



Toxic Site Identification Program in Tajikistan

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ORGANIZATIONAL BACKGROUND

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 Sites 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.

Country Background

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.

Water pollution is a serious issue in Tajikistan. Many surface water bodies are polluted by human activity. The Varzob River, which supplies drinking water to the capital of the country, Dushanbe, is polluted in the upper reaches by household and industrial wastewater. The Kafirnigan River is another important source of drinking water, but it receives industrial and domestic wastewater. 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 and it is unsuitable for drinking. Groundwater is also polluted after human activities (industrial, agricultural and domestic wastewater).

Hazardous 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.

TSIP and Safety Trainings 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 NGO Peshsaf — Blacksmith Institute/Pure Earth's main national 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. 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 Peshsaf, 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 is 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.

SITES SURVEYED IN 2016-2017

For the period 2016-2017, investigators in Tajikistan visited and took samples at 21 toxic sites. All the sites studied were former obsolete pesticide depots. Such sites are a serious issue throughout Tajikistan. They pose an immediate threat to the health of people who live there, who often do not know about the health dangers. The land on which the warehouses are located has been illegally privatized in the 1990s and early 2000s and the owners are building new houses on it. To get rid of the "evidence" some of the owners try to "solve" the problem of the obsolete pesticides on their land by throwing them into reservoirs or selling them to others. This of course, causes other issues, including contamination of local water sources.

Below are descriptions and, photographs of contaminated sites, as well as the results of laboratory tests of soil samples for pesticides.

TJ-4940 - Bakhor, Djami (Lindane)

The site is located in B.Khilol village, Dusti djamoat (former "Ilyich"), Djami area, Khatlon Oblast of the Republic of Tajikistan. It is approximately 83 km from Dushanbe. The site includes a pesticide storage facility and borders agricultural fields and other infrastructures (machine and tractor stations, cotton collection points). The warehouse on the site was not destroyed and the site was privatized by local entrepreneurs. It is divided into 2 sections. In front of the building there is storage and shop for bricks production (clay bricks). In the other section of the warehouse automobile parts are stored, as well as wheat. Previously, food was stored there. A cotton gin is located on the left side. In the Soviet period the site was completely isolated from the residential premises. Presently, 4 residential houses are built within 50 m of the warehouse, 15 people live there. Ninety people live within a radius of 100 m (up to 15 households). There are no water bodies near. Local population gets water with the help of pumping stations and pumps. Samples were collected in residential areas and within 10-20 m from the warehouse. The main pathways of exposure are: inhalation of dust and soil blowing by wind, and direct contact of people with contaminated soil.



Fig. 1. In front of the warehouse



Fig. 2. Shop for clay brick production

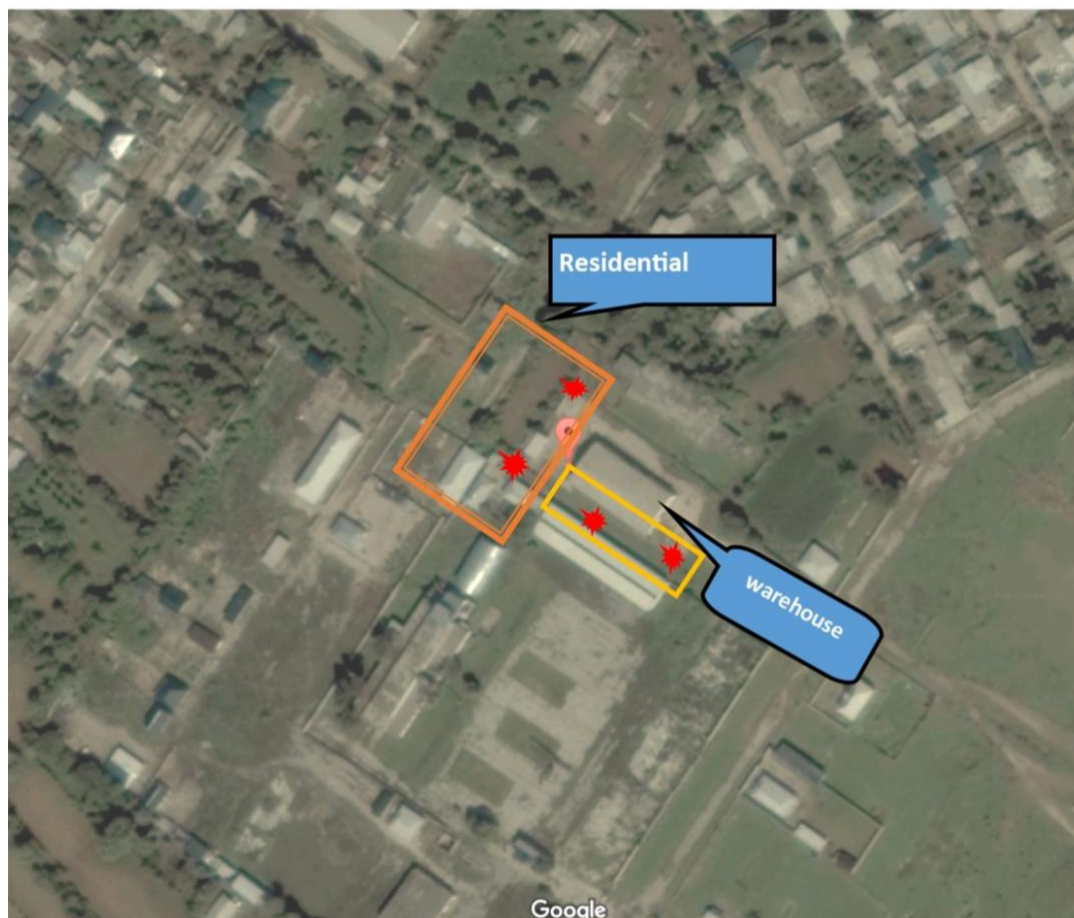


Fig. 3. Map of the site with sampling points

Table 1. Concentrations of contaminants (Bakhor, Djami)

Longitude/ Latitude	Date	Description of the sampling spot	Population	4.4 DDE, ppm	Diel drin, ppm	4.4 DDD, ppm	A- BHC, ppm	B- BHC, ppm	G- BHC, ppm	D- BHC, ppm	Aldri n, ppm	Heptac hlorepo x, ppm
68,835088; 38,066285	28/10/16	Residential place. New house new the warehouse	25 people, including 15 permanent residents	0	0	0	0	0	0,051	0,022	0	0,024

68,83507; 38,06627	28/10/17	Residential place. New house new the warehouse	25 people, including 15 permanent residents	0,033	0,08	0,063	0,04	0,087	0,062	0,084	0,074	0
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TJ-4981 - Vakhdad, Khamadoni (Lindane)

The area of the site is about 300 m², the site is located in Khamadoni area (former “Moskovsky”), 200 km from Dushanbe. The site is a former pesticides storage. It is a building with external walls only, no roof, windows or doors. The building was dissembled in the beginning of the 1990s, but the walls were not dismantled. Permissions for the construction of residential buildings in this area was already issued. In fact, the property is sold by the district administration to local residents. One of the houses is built near the warehouse. The owner uses part of the warehouse for storing feed for livestock, as well as wood and other things. In a radius of 50 m 10 new residential units are under construction at the moment, and some are already constructed. From the other side of the warehouse a local businessman partially cleaned a building, constructed a mill and began producing flour. According to local residents, the warehouse stored DDT, thiodan and sulfur. Access to the site is not limited. There are an obvious odor of pesticides and white traces on the ground. Pathways of exposure are vapor and dust inhalation, eating animal products, and direct dermal contact.



Fig. 4. Investigator is taking a sample



Fig. 5. Straw inside the warehouse



Fig. 6. Meeting with locals on the site



Fig. 7. Map of the site with sampling points

Table 2. Concentrations of contaminants (Vakhdat, Khamadoni)

Longitude/ Latitude	Date	Description of the sampling spot	Population	A- BHC, ppm	B-BHC, ppm	G-BHC, ppm	4.4 DDE, ppm
69,59521; 37,64857	11.07.2016	Residential place. New house in the warehouse	28	0	0	0,106	0,017
69,59566; 37,64861	11.07.2016	Residential place. New house in the warehouse	88	0,039	0,021	0,056	0,076

TJ-4990 - Dekhkan and Farming Entity Saidov, Khamadoni (Lindane)

The abandoned storage facility is located in Khamadoni district, Khatlon Oblast, about 200 km from Dushanbe. Previously the warehouse stored toxic chemicals and pesticides. The evidence is the numerous traces of yellow and white are found on the ground. At the

moment, the warehouse is privatized and is used as a garage for the local Dekhkan farm for storing materials though not food. Up to 25 storage employees (mainly drivers, mechanics and farm workers) are in the risk area. The main pathways of exposure are dust inhalation and direct dermal contact with pesticides, pesticides transfer on the soles of shoes, and possibly wasting the meat or drinking milk from cattle that graze near the warehouse. A small ditch, used for irrigation purpose, runs at the territory of the storage. The warehouse is surrounded by a concrete fence; entrance for children is limited. Approximate distance to the closest residential house - 400 meters.



Fig. 8. Former warehouse and ruins



Fig. 9. Sampling



Fig. 10. Map of the site with sampling points

Table 3. Concentrations of contaminants (Dekhkan and Farming Entity Saidov, Khamadoni)

Longitude/ Latitude	Date	Description of the sampling spot	Popu- lation	A- BHC, ppm	B- BHC, ppm	G- BHC, ppm	D- BHC, ppm	Hepta- chlor, ppm	Aldrin , ppm	Hepta- chlor- epox, ppm	Endo- sulfa- n-1, ppm	4.4 DDE, ppm	4.4 DDD, ppm	4.4 DDT, ppm
69,58146; 37,68901	28/1 1/16	Non- residential place	10	0,027	0,051	0	0,013	0	0	0	0,011	0,022	0,026	0,04 8
69,58174; 37,68849	28/1 1/16	Road place	15	13,75	1,16	10,24	5,64	0,80	0,00	0,90	0,17	0,70	0,23	0,21

TJ-4991 - Khamidov, Khamadoni (Pesticides)

This pesticides storage is located in Khamadoni area, kishlak “Khamidov”. Presently it is owned by Dekhkan and Framing Entity “Khoshimov”. The main storage space is completely destroyed; there are only remnants of the foundation. Up to 4 people worked there, including a guard. Presently, one can see obvious traces of pesticides and their burial – yellow and white marks on the ground. The main transmission paths are dust and vapor inhalation, dermal contact, and eating animal products. There is a free access both to people and animals. Several meters from the ditch runs an irrigation channel which is used for drinking purposes. Houses are built approximately 100 m from the warehouse.



Fig. 11. Livestock grazing on the site



Fig. 12. Former warehouse and ruins



Fig. 13. Map of the site with sampling points

Table 4. Concentrations of contaminants (Khamidov, Khamadoni)

Longitude/ Latitude	Date	Description of the sampling spot	Popula tion	A- BHC, ppm	B- BHC, ppm	G- BHC, ppm	D- BHC, ppm	Aldrin, ppm	4.4 DDE, ppm	4.4 DDD, ppm	4.4 DDT, ppm
69,64227; 37,61871	20/11/16	Village place	40	0,045	0,022	0,05	0,061	0	0,02	0,013	0
69,64246; 37,61876	20/11/16	Village place	60	0,006	0,099	0	0,038	0,034	0,02	0,08	0,019

TJ-4973 – Davlatobod, Khamadoni (DDT)

The site is located in 200 km from Dushanbe, in Khamadoni area (former “Moskovsky”). The region borders Afghanistan. In the Soviet period the region had a well developed agricultural sector. A lot of pesticide storages are located there, but were practically destroyed after the

collapse of the USSR. Today the information about them is almost non-existent. Previously, the warehouse in Davlatobod belonged to the Agricultural chemistry ministry, and after its liquidation after the collapse of the USSR the warehouse passed to local authorities and was sold. The new owner demolished the warehouse, destroyed the infrastructure and permitted construction on this territory. At the moment there is no storage there but 2 families live at the site. A few houses are located within 50 m. The territory is under constant construction; agricultural fields are nearby. There is quite an acrid odor. Ten children live there (total of 15 people); as well as cattle and poultry. Pathways of exposure are consumption of animal and plant products from the area.



