Waste and Chemicals in Central Asia

A Visual Synthesis

Waste and Chemicals in Central Asia:
A Visual Synthesis

based on official country information to the Basel Convention, Stockholm Convention, Rotterdam Convention, Montreal Protocol, state of the environment reports, scientific papers and news reports

This publication has been supported by the Swiss Federal Office for the Environment (FOEN).

The publication aims to catalyse remedial action on environmental legacies and responsible approaches to waste and chemicals management by sharing information and improving public awareness of situations and trends in the fields of waste and chemicals, the main areas of concern and notable responses.

Cover page: Municipal waste dump near Issyk-Kul Lake, Kyrgyzstan

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Contents

Foreword

The abundant natural resources of Central Asia served the needs of the entire Soviet economy, and since independence have created jobs and income for the five new states. In the Soviet period, Central Asia led in the production of uranium, mercury, antimony and other minerals. The Soviet military used the vast expanses of desert for testing missiles and nuclear, chemical and biological weapons, for rocket launches and the development of defense systems. The hot climate and abundant water and land resources in the southern part of Central Asia favored the development of large-scale irrigated agricultural systems that required substantial amounts of chemical fertilizers and pesticides. Since the end of the Soviet era, the new governments have banned some of the destructive activities – such as nuclear tests, nuclear weapon installations and the use of agricultural chemicals containing persistent organic pollutants – but have not always mapped the legacies or taken remedial measures. Other activities such as primary mercury mining and the use of contaminated equipment and illegally excavated pesticides continue.

Neglect and the underestimation of the health and environmental hazards from the waste and chemicals in the past have led to grim consequences that the countries still face and often cannot resolve alone. Now the extractive sector is expanding, agriculture is changing, the population is growing and the region is becoming more open than ever before to the outside world. This combination of historical and new developments puts the waste and chemical issue into special focus.

In most situations waste and chemicals are interlinked: agricultural chemicals – essential for food security and higher crop productivity – need to be disposed of properly when their validity expires, and the amounts applied should not exceed suggested limits, otherwise health and environmental risks are inevitable. The mining and metallurgy sector is a locomotive of the industrial sector of Central Asia, but it creates vast quantities of often hazardous waste. It also uses toxic chemicals – cyanides, for example – and failures in transportation, use or disposal of these and other hazardous chemicals could lead to disaster, in the short or long term. As urban populations and consumption grow, so do the volumes of solid municipal waste and potentially hazardous waste related to medicine, electronics and cars. The adoption of modern approaches to urban waste management in most locations is a recent development. A growing recognition of waste and chemicals management problems has led to the action taken by governments, citizens and donors.

This report provides a synthesis of the available information on waste and chemicals in Central Asia, presented primarily in a visual format intended to help educators, students and decision makers in the mining, energy, chemistry, agriculture, municipal, health, environmental and other relevant sectors understand the scale and complexities of the task ahead. It was prepared by experts to communicate selected hotspots, challenges and successes to national, regional and international audiences.

Cooperation between the Global Environment Facility (GEF) and Central Asian countries includes projects related to ozone-depleting substances, hazardous waste management and the detection and inventory of toxic chemicals and contaminated sites. The GEF chemicals and waste project portfolio will likely grow in the future, as many world regions are scaling up their efforts to minimize health and environmental risks, and new international instruments, such as the global mercury treaty, are coming on the scene. Central Asia may benefit from this growing global attention and finally resolve some past and current problems.

For Switzerland the sustainable management of waste and chemicals is a key priority not only at national and regional levels, but also internationally. Switzerland is host to the main international institutions and conventions relevant to chemicals and waste management, has an important international chemicals industry and is prominent in related research. Based on this expertise and responsibility, Switzerland has been assisting Central Asian nations in the development of national chemical profiles and environmental performance reviews, and with demonstrations of hazardous waste management approaches and mercury risk reduction measures.

Further enhancing the cooperation and coordination among all relevant actors in the sustainable management of chemicals and waste is another key priority for Switzerland. Therefore we look forward to improved synergies among the international, regional and national instruments in the implementation and further development of all relevant instruments and processes, including the four chemical and waste-related international agreements (Basel, Rotterdam, Stockholm and Minamata Conventions), and the Strategic Approach to International Chemicals Management.

Bern and Geneva 1 May 2013

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Ambassador, Head of International Affairs Division
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Spontaneous landfill fire, Dushanbe, Tajikistan

Waste	Kazakhstan	Kyrgyzstan	Tajikistan	Turkmenistan	Uzbekistan
Municipal waste generation, total	growing problem	growing problem	growing problem	growing problem	growing problem
Municipal waste generated per person	growing problem	growing problem	stable, some progress	no data	stable, some progress
Municipal waste collection, treatment and disposal practices	improvement of situation	mixed progress	mixed progress	improvement of situation	advanced progress
Municipal waste recycling and reuse	improvement of situation	mixed progress	mixed progress	no data	improvement of situation
Industrial hazardous waste generation	growing problem	stable, some progress	stable, some progress	no data	growing problem
Industrial waste reuse and reduction practices	improvement of situation	mixed progress	mixed progress	improvement of situation	improvement of situation
Institutions, legislation, regulations and programmes on waste	advanced progress	improvement of situation	improvement of situation	stable, some progress	improvement of situation
Waste statistics, data reporting and availability	improvement of situation	improvement of situation	mixed progress	limited progress	improvement of situation
Participation in international treaties and initiatives	improvement of situation	improvement of situation	stable, some progress	stable, some progress	improvement of situation
Public and private initiatives on waste and litter clean-up	advanced progress	advanced progress	stable, some progress	stable, some progress	advanced progress

Chemicals	Kazakhstan	Kyrgyzstan	Tajikistan	Turkmenistan	Uzbekistan
Manufacturing and industrial use of hazardous chemicals	growing problem	stable, some progress	stable, some progress	stable, some progress	stable, some progress
Use of mineral fertilisers and pesticides in agriculture	stable, some progress	mixed progress	mixed progress	no data	stable, some progress
Production and use of leaded gasoline	banned, phased-out	banned, phased-out	banned, phased-out	banned, phased-out	banned, phased-out
Use of ozone-depleting substances (Montreal Protocol, group "A")	banned, phased-out	banned, phased-out	banned, phased-out	banned, phased-out	banned, phased-out
Mercury pollution control and inventory of mercury uses and waste	improvement of situation	improvement of situation	stable, some progress	no data	no data
Progress in remediation and elimination of POPs and PCB pollution	advanced progress	stable, some progress	stable, some progress	no data	stable, some progress
Institutions, legislation, regulations and programmes on chemicals	improvement of situation	improvement of situation	stable, some progress	no data	improvement of situation
National chemical profile, data reporting and availability	improvement of situation	improvement of situation	mixed progress	limited progress	improvement of situation
Participation in international treaties and initiatives	improvement of situation	improvement of situation	stable, some progress	stable, some progress	improvement of situation
Monitoring of chemicals in the environment and health impacts	advanced progress	stable, some progress	stable, some progress	stable, some progress	advanced progress

This table is based on: the latest country reports to conventions, the latest UNECE environmental performance reviews, and expert consultations.

Data for 2001-2011

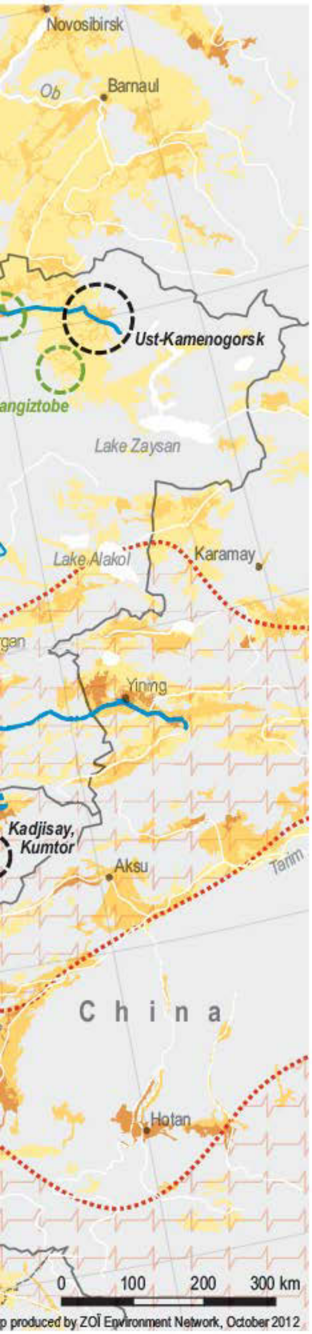
Positive trends: improvement of situation; advanced progress

Stable or mixed trends: stable, some progress; mixed progress

Negative trends: limited progress; growing problem

Other: banned, phased-out; no data

Synthesis of priority areas on waste and chemicals management



Industrial areas

Oil and gas extraction and petrochemical industries

Mining, processing and chemicals production

Legacy waste and chemical pollution of soils

Former uranium mining and processing sites

Former or active military test ranges, rocket facilities

Nature hazards and vulnerabilities:

Sea level fluctuation and storm surges

High or moderate seismic risk

Selected water bodies vulnerable to pollution and stress

Population density (inhabitants per km²)

1 5 50

Source: LandScan Global Population Database 2007, Oak Ridge, TN, Oak Ridge National Laboratory (→ www.ornl.gov/sci/landscan)

This report profiles the chemical and waste management practices of the five Central Asian countries and presents a synthesis of the available information on waste and chemicals in the region. Case studies provide examples of the challenges associated with pollution legacies and discuss the current conditions in some of the Central Asian hotspots. A section on sound management practices recalls the global context for action and includes timelines for the implementation of waste and chemicals management strategies. The report concludes with success stories which demonstrate the progress being made in the region.

The purpose of the report is to help readers understand the scale and complexities of the task ahead. Reducing health and environmental risks is neither simple nor inexpensive, and the amount of work that needs to done is daunting, but the countries of Central Asia are making a promising start.

