Toxic Site Identification Program in Azerbaijan

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Prepared by: Rovshan Abbasov, Alena Temnikova, Petr Sharov, Julia Sinitsky

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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, USAID, 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.

PROJECT BACKGROUND

The Toxic Site 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. Especially 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.

The ISS protocol helps stakeholders and governments understand the risks associated with contamination. Namely, it allows them to identify types of contaminates, 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

In Azerbaijan the program focuses specifically on legacy sites (i.e. abandoned or non-active) and artisanal sites (i.e. small-scale or informal industries).

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 Azerbaijan

A TSIP training of the Azerbaijan team was conducted in 2012, with participation of regional and global program coordinators of Pure Earth. A total of 15 people participated in the training, 8 of which became Pure Earth investigators in Azerbaijan. The two day workshop was technical in nature and dedicated almost entirely to describing the Initial Site Screening (ISS) process and working with TSIP database.

The national investigators, often from the environment or health departments at a national university, were trained to identify and assess contaminated sites using a rapid assessment tool called the Initial Site Screening protocol. The ISS identifies major elements of a contaminated site, including estimated population at risk, key pollutant information, human exposure pathway data and sampling data. As part of the training, a field visit is made by the group to demonstrate the methodology for assessing the human health impact of toxic sites.

Country Background - Azerbaijan

Azerbaijan is one of the most polluted countries in the Europe and Central Asia (ECA) region, due to the fact that during the 20th century it was one of the principal oil producing and processing countries without adequate environmental management (World Bank, 2008). The country was also one of the main producers and users of the persistent organic pollutants (POPs) (such as DDT, HCH, aldrin, dieldrin, etc). Assessments and inventories confirm that during the Soviet period, approximately twenty-five thousand tons of DDT were used in Azerbaijan yearly (IPEN, 2006). POPs pollution is one of the main pollution problems of Azerbaijan. Despite countless efforts, legacy POPs sites in Azerbaijan still pose danger to human health.

For example, there are a number of POPs producing industry plants in the surroundings of Sumgait. Sumgait was a city founded in the 1950s as a typical Soviet industrial center. There was rapid growth of chemical and petrochemical sectors in Sumgait from 1970 to 1985. Sumgait Surface-Active Substances Plant (SAS) is one of the first chemical enterprises of Azerbaijan. Since 1956, it operated as a chemical enterprise. In 1958 The Sumgait Surfactants Production Plant started to manufacture DDT and produced 480,549 tons of DDT until 1980 (Aliyeva et al, 2013). Approximately 1000 m2 of land was used for 22 years for different operations, associated with the production of DDT dust. Additionally, 24,000

tons of DDT were imported from the Russian Federation. More than 500,000 tons of DDT was used between 1958-1988 (IPEP, 2006).

DDT was used in agriculture as the cheapest and most effective pesticide. The Soviet government continued using of DDT in Azerbaijan until 1988.

Other contaminated areas on the Absheron Peninsula suffer from oil, mercury, and chemical contamination (Mora, et al. 2004; Khalilova and Mammadov, 2016). While most of abandoned industrial facilities have been decommissioned, their wastes still pose serious concerns for environment (Martin, 2001). Though there have been some remediation activities in former hotspots, these activities did not change situation fundamentally (Islamzadeh, A., and S. Khalilova. 2003).

The area of more than 33,000 ha of land in Azerbaijan is considered contaminated by industrial activities related to oil pumping and processing. 15000 ha of this land is heavily polluted and of primary environmental concern (ARB 2008; UNECE, 2010). Additionally, many areas are polluted with products from the petrochemical industry. Sources of contamination of the area also include chemical, metallurgy and energy industries as well as oil extraction and processing.

Pollution by cadmium is found near the old oil fields and in some lakes across Azerbaijan. Several lab results confirm that cadmium pollution level in Boyukshor Lake, for example, is nearly 40 mg/kg, which is several times above the maximum recommended level. Arsenic pollution is found near the Gu Lake which is 12 mg/kg and 1.5 times higher than recommended level (Pure Earth, 2016).

Crude oil contains mixture of many organic substances, most of which are highly carcinogenic. Benzene is a natural constituent of crude oil and is one of the elementary petrochemicals. Studies confirm that pollution with benzene is found almost in all places where crude oil spills occurred. High benzene concentrations are found both in air and soil near former oil plants. Volatile organic compounds (VOCs) are found around oil fields, and plants related to oil processes. For example, the areas close to Balakhani village in Baku region are highly polluted with oil products. In some places, as noted, PCB hotspots are found. In most cases, it is very easy to detect chemicals simply by smelling. Residential areas are heavily contaminated by oil. This causes of many types of health problems. Cancer, asthma, and lung related diseases are very common in the area.

Another hotspot of pollution near Baku is the region close to historical Black city. This is an area of oil and gas processing factories. In this area residential buildings are rather close to pollution. There are many houses, apartments, and offices in the North side of the area. There is also a heavy chemical smell in the area. According to the official information of the

Ministry of Ecology and Natural Resources, other chemicals including VOCs contaminate the air. Government reports confirm air pollution by NOx, VOCs, and Benzene as well (UNECE, 2010). Results show that soil samples show high concentrations. Studies show that long-term and short-term exposure to this contaminant may cause various kinds of health conditions include asthma, lung cancer and various types of skin diseases. Skin diseases may also be caused by acid rains, which are common to the area. The ministry of Ecology and Natural Resources confirms that acid rains are observed after long dry periods when NOx and SO2 have enough time to be accumulated in the air.

Thus, toxic pollution in Azerbaijan is a serious problem. Given that the region is densely populated, a large population is at risk from exposure to the toxins. It is important to determine the location of most of the polluted sites, and identify the sources of pollution, and finally to understand the pathways of contaminants.

In 2016-2017 a team of researchers in Azerbaijan surveyed 17 sites. The main focus was on the survey of lakes. These lakes are used for recreational purposes by the local population. In the water and sediment of the lakes, the investigators found a number of toxins including benzene and formaldehyde, which can be dangerous for human health.

IMPLIMENTATION STRATEGY

Coordination with the government

Currently, Pure Earth has strong ties with the government of Azerbaijan. Pure Earth has close partnerships with Azerbaijan's Ministry of Ecology and Natural Resources (MENR) and the Ministry of Agriculture.

Pure Earth has conducted two cleanup projects in Azerbaijan, both with full involvement of the government. The State Agency Azerkimya, as well as the MENR were direct partners in the Sumgait beach remediation project which was completed in 2015. In 2018, during the cleanup of Salyan, a heavily polluted pesticide site, Pure Earth, partnered with the Ministry of Agriculture.

In 2018, the MENR had been invited to become a member of the Global Alliance on Health and Pollution (GAHP). This will likely improve Pure Earth's close partnerships with the government.

During the TSIP assessment phase, all the activities were coordinated with the government. Now, the TSIP database is open to the MENR officials. This database is used in prioritization of the potential cleanup projects.

Sharing information with the government and NGOs

In Azerbaijan, the TSIP database is currently open to all NGOs, which are interested in using the data. The TSIP database is an asset for CSOs that are interested in publicizing issues related to pollution. Over the last five years, the TSIP database has been used in two universities in Azerbaijan, (Khazar University and Baku State University). Khazar University uses the database for its Environmental Classes. All events related to the activities of Pure Earth in Azerbaijan are public, and are open to Civil Society Organizations, non-profits, media and academia.

SITES SURVEYED IN 2016-2017

In 2016, a total of 13 sites were assessed with a great level of detail, and laboratory testing. In 2017, 4 sites were assessed.

Sites Surveyed in 2016

AZ-4590- Lokbatan Lake (Arsenic)

Lokbatan Lake is located in Lokbatan town in the Karadagsky District of Baku City. Water and sediments sample were taken and analyzed in the laboratory of the Ministry of Ecology and Natural resources. Both water and bottom sediments are heavily contaminated by As, Cd, Pb, phenol, PCBs. Industrial facilities are located in the south side of the lake. Also there are large piles of construction waste. In the northwest side there is an oil processing plant. There is a large landfill situated on the east side of the lake. Waste from the mines flows directly into the lake. Potential pathways of exposure are dermal contact, inhalation of dust, and fishing (further fish consumption).

Fig. 1 Water sampling

Fig. 2. Residential area near the lake

Fig. 3. Fishing in Lokbatan Lake

Fig. 4. Map of the site with sampling points

Table 1. Concentrations of contaminants (Lokbatan Lake)

Latitude/ Longtitude	Date	Sand/ soil/ sediment	Description of the sampling spot	Population	As	Cd
N40.32115823707; E49.692621231079	14 June, 2016	Sediment	Sample taken from the bottom (11 cm)	700	34 ppm	50 ppm
N40.317493506403; E49.716138839721	15 June, 2016	Sediment	Sample taken from the bottom (22 cm)	600	31 ppm	48 ppm
N 40.322205266437; E49.720258712768	16 June, 2016	water	Sample taken from the surface	700	102 ppb	42 ppb

AZ-4884 – Masazir Lake (Cadmium)

Masazir lake is located in Garadagh District near Baku City. Sampling results show that the water, bottom sediments and soil in nearby areas are heavy contaminated by cadmium.

There are many other contaminants both in water and sediments such as As, Phenol, PCBs, Pb. Pollution sources are old oil plants and wastewater from nearby industrial facilities. There are also 17 pipes which released sewage into the water. The area around the water was fenced but it is still easily accessible. Pathways of exposure are food ingestion (eating salt which is produced there), direct dermal contact (some people especially tourists go into the water) and inhalation of vapors.

Fig. 5. Sewage pipe

Fig. 6. View of the lake

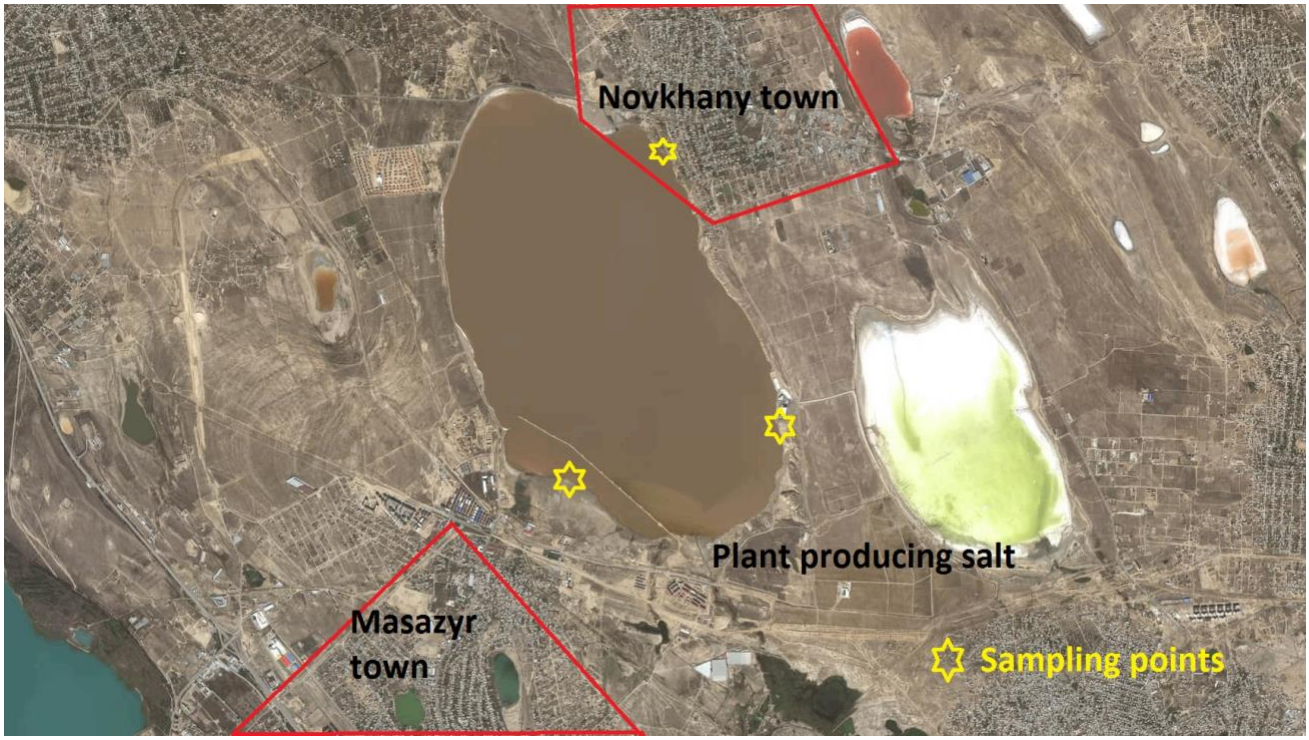


Fig. 7. Map of the site with sampling points

Table 2. Concentrations of contaminants (Masazir Lake)

Latitude/ Longtitude	Date	Sand/ soil/ sediment	Description of the sampling spot	Population	As	Phenol	PCBs	Cd	Pb
N40.518110; E49.780833	23 October, 2016	Sediment	Sample taken from the bottom (18 cm)	500	917 ppm	8997 ppm	7.1 ppm	434 ppm	56 ppm
N40.494094; E49.770018	24 October, 2016	water	Sample taken from the surface	500	558 ppb	39887 ppb	7.4 ppb	109 ppb	627 ppb
N40.494682; E49.791648	25 October, 2016	Sediment	Sample taken from the bottom (22 cm)	500	860 ppm	96951 ppm	8.6 ppm	851 ppm	90 ppm

AZ-4848 – Gu Lake (Arsenic)

Gu lake is located close to Garadagh District which is situated on 20 km to southwest from Baku city. Sampling results show that water, bottom sediments and soil near the lake are contaminated by arsenic, phenol, cadmium, lead.