Fig. 14. House was built on the place of warehouse



Fig. 15. Owner of the house at the site



Fig. 16. Map of the site with sampling points

Table 5. Concentrations of contaminants (Davlatobod, Khamadoni)

Longitude/ Latitude	Date	Description of the sampling spot	Populati on	A- BHC, ppm	B- BHC, ppm	G- BHC, ppm	D- BHC, ppm	Hepta chlor, ppm	Aldr in, ppm	Hepta chlor- epox, ppm	Endo sulfa n-1, ppm	4.4 DDE, ppm	Dield rin, ppm	4.4 DDD, ppm	4.4 DDT, ppm
69,534001; 37,72656	12.0 2.16	Residential place. New house in the warehouse	Two families about 15 persons	0,034	0,022	0,022	0,08	0,026	0	0,026	0,07 1	0,064	0	0,071	0,021
69,5339; 37,72653	12.0 2.16	Residential place. New house in the warehouse	More than 60 people	0,044	0	0	0,042	0	0,01 8	0,006	0,00 6	0,115	0,024	0,064	0,263

TJ-4958 - Djovidon, F. Saidov (Lindane)

The site is located in Djami area, approximately in 5 – 6 km from the district center. The site borders agricultural territory. In the USSR, the site was a part of an agricultural complex that included a storage of pesticides, garage for machinery and warehouse for the storage of petroleum products. Presently, only a half-ruined fence exists there. The Pesticides warehouse is practically destroyed. Access to the warehouse is open and accessible to children. Approximately in 30 m from the storage there are 2 ponds, used by local residents

for fishing. Also, there is a discharge canal, which flows into the Vakhsh River. The information about the presence of pesticides in the warehouse is unavailable. It is known that since 1995 two people worked here. There are obvious pesticide traces there. The smell is obvious and strong. The estimated pathways of exposure are air and dust inhalation, direct dermal contact with soil. Potentially - consumption of fish from the pond.



Fig. 17. Children at the site



Fig. 18. Inside the warehouse

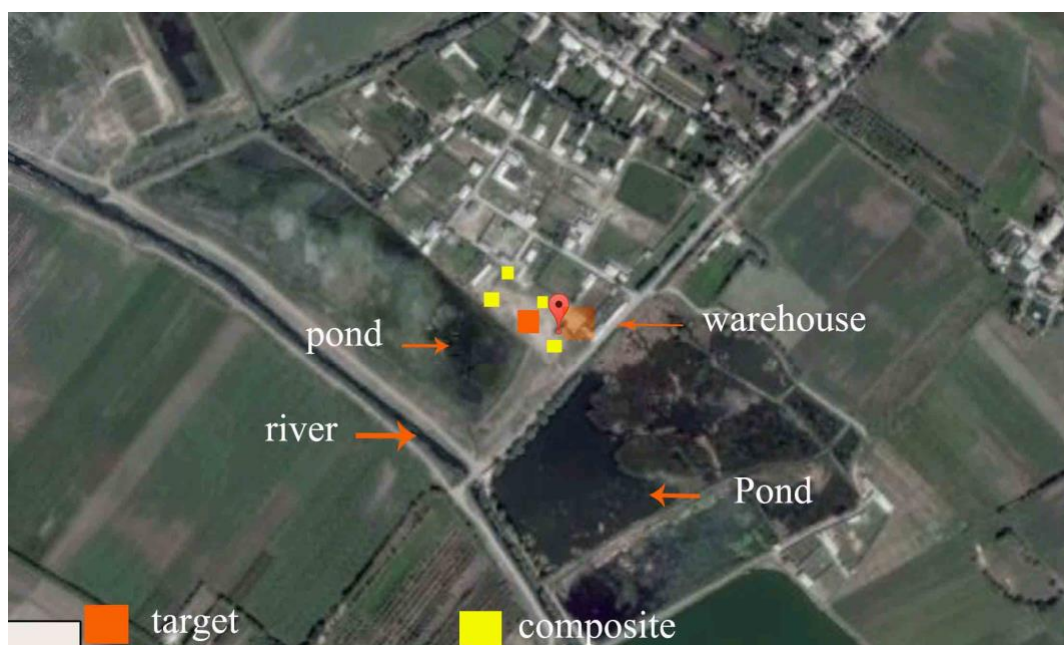


Fig. 19. Map of the site with sampling points

Table 6. Concentrations of contaminants (Djovidon, F. Saidov)

Longitude / Latitude	Date	Description of the sampling spot	Population	A-BHC, ppm	B-BHC, ppm	G-BHC, ppm	D-BHC, ppm	Heptachlor, ppm	Aldrin, ppm	Heptachlor-epox, ppm	Endosulfan-1, ppm	4.4 DDE, ppm	Dieldrin, ppm	Endrin, ppm	4.4 DDD, ppm	Endrin-Aldehyde, ppm	4.4 DDT, ppm
68,747331; 37,952554	28/10/16	Residential place. New house in the warehouse	25 people, including 20 permanent residents	83	50	66	42	11	2	0,71	1	0,207	0,41	0,18	3	0,77	18
68,746641; 37,953133	28/10/16	Residential place. New house in the warehouse	25 people, including 20 permanent residents	0,024	0,407	0,054	0,05	0,051	0	0,049	0,011	0,049	0	0	0	0	0

TJ-4956 - Zarnissor (former Engels) (Lindane)

The site is located in Zarnissor (former Engels) in Djami district, Khatlon Oblast. Approximate area is 0.6 ha. The site represents an isolated construction site, consisting of 3 buildings: a gatehouse, a garage and a half-ruined former warehouse which used to house pesticides. Small area no larger than half a hectare is adjacent to the buildings. This plot is used for the storage of cotton. There are dilapidated vehicles, tractor trailer, chickens and 5 permanent workers at the site. A discharge channel, used for irrigation, is behind the facility. The site is fenced throughout. In the northern part residential houses serve as a fence. The approximate distance from the warehouse to a residential home is more than 50 meters. In 1983 the plot was completely burnt, with nothing left from the warehouse. Later, the garage was restored, but not the warehouse. According to some sources, the pesticides were burnt along with the warehouse, according to other sources, the remains were buried right at the site. There is no reliable data, as no one witnessed this event. An elderly financier of the site provided investigators with the information on possible dumping of pesticides. There is no obvious smell. Access is limited for children and adults. The main pollutant is lindane. The pathways of exposure are dust inhalation, and direct dermal contact.



Fig. 20. Cotton collection point



Fig. 21. Animals on the site



Fig. 22. Sample collection near the warehouse

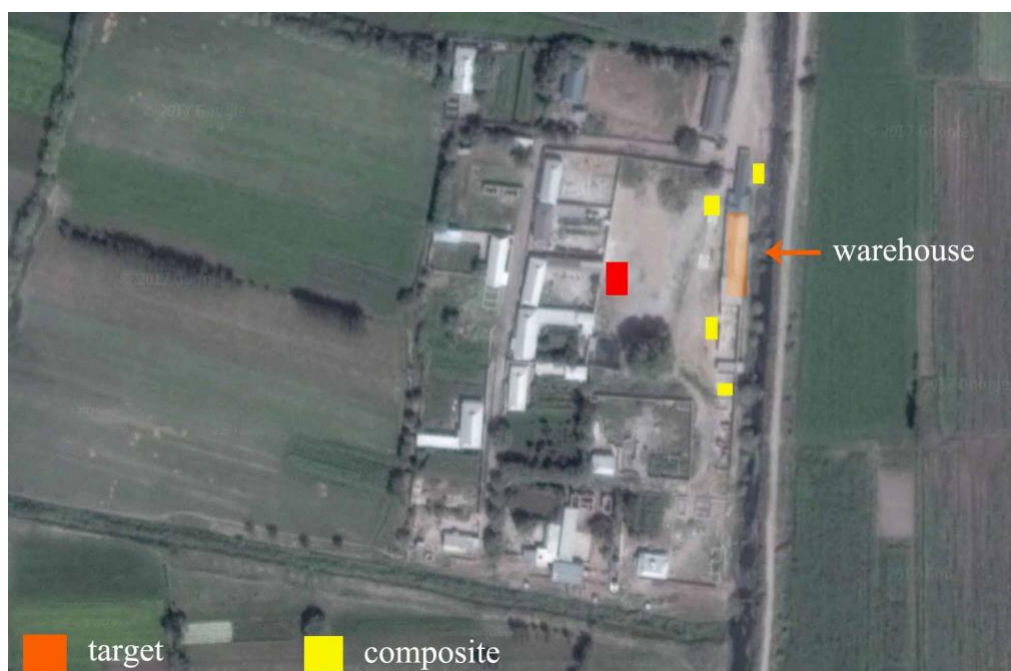


Fig. 23. Map of the site with sampling points

Table 7. Concentrations of contaminants (Zarnissor (former Engels))

Longitude/ Latitude	Date	Description of the sampling spot	Population	A- BHC, ppm	B- BHC, ppm	G- BHC, ppm	D- BHC, ppm	Aldrin, ppm	4.4 DDE, ppm	4.4 DDD, ppm	4.4 DDT, ppm
68,854835; 37,945061	27/10/16	Former warehouse of pesticides, now a place of collecting cotton	5 people work on a site seasonally	0	0,047	0	0	0	0	0,002	0,002
68,854912; 37,944958	27/10/16	Former warehouse of pesticides, now a place of collecting cotton	5 people work on a site seasonally	0,039	0,032	0,054	0,031	0,034	0,067	0,0146	0

1. TJ-4986 - Imomberdiev, Yavan (Pesticides)

The warehouse is located in Yavan district, about 50 km from Dushanbe. The warehouse is quite destroyed, there are no windows and doors, and it is used by local residents for domestic needs, for parking of vehicles and tractors. Also, it is used to store tapak (dried cow feces as a product for fuel), which can become a source of pollution of its own. Children often play there. Due to the legal and biohazardous uncertainty surrounding the warehouse, the sanitary protection zone was completely inhabited by the local population. There are no water sources within a radius of 500 meters. The main pathways of exposure are: dust and vapor inhalation, and direct dermal contact with soil.



Fig. 24. Inside the warehouse



Fig. 25. Children walking near warehouse



Fig. 26. Map of the site with sampling points

Table 8. Concentrations of contaminants (Imomberdiev, Yavan)

Longit ude/ Latitu de	Da te	Descripti on of the sampling spot	Popul ation	A- BHC , ppm	B- BHC , ppm	G- BHC , ppm	D- BHC , ppm	Hept achl or, ppm	Aldri n, ppm	Hept achl or- epox , ppm	Endos ulfan- 1, ppm	4.4 DDE , ppm	Dieldrin, ppm	Endrin, ppm	4.4 DDD , ppm	Endr ine- Alde hyde , ppm	End osu l- sulf , pp m	4.4 DDT, ppm
68,895 932; 38,198 66	28/ 10/ 16	Residenti al place. New house in the warehouse	Two familie s about 14 perso ns	0,01 2	0,03 7	0	0,00 6	0,07 7	0,051	0,059	0,0198	0,49 9	0,08	0	0,22 1	0,033	0	0,014 3
68,896 196; 38,198 646	28/ 10/ 16	Residenti al place. New house in the warehouse	More than 25 people	0,03 9	0,03 1	0,05 8	0,10 9	0	0	0,022	0,077	0,47 7	0,04	0	0,10 3	0,113	0,3	0,415

TJ-4992 - Ittifok, Khamadoni (DDT)

The site is located in the southern part of Tajikistan, in Khamadoni area of Khatlon Oblast. The territory borders Afghanistan. The warehouse is completely destroyed, however, there is evidences of bags and white marks. The area is actively developed, with cattle grazing. The storage was built close to the farmlands, and borders slopes. A river, used for irrigation and drinking purposes, flows 30 m from the warehouse and serves as a potential migration route. Despite the lack of storage building, there is a strong pesticides odor. Access to the site is not closed off. There are traces of white powder on the ground. The main pathways into the human body are: dust and vapor inhalation, dermal contact with soil.