The synthesis map shows the geographic distribution of the chemical and waste challenges facing Central Asia. Numerous issues from legacies and ongoing activities face the densely populated Ferghana Valley where three countries share borders and transboundary cooperation is a necessary component of an effective response. Major water ecosystems such as the Caspian Sea and several rivers in the region are pollution-sensitive spots. The use of river water for irrigation reduced flow, resulting in less dilution as the rivers received pollution from both agriculture run-off and urban waste. Improved practices and the demise of some Soviet era industry have reduced the levels of pollution, and together with the dramatic reduction in the use of agricultural chemicals have resulted in better water quality. Mining wastes in the mountains – both from legacies and as a result of the current mining boom – are vulnerable to natural disasters. The effect of climate change at higher elevations complicates the picture. Urban waste management systems, including recycling, have deteriorated since independence, but that trend has been reversed in recent years.

Country profiles:
Management of waste and chemicals

Waste and chemical issues in Kazakhstan

Sites with significant amounts of industrial waste and chemicals

- Poorly maintained radioactive waste, historical pollution
- Radioactive waste in controlled conditions
- Notorious historical pollution from industrial development
- Other industrial waste and chemical issues raising public concern

Arms race and military legacy waste

- Former nuclear test sites: soil pollution, affected ecosystems
- Rocket launch sites and former military test ranges: soil pollution, scrap metal, toxic spills

Municipal waste

- Poorly managed waste collection or landfill practices

Sites with significant amounts of persistent organic pollutants

- Major stores and dumps of obsolete pesticides recognized as hotspots
- Other disposal sites for agricultural chemicals
- Highly PCB-contaminated sites and major PCB-containing equipment sites
- Other PCB-contaminated sites

Improvements in waste and chemical management

- New hazardous waste disposal facilities
- Ongoing and planned clean-up actions or waste reduction initiatives
- ASTANA Municipal waste management initiatives

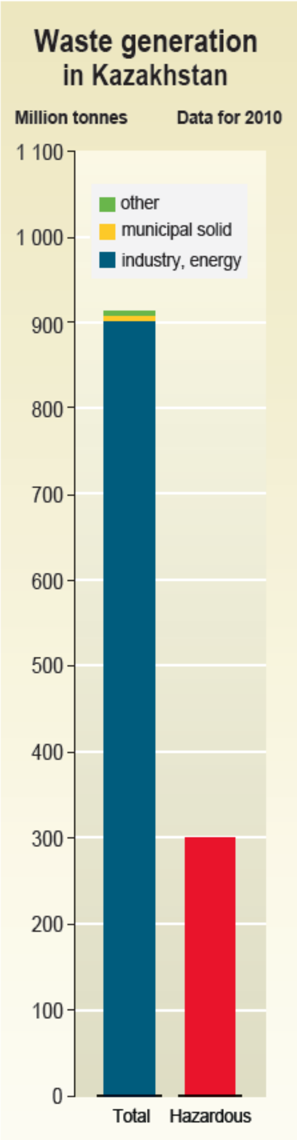
Kazakhstan

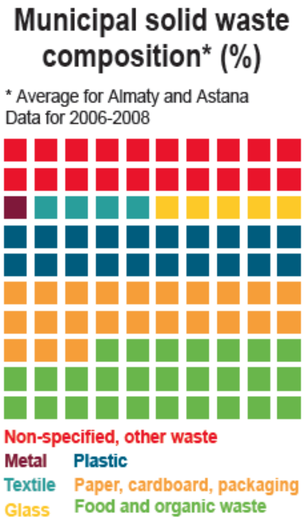
With the largest land area of any country in Central Asia, Kazakhstan has diverse industry with oil and petrochemicals concentrated in the west, and mining, metallurgy, chemicals and energy in the north and east. The country still has a high volume of industrial waste generated in the Soviet period, and a rapidly growing amount of industrial waste since 2000. Contamination by polychlorinated biphenyls (PCBs) and other persistent organic pollutants is an emerging issue that Kazakhstan did not recognize until recently, when inventories were conducted.

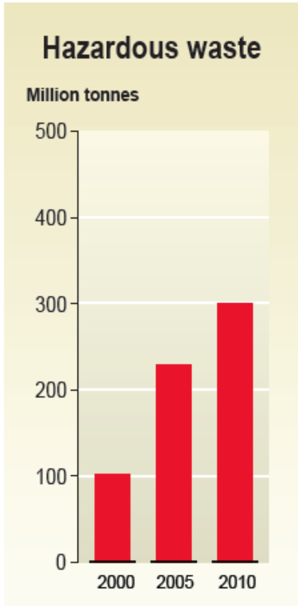
Kazakhstan has accumulated more than 22 billion tonnes of waste, including 16 billion tonnes of mining and processing waste, 6 billion tonnes of hazardous waste and almost 100 million tonnes of municipal solid waste. The generation of industrial waste increased from 100 to 900 million tonnes per year in the period 2000-2010, while hazardous waste increased from 100 to 300 million tonnes. Municipal solid waste generation increased from 1.5 to 3.0 million tonnes. Current rates of waste recycling/ reuse vary from less than 5 per cent for municipal to more than 25 per cent for industrial waste.

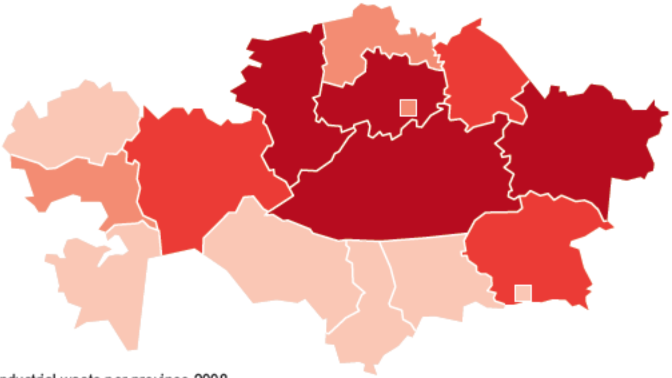
Source: Kazakhstan National Report for the Stockholm Convention (2011), UNECE environmental indicators →

Note: Total includes hazardous.



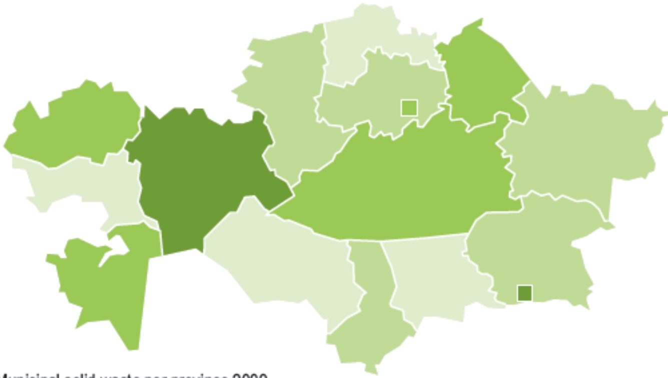






Industrial waste per province 2008
(thousend tonnes)

500 1 000 20 000

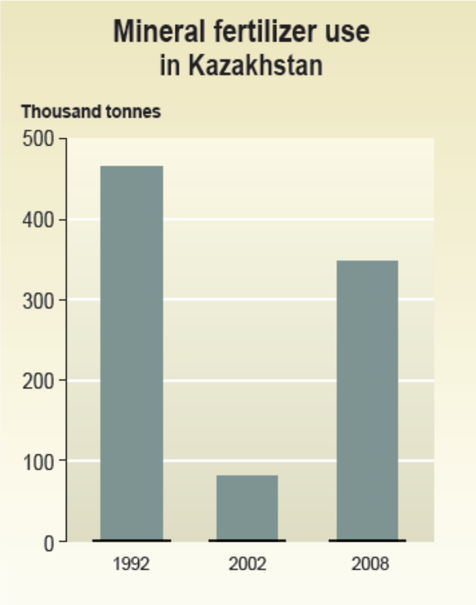


Municipal solid waste per province 2009
(thousend tonnes)

100 200 500

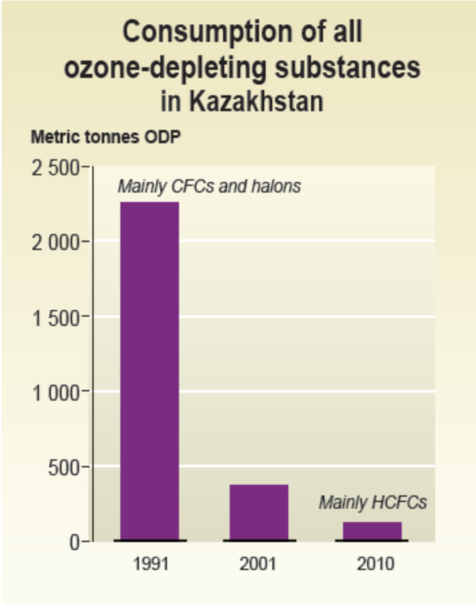
Per capita income in Kazakhstan is the highest in Central Asia, and consumption is growing faster there than in the other countries of the region. As a result, urban waste management is a developing concern in several major cities, where simple compacting of municipal waste has failed to solve the problem. Dozens of illegal small waste dumps exist in urban and rural areas across the country. In Almaty, a new municipal waste plant was successful until subsidies were removed; currently the plant's operation is suspended and the city has reverted to dumping its waste in landfills. Different cities have tried different approaches that all depended on financial support. Waste-to-energy incineration plants and sanitary landfills are planned in some cities.

Radioactive waste – more than 220 million tonnes of it – is also a concern in many parts of the country, but Kazakhstan has enjoyed some success in its clean-up and safety efforts. The state program on uranium mines closure and rehabilitation implemented between 2001 and 2010 introduced safety measures in 30 small and medium-sized abandoned uranium mines and waste sites across Kazakhstan covering a total area of 1 000 ha, but it has not yet tackled the larger sites. Currently Kazakhstan is the world's top uranium producer (about 20 000 tonnes per year), and employs underground in-situ leaching mining methods that generate minimal waste.



Source: FAO Stat (http://faostat.fao.org)

NOTE: data covers only nitrogenous and phosphate fertilizers



Source: UNEP Ozone Secretariat (http://ozone.unep.org)

NOTE: data covers all groups of substances in the Annex A, B, C and E

Mercury contamination in the industrial areas in Temirtau and Pavlodar has been remediated, and the clean-up of the adjacent rivers continues. The PCB inventories opened Kazakhstan's eyes to the contamination problem, and marked the beginning of remedial efforts. A persistent organic pollutants (POPs) inventory, which identified over 1 500 tonnes of obsolete and prohibited pesticides in 2003, led to the relocation and disposal of the bulk of these toxic agricultural chemicals to specialized hazardous waste storage sites, though further POPs destruction and elimination remains an open issue. Consumption of ozone-depleting substances such as chlorofluorocarbons (CFCs) decreased from 1 000 tonnes in 1990 to 500 tonnes in 2000 and zero in 2005, as CFCs were gradually replaced by HCFCs. Biological and chemical weapon test sites in the Aral Sea region have been remediated and cleaned up.