Large oil wells are the main sources of pollution. Locals can easily come to the lake. The contamination of the lake poses a danger to local communities and the population of Baku. All of the compounds found in the lake are highly toxic. Pathways of exposure are food ingestion, inhalation of dust, and dermal contact. Many people come there to fish. Then they eat the fist of sell it. Local people also believe that petrochemicals can be used for treatment of some diseases, which increases the recreational activities near the lake.

Fig. 8. View of the beach

Fig. 9. Map of the site with sampling points

Table 3. Concentrations of contaminants (Gu Lake)

Latitude/ Longtitude	Date	Sand/ soil/ sediment	Description of the sampling spot	Population	As	Phenol	PCBs	Cd	Pb
N40.319823; E49.766103	20 October, 2016	water	Sample taken from the surface	400	911 ppb	113 ppb	9.1 ppb	80 ppb	254 ppb
N40.313017; E49.766790	21 October, 2016	Sediment	Sample taken from the bottom (16 cm)	300	453 ppm	689 ppm	6.9 ppm	51 ppm	866 ppm
N40.309090; E49.754087	22 October, 2016	water	Sample taken from the surface	300	862 ppb	93 ppb	9.8 ppb	113 ppb	13426 ppb

AZ-4588 – Kirmizi Lake (Arsenic)

Kirmizi Lake is located in the southwest, in Karadag district between the Caspian Sea and Lokbatan Lake. Sampling results show that both water, bottom sediments and soil in areas close to the shore are characterized by heavy arsenic contamination. There are many other

contaminants both in water and sediments. During rains, large amount of water flow into the lakes. Contamination comes from old oil plants.

Pathways of exposure include food, inhalation, and dermal contact. A lot of people come there to fish. Also, the areas are used as a beaches. Local people believe that petrochemicals can be used for treatment of some diseases, and bathe in the water.

Fig. 10. Polluted beach and new houses there

Fig. 10. Sampling

Fig. 11. Map of the site with sampling points

Table 4. Concentrations of contaminants (Kirmizi Lake)

Latitude/ Longtitude	Date	Sand/ soil/ sediment	Description of the sampling spot	Population	As	Cd
N40.2929798: E49.710148	16.06.2016	sediment	The sample was taken near the shorline	300	87 ppm	34 ppm
N40,302308931709: E49,733219146728	17.06.2016	sediment	The sample was taken near the shorline	400	49 ppm	41 ppm
N40.288692272706; E49,697170257568	18.06.2016	water	The sample was taken near the shorline	300	104 ppb	36 ppb

AZ-4641 – Bulbula Lake (Arsenic)

Bulbula lake is located on the north east part of Baku and is fully surrounded by buildings. Sampling results show that water, bottom sediments and soil in close areas are characterized by arsenic and phenol contamination. The lake is a freshwater lake and people use it for fishing.

The main pollution source is old legacy oil wells. After exploitation of oil in Amirjan area, water from oil fields was directly diverted to the lake. There were large oil mines in the region before 1920s and some of them were in use until the 1980s. In the 1980s oil production was stopped due to the exhausting of resources.

Recently the area was occupied by illegally built houses. Most of these houses were directly built on oil wells. These illegal dwellings comprise an easy pathway of exposure through food, inhalation, and dermal contact. All of the compounds found at the site are highly toxic and may cause lung, skin and cancer diseases.

The government of Azerbaijan initiated cleaning the lake. Some feasibility studies were conducted here. However, due to financial issues, the exact date of the cleaning works is still unknown.

Fig. 12. Contaminated shore of the lake

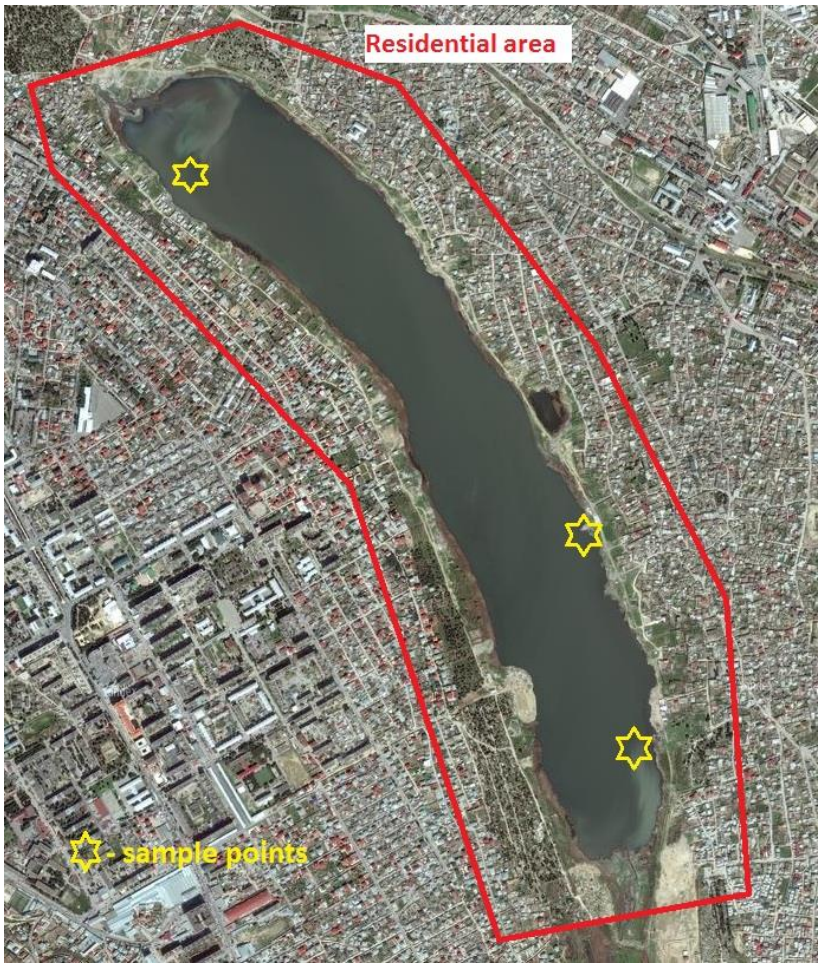


Fig. 13. Map of the site with sampling points

Table 5. Concentrations of contaminants (Bulbula Lake)

Latitude/ Longtitude	Date	Sand/ soil/ sediment	Description of the sampling spot	Population	As	Phenol	PCBs	Toluene	Benzene
N40.431133; E49.967826	17 July, 2016	water	Sample taken from the surface	600	408 ppb	920 ppb	5.2 ppb	812 ppb	26 ppb
N40.413229; E49.984992	18 July, 2016	Sediment	Sample taken from the bottom (22 cm)	700	161 ppm	680 ppm	8.1 ppm	1,7 ppm	0,123 ppm

N40.420286; E49.983104	19 July, 2016	water	Sample taken from the surface	700	221 ppb	940 ppb	4.4 ppb	764 ppb	33 ppb

AZ-4642 – Boyukshor Lake (Cadmium)

Boyukshor is the second largest lake in Azerbaijan and the largest on Absheron Peninsula. The coastline near the lake is occupied by shanty towns and other illegally built buildings. The north part of the lake was used as a landfill for municipal wastes. Many types of pollutants enter the area as a result of the metal production. The pollutants are: Hg, Cd, VOCs, Arsenic, and Benzene. All of these compounds are highly toxic and may cause lung and skin cancers. Unfortunately, local people believe that oil products mixed with water may have some positive health effects. Therefore, many people use the lake for bathing. Public awareness campaign conducted by some NGOs about the dangers of oil byproduct did not give any positive results.

In 2014, the Azerbaijani government started to clean the south east part of the lake. The south-eastern part of the lake was completely separated as a cleaning site. Large scale remediation activities took place. The un-remediated part is still heavily contaminated with large oil reservoirs. The surface of this part of the lake has a completely black oil surface.

Fig. 14. Contaminated shore of the lake

Table 6. Concentrations of contaminants (Boyukshor Lake)

Latitude / Longtitude	Date	Sand/ soil/ sediment	Description of the sampling spot	Population	As	Cd	Pb	Phenol	PCBs	Toluene	Benzene
N40,437949; E49,865043	21 July, 2016	water	Sample taken from the surface	5000	431, ppb	68, ppb	51, ppb	87, ppb	5,6 ppb	976, ppb	22, ppb

N40,437 165; E49,885 986	21 July, 201 6	water	Sample taken from the surface	2000	443, ppb	52, ppb	64, ppb	82, ppb	7,8 ppb	998, ppb	31, ppb
N40,431 939; E49,901 436	22 July, 201 6	Sedim ent	Sample taken from the bottom (16 cm)	3000	66, ppm	31, ppm	598, ppm	632, ppm	7,1 ppm	3,2 ppm	0,345 ppm
N40,447 094; E49,898 689	22 July, 201 6	Sedim ent	Sample taken from the bottom (18 cm)	2000	82, ppm	33, ppm	607, ppm	754, ppm	6,9 ppm	4,7 ppm	0,398 ppm
N40,451 797; E49,889 840	23 July, 201 6	water	Sample taken from the surface	2000	121, ppb	41, ppb	44, ppb	84, ppb	7,2 ppb	744, ppb	43, ppb
N40,454 671; E49,857 147	23 July, 201 6	Sedim ent	Sample taken from the bottom (20 cm)	1000	75, ppm	70, ppm	662, ppm	644, ppm	6,6 ppm	8,7 ppm	0,667 ppm

AZ – 4783 – Khojohasan Lake (Cadmium)

Lake Khojahasan is an inland body of salt water in a valley next to Baku. In recent years the lake water level has risen due to the influx of waste water generated from the excavation and operation of oil and gas wells on the west shore, as well as from waste water from Khojahasan settlement and agriculture.

Samples from the lake confirm heavy Cadmium and Arsenic contamination. Phenol and Lead concentrations are also high. Pathways of exposure include food, inhalation, and skin

contact. many people come here to fish. Also, the areas is used as a beach so people may become ill from using the water for recreational purposes.

Fig. 15. Contaminated shore

Table 7. Concentrations of contaminants (Khojohasan Lake)

Latitude/ Longtitude	Date	Sand/ soil/ sediment	Description of the sampling spot	Population	As	Phenol	PCBs	Cd
N40.408267; E49.779740	22 August, 2016	water	Sample taken from the surface	1000	520 ppb	91 ppb	7.2 ppb	78 ppb
N40.412450; E49.774590	23 August, 2016	Sediment	Sample taken from the bottom (18 cm)	1000	187 ppm	684 ppm	7,8 ppm	42 ppm
N40.384474; E49.778367	24 August, 2016	water	Sample taken from the surface	1000	643 ppb	87 ppb	5.4 ppb	91 ppb

AZ – 4800 – Zig Lake (Arsenic)

Zig lake is located near the Caspian Sea, so its water is mixed with sea water. The lake has been used for salt production for many years.