Fig. 27. Houses were built where the warehouse used to be



Fig. 28. Children at the site

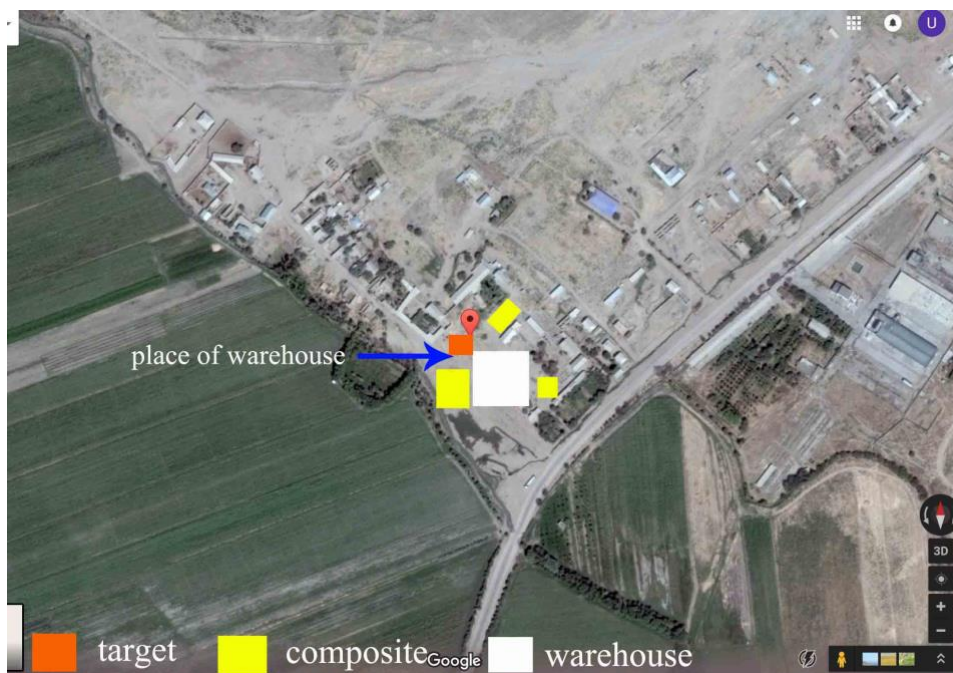


Fig. 29. Map of the site with sampling points

Table 9. Concentrations of contaminants (Ittifok, Khamadoni)

Longitude/ Latitude	Date	Description of the sampling spot	Popula tion	A- BHC, ppm	B- BHC, ppm	G- BHC, ppm	D- BHC, ppm	Aldrin, ppm	Hepta chlor- epox, ppm	Endo sulfan- 1, ppm	4.4 DDE, ppm	4.4 DDD, ppm	Endo sulf2, ppm	Endrine- Aldehyde, ppm	Endo sul- sulf, ppm	4.4 DDT, ppm
69,65479; 37,68028	13/11/16	Residential place. New house in the warehouse	More than 30 people	0,016	0,059	0,028	0,017	0,038	0,000	0,011	0,082	0,032	0,000	0,000	0,000	0,088
69,65476; 37,68005	13/11/16	Residential place. New house in the warehouse	More than 100 people around 50 metres	0,333	0,000	0,095	0,000	0,562	0,378	0,697	10,028	5,032	2,011	1,005	9,611	#####

TJ-4971 - Ozodii Sharq (former Lenin) (Lindane)

The site is located in one of the villages in the Djami area, approximately 92 km from Dushanbe. No part of the warehouse is left, not even a foundation. According to local residents, the warehouse stored pesticides, later petroleum, oil, and lubricants, and served as a cotton collection point. Reduction in crop acreage and the collapse of the USSR resulted in the privatization of the warehouse. After the collapse of the Soviet Union, the site was immediately sold to people who received illegal construction permits. As a result, there are 2 houses constructed on the territory of the warehouse, and up to 10 new houses constructed behind it. Population of this new settlement is 300 people. About 15 people live right on the territory of the warehouse. Cattle graze there as well. There are yellow pesticides marks in the yard of one of the houses. Migration routes could be through the Obguzar river which flows in 10 m from the warehouse. Water from the river is used for irrigation and drinking purposes. Other pathways of exposure are: dust inhalation, direct dermal contact with soil.



Fig. 30. Former warehouse



Fig. 31. Children living at the site



Fig. 32. Yellow traces of pesticides

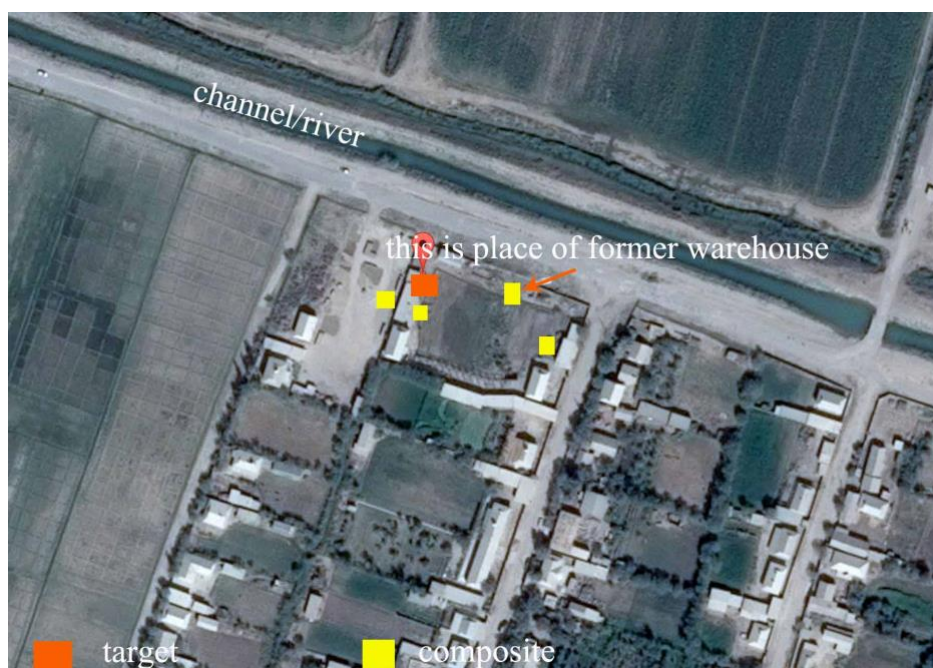


Fig. 33. Map of the site with sampling points

Table 10. Concentrations of contaminants (Ozodii Sharq (former Lenin))

Longitude / Latitude	Date	Description of the sampling spot	Population	A-BHC, ppm	B-BHC, ppm	D-BHC, ppm	Heptachlor, ppm	Heptachlor-epox, ppm	Endosulfan-1, ppm	4.4 DDE, ppm	4.4 DDD, ppm	4.4 DDT, ppm
68,85006; 38,005809	28/10/16	Residential place. New house in the warehouse	Two families about 14 persons	0	0,044	0,008	0,008	0,004	0,004	0,005	0,005	0,007
68,849652; 38,005819	28/10/17	Residential place. New house in the warehouse	More than 25 people	0,05	0,125	0	0	0	0	0	0	0

TJ-4993 - Sarhadchi, Khamadoni (Heptachlor)

Following a common pattern in modern Tajikistan, this site is a perfect example of when an old pesticide warehouse is destroyed, the area gradually becomes inhabited. This former storage is in Khamadoni area, approximately 197 km from Dushanbe. The storage was functional until the collapse of the Soviet Union. Then the storage was partially destroyed. Gradually, the territory was sold to the local population for building purposes. At the moment, the walls of the warehouse border a new house. Another 3 houses are near the storage. A small irrigation channel flows nearby; this is a source of drinking water and could be a migration route. Previously the warehouse stored DDT, Thiodan, sulfur and other toxic chemicals. The smell is quite strong. According to residents, there are cases of death of domestic animals. Access to the storage is not prohibited. The main pathways into human body are: dust inhalation, and direct dermal contact with contaminated soil.



Fig. 34. Houses near the warehouse



Fig. 35. Ruins of the the warehouse



Fig. 36. Children on the site

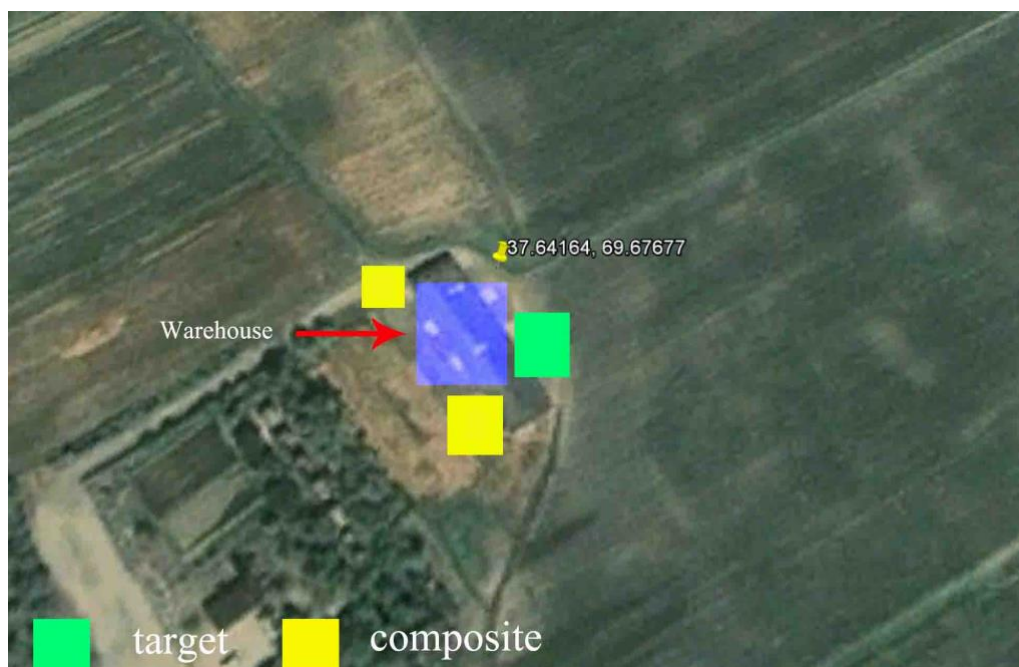


Fig. 37. Map of the site with sampling points

Table 11. Concentrations of contaminants (Sarhadchi, Khamadoni)

Longitude/ Latitude	Date	Description of the sampling spot	Population	A- BHC, ppm	G- BHC, ppm	Heptachlor, ppm	Heptachlor- epox, ppm	4.4 DDE, ppm
69,67642; 37,64156	13/12/16	Residential place. New house in the warehouse	Three families about 25 persons	0,013	0,026	0,037	0,214	0
69,67702; 37,64179	13/12/16	Residential place. New house in the warehouse	More than 80 people	0,028	0	0	0,045	0,026

TJ-4988 - State Farm 1, (Sovhoz 1) Yavan (Aldrin)

This pesticides storage was built at the end of the 1960s and is located on state farm № 1. The warehouse is virtually destroyed and has not functioned since the end of the 1980s. Previously the warehouse stored pesticides. Presently, it is not privatized; it is owned by the local djamoat. Up to 10 residential houses built in the 1990s are located near the warehouse. Within a radius of 100 m there are up to 20 residential units. Access to the warehouse is not prohibited, and is a favorite playground for children. The smell is quite strong. According to the head of the nature protection in the district, the warehouse previously stored Thiodan, DDT and sulfur. Up to 50 people live within the territory of site, 40 of them are children.. Approximate distance to the school is 500 meters. The main pathways into the human body are: dust inhalation, and direct dermal contact of people with contaminated soil.



Fig. 38. Village near the warehouse



Fig. 39. View of the warehouse

Table 12. Concentrations of contaminants (State Farm 1, (Sovhoz 1) Yavan)

Longitude/ Latitude	Date	Description of the sampling spot	Population	A- BHC, ppm	B- BHC, ppm	G- BHC, ppm	D- BHC, ppm	Hepta chlor, ppm	Aldrin, ppm	Hepta chlor- epox, ppm	Endo sulfan- 1, ppm	4.4 DDE, ppm	4.4 DDD, ppm	4.4 DDT, ppm
69,031951; 38,284419	28/10/16	Residential place. New house in the warehouse	More than 10 families in 50 metres	0,003	0,016	0,027	0,016	0,006	0,008	0,007	0,004	0,009	0,02	0,073
69,032023; 38,284165	28/10/17	Residential place. New house in the warehouse	More than 10 families in 50 metres	0,063	0,025	0,068	0,043	0	0,062	0	0	0,053	0	0

TJ-4985 - State farm 4, (Sovhoz 4)Yavan (Lindane)

The warehouse is located in Yavan district, Khatlon region, about 50 km from Dushanbe.

The warehouse has kept its original shape and has no apparent structural flaws. Previously, the warehouse was used to store pesticides, including DDT, Lindane and Aldrin.