Waste and chemical issues in Kyrgyzstan

Sites with significant amounts of industrial waste and chemicals

- Poorly maintained radioactive waste, historical pollution
- Radioactive waste in controlled conditions
- Notorious historical pollution from industrial development
- Other industrial waste and chemical issues raising public concern
- Major source of hazardous industrial waste

Sites with significant amounts of persistent organic pollutants

- Major stores and dumps of obsolete pesticides recognized as hotspots
- PCB-contaminated sites

Municipal and tourism sector waste

- Poorly managed waste collection or landfill practices
- Significant amount of tourism waste in summer season

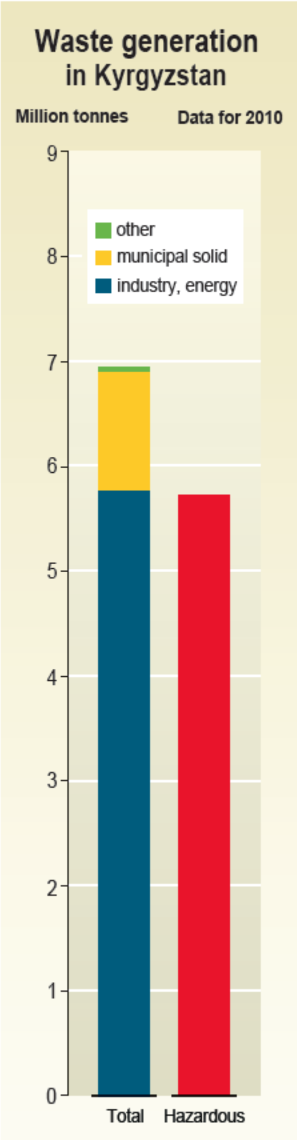
Improvements in waste and chemical management

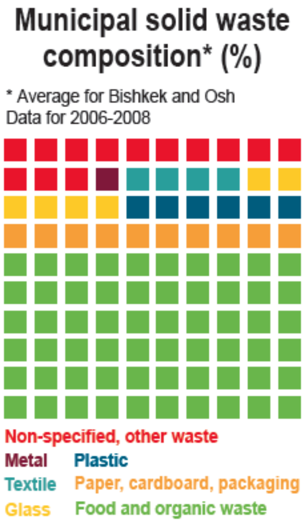
- Ongoing and planned clean-up actions or waste reduction initiatives
- OSH Municipal waste management initiatives

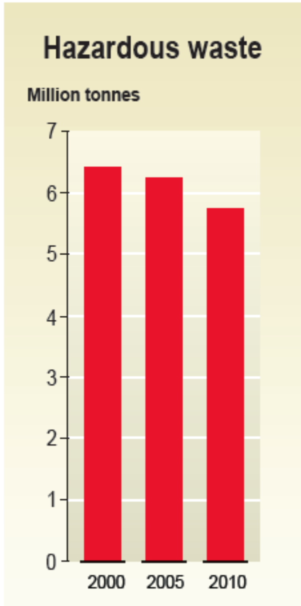
Kyrgyzstan

Most of Kyrgyzstan is mountainous terrain where the headwaters of the key rivers in Central Asia are located. About half of the country's hazardous waste was accumulated during the Soviet period and about half since independence, mostly from mining and processing.

Kyrgyzstan has generated between 5 and 10 million tonnes of industrial waste annually in recent years, including 5 million tonnes of waste from the Kumtor gold mine in the Issyk-Kul Province. The environmental statistics for the country estimate about 95 million tonnes of total waste, including 85 million tonnes of hazardous waste from active enterprises. Another 145 million tonnes of waste from mining and processing industries closed between the 1950s and the 1990s are considered as legacy waste. Overall, waste occupies more than 1 200 ha, and half of this is radioactive legacy waste contained in 33 tailings and more than 20 other waste sites spread across the country. The waste area of the national enterprise specializing in radioactive materials processing occupies another 300 ha.

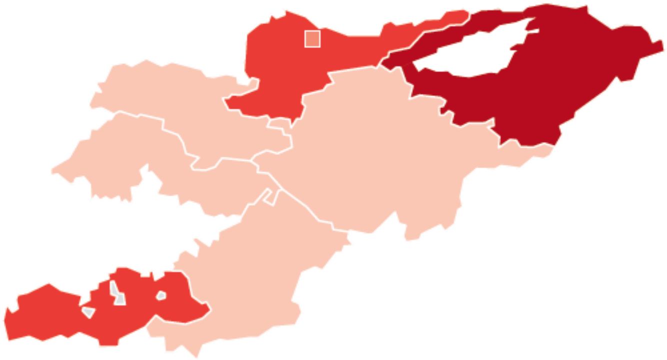




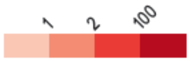


Source: Kyrgyzstan State of the Environment Reports, UNECE environmental indicators →

Note: Total includes hazardous.



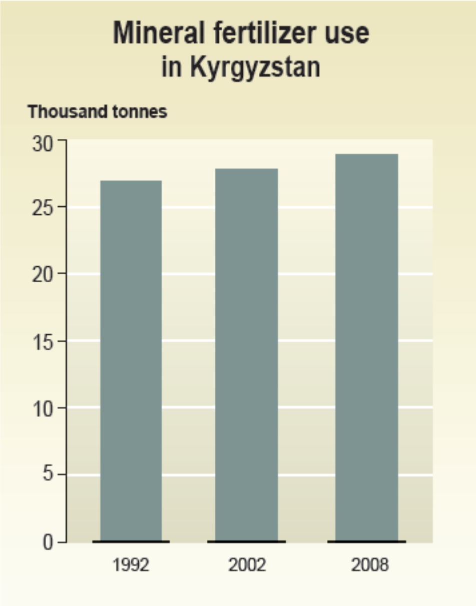
Industrial waste per province 2010-2011 (average)
(thousend tonnes)



Municipal solid waste per province 2010-2011 (average)
(thousend tonnes)

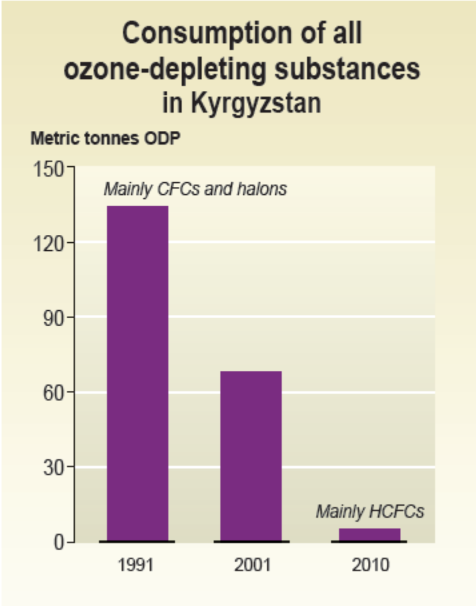
In recognition of the potential damage to its image, Kyrgyzstan regards the remediation and disposal of waste as a priority environmental issue. Unfortunately, as one of poorest countries in the region, Kyrgyzstan does not have the financial capacity to match its will. In addition, the country's natural conditions exacerbate the problem: intense erosion, seismic activity and landslides all make the containment of waste more difficult. Local residents searching for scrap metals at abandoned industrial waste sites often destroy the surface protective covers (where they exist), thereby increasing the impact of waste erosion. Mine waste has fuelled discontent and resistance to mining in general, and has colored perceptions. Regardless of the accuracy of the perceptions, this has had a considerable negative economic impact.

Municipal waste management relies on old and discredited practices, principally dumping on open ground. The amount of municipal waste generated has grown from 100-150 kg per person to 200 kg per person over the last 5 years (2005-2010), now exceeding 1 million tonnes annually. Almost three quarters of the total municipal waste is generated in the capital city, Bishkek. The conditions in most city waste collection points and urban landfills are unsatisfactory, and more than half of the municipal solid waste disposal sites do not meet environmental health requirements. But progress on a new system of waste classification and inventory is encouraging, as are recently adopted policies and commissions on chemicals. Perhaps most encouraging of all are the public initiatives taken by volunteers across the country. In cities, at Lake Issyk-Kul and in the remote mountains, young people and others work to collect rubbish and make these areas appear cleaner.



Source: FAO Stat (http://faostat.fao.org)