Zig lake is a very popular place for tourists as well as for the locals. It is believed that mineral mud and the lake's water help people to treat different diseases. The saline level of the lake is very high compared to other lakes. The lake is so salty it allows humans to float easily.

Despite its poor water quality, Zig lake has the potential to be developed for tourism and land reclamation. However, currently the lake is polluted with contaminants from old oil mines that still continue to release contaminated water into the lake. Pathways include food, inhalation, and skin contact. Residential areas are located within areas of high oil pollution.

Fig. 16. Contaminated water

Table 8. Concentrations of contaminants (Zig Lake)

Latitude/ Longtitude	Date	Sand/ soil/ sediment	Description of the sampling spot	Population	As	Phenol	PCBs	Toluene	Benzene
N40.351287; E49.991093	17 July, 2016	water	Sample taken from the surface	1000	516 ppb	893 ppb	5.9 ppb	785 ppb	194 ppb

N40.353118; E49.985600	18 July, 2016	Sediment	Sample taken from the bottom (18 cm)	1000	146 ppm	671 ppm	8.7 ppm	17090 ppm	58 ppm
N40.358874; E49.989377	19 July, 2016	water	Sample taken from the surface	1000	361 ppb	948 ppb	3.9 ppb	844 ppb	2050 ppb

AZ-4846 – Zabrat Lake

Lake is situated in the outskirts of Baku next to the town of Zabrat. A town is situated on the north and west shores. The eastern shore has a cemetery. The south shores were previously occupied by oil wells but these have been stopped and the land has been developed as a brownfield project. The lake has no particular function in terms of recreation due to high pollution level and high salinity.

The smell of oil products can be easily detected around the lake, these are mostly from VOCs. Pathways include direct contact, fishing, bathing and inhalation.

Fig. 17. Contaminated water

Table 9. Concentrations of contaminants (Zabrat Lake)

Latitude/ Longitude	Date	Sand/ soil/ sediment	Description of the sampling spot	Population	As	Phenol	Pb	PCBs	Toluene	Benzene

N40.469542; E49.940763	20 September, 2016	water	Sample taken from the surface	580	638 ppb	824 ppb	17000 ppb	4,8 ppb	798 ppb	112 ppb
N40.470913; E49.934626	21 September, 2016	Sediment	Sample taken from the bottom (18 cm)	650	432 ppm	735 ppm	987 ppm	10,7 ppm	16980,0 ppm	156 ppm
N40.473688; E49.939519	22 September, 2016	water	Sample taken from the surface	800	575 ppb	967 ppb	112 ppb	6,5 ppb	855 ppb	3557 ppb

AZ-4847 – Binagadi Lake (Arsenic)

The fresh water lake originally was part of the salt marshes north of Baku. Situated to the north are agricultural developments which shape the landscape. Pollution from the town of Binagadi comes to the lake via series of marshes. Flora and fauna are abundantly available and thrive very well in this relatively secluded lake.

Binagadi lake was part of the salt marshes between Boyuk shore and Masazyr. Later when the oil exploration began, the lakes were used to store water that came up during drilling. This process polluted the lakes with oil contaminants and at the same time the polluted water lowered the salinity level.The other shores are relatively free from urban development.

Sample results confirmed heavy Arsenic and VOCs contamination. Cadmium and Phenol concentrations are also high. All of these compounds are highly toxic and may cause cancer and skin diseases. Pathways of exposure include skin contact, inhalation, ingestion (via fish), and bathing.

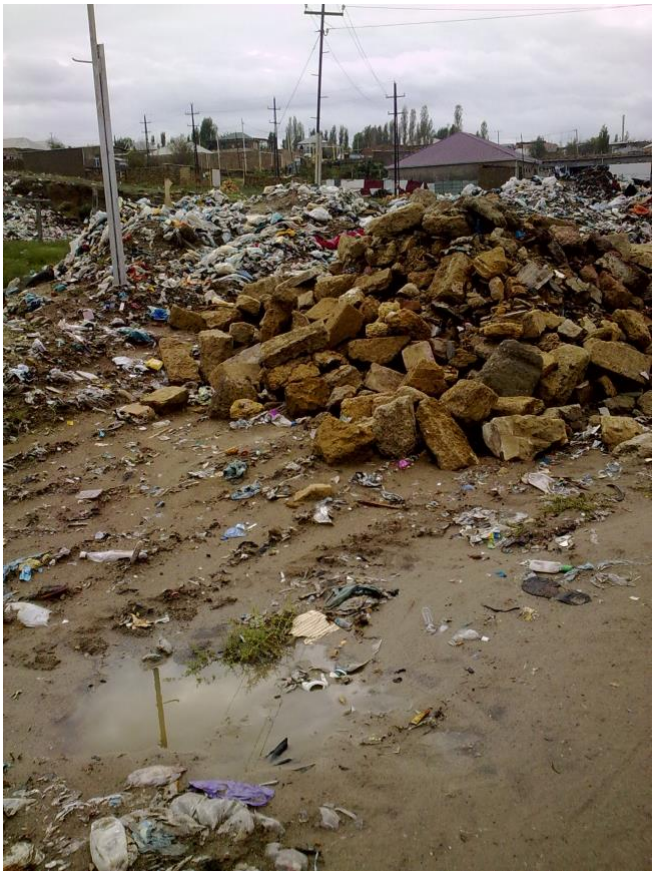


Fig. 17. Contaminated shore

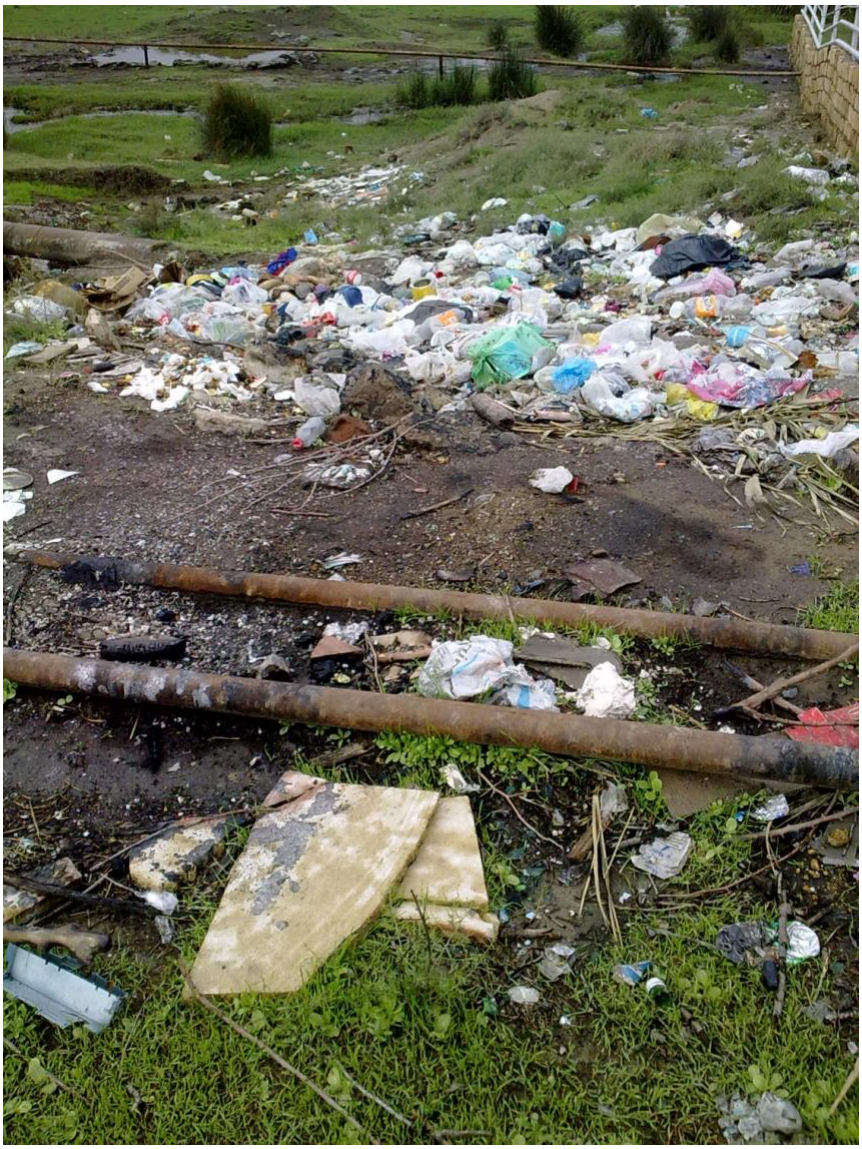


Fig. 18. Oil pipes

Table 10. Concentrations of contaminants (Binagadi Lake)

Latitude/ Longtitude	Date	Sand/ soil/ sediment	Description of the sampling spot	Population	As	Phenol	Cd	PCBs	Toluene	Benzene

N40.470913; E49.934626	22 September, 2016	water	Sample taken from the surface	1200	1172 ppb	765 ppb	117 ppb	7,4 ppb	654 ppb	1060 ppb
N40.469542; E49.940763	23 September, 2016	Sediment	Sample taken from the bottom (21 cm)	1400	719 ppm	876 ppm	87 ppm	11,3 ppm	17180 ppm	56 ppm
N40.473688; E49.939519	24 September, 2016	water	Sample taken from the surface	2000	2324 ppb	900 ppb	14 ppb	6,9 ppb	822 ppb	2740 ppb

AZ-4931 – Kurdakhani Lake (Arsenic)

Kurdakhani is an inland body of salt water with no outlet. The Lake is situated near Baku Heydar Aliyev International Airport. It is one of the most contaminated lakes in the area, containing traces of oil dumping and sewage.

The lake is used for fishing but heavy pollution has degraded water quality and oxygen levels severely. Many toxic elements are present, and phenols that can be easily smelled in the area. Kurdakhani lake is polluted due to lack of centralized sewerage system in residential area and nearby old oil wells.

There are several examples of adverse health effects on the site. Over the last 10 years, rates of cancers have doubled according to local doctors. It is likely that most diseases in the area are directly related to these effects. There are residential areas are located along the lake. Pathways of exposure include direct contact, fishing, and inhalation.

Fig. 19. Contaminated shore of the lake

Fig. 20. Contaminated stream

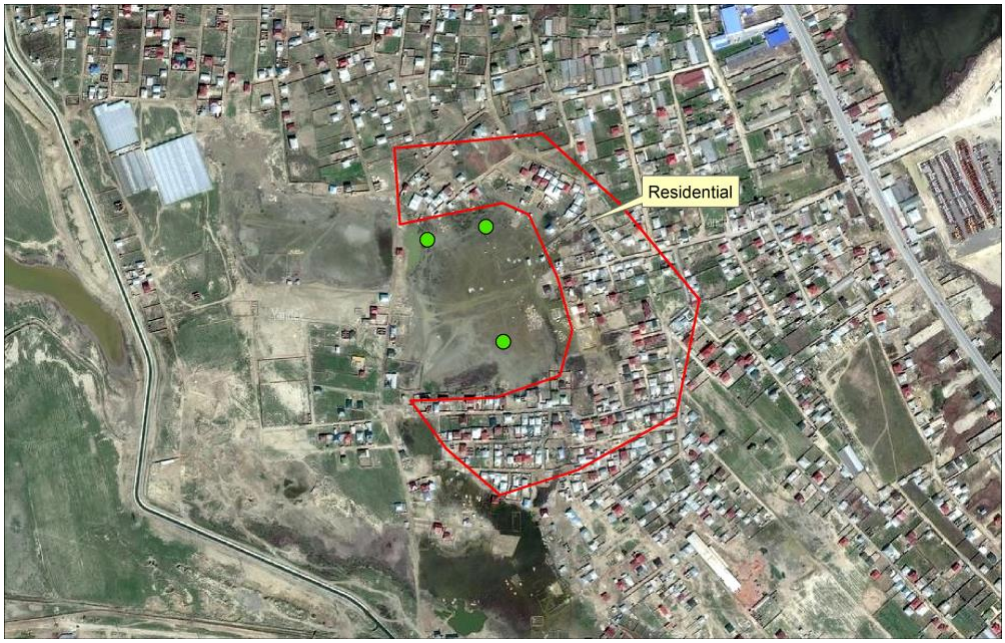


Fig. 21. Map of the site with sampling points

Table 11. Concentrations of contaminants (Kurdakhani Lake)

Coordinates	Date	Sand/ soil/ sediment	Description of the sampling spot	Population	As	Benzene	Phenol	PCBs	Cd	Pb
N40.537666 E49.916045	24 November, 2016	Sediment	Sample taken from the bottom (16 cm)	250	76 ppm	25,4 ppm	895 ppm	8,3 ppm	322 ppm	1211 ppm
N40.535937 E49.916388	25 November, 2016	water	Sample taken from the surface	350	2240 ppb	1060 ppb	1094 ppb	5.9 ppb	96 ppb	873 ppb
N40.537470 E49.914886	26 November, 2016	water	Sample taken from the surface	300	894 ppb	2398 ppb	799 ppb	16.7 ppb	10.3 ppb	891 ppb

AZ-4932 – Mirzaladi Lake (Cadmium)

Mirzaladi is a salt lake and is located in Abşeron, Azerbaijan. Sampling results show that water, bottom sediments and soil in areas close to the lake are characterized by heavy cadmium contamination. There are many other contaminants both in water and sediments. Pollution by these substances cause depression of the central nervous system, headache, nausea and loss of coordination.