At the moment, the warehouse is completely privatized. There is no sanitary protection zone, as the local authorities sold the territory for the construction of housing. The concreted irrigation channel is near the warehouse. Within a radius of 50 meters from the warehouse 5-6 houses are built, within a radius of 100 meters - 12 houses. The access to the warehouse is not limited for the local population, but its interior is closed. The warehouse is divided into several sectors. Only 2 parts were available to the investigators, these 2 parts were used for the production of bricks, as well as for storing animal feed.

Possible pathways of exposure are: inhalation of dust, and eating animal products.



Fig. 40. Warehouse is still used for entrepreneurs needs



Fig. 41. New house very close to the warehouse

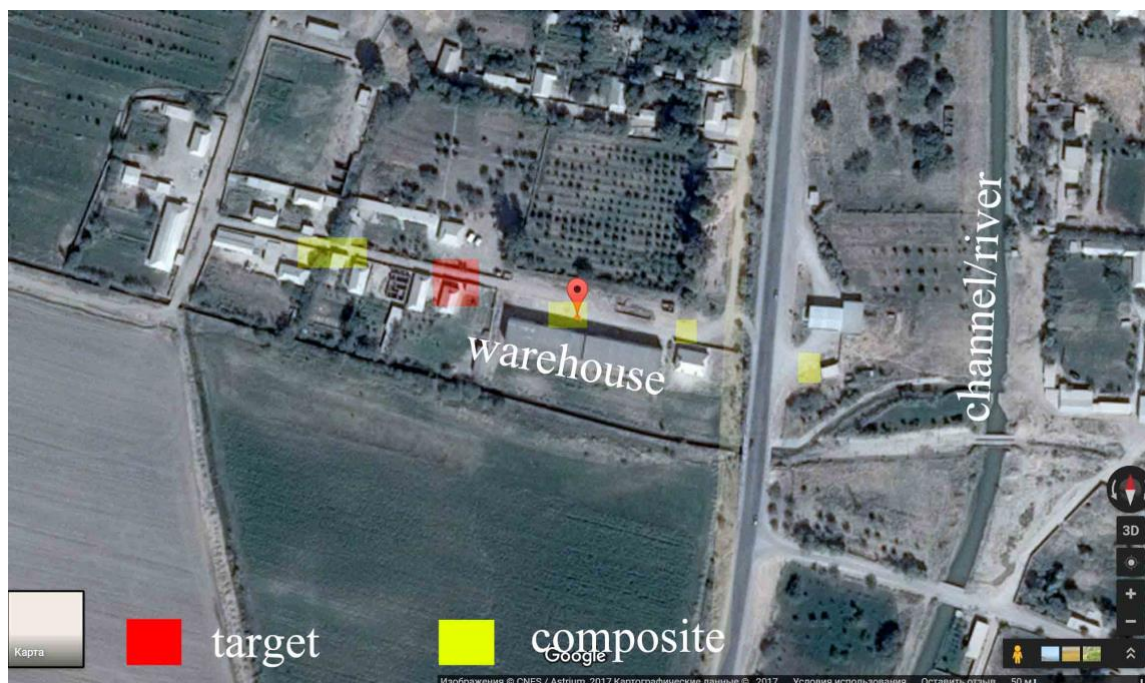


Fig. 42. Map of the site with sampling points

Table 13. Concentrations of contaminants (State farm 4, (Sovhoz 4)Yavan)

Longitude/ Latitude	Date	Description of the sampling spot	Population	A- BHC, ppm	B- BHC, ppm	G- BHC, ppm	D- BHC, ppm	Hepta chlor, ppm	Hepta chlor- epox, ppm	4.4 DDE, ppm
68,936682; 38,094001	28/10/16	Residential place. New house in the warehouse	Two families about 14 persons	0,018	0	0,006	0	0	0,004	0,001
68,936314; 38,09408	28/10/17	Residential place. New house in the warehouse	More than 25 people	0,356	0,048	0,359	0,318	0,168	0	0

TJ-4984 - Sovhoz [State Farm] 5, Yavan (Heptachlor)

The site locates in Yavan district, approximately in 50 km from Dushanbe. The warehouse is partially destroyed. A family of 7 people lives on the territory of the warehouse. Their house is adjacent to the warehouse wall. Traces of chemicals can be seen. Another 2 families live

nearby. The total population at the State farm is 119. The risk to human health comes from the fact is the warehouse used to stored dangerous toxic chemicals, and nobody cleaned the territory. Presently the warehouse stores animal feed and products of one of the families. No water bodies are located nearby. Pathways of exposure are direct contact and air (dust and soil inhalation).



Fig. 43. Access to the warehouse



Fig. 44. Traces of pesticides

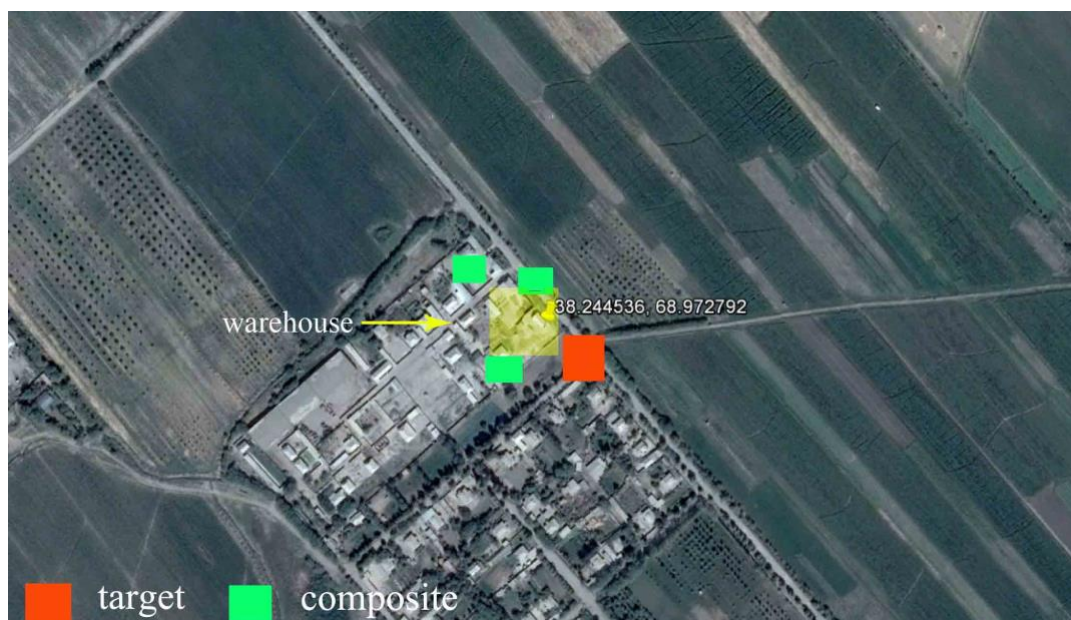


Fig. 45. Map of the site with sampling points

Table 14. Concentrations of contaminants (Sovhoz 5, Yavan)

Longitude/ Latitude	Date	Description of the sampling spot	Population	A-BHC, ppm	B-BHC, ppm	G-BHC, ppm	D-BHC, ppm	Hepta chlor, ppm	Aldrin, ppm	Hepta chlor- epox, ppm	Endo sulfa n-1, ppm	4,4 DDE, ppm	Dieldrin, ppm	4,4 DDD, ppm	4,4 DDT, ppm
68,972893; 38,244495	28/10/ 16	Residential place. New house in the warehouse	Two families about 14 persons	0,031	0,046	0	0,048	0,547	0,333	5	0,355	0,563	0,162	0,115	0,284
68,972792; 38,244536	28/10/ 17	Residential place. New house in the warehouse	More than 25 people	0,014	0	0,035	0	0	0	0	0	0,0162	0	0	0,187

TJ-4972 - State Farm 6, (Sovhoz 6) Yavan (Lindane)

Like most of the warehouses in Javan district, the warehouse in the State Farm 6 is almost wholly preserved, mostly due to the local population. Since the beginning of the 2000s, the warehouse was virtually inhabited. Residential houses were built nearby, and one of the families practically settled down in the warehouse. Currently there are 2 houses on the site. Both families use the warehouse together. Animal feed, and cattle of local residents are stored here. Earlier in the Soviet period, hazardous chemicals were stored there. The main pollutant at the site is Lindane. Pathways of exposure are vapor and dust inhalation, and eating local animal products. The main population in the area of the warehouse is 17 people, including 12 children. Within a radius of 100 there is no water.



Fig. 46. View of the warehouse and new houses



Fig. 47. Inside the warehouse



Fig. 48. Crops produced in 10 meters from the warehouse



Fig. 49. Map of the site with sampling points

Table 15. Concentrations of contaminants (State Farm 6, (Sovhoz 6) Yavan)

Longitude/ Latitude	Date	Description of the sampling spot	Population	A- BHC, ppm	B- BHC, ppm	G- BHC, ppm	D- BHC, ppm	Aldrin, ppm	Endos ulfan- 1, ppm	4.4 DDE, ppm	4.4 DDD, ppm	4.4 DDT, ppm
68,884228; 38,126077	28/10/16	Residential place. New house in the warehouse	Two families about 14 persons	0,10	0,02	0,07	0,03	0,04	0,03	0,07	0,00	0,00
68,884443; 38,125958	28/10/17	Residential place. New house in the warehouse	More than 25 people	6,94	0,73	3,70	1,15	0,00	0,00	0,41	0,09	0,24

TJ-4982 - Turdyev, Khamadoni (Aldrin)

This warehouse is located in Khamadoni area, Khatlon Oblast, 191 km from Dushanbe. The site is located in close proximity to the border with Afghanistan. This caused the ban on the construction of residential houses in the newly opened areas. There is nothing left from the warehouse, only a foundation and a bottom layer of bricks remain. The warehouse is located near the agricultural lands. Locals eat fish from the river. There is a strong smell of pesticides at the site and one can see obvious yellow marks of chemicals on the ground. It is unclear who owns the warehouse.

The main pathways into human body: dust inhalation, direct dermal contact of people with contaminated soil. The key pollutants - DDT and aldrin. Migration route are through the nearby river and wind blowing on the site.



Fig. 50. Fishing 10 meters from the warehouse



Fig. 51. Foundation of the warehouse



Fig. 52. Map of the site with sampling points

Table 16. Concentrations of contaminants (Turdyev, Khamadoni)

Longitude/ Latitude	Date	Description of the sampling spot	Population	A- BHC, ppm	B- BHC, ppm	G- BHC, ppm	D- BHC, ppm	Aldrin, ppm	Endosulfan-1, ppm	4.4 DDE, ppm	Dieldrin, ppm	Endrin, ppm	4.4 DDD, ppm	4.4 DDT, ppm
69,55305; 37,6249	11.09. 2016	Agriculture and road	No houses around	0,004	0,012	0,050	0,003	0,003	0,005	0,064	0,022	0,002	0,012	0,033
69,55269; 37,62508	11.09. 2016	Agriculture and road	No houses around	0,000	0,083	0,000	0,000	0,074	0,006	0,358	0,000	0,000	0,059	0,261

TJ-4963 - Tursunzoda or Tursunzade, Djami

This site is located in Djami area, Khatlon Oblast, approximately in 83 km from Dushanbe. In the soviet period the site was a complex of warehouses of toxic chemicals and fuel, as well as machine and tractor station. The complex was completely demolished; it was decided to permit construction on the territory. Presently, there is a new street full of residential houses, including foundations of new buildings. There is a strong smell of pesticides in the house of a resident named Oynabad. According to her, it is impossible to sleep in the living-room because of the smell. Obvious marks of pesticides are seen behind the living room. She informed the investigators that when they got the land, her husband removed about 400 cubes of soil to an unknown location. The site is under constant construction. Cattle graze on an alleged dumping ground of pesticides. Pregnant women live there. Oynabad complains of a significant deterioration in health. The main pollutant is lindane. The main route of migration into human body: dust inhalation, and direct dermal contact of people with contaminated soil.