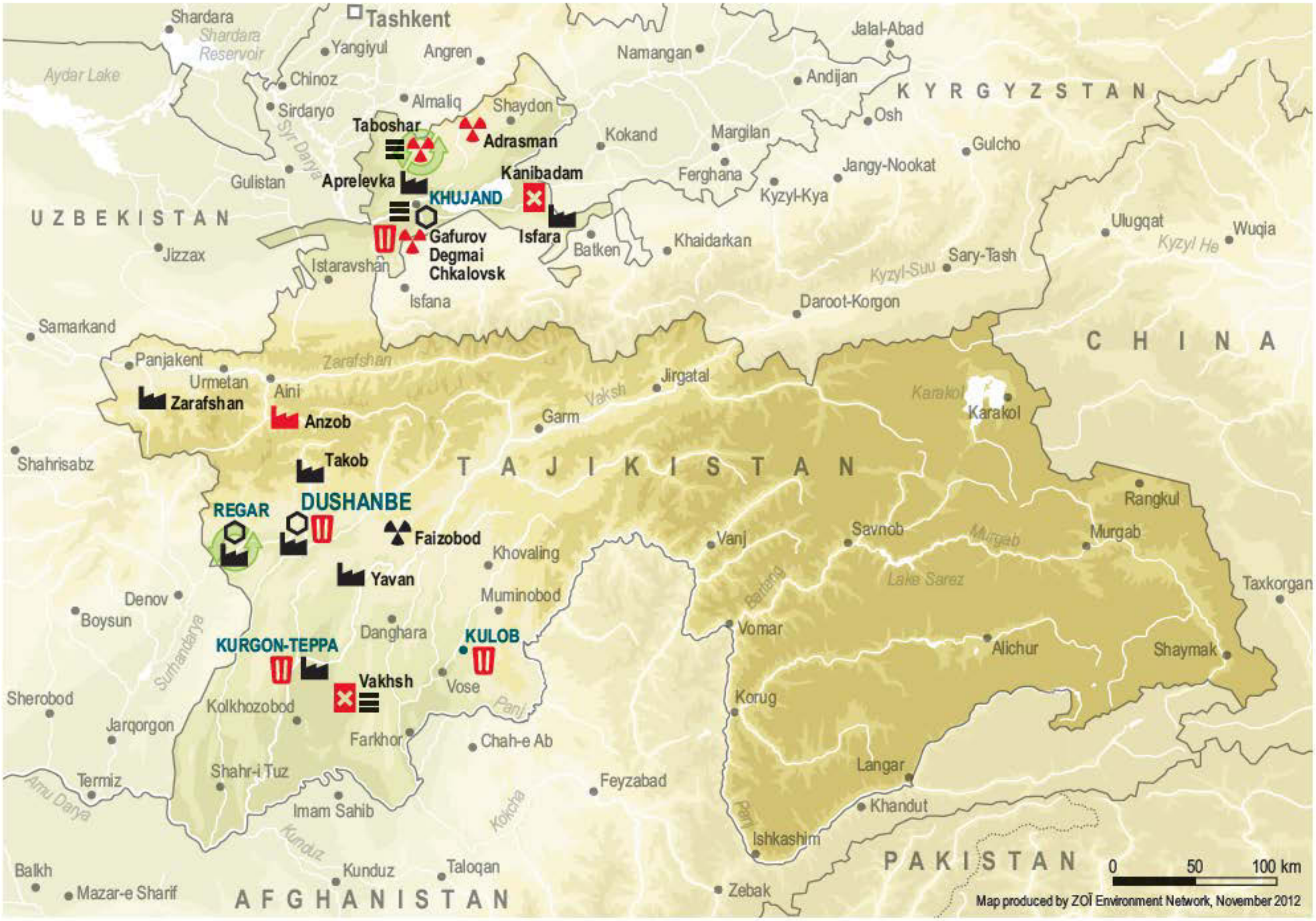
NOTE: data covers only nitrogenous and phosphate fertilizers



Source: UNEP Ozone Secretariat (http://ozone.unep.org)

NOTE: data covers all groups of substances in the Annex A, B, C and E

Kyrgyzstan is a traditional producer of asbestos-containing construction materials that are used nationally and exported abroad. The country also continues the tradition of primary mercury mining for export, and phasing out the mercury industry – not an easy task – is closely linked with the socio-economic dependency of the local community and with finding viable alternatives to mercury mining. There are areas where mercury is used by the artisanal, small-scale gold miners for gold extraction, but the amount of mercury application and release into the environment is supposedly minor. The use of ozone-depleting substances has fallen, but the cases of illegal export of CFCs from abroad continue, as does the import of huge numbers of toys that potentially contain hazardous substances.



Waste and chemical issues in Tajikistan

Sites with significant amounts of industrial waste and chemicals

- Poorly maintained radioactive waste, historical pollution
- Radioactive waste in controlled conditions
- Notorious historical pollution from industrial development
- Other industrial waste and chemical issues raising public concern
- Large amount of waste

Municipal waste

- Poorly managed waste collection or landfill practices

Sites with significant amounts of persistent organic pollutants

- Major stores and dumps of obsolete pesticides recognized as hotspots
- PCB-contaminated sites

Improvements in waste and chemical management

- Ongoing and planned clean-up actions or waste reduction initiatives
- KULOB Municipal waste management initiatives

Tajikistan

Most of Tajikistan's waste, along with most of the population and industry, is concentrated in the lower elevations in the western part of the country. The rest of the country comprises high mountains with little population or industry. The disposal of industrial waste, particularly legacy waste from Soviet-era uranium mining and processing, is a major environmental concern in northern Tajikistan. As in Kyrgyzstan, natural disasters and erosion are the key forces negatively affecting the current state and future safety of the legacy waste. Two large agricultural waste sites containing up to 10 000 tonnes of obsolete and prohibited pesticides and other toxic agrochemicals pose major environmental and health risks. In addition, poor management of hazardous waste from the transport and medical sectors is a growing concern.

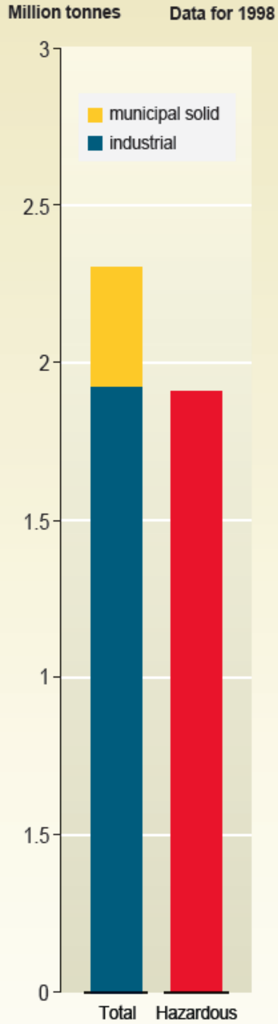
The industrial sector generates about 1.5 million tonnes of waste annually, an amount that is roughly equivalent to the yearly amount of municipal waste. There is an estimated total of 200 million tonnes of accumulated waste in the country. More than 120 waste sites of different types (urban landfills, agriculture, mining and manufacturing waste) cover an area of 1 400 ha. Initial studies and inventories of waste sites have been carried out, and some progress has been made, but most waste legacies and the emerging waste issues remain unresolved. The reuse of construction waste and the recycling of industrial waste in the aluminum and textile sectors is one of the more positive waste management trends since independence.

Municipal solid waste composition* (%)

* Average for Dushanbe
Data for 2006-2008

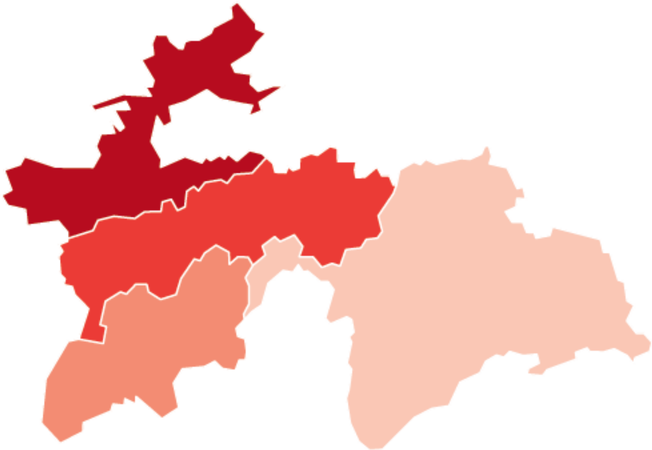
Source: S. Webb. PhD Thesis. Management of environmental risks associated with landfills in seismically active regions of Central Asia, 2009

Waste generation in Tajikistan

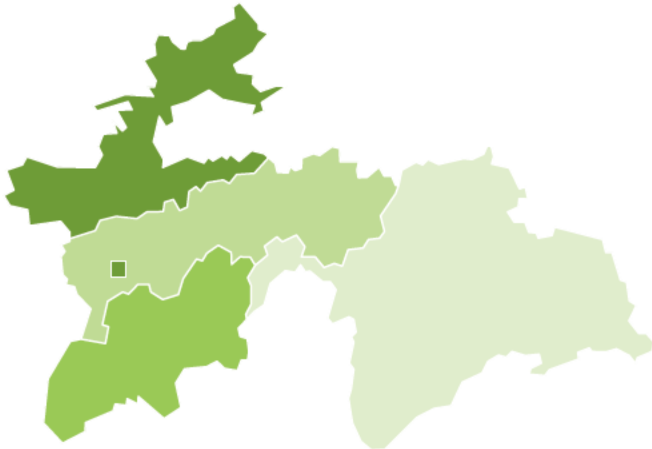


Source: Tajikistan State of the Environment Report →

Note: Total includes hazardous.



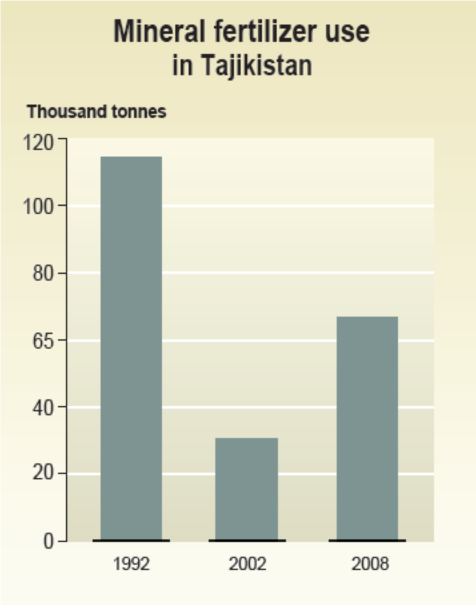
Industrial waste per province 1998-2000 (average)
(thousend tonnes)



Municipal solid waste per province 1998-2000 (average)
(thousend tonnes)

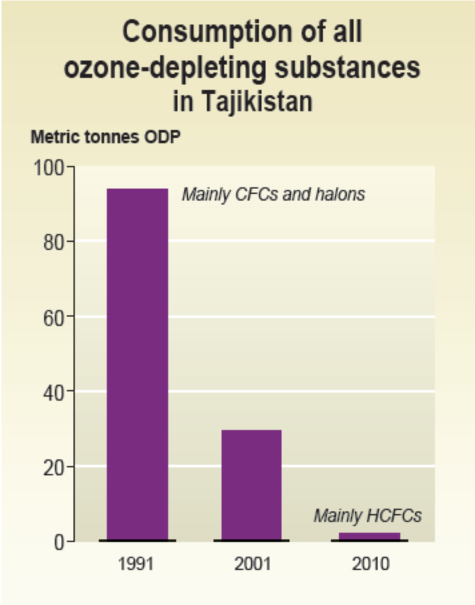
Urban populations have increased due to migration from the countryside, and municipal waste has grown in proportion to the population and growth in consumption. Meanwhile, environmental health awareness has declined, and the condition of almost all urban landfills is daunting. Waste disposal in Dushanbe and other large urban centers remains an important issue for municipal and environmental authorities. Waste tariffs for residents and waste charges for businesses are very low, and lead neither to improvements in waste collection and disposal nor to incentives in waste sorting and recycling.