İt is very difficult to find of the source of pollution, but it may come from the old oil plants and untreated wastewater of the industrial units. Also local utility waters are discharged into the lake. Pollution Pathways include food ingestion, direct contact, and inhalation.

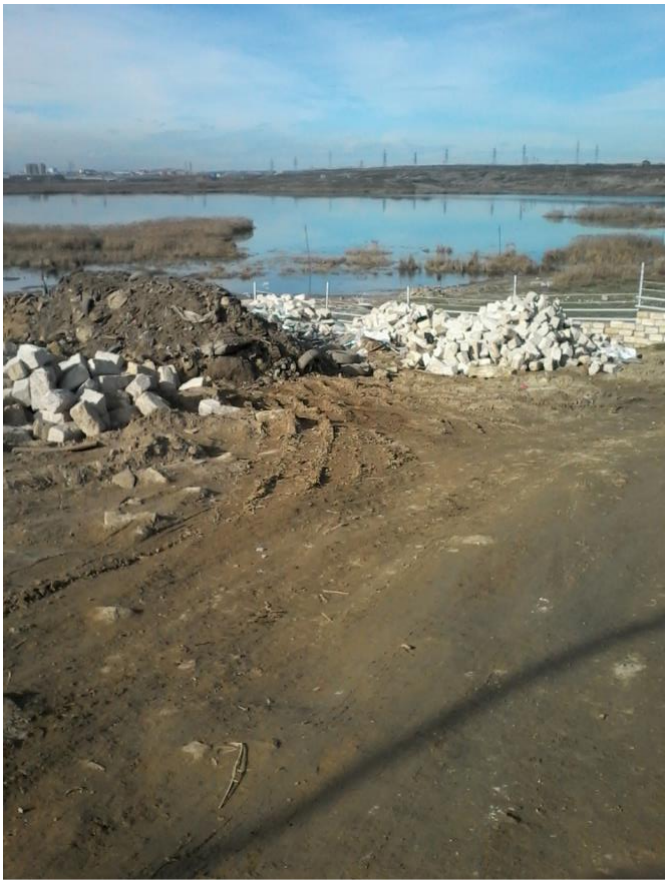


Fig. 22. Contaminated shore

Fig. 23. Map of the site with sampling points

Table 12. Concentrations of contaminants (Mirzaladi Lake)

GPS	Date	Sand/ soil/ sediment	Description of the sampling spot	Population	As	Phenol	PCBs	Cd	Pb
N40.495520 E49.821775	20 November, 2016	Sediment	Sample taken from the bottom (20 cm)	300	196 ppm	980 ppm	9,8 ppm	93 ppm	1871 ppm
N40.490821 E49.809415	21 November, 2016	water	Sample taken from the surface	250	785 ppb	1454 ppb	6.4 ppb	57.8 ppb	979 ppb
N40.488993 E49.811819	22 November, 2016	water	Sample taken from the surface	450	2134 ppb	790 ppb	21.3 ppb	660 ppb	865 ppb

AZ-4939 – Gala Lake (Benzene)

Gala lake is located in the town of Gala, Khazar district. Oil processing and other production, including steady development of communal fields has caused massive pollution. In addition, anthropogenic influence of the Absheron peninsula has caused contamination of Gala lake.

Sampling results show that both water, bottom sediments and soil in areas close to the lake are characterized by Volatile Organic Compound (VOC) pollution. There are many other contaminants such as phenol, PCBs and Lead both in water and sediments. The pathways of exposure are inhalation, fishing and direct contact.

The government of Azerbaijan has an initiative to clean the lake. Some feasibility studies were conducted. However, the exact date of the cleaning working is not known.

Fig. 24. Contaminated area

Fig. 25. Map of the site with sampling points

Table 13. Concentrations of contaminants (Gala Lake)

Coordinates	Date	Sand/ soil/ sediment	Description of the sampling spot	Population	Benzene,	Phenol	PCBs	Toluene	Pb
N40.426625; E50.165255	22 November, 2016	Sediment	Sample taken from the bottom (18 cm)	110	78.7 ppm	757 ppm	6,1 ppm	340 ppm	1680 ppm
N40.422639; E50.167930	23 November, 2016	water	Sample taken from the surface	200	2590 ppb	987 ppb	9.7 ppb	43200 ppb	650 ppb
N40.441063; E50.159433	24 November, 2016	water	Sample taken from the surface	240	134 ppb	968 ppb	11.3 ppb	52400 ppb	67450 ppm

Sites Surveyed in 2017

AZ-5383 - Dashagil lake (benzene)

The main sources of pollution at Dashagil lake are the oil mines located very close to the lake. The main contaminant is benzene. According to 2010 census 4700 people lived close to the lake and use water for bathing/fishing. A Ministry of Economic Development official stated that the government is interested in cleaning the lake and opening it to the public. The district authorities want to clean the lake and make it a recreational fishing site. However, due to financial problems, there are no plans to do it in the near future.

Fig. 26. Contaminated water

Fig. 27. Residential area next to the lake

Fig. 28. Water sampling

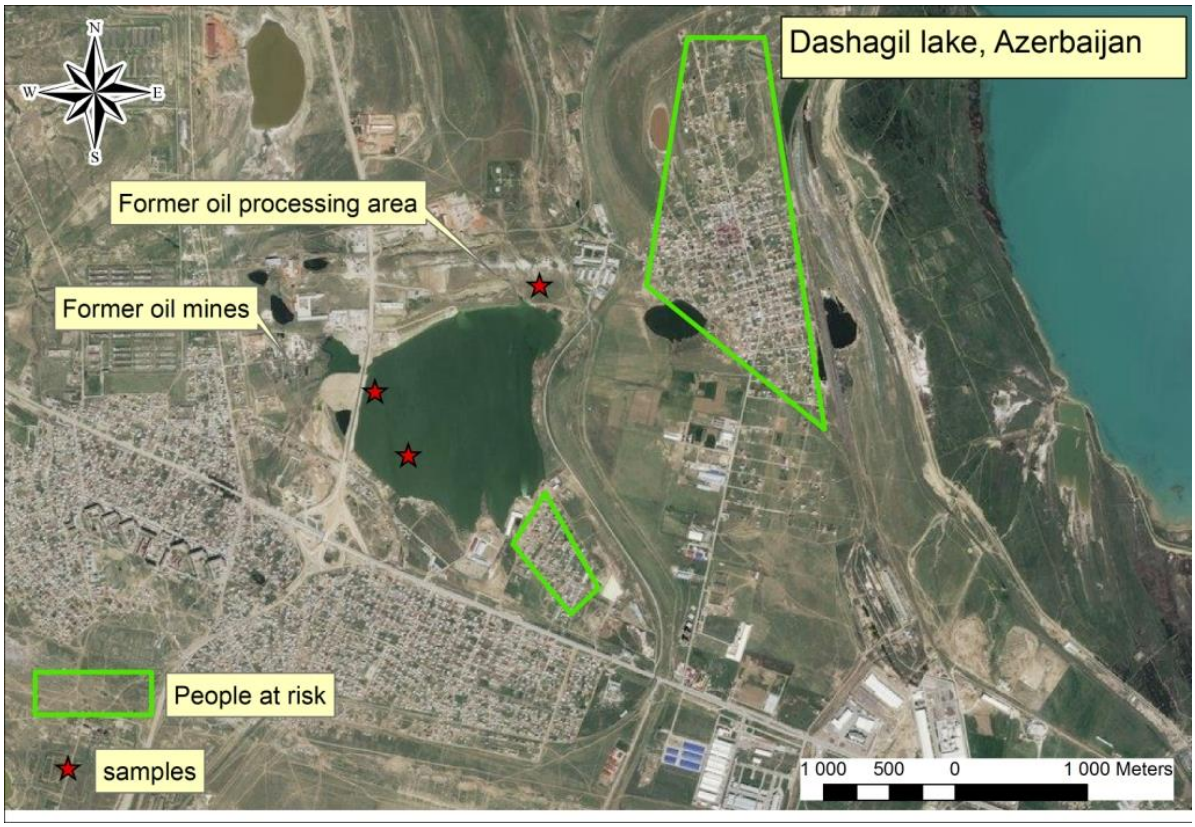


Fig. 29. Map of the site with sampling points

Table 14. Concentrations of contaminants (Dashagil Lake)

Coordinates	Date	Sand/ soil/ sediment	Description of the sampling spot	Population	Benzene	As	Cd	Pb	Phenol	Cr
N40,470000271728; E49,641852378845	19 June, 2017	water	Sample taken from the surface	450	121 ppb	431, ppb	53, ppb	88, ppb	92 ppb	5,6 ppb
N40,472706; E49,639679	19 June, 2017	water	Sample taken from the surface	850	97 ppb	443, ppb	65, ppb	76, ppb	87, ppb	7,8 ppb

N40,477897; E49,651175	19 June, 2017	Sediment	Sample taken from the bottom (30 cm)	1400	103 ppm	66, ppm	5,9, ppm	7,8, ppm	500, ppm	7,1 ppm

AZ-5367 - Chukhurdere lake

Chikhurdere lake is located in Absheron peninsula, close to the international airport of Baku. The lake is contaminated by various heavy metals. The source of the contamination is old oil fields, but the main contamination is from cadmium. The water from the lake is used for washing and bathing. Some people fish there. An official from the Ministry of economic development says that the government is interested in cleaning the lake and making it a recreational area.