Fig. 53. General view



Fig. 54. Sampling in the yard near the warehouse



Fig. 55. Map of the site with sampling points

Table 17. Concentrations of contaminants (1. Tursunzoda or Tursunzade, Djami)

Longitude/ Latitude	Date	Description of the sampling spot	Population	A- BHC, ppm	B- BHC, ppm	G- BHC, ppm	D- BHC, ppm	Hepta chlor, ppm	Aldrin, ppm	Hepta chlor- epox, ppm	Endo sulfan- ppm	4.4 DDE, ppm	4.4 DDD, ppm	4.4 DDT, ppm
68,795611; 37,958684	28/10/16	Residential place. New house in the warehouse	One family about 8 people	0,057	1,373	0,000	0,358	0,000	0,047	0,079	0,000	0,069	0,040	0,090
68,795699; 37,958523	28/10/16	Residential place. New house in the warehouse	More than 100 people on a site	0,003	0,01	0,007	0,003	0,003	0	0,002	0,007	0,058	0,023	0,07

TJ-4989 - 10 years of Independence, Khamadoni (Lindane)

The storage is located in the farming entity “10 years of Independence”, in Khamadoni area, 200 km from Dushanbe. The storage is completely destroyed, new settlements are constructed at the site. According to the local inhabitants, it is quite hard to breathe in summer because of acrid pesticide smell. There is a pond at the site, used only during the irrigation season and only for irrigation purposes. Before being knocked down, the warehouse stored pesticides, including Thiodan, DDT and others. According to preliminary estimates, up to 25 children live in the area. Children pass by the warehouse on their way to school. The main route of migration into human body: dust inhalation and direct dermal contact of people with contaminated soil.



Fig. 56. Hay inside the warehouse



Fig. 57. New house near the warehouse

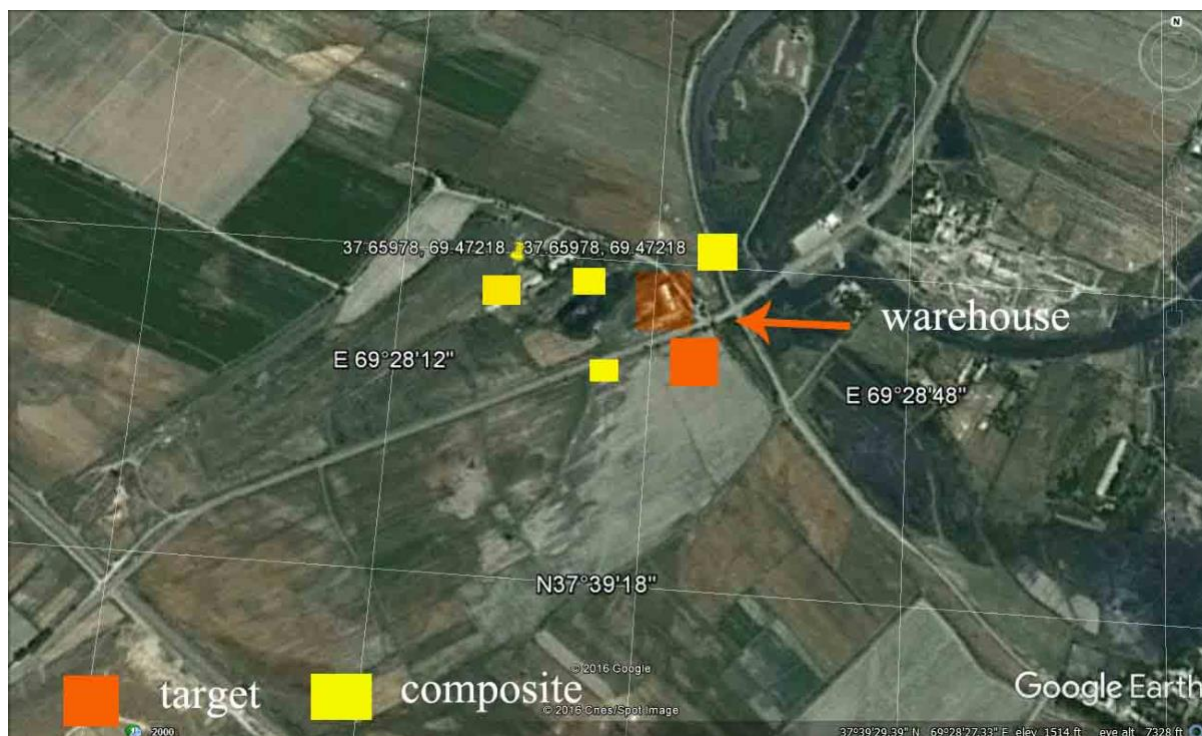


Fig. 58. Map of the site with sampling points

Table 18. Concentrations of contaminants (10 years of Independence, Khamadoni)

Longitude/ Latitude	Date	Description of the sampling spot	Population	A- BHC, ppm	B- BHC, ppm	G- BHC, ppm	D- BHC, ppm	Heptachlor, ppm	4.4 DDE, ppm	4.4 DDD, ppm	4.4 DDT, ppm
69,47218; 37,65978	16/11/16	Residential place. New house in the warehouse	Two families about 14 persons	0,000	0,000	0,000	0,111	0,000	0,035	0,015	0,023
69,47206; 37,65977	16.11.2016	Residential place. New house in the warehouse	More than 25 people	16,430	3,530	18,890	14,500	1,120	0,500	0,170	0,000

TJ-4987 - 50 years of USSR, Yavan (Lindane)

This warehouse remains in fairly good condition, because it was owned by private individuals who used for a variety of purposes, including food storage. Three years ago it was sold. There is a new residential house built near the storage. Part of the warehouse was

completed and is used as a cow house, where livestock feed is also kept. Up to 8 people live in the house. About 300 meters from the site there is a body of water that is used for drinking purposes and irrigation, which could be a migration route. Main pollutants are DDT and Thiodan. Pathways of exposure are through the dust inhalation and dermal contact with soil, as well as drinking milk, eating animal products, food products, as well vapor inhalation.



Fig. 59. Warehouse still used by local businessmen for food storage



Fig. 60. Part of warehouse is used for storage of hay

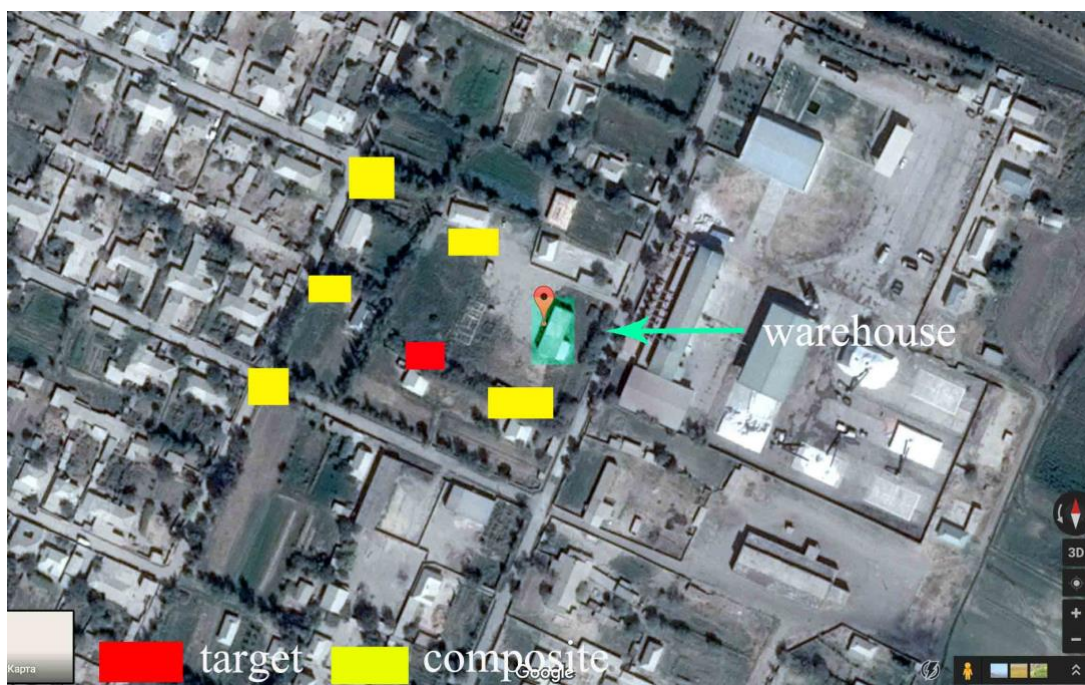


Fig. 61. Map of the site with sampling points

Table 19. Concentrations of contaminants (50 years of USSR, Yavan)

Longitude/ Latitude	Date	Description of the sampling spot	Population	A- BHC, ppm	B- BHC, ppm	G-BHC, ppm	D- BHC, ppm	4.4 DDD, ppm
68,896966; 38,131817	28/10/16	Residential place. New house in the warehouse	Three families about 20 persons	0,066	0,000	0,008	0,019	0,000
68,897216; 38,131833	28/10/17	Residential place. New house in the warehouse	More than 200 people in a radius of 200 people	0,000	0,020	0,035	0,000	0,044

TJ – 5413 - Ziraki, Kulyab (DDT)

This site is located in southern Tajikistan, about 10 minutes drive from the center of Kulyab. The territory of the warehouse is approximately 1 ha, and consists of 4 blocks. On the left there are a lot of old DDT bags, about 1 ton. The bags are open. There are a lot of bottles of Chinese pesticides on the left hand side. The second block of buildings has more than 3.5 tons of DDT with closed doors, a good roof and a guard. This DDT was found by the Committee on Nature protection in 2006 and they promised to repackaged and utilize it before the end of the year, but this has not yet occurred. All packages were good condition but we investigators could not enter and inspect because the doors were closed. There are 10 people work in this warehouse. Also there are 2 houses built in the territory of warehouse. Four adult people are living there and 6 children. Access to the warehouse is open and easy. Children play there without any problems. Pathways of exposure are dust and wind. People have a direct contact. Local people, who live there have livestock, chickens. Drinking water is available from local river which is 100 meters from the warehouse.



Fig. 62. General view of the warehouse



Fig. 63. Livestock farming on the site



Fig. 64. New house was built on the territory of warehouse



Fig. 65. Bags with DDT



Fig. 66. Bottles with unknown substance

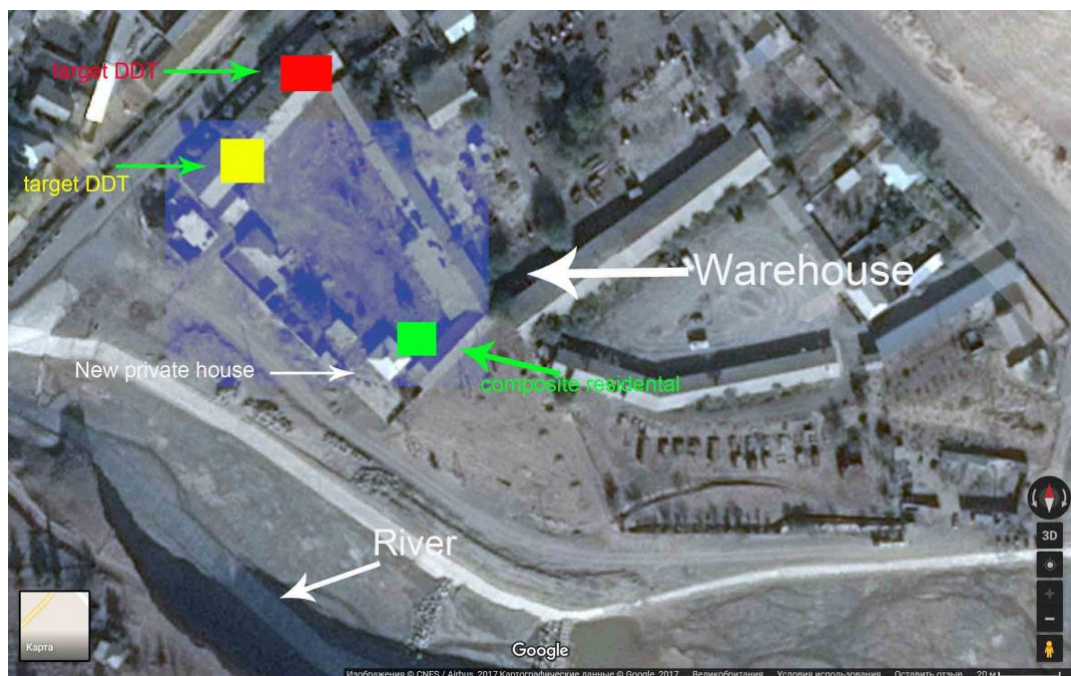


Fig. 67. Map of the site with sampling points

Table 20. Concentrations of contaminants (- Ziraki, Kulyab)

Longitude/ Latitude	Date	Description of the sampling spot	Population	Aldrin, ppm	DDT, ppm	Deldrin, ppm	Lindan, ppm	Metoxyclor, ppm	Geptachlor, ppm	HCH
69,839857; 38,002763	06.01.2017	in warehouse	10	5,16	6,33	0,42	0	6,29	0	0
69,83967; 38,002571	06.01.2017	in warehouse	10	3,34	4,88	0	0,16	0	13,82	1,74
69,840188; 38,002221	06.01.2017	10 metres from residential place	10	0	0	0	0	0	0	0

TJ – 5404 - Pesticide Warehouse, Darkat, Muhojirobod, Farhor (DDT)

This site is located in Khatlon oblast, Farhor province, 191 km south-east of Dushanbe. The size of warehouse is 650 sq.m. Ten meters from the warehouse there is a small irrigation river. In the soviet era, this warehouse was state property and was storage for 11 types of pesticides and mineral fertilizers. Now the warehouse was privatized by a local businessman. The main pollutants which are still in warehouse are Thiodan and DDT 75%. The Owner does not use this space and is waiting for clean-up activities which were promised by Committee on Nature protection in 2006 but were not done. Around 20 meters from warehouse there are plenty of new houses. There are at least 3 barrels of thiodan with sign and another one - DDT 75% (according to one specialist). Another barrel is unknown and will be clarified after lab tests. The pathways of exposure are dust, wind and soil. It is easy to get to the warehouse. Around the warehouse, in a radius of up to 50 meters, there are up to 20 new houses that have been built over the past 25 years. According to the owner of the warehouse, children do not enter the territory, although children do gather fruits in the garden. Part of the warehouse are used by the owner to store straw.