In Soviet times, Tajikistan had one of the highest rates of application of agricultural chemicals per hectare in Central Asia. As a result, much of the arable land had excessive concentrations of pesticides and mineral fertilizers. Since independence, the application of agrochemicals has greatly declined and farmers increasingly have switched to biological methods and organic fertilizers. Another positive development is the significant reduction in the consumption of ozone-depleting substances (this is partly due to the decline in the Pamir refrigerator manufacturing business).



Source: FAO Stat (http://faostat.fao.org)

NOTE: data covers only nitrogenous and phosphate fertilizers



Source: UNEP Ozone Secretariat (http://ozone.unep.org)

NOTE: data covers all groups of substances in the Annex A, B, C and E

Tajikistan has several opportunities to improve its management of waste and chemicals: developing its national inventory of waste and bringing its waste and chemicals statistics up to date; revising its financing and support of recycling and reuse of municipal waste and encouraging youth initiatives and education on waste; improving the conditions in major landfills and taking action on hazardous waste landfills; securing the conditions of tailings at risk from natural disasters and erosion; and developing a national chemical profile and regulations.

Waste and chemical issues in Turkmenistan

Sites with significant amounts of waste and chemicals

- Radioactive waste in controlled conditions
- Notorious historical pollution from industrial development
- Other industrial waste and chemical issues raising public concern

Improvements in waste and chemical management

- Ongoing and planned clean-up actions or waste reduction initiatives
- ASHGABAT — Municipal waste management initiatives
- Controlled storage of obsolete agrochemicals

Turkmenistan

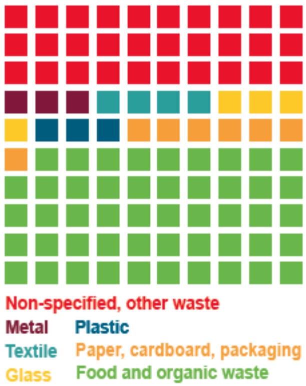
Turkmenistan is characterized by its large area and small population. Turkmenistan's hazardous waste is concentrated in the western part of the country, where the oil and chemical industries have operated for many decades on the Caspian Sea, mainly on the Cheleken Peninsula and in Turkmenbashy Gulf. The country's industrial profile has diversified and production levels have increased since independence, particularly for mineral fertilizers, iodine, bromine and other chemicals. At the same time, consumption of ozone-depleting substances has dramatically decreased.

Almost 500 000 tonnes of municipal waste are generated annually in Turkmenistan, and almost all of it goes into landfills. Separation at source has not yet been introduced, but there are unofficial schemes for the collection of paper, glass, plastics and food residues.

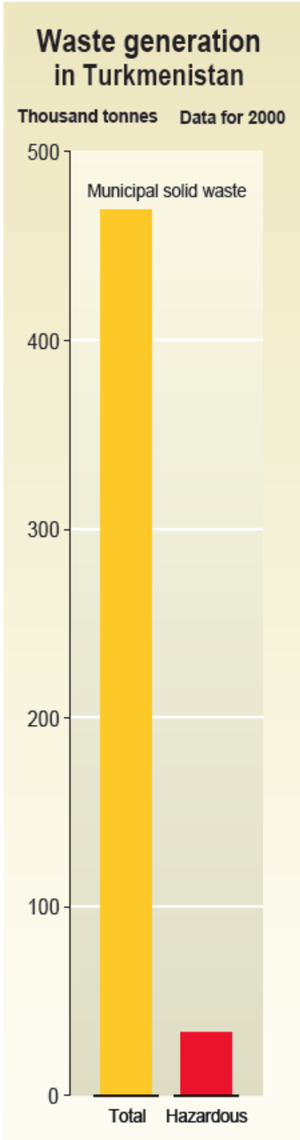
Turkmenistan has recently made good progress on the relocation and safe disposal of radioactive waste generated in iodine and bromine manufacturing, and has made improvements in oil industry practices. There is also proven capacity for toxic waste clean-up, as demonstrated by the State Concern "Turkmen Chemistry", which has collected hazardous waste from abandoned pesticide storage sites from across the entire country and disposed of it in specially designated sites that are fenced, guarded and regularly inspected. The creation in 2009 of the National Program for Safe Management of Medical Waste in Health Facilities (implemented in 2011) is another remarkable achievement.

Municipal solid waste composition* (%)

* Average for Ashgabat
Data for 2007-2008



Source: W. Straka, G. Allaberdiyev.
Site investigation: Management of environmental risks associated with landfills in seismically active regions of Central Asia, 2008



Source: Turkmenistan State Committee on Statistics →

Note: Total includes hazardous.

Waste and chemical issues in Uzbekistan

Sites with significant amounts of industrial waste and chemicals

- Poorly maintained radioactive waste, historical pollution
- Radioactive waste in controlled conditions
- Industrial waste and chemical issues raising public concern
- Major source of hazardous industrial waste

Sites with significant amounts of persistent organic pollutants

- Disposal sites for agricultural chemicals
- PCB-contaminated sites

Improvements in waste and chemical management

- Ongoing and planned clean-up actions or waste reduction initiatives
- TASHKENT Municipal waste management initiatives

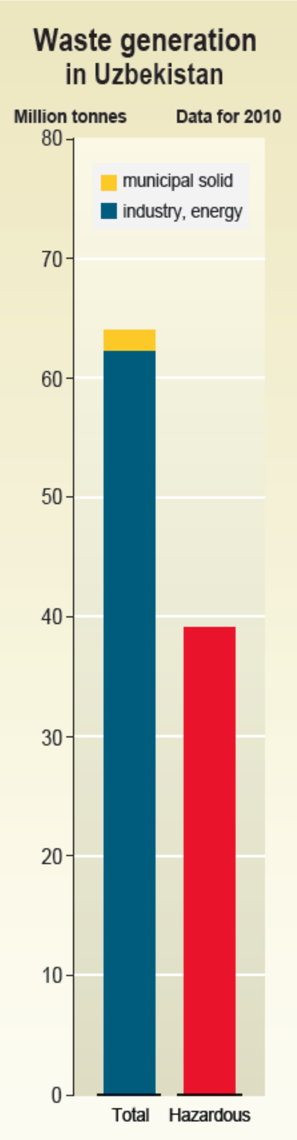
Uzbekistan

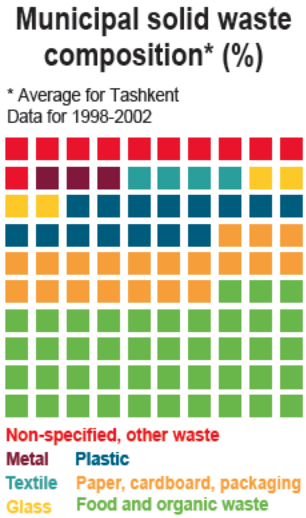
Uzbekistan, which has a largely rural population of 29 million, is the most populous of the Central Asian countries and has probably the most diverse economic profile. Most industrial waste is concentrated in the Navoiy province in the middle of the country and around the cities of Tashkent, Almalyk and Chirchik. Soviet legacies include residual pollution in some rivers, the accumulation of agricultural chemicals in the Ferghana Valley and abandoned uranium mining sites in Charkesar and Yangiabad.

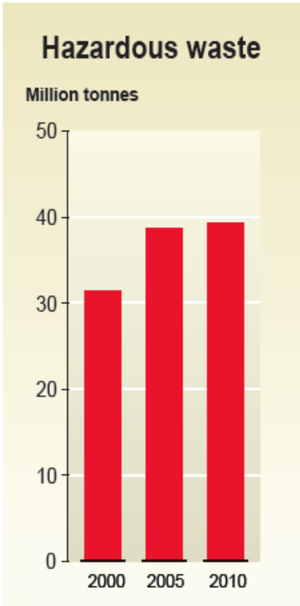
The industrial and agricultural sectors generate between 50 to 100 million tonnes of waste annually, including roughly 40 million tonnes of hazardous waste. The volume of municipal waste generation exceeds 4-6 million tonnes per year and the amount of municipal waste generation per capita remained at a level of 160-200 kg per person for 2005-2010. Historically, the country has managed municipal waste well, and in recent years has improved its municipal waste management systems. Uzbekistan now has a recycling program for paper, plastics and metals. The total amount of accumulated waste in the country is estimated at 2 billion tonnes. There are 178 urban landfills, 40 tailings and sludge ponds and a dozen other waste dumps occupying an area of 2 000 ha.

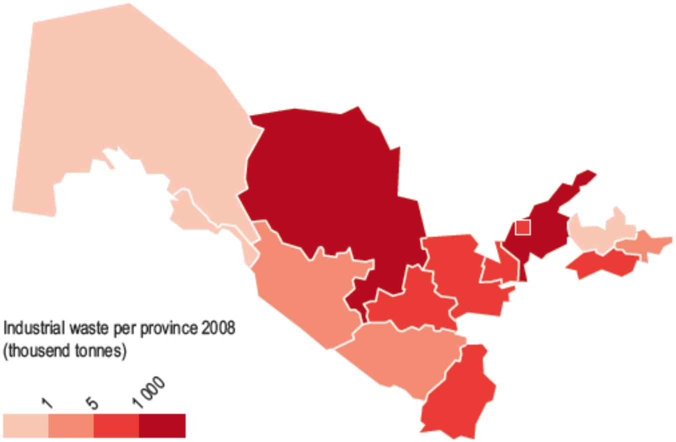
Source: Uzbekistan State of the Environment Reports, UNECE environmental indicators →

Note: Total includes hazardous.