Fig. 30. Contaminated shore

Fig. 31. Residential area on the contaminated site

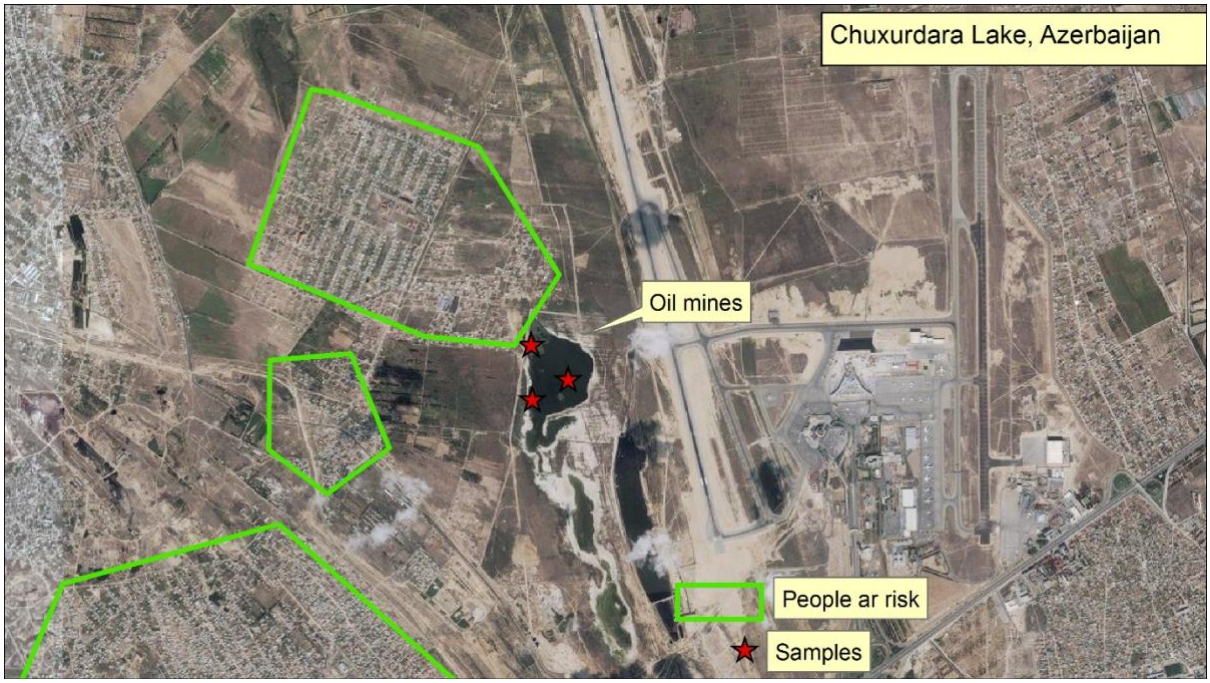


Fig. 32. Map of the site with sampling points

Table 15. Concentrations of contaminants (Chukhurdere Lake)

Coordinates	Date	Sand/ soil/ sediment	Description of the sampling spot	Population	Benzene	As	Cd	Pb	Phenol	Cr
N40,467 351; E50,026 08	19 June, 2017	water	Sample taken from the surface	3200	121 ppb	431, ppb	34, ppb	88, ppb	82 ppb	5,0ppb
N40,464 934; E50,029 247	19 June, 2017	water	Sample taken from the surface	1250	90 ppb	443, ppb	30, ppb	76, ppb	87, ppb	8,0 ppb
N40,464 07; E50,025 966	19 June, 2017	Sediment	Sample taken from the bottom (30 cm)	1430	103 ppm	66, ppm	230, ppm	7,8, ppm	500, ppm	7,0 ppm

AZ-5392 - Hajigabul lake

Sampling results show that water, bottom sediments and soil in areas close to the lake are heavy contaminated with cadmium. Until 1992 Soviet military troops had a base close to the lake. While leaving the region, they threw unknown liquids into the lake. Local people say that the pollutants in the lake were causing the death of animals in the area. The lake is used for fishing and bathing. Also, this is a place for migratory birds, which local people hunt. The government of Azerbaijan has been involved in an initiative to clean the lake. However, the date of the cleanup is not yet known.

Fig. 33. Contaminated groundwater

Fig. 34. Residential area on the contaminated site

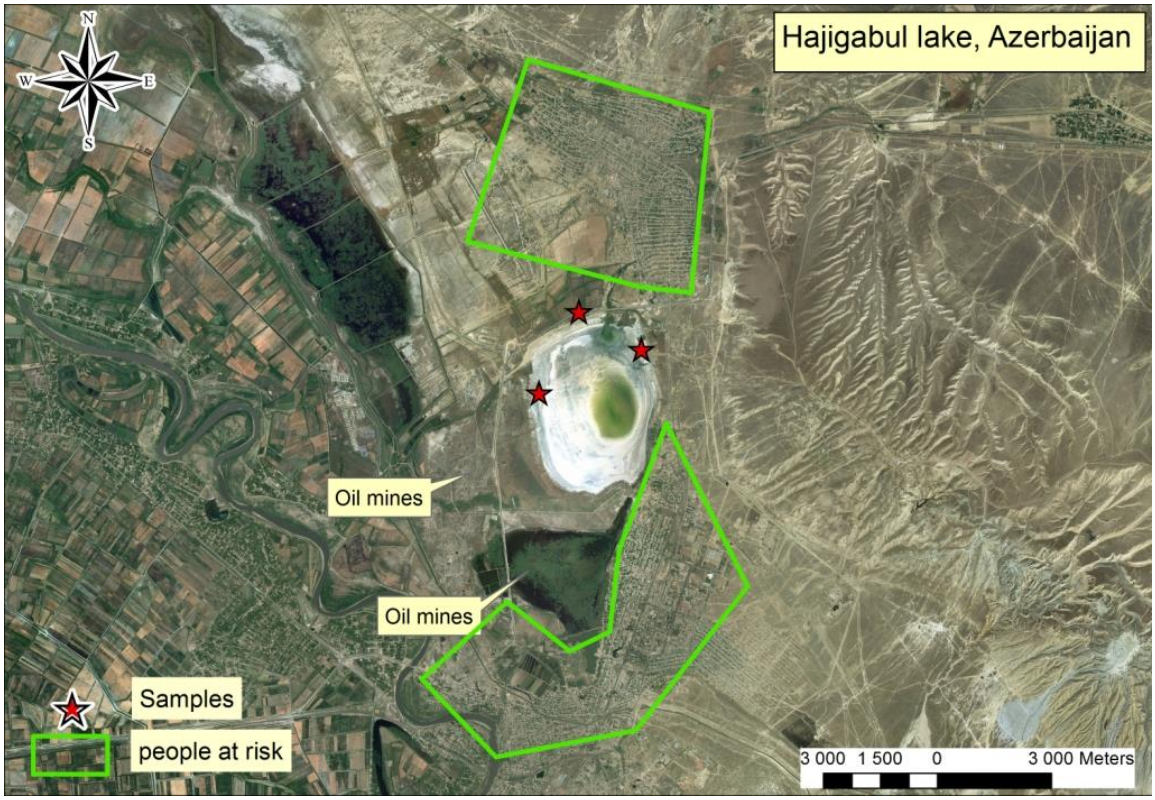


Fig. 35. Map of the site with sampling points

Table 16. Concentrations of contaminants (Hajigabul Lake)

Coordinates	Date	Sand/ soil/ sediment	Description of the sampling spot	Population	Cd
N39.990438; E48.914519	24 June, 2017	Water	Samples taken from the surface	800	296 ppb
N40.007665; E48.924389	25 June, 2017	Water	Samples taken from the surface	1200	285 ppb
N39.998723; E48.939495	26 June, 2017	Sediment	Sample taken from the bottom (26 cm)	1000	902 ppm

AZ-5366 - Korpukend Former Pesticide Aeroground

Korpukend Pesticide Aeroground has been used as a landing strip for small planes that sprinkled DDT over the cotton fields. DDT odor is easily detected. The area is used as a pasture for cattle. Pathways include inhalation and migration through food. Main pollutant is

DDT, depth of pollution of which reaches 2-3 m. A local officer from the Environmental Department confirmed that the area is heavily polluted and must be cleaned. Local Municipality has no resources to clean the area.

Fig. 35. Pesticide white powder

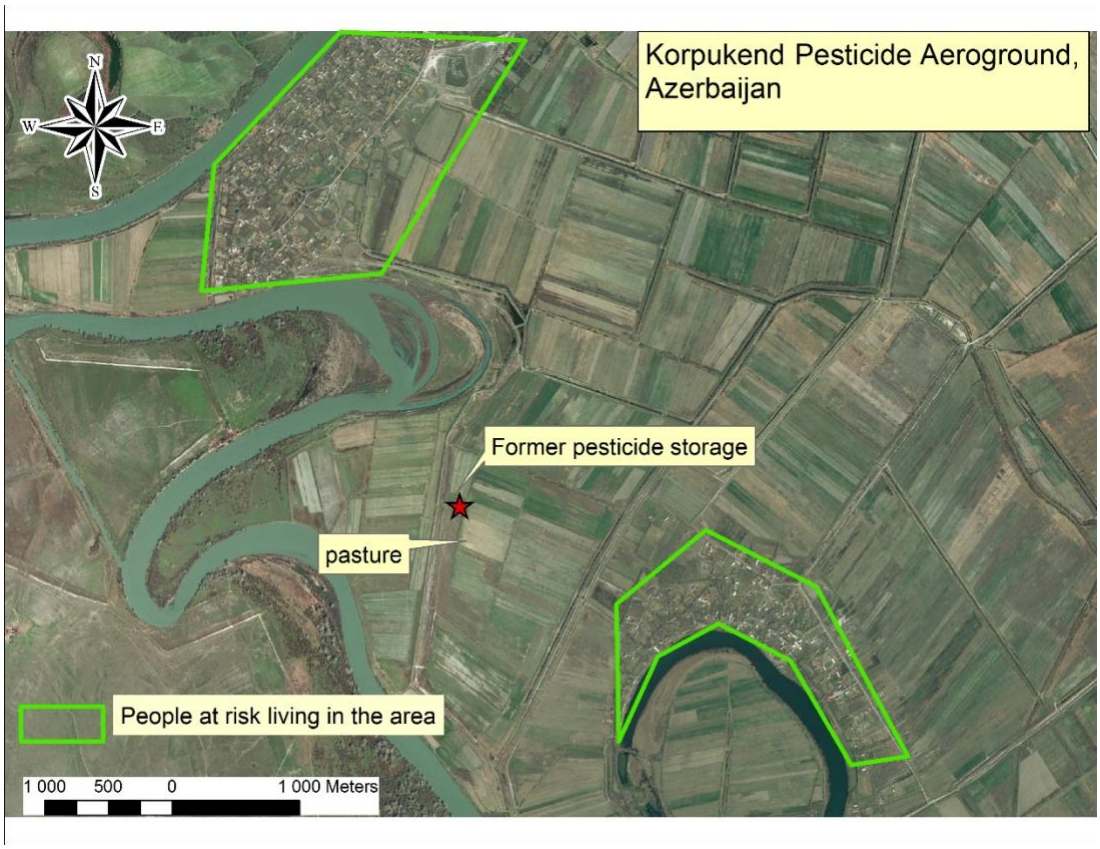


Fig. 36. Map of the site with sampling points

Table 17. Concentrations of contaminants (Korpukend Former Pesticide Aeroground)

GPS#	Date	Sand/ soil/ sediment	Description of the sampling spot	Population	DDT, ppm
N40,244689; E47,501399	04 May 2017	Sediment	Sample taken from the bottom (45 cm)	900	113,3
N40,244601; E47,501611	04 May 2017	Sediment	Sample taken from the bottom (21 cm)	700	96.5
N40,244323; E47,50139	04 May 2017	Sediment	Sample taken from the bottom (30 cm)	1700	145,3

N 40.244123 E 47.500990	04 May 2017	Sediment	Sample taken from the bottom (30 cm)	1700	67,8

Implementation strategy/coordination with government

In general, local authorities, in particular the Ministry of Economic Development, support the work on the assessment of contaminated sites. They are also interested in cleaning up these territories, but, due to lack of funding, they are not able to do so.

The Ministry of Ecology and Natural Resources in Azerbaijan and the Ministry of Agriculture took part in work with TSIP helping to choose sites for assessment. The officials who were involved: Mr. Elgan Yunuszade (the head of Monitoring Department) and Mr. Jamal Kuliev (the Director of Phytosanitary Service).

POLLUTION SOURCES AND KEY POLLUTANTS

Total Sites Surveyed in Azerbaijan

Beginning 2009, 136 sites have been analyzed in Azerbaijan.

Polluting industries in Azerbaijan include, but are not limited to:
Petrochemical Industries (refineries), Chemical Manufacturing (acids, organics, base chemicals), Industrial/Municipal Dump Site, Pharmaceutical Manufacturing, Pesticide Manufacturing, Agriculture, Heavy Industry (casting, rolling, stamping), Mining and Ore Processing, Multiple Diverse Industries, Lead - Battery Recycling, Power Plants (coal or oil), Food Processing.

The distribution of plots by type of industry is shown in Table 18 and Figure 37.