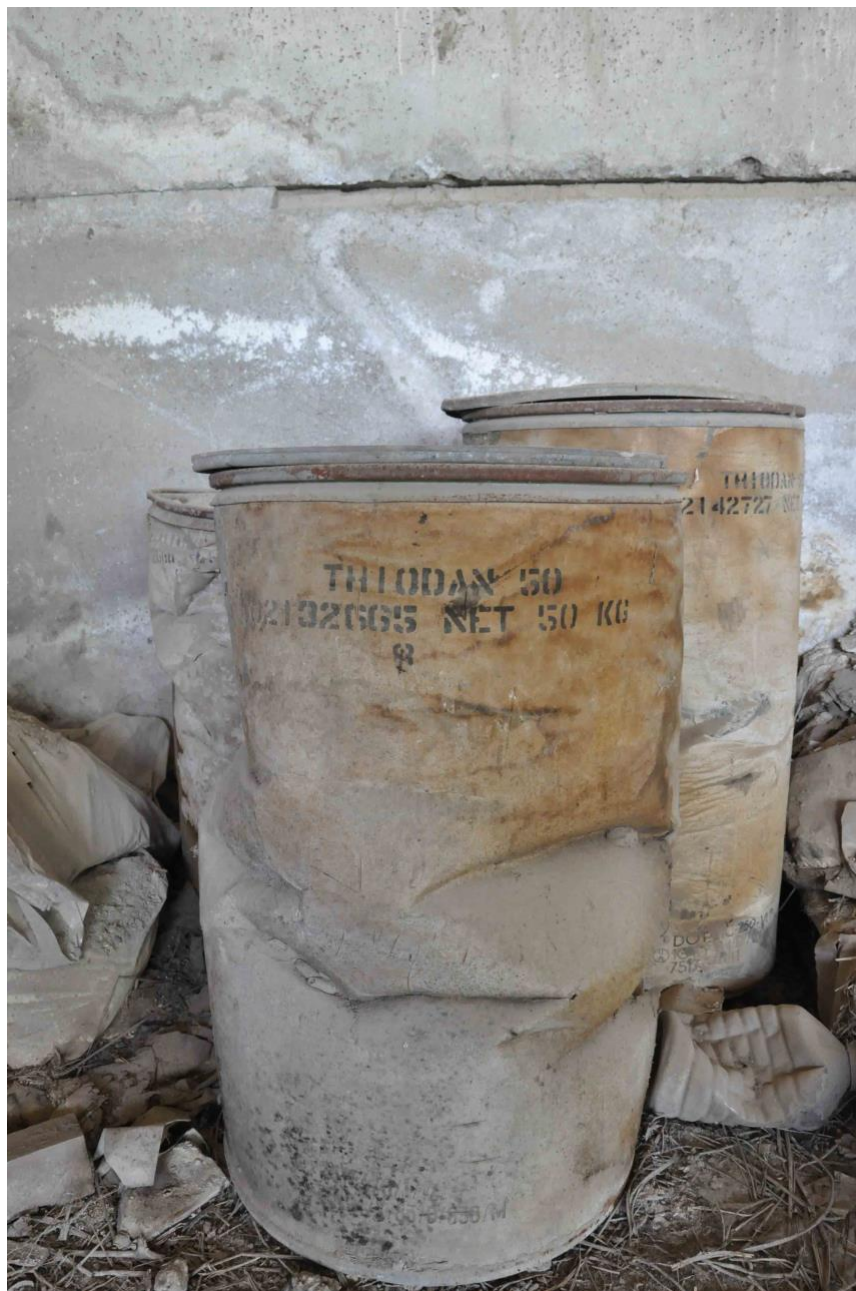


Fig. 68. Drums in very poor condition with Thiodan



Fig. 69. Obsolete pesticides in the warehouse



Fig. 70. Bags with pesticides



Fig. 71. View of the warehouse



Fig. 72. Fruits drying in the territory of warehouse

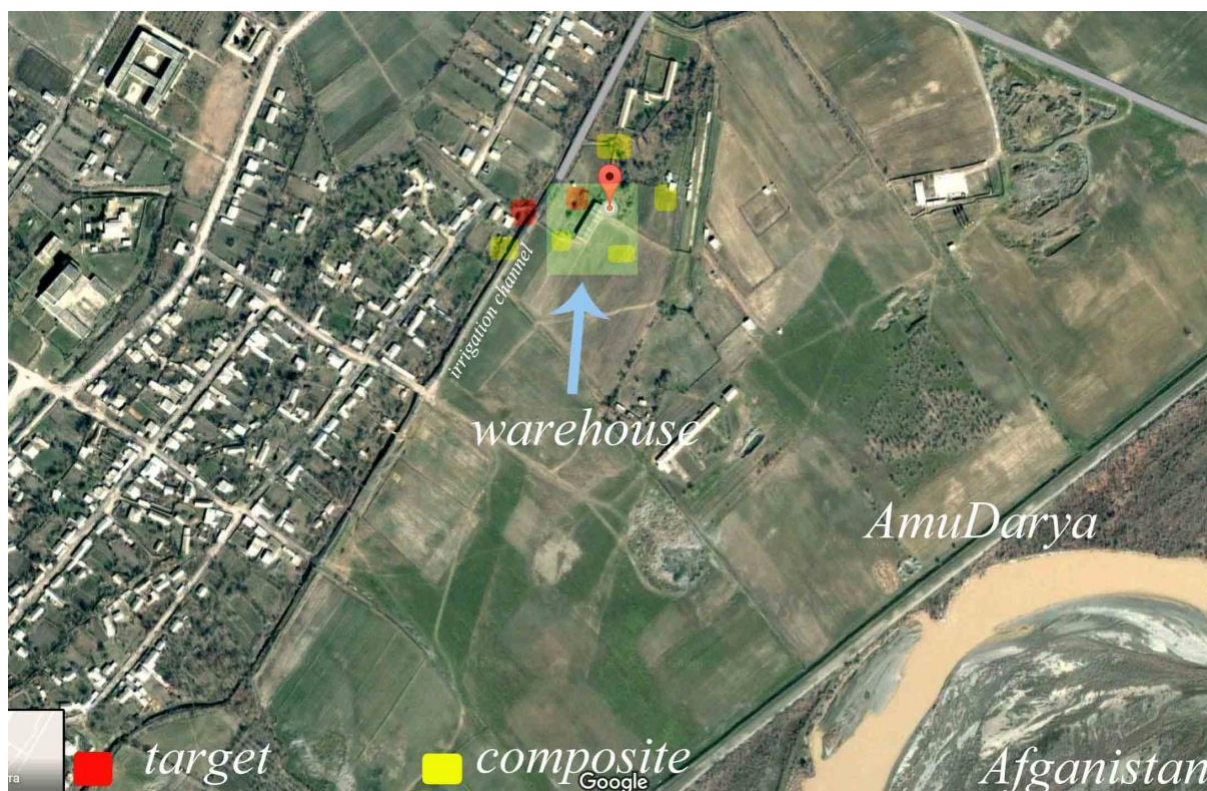


Fig. 73. Map of the site with sampling points

Table 21. Concentrations of contaminants Pesticide Warehouse, Darkat, Muhojirobod, Farhor)

GPS	Date	Description of the sampling spot	Population	DDT
69,46143333; 37,52335	14/06/17	in warehouse	20 houses around warehouse	12
69,46163333; 37,52273333	14/06/17	in warehouse	20 houses around warehouse	12,66
69,4616; 37,52281667	14/06/17	10 metres from residential place	20 houses around warehouse	1,9

Implementation strategy/coordination with 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).

Coordinators and researchers worked closely with government agencies from selecting sites to assessing them.

The Committee on Nature protection is interested in cleaning up the assessed priority sites, but because of a lack of funding cannot do it on its own.

Pollution Sources and Key Pollutants

Since 2009, 67 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 60% of all sites are polluted with toxins from the agriculture industry. The remaining sites are polluted from mining, landfill, heavy and chemical sources. The distribution of plots by type of industry is shown in Table 22 and Figure 74.

Table 22: The number of sites as categorized by pollution source assessed by Pure Earth's investigators in the TSIP Database

Industry	Number of Sites
Agriculture	40
Industrial/Municipal Dump Site	6
Mining and Ore Processing	5
Other	5
Lead - Battery Recycling	2
Petrochemical Industries (refineries)	2
Chemical Manufacturing (acids, organics, base chemicals)	2
Heavy Industry (casting, rolling, stamping)	1
Industrial Estate (mixed industries)	1
Lead Smelting (with ingot production)	1
Nuclear Fuel Processing	1
Product Manufacturing (electronics, equipment, clothing)	1
Total	67

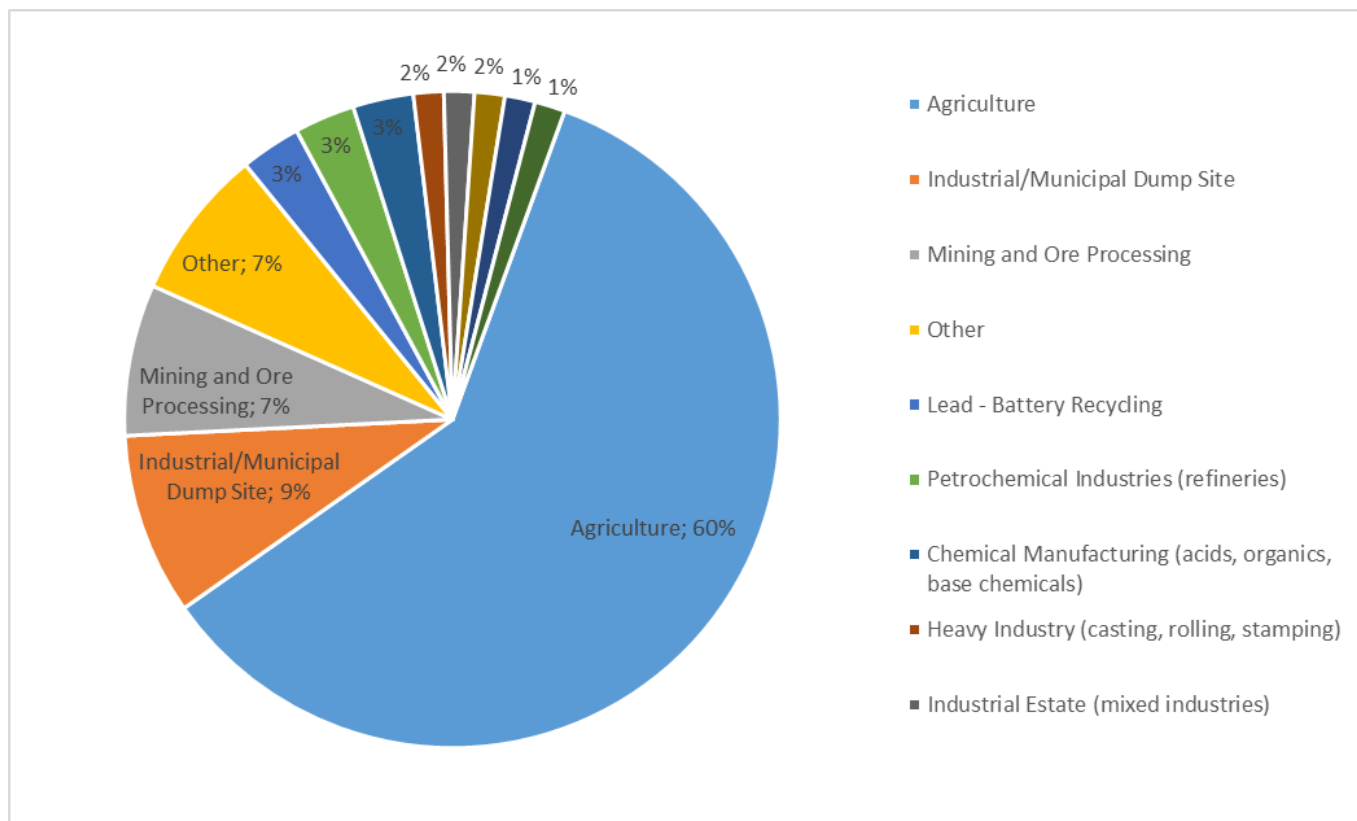


Fig. 74. Segmentation of sites as categorized by pollution source assessed by Pure Earth's investigators in the TSIP Database