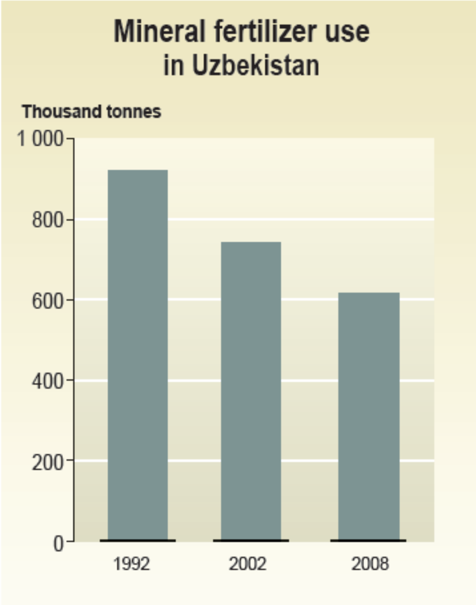






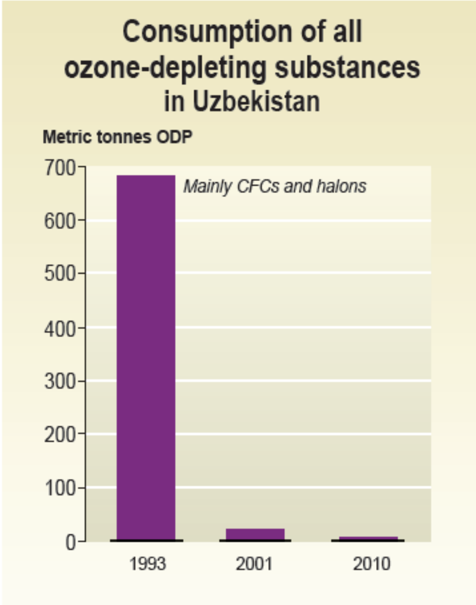
Uzbekistan has the largest area of irrigated land in Central Asia with a significant part originally devoted to cotton cultivation for the needs of the Soviets. Uzbekistan's agricultural production relied to a large degree on massive applications of fertilizers and agrochemicals, resulting in the formation of dozens of sites for the dumping of obsolete and expired substances. Following independence, the profile of the agricultural sector started to change and a significant area of cropland is now allocated to food production. As in other countries of Central Asia, agricultural chemicals are now applied less intensely and in smaller amounts, and biological methods for plant protection and productivity have often replaced chemical ones. The high concentrations of legacy pesticides in soils in the Ferghana Valley provinces still cause concern.

The country has made progress on several fronts, including improvements in wastewater treatment. Tashkent has upgraded its municipal solid waste system. Several mining enterprises extracting gold are shifting to a technology that allows more efficient gold extraction from refractory ores and produces less hazardous waste. Most uranium extraction is now based on underground leaching technology that produces less waste than previous surface mining and open-air uranium leaching practices. Initial remediation has begun at the Charkesar and Yangiabad uranium sites with government and donor support. While waste on the surface has been isolated, sealed or fenced, the drainage of mine water containing excessive concentrations of uranium, lead and other pollutants presents a challenge. Processing plants are removing mercury from light bulbs. The use of ozone-depleting substances has decreased from more than 700 tonnes in 1992 to almost zero in 2010.



Source: FAO Stat and Uzbekistan State of the Environment report 1988-2008

NOTE: data covers only nitrogenous and phosphate fertilizers



Source: UNEP Ozone Secretariat (http://ozone.unep.org)

NOTE: data covers all groups of substances in the Annex A, B, C and E

The national chemicals management profile of Uzbekistan drawn up in 2012 in collaboration with UNITAR is a good reference document, providing a comprehensive overview of the legal, institutional and technical infrastructure for chemicals management. It recommends moving forward with ratification of the Stockholm and Rotterdam Conventions as well as drawing up a national action plan on the Strategic Approach to International Chemicals Management (SAICM), and creating an efficient institutional and financial base for implementation. It also calls for improvements in the system of labeling hazardous substances, and action on obsolete pesticides and other hazardous waste.

Waste in Central Asia

Waste is easy to recognize, but can be hard to define. It is something for which we have no further use. But one word covers two different concepts: what remains for disposal after making or using a needed product on the one hand and from inefficient production on the other. We may disagree about what waste really is. For some it is an opportunity, as disposal generates revenue. Waste comes in many forms. Examples of common types of municipal waste include plastics, textiles, wood, paper, glass, metals and organic materials, not forgetting hazardous waste.

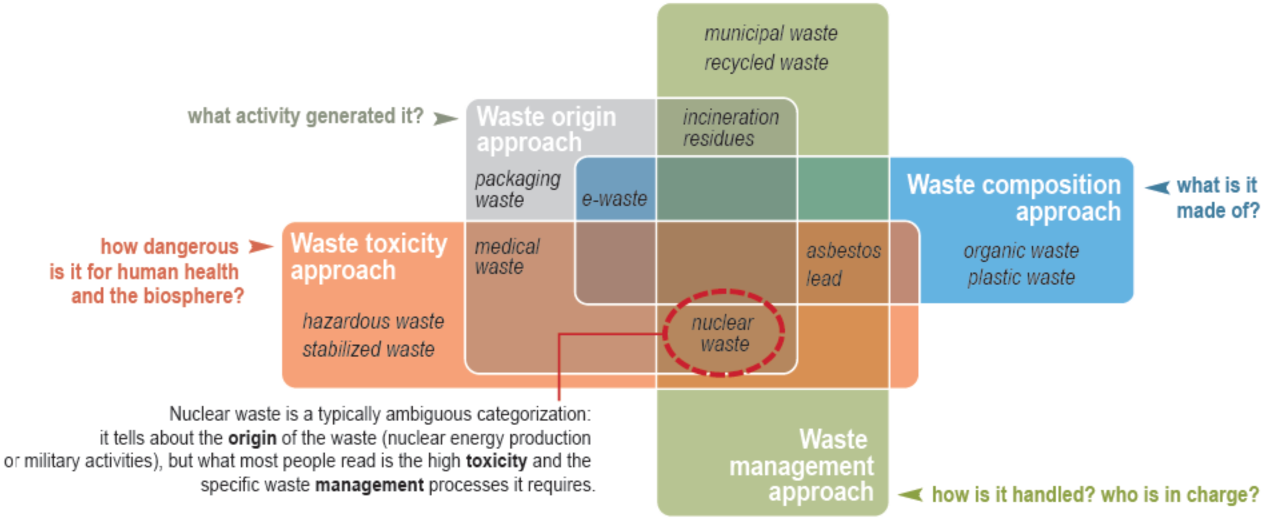
Given the different systems of waste classification in Central Asia, it is difficult to form a clear regional overview of hazardous and municipal waste – what and how much there is and how it is handled. Limited statistics and data availability on waste and different units of measurement used in waste statistics (by volume or by mass) add further complexity.

In Central Asia, as in other parts of the world, there is a growing concern about the rapidly increasing amounts of plastic waste and of electronic and electrical waste (e-waste). Other priority waste issues in the region include hazardous waste in extractive industries, agriculture and the military, and outdated municipal waste management approaches.

About the difficulties of classifying waste (and counting it)

Different approaches and overlapping definitions

Statistical institutes of the world use various waste classifications, based on different approaches.
This diversity is the major obstacle to data globalization and comparison.



Waste external costs... a (dry but) useful approach

LANDFILL, INCINERATION AND OTHER WASTE-RELATED ACTIVITIES

EMISSIONS TO SOIL AND WATER

Landfill leachates and incineration ashes

Mercury
Lead
Cadmium
Arsenic
Chromium
Heavy metals
Asbestos
Radioactivity

EMISSIONS TO AIR

Incineration fumes

Particulate matters
Dioxins
Furans
Sulphur dioxide

Landfill gases:

Methane

Carbon dioxide
Nitrogen oxides
Polychlorinated biphenyls (PCBs)

DISAMENITIES

Odour
Visual impact
Pests (insects, rats)
Heavy vehicle trafic
Noise

LAND CONSUMPTION

The space dedicated to landfill and other waste management or confinement sites is lost for farming, housing and leisure.

Endangered resources

Contaminated rivers, ocean, aquifers
Contaminated soil and cropland
Air pollution
Sanitation problems

Loss of biodiversity and ecosystem services

Climate change

Disasters
More infectious diseases
Salinisation of freshwater
Agricultural changes

Loss of value (land, house)

Land competition

Conflicts related to environmental justice (poor vs. rich neighbourhoods) and land competition

Freshwater and food resources at stake

Drop in yield

Quality of life impaired

Health consequences

Liver, kidney dysfunctions
Breast feeding
Respiratory system impairment
Blood and nervous disorders
Cancers

POSSIBLE WAYS OF MEASURING THESE COSTS [EXAMPLES]

Climate change costs

Disasters casualties (live losts)
Disasters insurance costs

Volume or price of yield losses

Humanitarian and institutional health expenses (famines, disasters)
Famine casualties

Sea-level rise:
Number of refugees
Price of land lost

Biodiversity costs

Loss of "ecosystem services"
Cost of remediation

Cost of drinkable water alternative

Health costs

Health spending
Years of Life Lost (YOLL) approach
Value of Statistical Life (VSL) approach
Lives saved by remediation

Health expenditures related to psychological disorders (including depression)

Cost of disamenities

Price of land
Loss of land revenue
Cost of remediation
Impact on tourism

Cost of conflicts over land

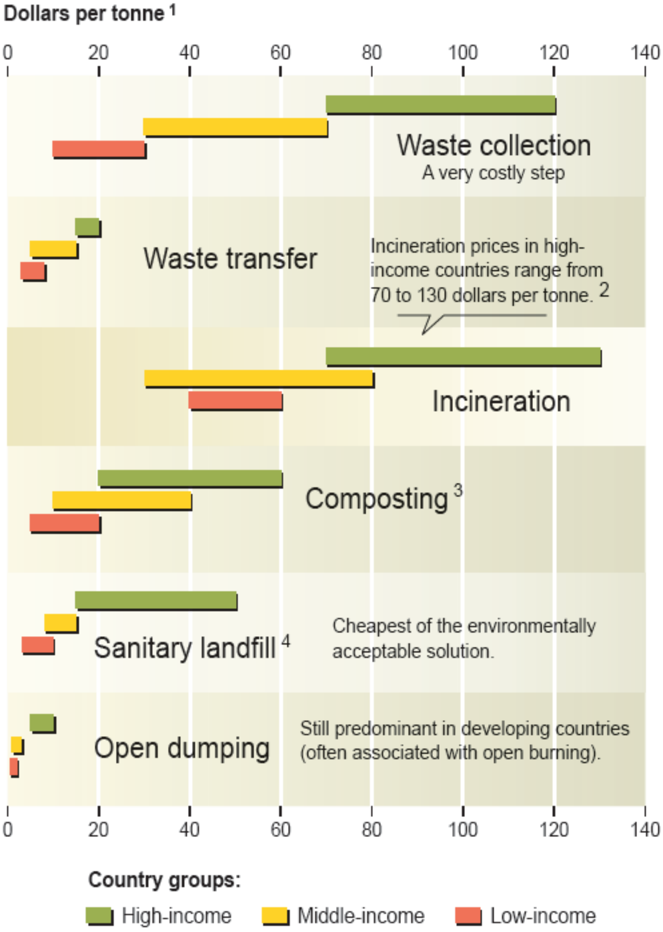
Cost of litigation
Years of proceedings

Source: Emmanuelle Bournay from various sources including *A Study on the Economic Valuation of Environmental Externalities from Landfill Disposal and Incineration of Waste*, European Commission, 2000; Stern Review Report on the Economics of Climate Change, 2006; The Economics of Ecosystems and Biodiversity (TEEB) Study, 2011.