Table 18: The number of sites as categorized by pollution source assessed by Pure Earth's investigators in the TSIP Database

Industry	Number of Sites
Agriculture	51
Chemical Manufacturing (acids, organics, base chemicals)	26
Food Processing	1
Heavy Industry (casting, rolling, stamping)	3
Industrial Estate (mixed industries)	1
Industrial/Municipal Dump Site	1
Lead - Battery Recycling	1
Mining and Ore Processing	4
Multiple Diverse Industries	2
Pesticide Manufacturing	9
Petrochemical Industries (refineries)	17
Pharmaceutical Manufacturing	1
Power Plants (coal or oil)	1
Product Manufacturing (electronics, equipment, clothing)	1
Unknown	17
Total	**136**

Figure 37. Segmentation of sites as categorized by pollution source assessed by Pure Earth's investigators in the TSIP Database

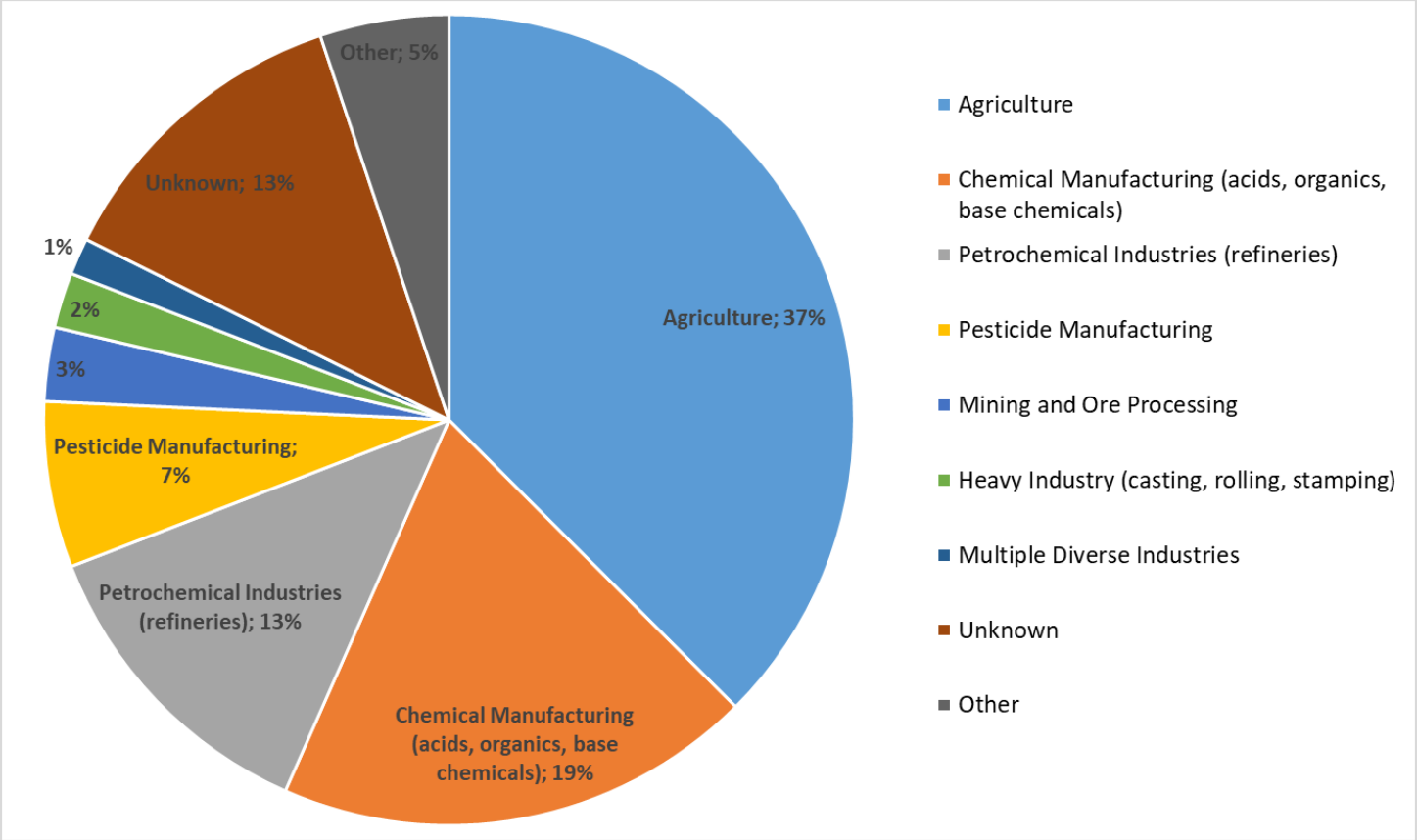
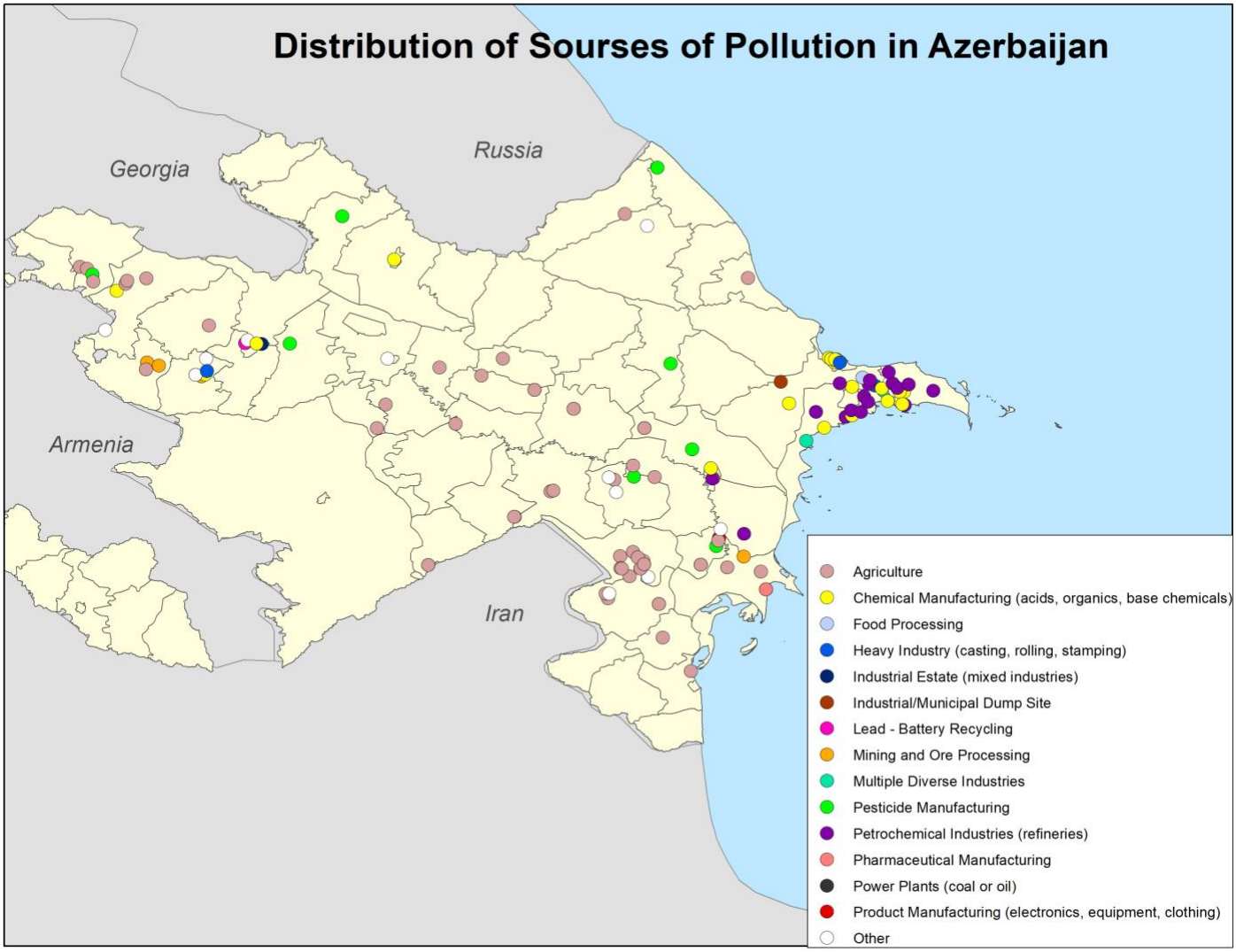


Figure 38. Geographical Distribution of pollution sources in Azerbaijan



Based on the analysis of the obtained data, it was found that 44% of the estimated sites were contaminated with pesticides (including DDT and endosulfan), and 8% of the surveyed sites were contaminated with volatile organic pollutants (benzene). Other sites were contaminated with cadmium (8%) and arsenic (7%).

The types of pollutants that were found at the sites are shown in Table 19 and Figure 39. Figure 40 shows the geographical distribution of sites ranked by type of pollutants in Azerbaijan.

Table 19: 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
Arsenic	10
Benzene	11
Cadmium	11
Chromium (Total)	5
Cyanide	1
DDT	41
Endosulfan	1
Fluorides	1
Formaldehyde	3
Lead	4
Mercury - elemental	3
Pesticides (Total)	17
Other	4
Phenol	2
Radiation	2
Sulfur Dioxide	4
Total Petroleum Hydrocarbon (TPH)	1
Total Suspended Particulate (TSP)	1
Unknown	13
Total	**136**

