJ-8206	АДХ им. О. Нозирбоева - O. Nozirboeva	Agriculture	DDT		
TJ-8207	ПК "Ленинград" - "Leningrad"	Agriculture	DDT		
TJ-8208	ДХ им Д. Хамдамова - DH im D. Hamdamova	Agriculture	DDT		
TJ-8209	АДХ "Дустӣ" - "Dusti"	Agriculture	DDT		
TJ-8210	АХД "Фирдавси" - AHD "Firdavsi"	Agriculture	DDT		
TJ-8211	АДХ "Юсуф - Вафо" - ADH "Usuf - Vafo"	Agriculture	DDT		
TJ-8212	АХД "Хакикат" - AHD "Hakikat"	Agriculture	DDT		
TJ-8213	АДХ им "Хочи Амиров" - ADH im "Hochi Amirov"	Agriculture	DDT		
TJ-8214	АХД "Заравшон" - AHD "Zaravshon"	Agriculture	DDT		
TJ-8215	АХД им "Рудаки" - AHD im "Rudaki"	Agriculture	DDT		
TJ-8217	АХД "Файзи Султон" - AHD "Payzi Sulton"	Agriculture	DDT		
TJ-8218	АХД "У. Хайом" - AHD "U. Hayom"	Agriculture	DDT		
TJ-8219	АХД "Ч. Эргашев" - AHD "C. Ergashev"	Agriculture	DDT		
TJ-8220	Сельхозхимия и хозяйство им. Каленина - Selhozhimiya i hoziaystvo im Kalenina	Agriculture	DDT		
TJ-8221	Хозяйство им Х. Назарова - Hoziystvo im H. Nazarova	Agriculture	DDT		
TJ-8222	Хозяйство им. К. Назарова - Hoziystvo im. K. Nazarova	Agriculture	DDT		
TJ-8223	ЧП "Иттифок" - CP "Ittifok"	Agriculture	DDT		
TJ-8256	Хозяйство им. Хубайдуллоева - hoiystvo im Hubaydulloeva	Agriculture	DDT		
TJ-8257	Хозяйство им Мирзоматова - Hoziystvo im Mirzomatova	Agriculture	DDT		

TJ-8258	Хозияйство им. Р. Ходжиева - Hoziaystvo im R. Hojjeva	Agriculture	DDT		
TJ-8259	Хозияйство им. С. Айна - Hozaystvo im. A. Ayni	Agriculture	DDT		
TJ-8260	АХД "Дусти" - AHD "Dusti"	Agriculture	DDT		
TJ-8261	АХД Шухрат - AHD Shuhrat	Agriculture	DDT		
TJ-8262	КАНЗ "Наврӯз" - KANZ "Navruz"	Agriculture	DDT		
TJ-8263	АХД "Логин" - AHD "Login"	Agriculture	DDT		
TJ-8264	АХД "Шарк" - AHD "Shark"	Agriculture	DDT		