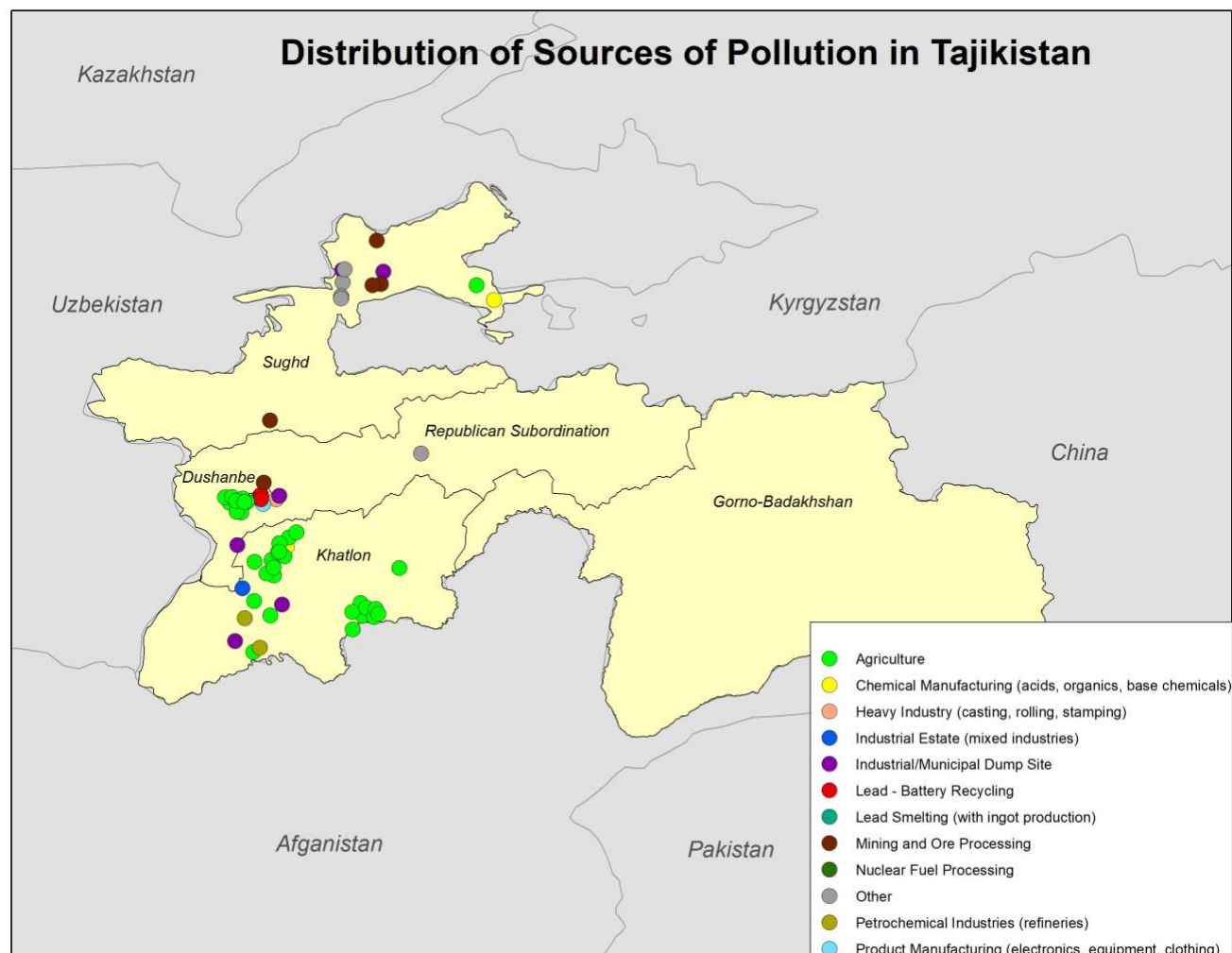


Fig. 75. Geographical Distribution of pollution sources in Tajikistan

Based on an analysis of the data obtained, it was revealed that over 67% of the estimated sites were contaminated with pesticides (including DDT, lindane, etc.) Radioactive contamination (uranium) was detected in 12% of the studied sites.

The types of pollutants that were found at the sites are shown in Table 23 and Figure 76. Figure 77 shows the geographical distribution of sites ranked by type of pollutants in Tajikistan.

Table 23: The number of sites as categorized by contaminant assessed by Pure Earth's investigators in the TSIP Database

Key Pollutant	# of sites
2,3,7,8-TCDD (Dioxins)	1
Aldrin	2
Asbestos	2
Chromium (Hex)	1
DDT	20
Endrin	1
Heptachlor	2
Lead	2
Lindane (Hexachlorocyclohexane all forms)	13
Mercury - elemental	2
Organochlorine not otherwise specified	4
Other	2
PCBs (PolyChlorinated Biphenyls)	1
Pesticides (Total)	3
Phenol	2
Radiation	1
Uranium	8
Total	67

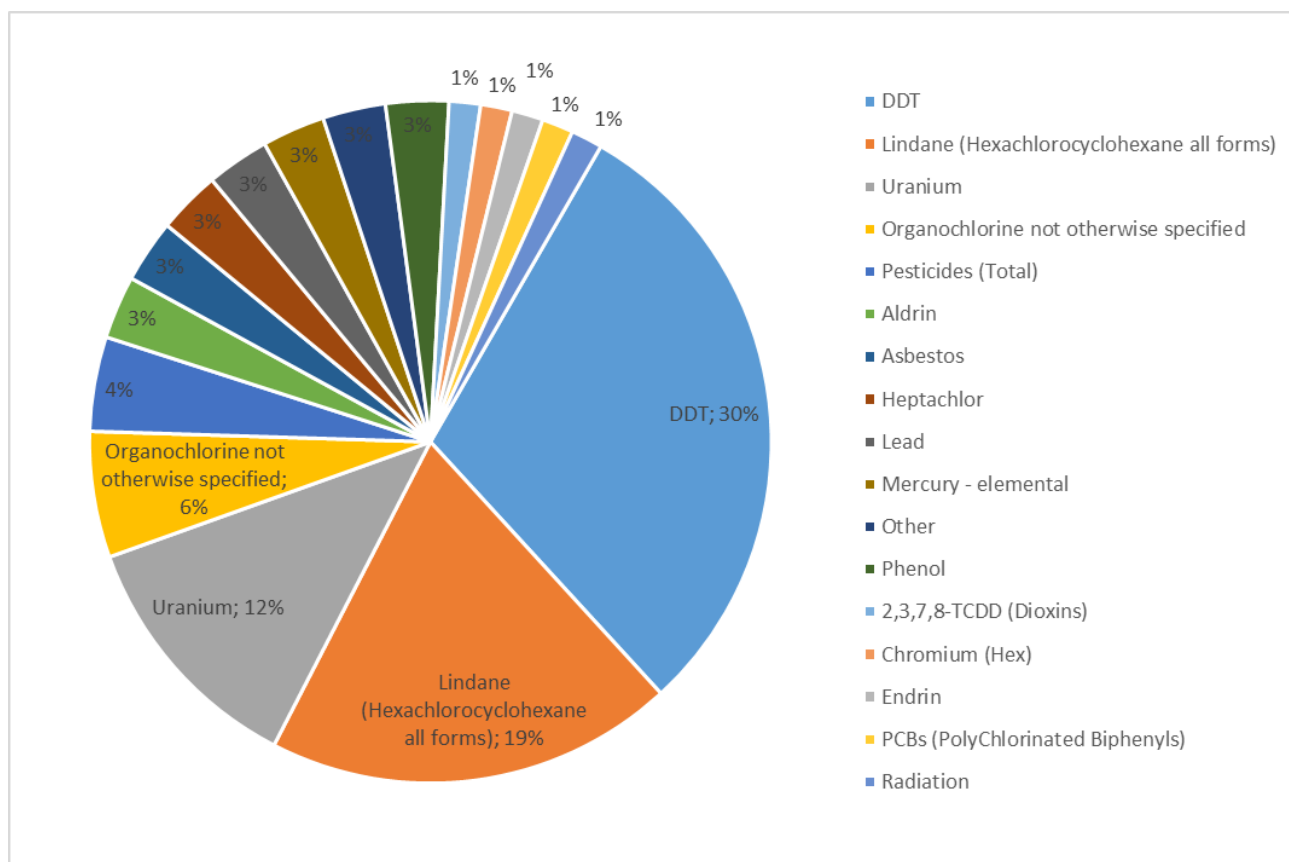


Fig. 76. Polluted sites in Tajikistan broken down by type of pollutant

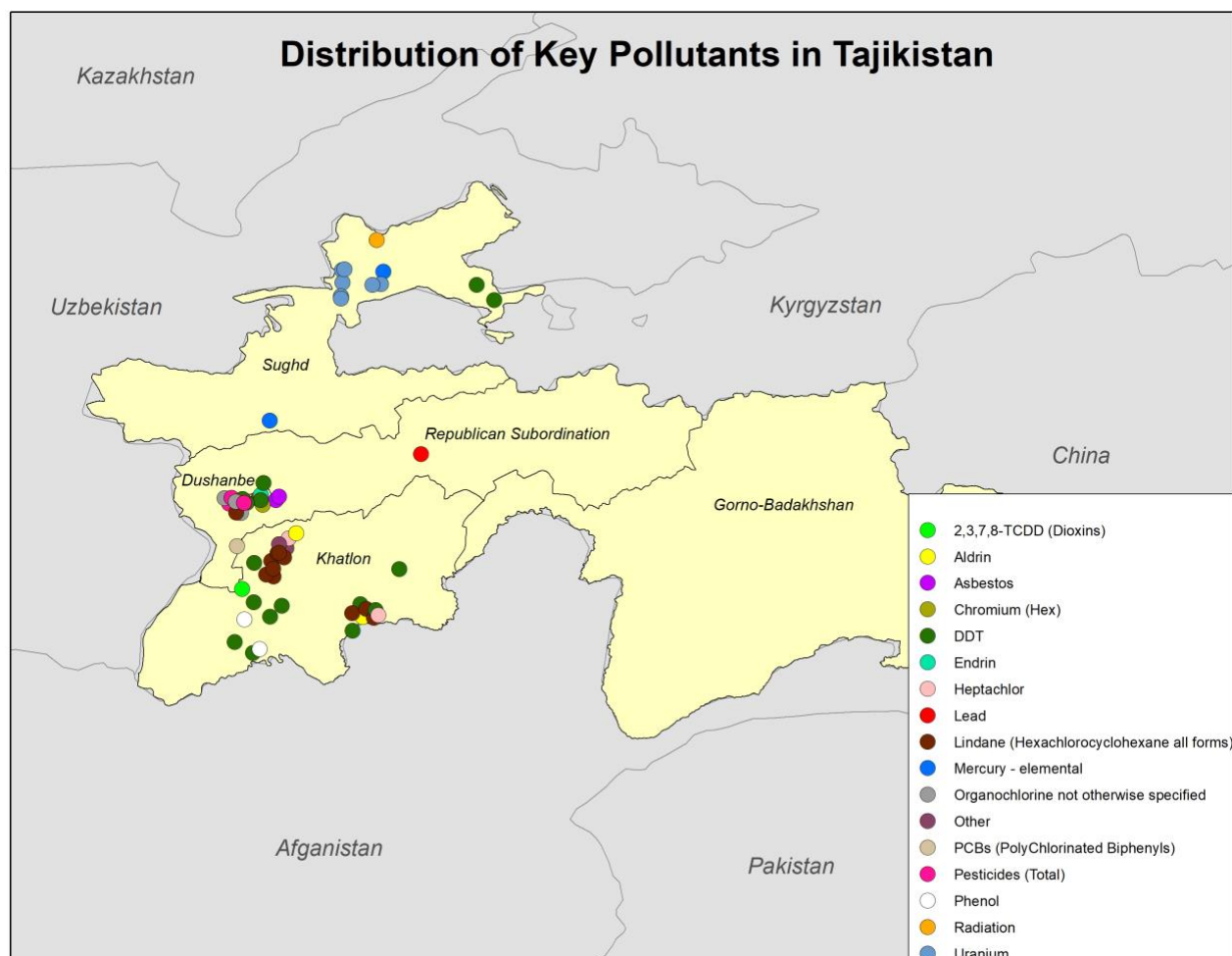


Fig. 77. Map of contaminated sites in Tajikistan

Table 24 shows the geographic location of the polluted sites in Tajikistan, the site names, number of people living nearby, the number of people at risk, and also the maximum allowable concentrations of each pollutant.