Figure 39. Polluted sites in Azerbaijan broken down by type of pollutant

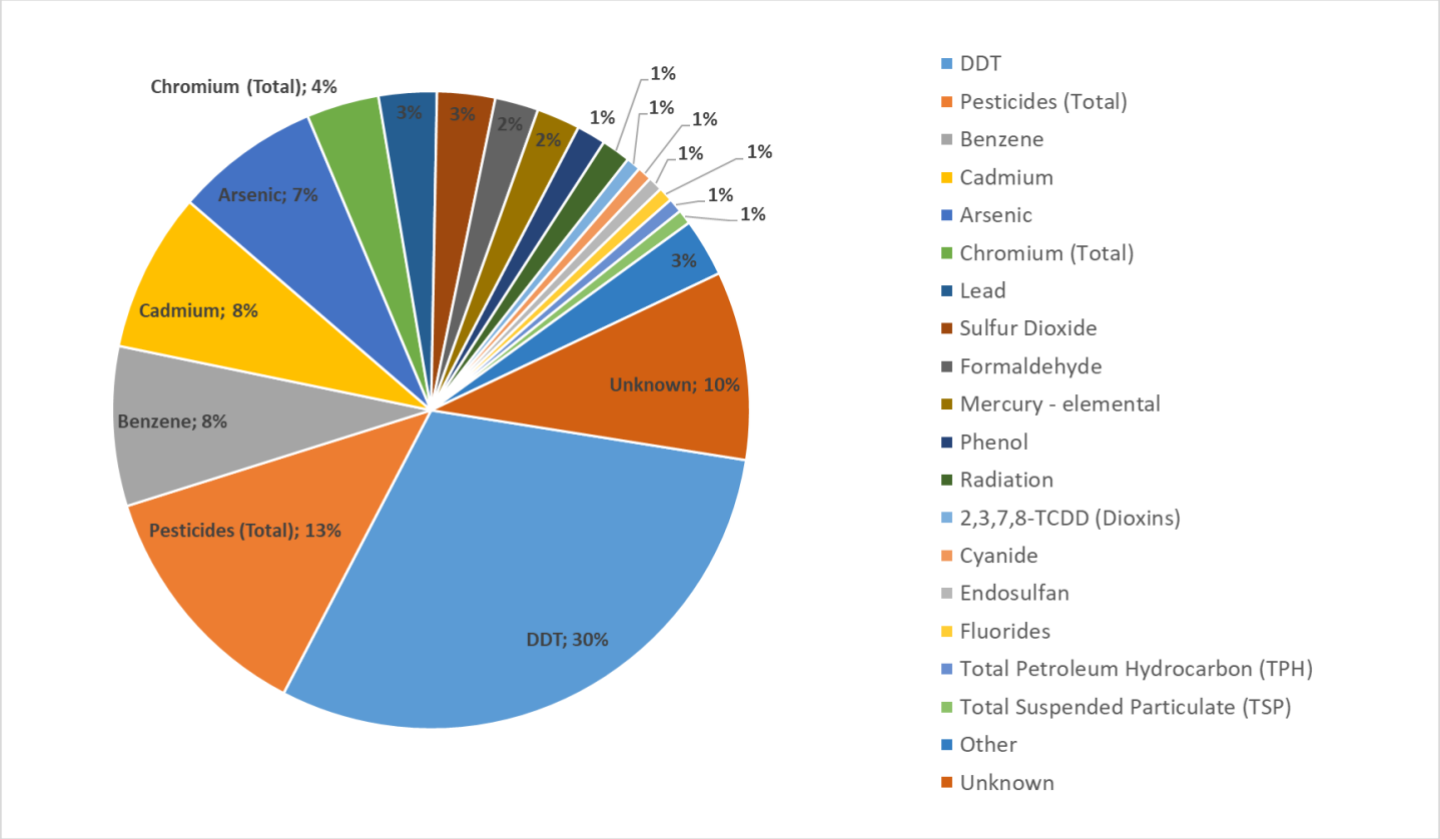


Figure 40. Map of contaminated sites in Azerbaijan

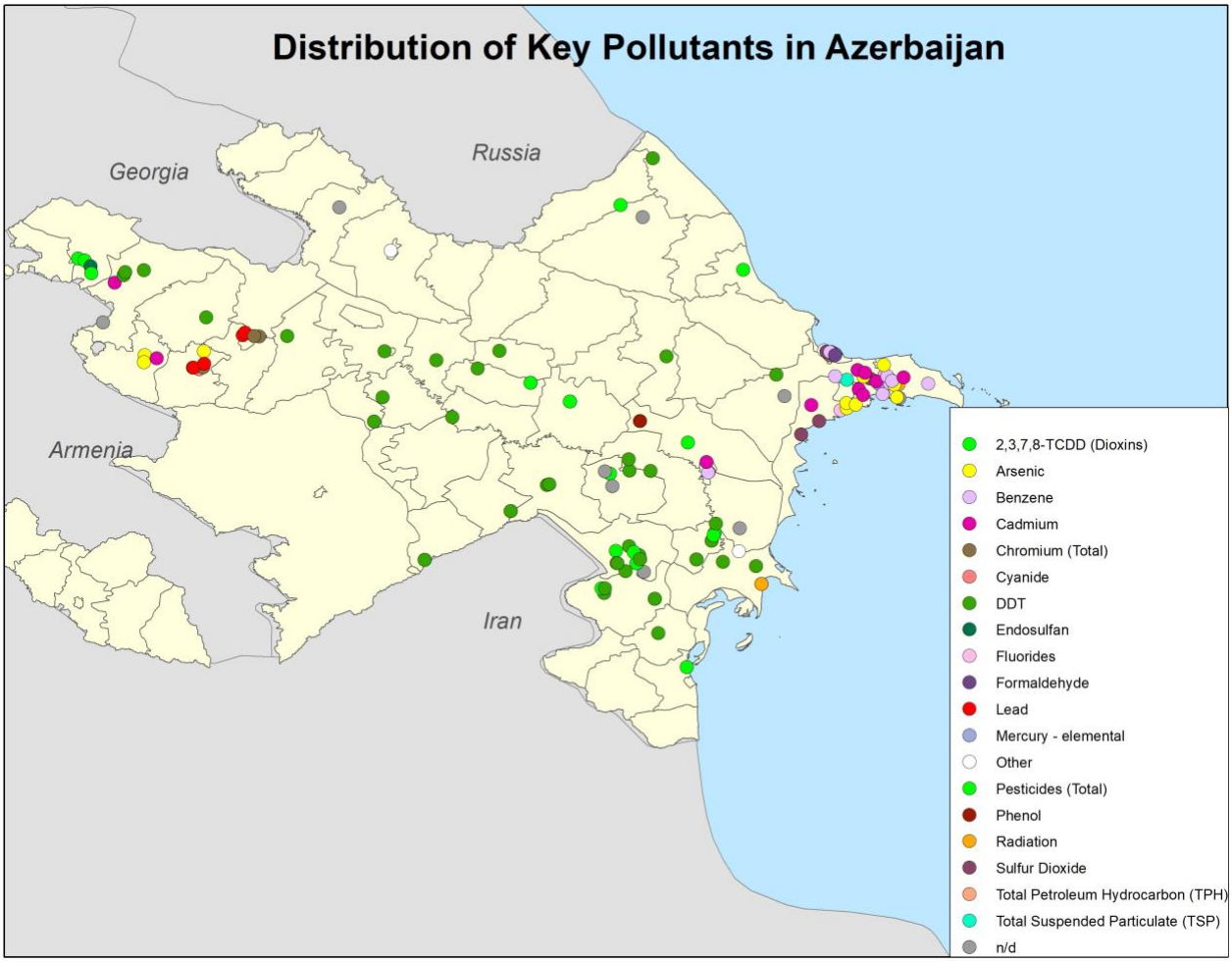


Table 20 shows the polluted sites in Azerbaijan, the site names, and the concentrations of key pollutants.

List of Sites analyzed in Azerbaijan

Table 20: List of Sites Assessed in Azerbaijan

Site ID	Site name	Source of Industry	Key Pollutant	Maximum test result	Units
AZ-284	Sumgait	Chemical Manufacturing (acids, organics, base chemicals)	Mercury - elemental	n/d	
AZ-285	Absheron Peninsula	Petrochemical Industries (refineries)	n/d	n/d	
AZ-3117	Sumgayit, politetilen zavodu	Chemical Manufacturing (acids, organics, base chemicals)	Other	n/d	
AZ-3127	Negtchala Yod Zavodu	Chemical Manufacturing (acids, organics, base chemicals)	n/d	n/d	
AZ-3128	Neft_ala Yod-Brom Zavodu	Pharmaceutical Manufacturing	Radiation	3,44	mg/kg or ppm
AZ-3129	Jangi Pesticide Polygon	Industrial/Municipal Dump Site	DDT	12,00	mg/kg or ppm
AZ-3130	Sumgait Superphosfat Plant	Chemical Manufacturing (acids, organics, base chemicals)	Chromium (Total)	329,00	mg/kg or ppm
AZ-3151	Sumgait Ethylene Polyethylene Plant (SEPP)	Chemical Manufacturing (acids, organics, base chemicals)	Cadmium	20,20	mg/kg or ppm
AZ-3161	Baku Iodine Plant	Chemical Manufacturing (acids, organics, base chemicals)	Radiation	5,12	mg/kg or ppm
AZ-3162	Garadagh Cement Plant	Chemical Manufacturing (acids, organics, base chemicals)	Sulfur Dioxide	226,00	ug/m3
AZ-3171	Sumgait Surface-active substances plant	Chemical Manufacturing (acids, organics, base chemicals)	Mercury - elemental	3250,00	mg/kg or ppm

AZ-3175	Former Horadiz chemical supply facility	Pesticide Manufacturing	DDT	10,10	mg/kg or ppm
AZ-3176	Shamakhi Chemical Union	Pesticide Manufacturing	DDT	66,50	mg/kg or ppm
AZ-3182	Sarijallar Railway Station	Pesticide Manufacturing	DDT	52,10	mg/kg or ppm
AZ-3198	Former Jalilabad Inter-district Pesticide Union	Agriculture	DDT	26,64	mg/kg or ppm
AZ-3207	Former Tovuz Cement Factory	Chemical Manufacturing (acids, organics, base chemicals)	Cadmium	42,50	mg/kg or ppm
AZ-3212	Former Salyan Pesticide Airdrome	Agriculture	DDT	31,90	mg/kg or ppm
AZ-3257	Salyan Plastic Mass Processing Plant	Product Manufacturing (electronics, equipment, clothing)	2,3,7,8-TCDD (Dioxins)	0,00	mg/kg or ppm
AZ-3275	Sumgait organic synthesis factory		n/d	n/d	
AZ-3277	Shirvan Chemical Substances_ Storage	Chemical Manufacturing (acids, organics, base chemicals)	Chromium (Total)	391,00	mg/kg or ppm
AZ-3286	Sumgait Plant of Additives	Chemical Manufacturing (acids, organics, base chemicals)	n/d	n/d	
AZ-3287	Sumgait Uzvi Sintez Zavodu		Formaldehyde	62,50	mg/kg or ppm
AZ-3291	Organic synthesis factory	Chemical Manufacturing (acids, organics, base chemicals)	Sulfur Dioxide	1556,00	ug/m3
AZ-3292	Sumgait Plant of Additives	Chemical Manufacturing (acids, organics, base chemicals)	Formaldehyde	71,00	mg/kg or ppm
AZ-3447	Masalli Agricultural Union	Agriculture	DDT	8,98	mg/kg or ppm
AZ-3450	Barda Pesticide Storage	Agriculture	DDT	584,00	mg/kg or ppm
AZ-3456	Laki Fertilizers' Storage	Agriculture	DDT	9,62	mg/kg or ppm

AZ-3464	Binagadi Steel Production Company	Heavy Industry (casting, rolling, stamping)	Sulfur Dioxide	105000,00	ug/m3
AZ-3480	Ujar Interdistrict Supply Storage	Agriculture	DDT	8,70	mg/kg or ppm
AZ-3533	Sumgait Synthetic Rubber Plant	Chemical Manufacturing (acids, organics, base chemicals)	Benzene	9,21	mg/kg or ppm
AZ-3541	Sumgait aluminium plant	Heavy Industry (casting, rolling, stamping)	Formaldehyde	33,40	mg/kg or ppm
AZ-3547	Yevlakh Pestisid Storage	Agriculture	DDT	12,10	mg/kg or ppm
AZ-3548	TarTar Pesticid Storage	Agriculture	DDT	19,50	mg/kg or ppm
AZ-3595	Dashkesan Iron Ore Mining Factory	Mining and Ore Processing	Cyanide	6,32	mg/kg or ppm
AZ-3596	The Former Siyazan Rural Pesticide Supply Department	Agriculture	Pesticides (Total)	14,20	mg/kg or ppm
AZ-3598	Ganja Aluminum Factory	Industrial Estate (mixed industries)	Chromium (Total)	169,00	mg/kg or ppm
AZ-3600	Beyleqan Pesticide Storage	Agriculture	DDT	12,10	mg/kg or ppm
AZ-3601	Gusar Pestiside storage	Agriculture	Pesticides (Total)	10,20	mg/kg or ppm
AZ-3604	Quba Pesticide Strorage	Agriculture	n/d	n/d	
AZ-3608	Hajigabul Pestiside Stroage	Pesticide Manufacturing	Pesticides (Total)	9,75	mg/kg or ppm
AZ-3610	Garadagh Gas Refining Plant	Petrochemical Industries (refineries)	Fluorides	4670,00	mg/kg or ppm
AZ-3612	Imishli Pesticide Storage	Agriculture	DDT	16,10	mg/kg or ppm
AZ-3613	Baku Industrial Experiment Factory	Chemical Manufacturing (acids, organics, base chemicals)	Other (Nox)	657,00	ug/m3
AZ-3616	Shaki Fertilizers' Plant	Chemical Manufacturing (acids, organics, base chemicals)	Other (NO3)	66100,00	ug/l or ppb