Waste can be expensive for those responsible for disposing of it. Sometimes disposal demands sophisticated technology; sometimes the technology itself is not yet available, as with radioactive waste. Local, easily identifiable pollution may show up in environmental or news reports, but most environmental damage from waste is harder to measure and even to recognize – climate change, for example, or damage to ecosystems and biodiversity. Waste also damages health and causes loss of amenities, for example by discouraging tourism and requiring land restoration. These hidden impacts clarify how external costs need to be shown as an internal, intrinsic part of the price society has to pay.

Almost all of the Central Asian countries generate large amounts of hazardous waste – primarily from mining and manufacturing. Current waste generation in combination with legacy waste from mining and agriculture and soils contaminated with persistent organic pollutants (POPs) add up to a globally significant problem. The countries in the region have adopted some initiatives, but with Soviet assistance no longer available and with limited resources of their own, poorer countries are looking for donor support. The scale of the problem, however, indicates that donors can at best demonstrate how a clean-up could proceed, but cannot fully fund the effort.

Solid waste management costs



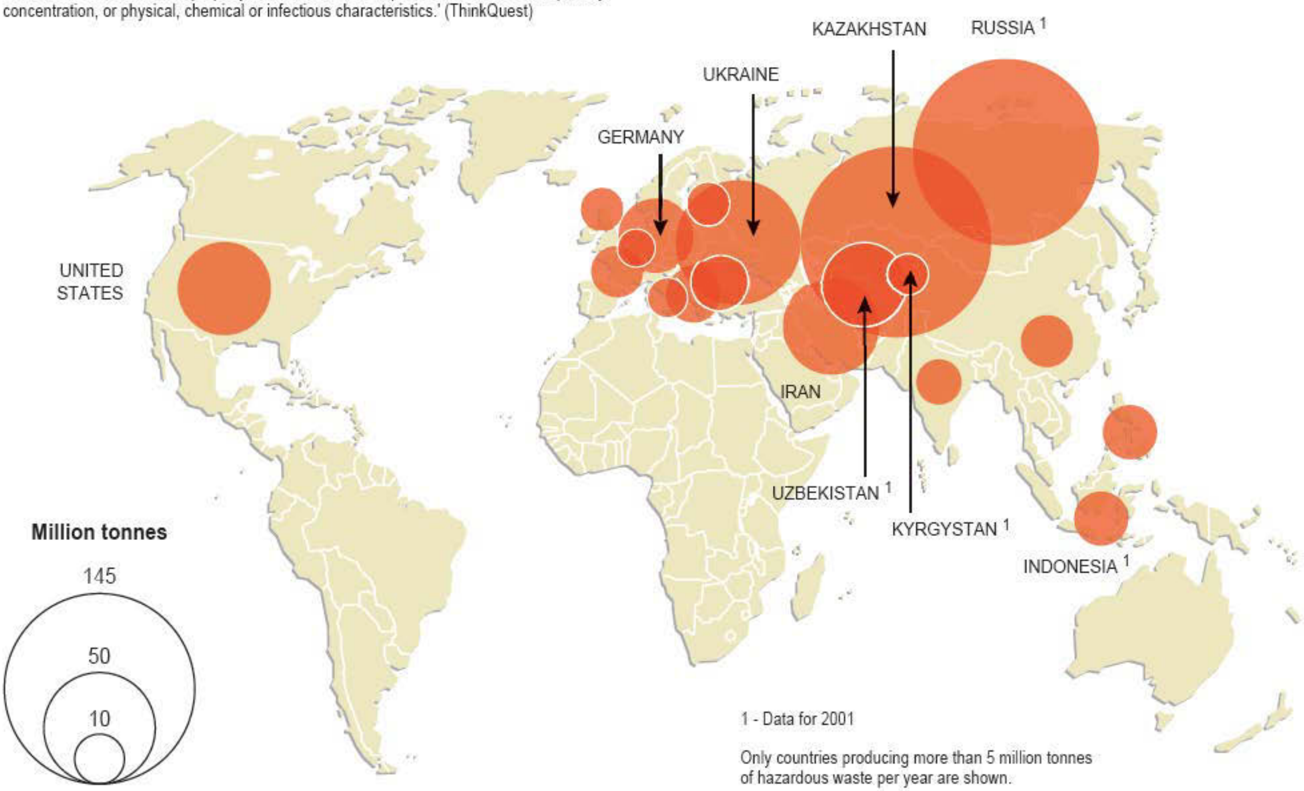
1 - In order to capture economies-of-scale, the study considers cities over 500 000 people or producing more than 250 tonnes of waste a day.
2 - The higher range of costs for incineration is for systems with modern air pollution control.
3 -The higher range of costs for composting is for systems with mechanized classification, pulverization and forced aeration; while the lower range of costs is for systems with hand sorting, trommel screening and simple open air windrows.
4 - The higher range of costs for sanitary landfill is for systems with plastic membranes and full leachate collection and treatment systems; while the lower range of costs is for natural attenuation landfills where site conditions do not require leachate management. Careful site selection can substantially reduce landfill costs.

Source: Sandra Cointreau, *Occupational and Environmental Health Issues of Solid Waste Management. Special Emphasis on Middle- and Lower-Income Countries*, World Bank, Urban papers, July 2006.

Major hazardous waste producers
(countries for which data are available)

'Hazardous waste is solid waste which may pose a substantial hazard to human health or the environment when improperly treated, stored or disposed of because of its quantity, concentration, or physical, chemical or infectious characteristics.' (ThinkQuest)

Please be careful when interpreting this map: wastes that can be considered as hazardous differ from one country to the next.

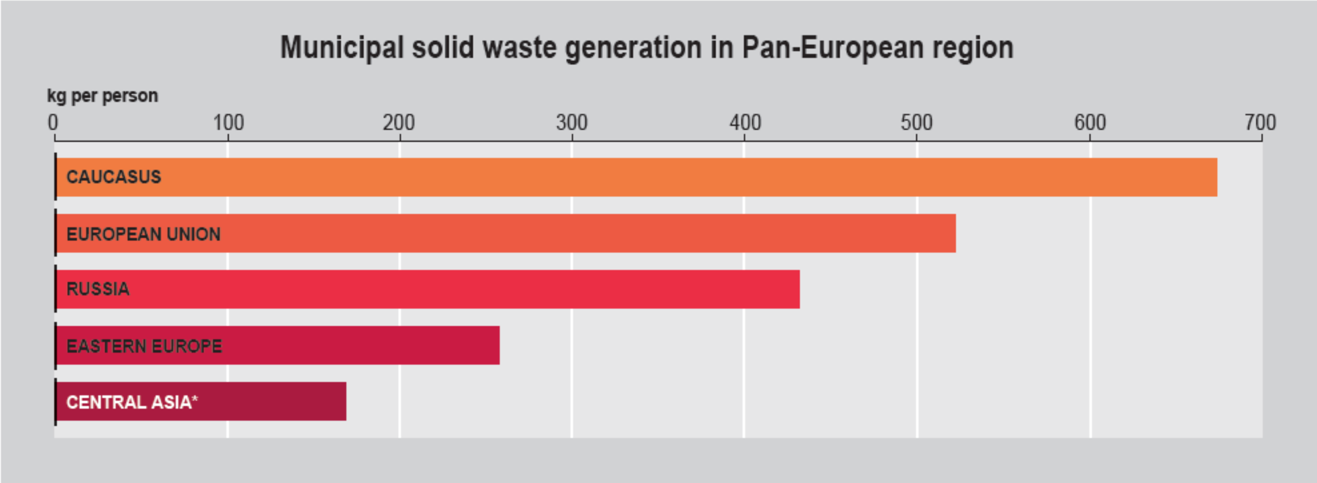


1 - Data for 2001

Only countries producing more than 5 million tonnes of hazardous waste per year are shown.

Sources: Basel Convention, 2011 (data for 2007 or latest year available); *Environmental Indicators*, United Nations Statistics Division, 2009; Eurostat 2011 (data for 2008 or latest year available); Philippe Chalmin, Catherine Gaillochet, *Du rare à l'infini. Panorama mondial des déchets 2009.*

As parties to international conventions related to chemicals and waste, the countries of the region are making these a political priority. Together with new standards for industrial production and new technology, this political attention is fuelling progress. Increasingly, municipal waste is an issue in the Central Asian capitals and other major cities as they strive to maintain an image of cleanliness. Most of the hazardous waste in the region is located in desert areas with low populations, but some industrial towns also have their share. In the mountainous countries – where all the waste is upstream from the lowland countries – even small amounts of waste carry significant risks.