SITES ASSESSED IN TAJIKISTAN

Table 24: List of Sites Assessed in Tajikistan

SiteID	Site Name	Source of Industry	Key Pollutant	Total population at risk	Maximum test result	Units
TJ-2086	Anzob Mining and Beneficiation Complex (Mining and Ore Processing	Mercury - elemental	15000		
TJ-2889	Kanibadamsky POPs Landfill	Agriculture	DDT	2000	1074.0000000	mg/kg or ppm
TJ-2904	Vahsh pesticide burial ground	Industrial/Municipal Dump Site	DDT	8000	1074.0000000	mg/kg or ppm
TJ-2957	Landfill of solid domestic waste in Rudaki	Industrial/Municipal Dump Site	PCBs (PolyChlorinated Biphenyls)	17000	0.0000000	mg/kg or ppm
TJ-2964	Javanese Chemical Plant - JSC	Chemical Manufacturing (acids, organics, base chemicals)	Other	13000		
TJ-2966	Solid domestic waste ground in Khudjand	Industrial/Municipal Dump Site	Mercury - elemental	6000		
TJ-2986	JSC	Chemical Manufacturing (acids, organics, base chemicals)	DDT	0		
TJ-3208	Pesticides Burial Site, Village 1, Kumsangir Region	Agriculture	DDT	1000	107.41000000	mg/kg or ppm

TJ-3240	Village Bagara of Vahsh region	Agriculture	DDT	700	8.7000 0000	mg/kg or ppm
TJ-3241	Village Oikamar of Khuroson region	Agriculture	DDT	696	6.1300 0000	mg/kg or ppm
TJ-3242	POPs Landfill in djamoat Kirov, Vahsh region	Industrial/Municipal Dump Site	DDT	200	0.0000 0000	mg/kg or ppm
TJ-3248	Kishlak Sogdiana, Vahsh region	Agriculture	DDT	80	5.9300 0000	mg/kg or ppm
TJ-3272	Bitumen Plant of Rumi Region	Petrochemical Industries (refineries)	Phenol	120		
TJ-3328	LLC	Heavy Industry (casting, rolling, stamping)	Asbestos	0	0.0000 0000	mg/kg or ppm
TJ-3329	Landfill of solid domestic waste in Dushanbe	Industrial/Municipal Dump Site	Asbestos	100	0.0000 0000	mg/kg or ppm
TJ-3424	School ¹ 5, Istiklol (Taboshar)	Industrial/Municipal Dump Site	Uranium	3000	0.0032 8700	ug/m3
TJ-3451	Former Building of KIP Automatics (uranium production adit), Sarymsakli, Istiklol (Taboshar)	Other	Uranium	150	0.0008 4000	mg/kg or ppm
TJ-3452	Gozien Settlement near Digmay Tailings	Nuclear Fuel Processing	Uranium	1700	0.0027 2000	mg/kg or ppm
TJ-3462	Chkalovsk Tailing Dump (maps 1-9)	Blank	Uranium	0	0.0004 8000	mg/kg or ppm
TJ-	A Former	Other	Uranium	500	0.0009	mg/kg or

3466	Garment Factory, village Old Taboshar, Istiklol town				8000	ppm
TJ-3469	Former uranium mine ¹ 3, Khujand	Other	Uranium	340	0.0004 9000	mg/kg or ppm
TJ-3609	Tannery - Tojik Intikol LLC, Firdavsi District, Dushanbe	Product Manufacturing (electronics, equipment, clothing)	Chromium (Hex)	2000	140.00 00000 0	ug/l or ppb
TJ-3640	Private Enterprise for the Production of Lime -	Industrial Estate (mixed industries)	2,3,7,8-TCDD (Dioxins)	0		
TJ-3651	Petroleum Refinery LLC	Petrochemical Industries (refineries)	Phenol	4000		
TJ-4067	Small lead acid battery recycling plant	Lead Smelting (with ingot production)	Lead	2000		
TJ-4068	lead batteries reception center, Dushanbe	Lead - Battery Recycling	Endrin	0		
TJ-4139	Cable factory, Dushanbe	Lead - Battery Recycling	DDT	0		
TJ-4154	Cement making plant	Mining and Ore Processing	DDT	0		
TJ-437	Chkalovsk hydrometallurgical plant tailing pond	Mining and Ore Processing	Uranium	1000	0.0004 8000	mg/kg or ppm
TJ-4419	Warehouse	Agriculture	DDT	0		
TJ-4420	Gold processing factory "Pakrut"		Lead	0		
TJ-	Warehouse	Agriculture	Organoc	0		

4421			hlorine not otherwise specified			
TJ-4422	Warehouse	Agriculture	DDT	0		
TJ-4690	Ziratkor	Agriculture	DDT	75	7.0000 0000	mg/kg or ppm
TJ-4691	Kalinin	Agriculture	Pesticide s (Total)	5	7.0000 0000	mg/kg or ppm
TJ-4692	Moscow	Agriculture	Organoc hlorine not otherwise specified	2	8.0000 0000	mg/kg or ppm
TJ-4693	Storage Khaidar Mirov	Agriculture	Pesticide s (Total)	10	5.5000 0000	mg/kg or ppm
TJ-4694	Sumbula	Agriculture	Organoc hlorine not otherwise specified	21	8.0000 0000	mg/kg or ppm
TJ-4695	Jdanov	Agriculture	DDT	6	6.5000 0000	mg/kg or ppm
TJ-4696	Dzerjinskiy	Agriculture	DDT	2	7.5000 0000	mg/kg or ppm
TJ-4698	Marks	Agriculture	Lindane (Hexachl orocyclo hexane all forms)	15	8.0000 0000	mg/kg or ppm
TJ-4699	Selknozhimiya	Agriculture	Organoc hlorine not otherwise specified	54	7.0000 0000	mg/kg or ppm
TJ-4700	Latif Murodov	Agriculture	Pesticide s (Total)	13	5.0000 0000	mg/kg or ppm
TJ-4731	Collective Farm Lenin	Agriculture	DDT	7	0.0000 0000	mg/kg or ppm
TJ-	Bakhor, Djami	Agriculture	Lindane	1000	0.0870	mg/kg or

4940			(Hexachl orocycloh exane all forms)		0000	ppm
TJ-4956	Zarnissor (former Engels)	Agriculture	Lindane (Hexachl orocycloh exane all forms)	18	0.0540 0000	mg/kg or ppm
TJ-4958	Djovidon, F. Saidov -	Agriculture	Lindane (Hexachl orocycloh exane all forms)	150	82.510 00000	mg/kg or ppm
TJ-4963	Tursunzoda or Tursunzade, Djami -	Agriculture	Lindane (Hexachl orocycloh exane all forms)	200	1.3730 0000	mg/kg or ppm
TJ-4971	Ozodii Sharq (former Lenin)	Agriculture	Lindane (Hexachl orocycloh exane all forms)	300	0.1250 0000	mg/kg or ppm
TJ-4972	State Farm 6, (Sovhoz 6) Yavan -	Agriculture	Lindane (Hexachl orocycloh exane all forms)	96	6.9400 0000	mg/kg or ppm
TJ-4973	Davlatobod, Khamadoni -	Agriculture	DDT	215	0.2630 0000	mg/kg or ppm
TJ-4981	Vakhdat, Khamadoni -	Agriculture	Lindane (Hexachl orocycloh exane all forms)	121	0.1060 0000	mg/kg or ppm
TJ-4982	Turdyev, Khamadoni -	Agriculture	Aldrin	100	0.0740 0000	mg/kg or ppm
TJ-4984	State Farm 5, (Sovhoz 5) Yavan	Agriculture	Heptachl or	100	5.2910 0000	mg/kg or ppm

TJ-4985	State farm 4, (Sovhoz 4)Yavan -	Agriculture	Lindane (Hexachlorocyclohexane all forms)	120	0.35900000	mg/kg or ppm
TJ-4986	Imomberdyev, Yavan -	Agriculture	Other	100	0.11300000	mg/kg or ppm
TJ-4987	50 years of USSR, Yavan - 50	Agriculture	Lindane (Hexachlorocyclohexane all forms)	462	0.06600000	mg/kg or ppm
TJ-4988	State Farm 1, (Sovhoz 1) Yavan -	Agriculture	Aldrin	50	0.06200000	mg/kg or ppm
TJ-4989	10 years of Independence, Khamadoni	Agriculture	Lindane (Hexachlorocyclohexane all forms)	160	18.89000000	mg/kg or ppm
TJ-4990	Dekhkan and Farming Entity Saidov, Khamadoni	Agriculture	Lindane (Hexachlorocyclohexane all forms)	10	13.75000000	mg/kg or ppm
TJ-4991	Khamidov, Khamadoni	Agriculture	Lindane (Hexachlorocyclohexane all forms)	150	0.09900000	mg/kg or ppm
TJ-4992	Ittifoq, Khamadoni -	Agriculture	DDT	1000	30.07400000	mg/kg or ppm
TJ-4993	Sarhadchi, Khamadoni	Agriculture	Heptachlor	670	0.21400000	mg/kg or ppm
TJ-5404	Pesticide Warehouse, Darkat, Muhojirobod, Farhor	Agriculture	DDT	50	12.66000000	mg/kg or ppm
TJ-5413	Ziraki, Kulyab	Agriculture	DDT	10	6.33000000	mg/kg or ppm

TJ-754	Degmai (or Degmay) Radioactive Storage Site, Degmai Village, Sughd Region	Mining and Ore Processing	Uranium	10000	0.0025 0000	mg/kg or ppm
TJ-786	Taboshar Uranium Tailing Dump	Mining and Ore Processing	Radiation	12000		

LESSONS LEARNED

Before beginning the next round of TSIP work it may be good to develop a strategy in approaching both private residents and government officials.

In the course of work, there were difficulties in the legal sphere related to privatized polluted lands (for example, pesticide storage facilities). After the collapse of the Soviet Union, there were few regulations when it came to the sale and building of homes on contaminated land. There are people living in such illegally built houses all over Tajikistan.

Currently, building residences on land contaminated with pesticides constitutes a violation of the Land Code. The owners of such sites did not allow access to the pollution survey, since they know that people are not supposed to be living there. Work on such sites is possible only with the assistance and intervention of state authorities.

Another difficulty was in working with the state authorities themselves. Since the initial land transactions were made illegally, government representatives often asked the TSIP team to do the sampling work as quietly as possible without publicity and media coverage.

The choice of any areas for research should always be coordinated with the authorities, in order to ensure compliance and access to the sites. Movement around certain areas, requires the presence of government representatives.

Most people who live in illegally built houses near former or current pesticide storages are often forthcoming about the dangers of living in such a neighborhood and share the available

information (including any adverse health effects they suffer). However, when the authorities intervene, and perhaps threaten the residents, the testimony of people changes. The people fear that their land will be taken away, and they may lose their only available housing.

In the course of our work, it was found that some areas were cleared by the local population, bypassing any safety procedures. In such cases pesticides were thrown into the nearest water bodies.

In the future, all these things need to be taken into consideration before conducting TSIP work, to ensure accuracy of analysis without disturbing the lives of local residents, or making their lives more difficult. A strategy for working with government authorities without causing unnecessary friction is also vital.

Since working with updated database is complicated more thorough training of TSIP investigators is necessary.