AZ-3629	Neftchala Pesticide Storage	Agriculture	DDT	11,90	mg/kg or ppm
AZ-3630	Baku Steel Company	Multiple Diverse Industries	Mercury - elemental	14,60	mg/kg or ppm
AZ-3643	Kazakh pecticide storage	Agriculture	Pesticides (Total)	14,60	mg/kg or ppm
AZ-3644	Ujar (Mususlu) Pestiside Stroage		Pesticides (Total)	12,90	mg/kg or ppm
AZ-3645	Kurdamir Pesticide Storage		Pesticides (Total)	13,20	mg/kg or ppm
AZ-3649	Goycay Pecticide Storage	Agriculture	DDT	19,10	mg/kg or ppm
AZ-3745	Former Akstafa Pesticid Storage	Agriculture	Pesticides (Total)	33,10	ppm
AZ-3746	Dashkesen Cobalt Mining	Chemical Manufacturing (acids, organics, base chemicals)	Chromium (Total)	5,86	mg/kg or ppm
AZ-3760	Padar railway accident	Agriculture	Phenol	105,00	ug/m3
AZ-3764	Qax (Alibayli) G_brə anbar_	Pesticide Manufacturing	n/d	n/d	
AZ-3789	Alimardanli Village Pesticide Storage	Agriculture	DDT	3217,70	mg/kg or ppm
AZ-3792	Lajat Pectiside Storage near railway station	Pesticide Manufacturing	DDT	106,30	mg/kg or ppm
AZ-3793	Daşkəsən Alunit zavodu		n/d	n/d	
AZ-3794	Dashkesan Alunite Enrichment SIte		Lead	54,20	ug/l or ppb
AZ-3805	Dalmammadli Railway Station, Fertilizers' Plant and Pesticide Storage	Pesticide Manufacturing	DDT	2077,10	mg/kg or ppm
AZ-3806	Garadagh gasconcrete and lime production factory	Multiple Diverse Industries	Sulfur Dioxide	46,00	ug/m3
AZ-3816	Salyan Agricutural Chemical Union	Pesticide Manufacturing	DDT	128,00	mg/kg or ppm
AZ-3854	Nohun village former pesticide site	Agriculture	DDT	2537,70	mg/kg or ppm
AZ-3877	Shirvan Oil Residuals	Petrochemical Industries (refineries)	Benzene	64,20	mg/kg or ppm
AZ-3884	Technical Rubber Products Plant	Chemical Manufacturing (acids, organics,	Benzene	335,60	mg/kg or ppm

		base chemicals)			
AZ-3885	Gadabay Gold and Copper Mine	Mining and Ore Processing	Arsenic	30000,00	ug/l or ppb
AZ-3890	AzerNeftYag Plant	Chemical Manufacturing (acids, organics, base chemicals)	Benzene	98,30	mg/kg or ppm
AZ-4038	Lead-Acid Battery Disassemble Area in Ganja city	Lead - Battery Recycling	Lead	2680,00	mg/kg or ppm
AZ-4045	Vurgun Town Former Pesticide Site	Pesticide Manufacturing	Endosulfan	4,25	mg/kg or ppm
AZ-4080	Toxic Waste Management Site of Gadabay Gold and Copper Mine	Mining and Ore Processing	Cadmium	6,90	mg/kg or ppm
AZ-4095	Ganja Alabaster Production Area		Lead	1220,00	ug/m3
AZ-4112	Former Lenkaran (Marso) Pesticide Storage	Agriculture	Pesticides (Total)	1451,00	mg/kg or ppm
AZ-4129	Padar Railway Accident update	Agriculture	Phenol	6591000,00	mg/kg or ppm
AZ-4137	Azbentonit Cement and Dry mixtures Plant	Chemical Manufacturing (acids, organics, base chemicals)	Total Suspended Particulate (TSP)	2250,00	ug/m3
AZ-4147	Fromer Bilasuvar Agricultural Chemical Uniion		DDT	443,28	mg/kg or ppm
AZ-4148	Former Bilasuvar Pesdiside Storage	n/d	n/d	n/d	
AZ-4149	Lower Gurali Pesdicide Aerodrome	Agriculture	Pesticides (Total)	n/d	
AZ-4150	Nasimi Pesidicide Aerodrome	Agriculture	Pesticides (Total)	1150,00	mg/kg or ppm
AZ-4196	Sabun_u District Oil Polluted areas	Power Plants (coal or oil)	Total Petroleum Hydrocarbon (TPH)	1925,00	mg/kg or ppm
AZ-4197	Takla Pesdicide Storage	Agriculture	DDT	149,20	mg/kg or ppm
AZ-4198	Abazalli Pesdicide Storage	Agriculture	Pesticides (Total)	64,62	mg/kg or ppm
AZ-4208	Lower Gurali Aerodrome (Bilasuvar)	Agriculture	Pesticides (Total)	1270,50	mg/kg or ppm

AZ-4217	Goyceli and Tatli pesticide points	Agriculture	Pesticides (Total)	4362,20	mg/kg or ppm
AZ-4230	Qaratapa Pesticide Storage, Sabiradad (Former)	Agriculture	DDT	2730,00	mg/kg or ppm
AZ-4231	Moldai Aerodrome (Saatli)	Agriculture	Pesticides (Total)	1240,00	mg/kg or ppm
AZ-4297	Former Sugarishan Aerodrome (Sabirabad)	Agriculture	DDT	1876,10	mg/kg or ppm
AZ-4298	Former Dada Gorgud village Pectiside Distribution Point		n/d	n/d	
AZ-4313	Abazalli Aeroground (Former), Jalilabad		DDT	1342,00	mg/kg or ppm
AZ-4314	Aribatan Aerodrome, Salyan	Agriculture	Pesticides (Total)	3070,00	mg/kg or ppm
AZ-4316	Amankend Pesticide Distribution Point	Agriculture	DDT	2021,00	mg/kg or ppm
AZ-4317	Khirmandali Pesticide Distribution Point-1	Agriculture	n/d	n/d	
AZ-4324	Fromer Yuxari Agali Pesticide Distribution Point	Agriculture	DDT	1891,40	mg/kg or ppm
AZ-4327	Former Gunashli Pesticide Distribution Point (Bilasuvar)	Agriculture	DDT	2246,60	mg/kg or ppm
AZ-4328	Former Chuxanli Aerodrome (Salyan)		DDT	1121,20	mg/kg or ppm
AZ-4329	Former Zahmatabad Pesticide Distribution Point (Bilasuvar)	Agriculture	DDT	1198,10	mg/kg or ppm
AZ-4341	Former Chayli Pesticide Distribution Point (Bilasuvar)	Agriculture	Pesticides (Total)	2567,20	mg/kg or ppm
AZ-4342	Fromer Saatli Agricultural and Chemical Union		n/d	n/d	
AZ-4387	Ganja cement factory	Chemical Manufacturing (acids, organics, base chemicals)	Chromium (Total)	1643,00	mg/kg or ppm
AZ-4388	Qaraxanlı kənd estakadası	Agriculture	DDT	2593,10	mg/kg or ppm
AZ-4389	Former Mukhatariyat Village Pesticide Distribution Point (Shamkir)	Agriculture	DDT	2346,40	mg/kg or ppm

AZ-4428	Gosha Gold Mine		n/d	n/d	
AZ-4432	Sabunchu town polluted areas		Benzene	112,11	mg/kg or ppm
AZ-4433	Balakhani village polluted areas		Benzene	323,23	mg/kg or ppm
AZ-4444	Chovdar Gold Mine		Arsenic	0,00	mg/kg or ppm
AZ-4445	Qushchu Railway Station	Heavy Industry (casting, rolling, stamping)	Lead	1258,00	mg/kg or ppm
AZ-4448	Rustam Aliyev Village Road in Gadabay District	Agriculture	Arsenic	31,30	mg/kg or ppm
AZ-4588	Kirmizi Lake, Absheron	Chemical Manufacturing (acids, organics, base chemicals)	Arsenic	87,00	mg/kg or ppm
AZ-4590	Lokbatan Lake, Absheron	Petrochemical Industries (refineries)	Arsenic	102,00	ug/l or ppb
AZ-4641	Bulbula Lake	Chemical Manufacturing (acids, organics, base chemicals)	Arsenic	161,00	mg/kg or ppm
AZ-4642	Boyukshor Lake	Chemical Manufacturing (acids, organics, base chemicals)	Cadmium	68,00	ug/l or ppb
AZ-4657	Halach (Beylagan) Pesticide Storage	Agriculture	DDT	4689,34	mg/kg or ppm
AZ-4660	Horadiz chemical supply facility (Former)	Agriculture	DDT	2034,30	mg/kg or ppm
AZ-4661	Former Jalilabad Inter-district Pesticide Union	Agriculture	DDT	3126,45	mg/kg or ppm
AZ-4662	Former Dayikend (Salyan) Pesticide Storage	Agriculture	DDT	1875,20	mg/kg or ppm
AZ-4663	Fromer Bilasuvar Agricultural Chemical Uniion	Agriculture	DDT	443,28	mg/kg or ppm
AZ-4666	Kurdamir Pesticide Storage	Agriculture	Pesticides (Total)	9465,56	mg/kg or ppm
AZ-4668	Neftchala Pesticide Storage	Agriculture	DDT	3056,34	mg/kg or ppm
AZ-4671	Ujar (Mususlu) Pestiside Storage	Agriculture	Pesticides (Total)	1437,23	mg/kg or ppm

AZ-4732	Imishli (Central) Pesticide Storage	Agriculture	DDT	4652,11	mg/kg or ppm
AZ-4783	Khojohasan Lake, Absheron Rayon, Azerbaijan	Petrochemical Industries (refineries)	Cadmium	91,00	ug/l or ppb
AZ-4800	Zig Lake	Chemical Manufacturing (acids, organics, base chemicals)	Arsenic	146,00	mg/kg or ppm
AZ-4846	Zabrat lake	Petrochemical Industries (refineries)	Benzene	156,00	mg/kg or ppm
AZ-4847	Binagadi Lake	Petrochemical Industries (refineries)	Arsenic	719,00	mg/kg or ppm
AZ-4848	Gu lake	Petrochemical Industries (refineries)	Arsenic	453,00	mg/kg or ppm
AZ-4884	Masazir lake	Food Processing	Cadmium	434,00	mg/kg or ppm
AZ-4931	Kurdakhani Lake	Petrochemical Industries (refineries)	Arsenic	2240,00	ug/l or ppb
AZ-4932	Mirzaladi lake, Garadagh District, Azerbaijan	Petrochemical Industries (refineries)	Cadmium	660,00	ug/l or ppb
AZ-4939	Gala lake	Petrochemical Industries (refineries)	Benzene	134,00	ug/l or ppb
AZ-4995	Ganli-Gel Lake	Petrochemical Industries (refineries)	Cadmium	193,00	ug/l or ppb
AZ-4996	Ramana Lake	Petrochemical Industries (refineries)	Benzene	3790,00	ug/l or ppb
AZ-5338	Old Iodine Bromine mine, Azerbaijan	Mining and Ore Processing	Other (Bromine in soil)	184,00	mg/kg or ppm
AZ-5341	Old oil-gas mine	Petrochemical Industries (refineries)	Benzene	93,00	mg/kg or ppm
AZ-5366	Korpukend Former Pesticide Aeroground	Agriculture	DDT	145,30	mg/kg or ppm
AZ-5367	Chuxurdara Lake	Petrochemical Industries	Cadmium	230,00	mg/kg or ppm

		(refineries)			
AZ-5383	Dashagil lake	Petrochemical Industries (refineries)	Benzene	121,00	ug/l or ppb
AZ-5392	Hajigabul lake	Chemical Manufacturing (acids, organics, base chemicals)	Cadmium	902,00	mg/kg or ppm
AZ-5403	Fatmai 1 lake	Petrochemical Industries (refineries)	Cadmium	17,00	ug/l or ppb

LESSONS LEARNED

Challenges

It may be beneficial to hold TSIP trainings more often, or to have refreshers for the investigators in the local language. It may be good to have another full scale TSIP training before more TSIP sites are assessed in Azerbaijan. Some of the investigators have limited English and Russian language skills, and it was, at times, challenging for working with specialists in headquarters and updating information in the database. Other investigators had to leave for a variety of reasons, and other had to be hired as their replacements. Because of this, their TSIP work required an additional amount of supervision.

Recommendations

With the current level of the local partnership, it is necessary to increase future activities in Azerbaijan. The possible activities are listed below but not limited to:

- Continuing of the TSIP program in Azerbaijan.
- Starting of an HPAP in Azerbaijan, collaborating with government agencies.
- Identifying the main sources of urban pollution through sampling.
- Identifying the main sources of current agricultural pollution.
- Gathering information about pollutants in the Agricultural sector.
- Continuing small scale cleanup projects.
- Working to identify the most vulnerable part of population in terms of pollution health risks.
- Assisting government institutions in developing or updating policies to improve public health.

- Working with the government and other organizations to increase the availability of environmental data including air and water quality information.
- Increasing cooperation with other UN agencies in Azerbaijan (UNDP, FAO, WHO) and assist them in including child and gender focused components.
- Conducting trainings for government representatives in toxic pollution issues, which consider both impact and mainstreaming.
- Involving Azerbaijan's youth in projects related to environmental education. For example, supporting several pilot schools in urban areas in obtaining environmental data including indoor air and water quality information. Small scale testers and equipment could help to involve school children in the data collection. Small radon testers, CO detectors, and indoor air pollution control equipment could help pilot schools to control air quality in schools.
- Developing a short and readable guideline for schools that would provide necessary knowledge for teachers and schoolchildren regarding proper behavior in polluted hotspots.