Source: UNECE Environmental indicators 2011, national state of the environment reports

NOTE: average annual value for 2005-2008. Data for Tajikistan and Turkmenistan are not available

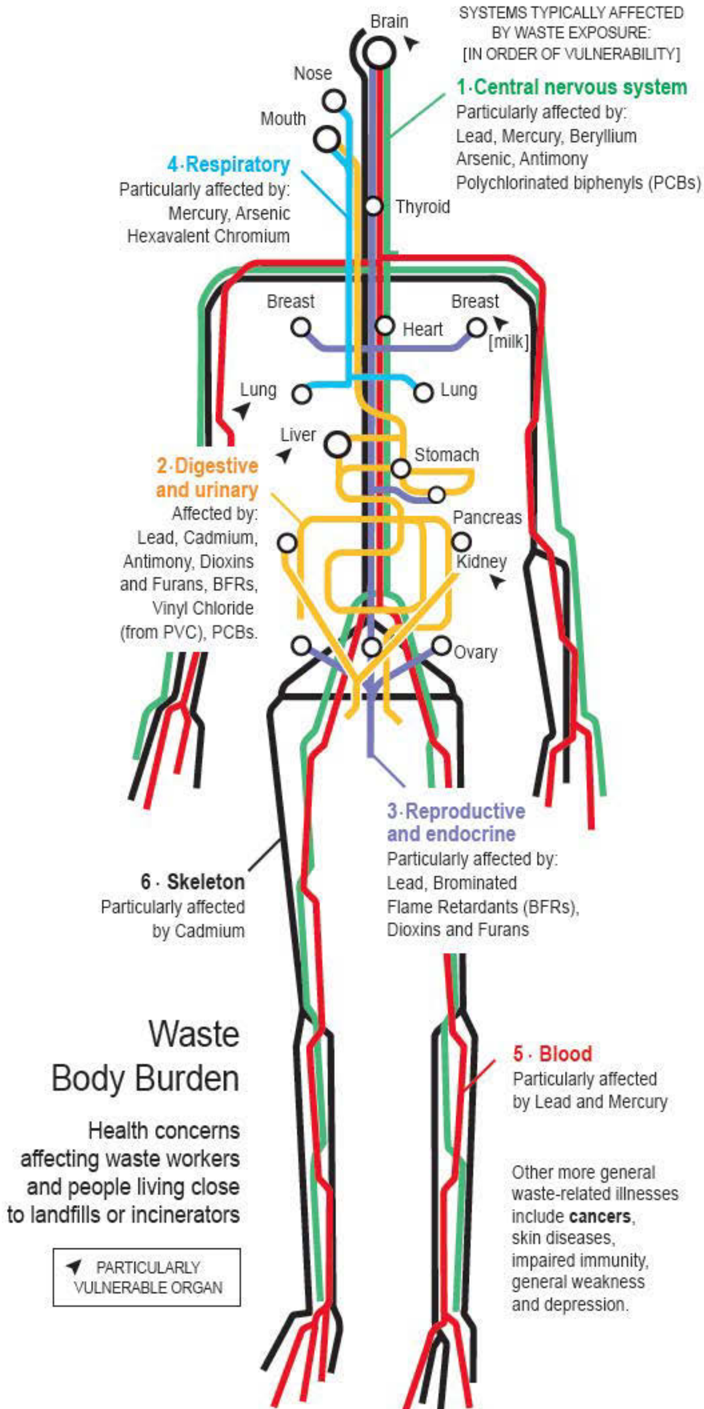
Wastewater and solid municipal waste

Traditionally, the Central Asian countries and cities have opted for the simple solution to municipal waste problems – dumping the waste in landfills located on convenient open ground not too far from the sources. Many of these dumping grounds have long since passed their useful life, but continue in service. They tend to be poorly organized, with inadequate planning and engineering, no sorting, no inventories conducted and lacking in modern measures to make them safer. The focus was on maintaining clean cities; the dumping grounds were out of sight and out of mind. These primitive landfills also accepted transport, construction and food processing waste. Over time residential areas grew closer to the landfills, which now represent a health hazard in a number of cities.

The only waste compaction is carried out by bulldozers, and intermediate covers are rarely installed. As a result, these landfills typically have small fires that burn constantly and release toxic substances. The inadequate compaction of the waste increases the washouts that cause erosion and releases into the environment.

The countries lack the infrastructure to manage waste separation, and have demonstrated no will to change course. The failure to collect waste from collection points results in random dumping and the burning of waste either by self-ignition or because fires were deliberately set. Fallen leaves are burnt rather than composted in the cities, and the emissions are a health hazard. The manual recovery of usable waste from containers is common in Central Asia, and an informal collection system targets glass, plastic bottles and even dry bread.

In the Soviet period, most Central Asia cities had wastewater treatment systems managed by special authorities, especially where a downstream population was potentially at risk. In some cases the residential systems were linked to industrial wastewater treatment, and efficiency declined. Unfortunately, these wastewater treatment systems received little attention after they were built, and are no longer functioning at a satisfactory level. Now even capital cities are wondering what to do about their wastewater. Meanwhile, in most cities storm water discharges directly into water bodies.



Sources: Silicon Valley Toxics Coalition, 2010; Metro lines adapted from Sam Loman, 2011 (www.just-sam.com).

Fires in waste bins, Bishkek, Kyrgyzstan


Waste pickers with dogs in Bishkek landfill, Kyrgyzstan

Solvents and paints

Businesses and individuals in Central Asia often do not recognize the potential hazards related to solvents and paints, and dispose of them with other waste, thus adding to the environmental risks. Solvents are widely used – in dry cleaning, paint thinners, nail polish removers and in many other applications. Some are associated with toxicity to the nervous and reproductive systems, liver and kidney damage, respiratory problems and cancer, so their disposal demands particular care.

E-waste

The amount of e-waste, end-of-life electrical and electronic products is growing very fast. The problem was initially mainly thought to be an issue in developed countries, but in fact the volume of obsolete personal computers and mobile phones generated in developing countries has already exceeded that of developed countries. Central Asia is no exception to this trend: the number of mobile phone and personal computer users in the region has skyrocketed in the last decade.

The content of much e-waste can be a risk to health and the environment: considerable vigilance is required in order to guard against health or environmental risks when lamps containing mercury and cadmium, modern types of battery and other e-products are finally dismantled. Criteria are currently being developed for the labeling of nanomaterials under the Globally Harmonized System of Classification and Labeling of Chemicals.

There are no facilities or established procedures in Central Asia for separating waste in batteries, and no cultural awareness of the potential problems when e-waste is not managed properly. In some instances lamps with mercury content are compacted, the mercury extracted and the waste recycled, but no system exists for the return or disposal of used electronics such as mobile devices and computers. In recent years Uzbekistan has increased its capacities for disposing of lamps containing mercury. With an increased focus on green design globally, the amount of electronic waste is expected to decline over time.

Motorisation level in Central Asia

Number of cars per 1 000 people in 2009[1]

[1] Except for Uzbekistan (2004), Turkmenistan (2007)

Red cars are for countries where the numbers of cars between 2003 and 2009 increased by 30 % or more.

Map produced by ZOÏ Environment Network, November 2012
Source: World Bank Development Indicators (→ http://data.worldbank.org/data-catalog/world-development-indicators)

Hazardous waste in the transport sector

The number of light cars in Central Asia is growing, and so is the volume of waste in the road transport sector. A significant waste problem from road vehicles is used tires. Toxic substances can leach out from tires in landfills and if the tires are burned they may emit ultrafine toxic particles. In some cases tires are re-used (for example, to prevent river bank erosion) or recycled, particularly in Kazakhstan, but the countries of Central Asia have no systems yet in place for the recycling of defunct cars, spare parts, lead acid batteries or used oils, brake fluid and antifreeze.

Railways use creosote-treated wooden sleepers or crossties in tracks across Central Asia and beyond. Creosote, a wood preservative, contains toxic compounds including polycyclic aromatic hydrocarbons. Some are carcinogenic. While the sleepers remain embedded in railway tracks the creosote does not pose environmental or health risks. But residents sometimes use out-of-service crossties as a construction material for farms or houses, thereby increasing exposure to the carcinogenic effects of creosote.

Aviation can also produce hazardous waste in the form of chemicals that must be disposed of after use in maintenance and cleaning. A notorious pollution hotspot in Semipalatinsk in the eastern part of Kazakhstan was created when Soviet military aviation fuel leaked and seeped underground, contaminating local groundwater sources. The authorities now informally call the contaminated groundwater “Kerosene Lake”, and measures to contain and clean up the pollution are under way. Most of the Soviet-produced aircraft in Central Asia are at the end of their operational lifetime or already out of service. About 800 of these obsolete military and civilian aircraft have not been dismantled and remain in airports.

Hazardous waste in the medical sector

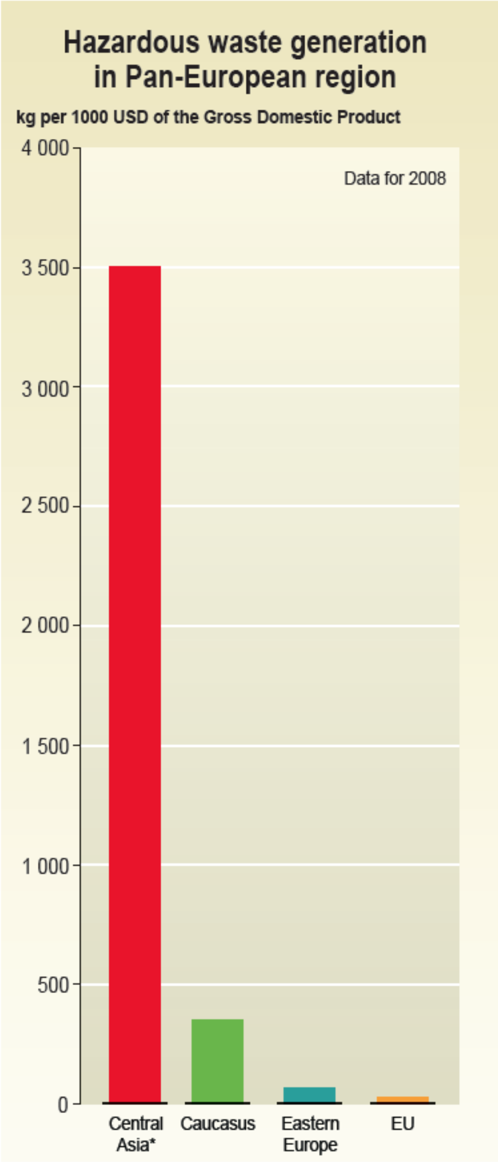
Biomedical waste consists of solids, liquids, sharp items such as scalpels and needles, and laboratory waste – blood, for instance – contaminated with potentially infectious agents or other materials that are judged a threat to public health or the environment. Common producers of this form of waste include hospitals, laboratories, and doctors', dentists' and veterinary premises. The same sources also generate what is sometimes called medical or clinical waste, which is not contaminated but could appear to be to outsiders.

Biomedical waste must be properly managed to protect people, specifically health-care and sanitation workers regularly exposed to it. It should be placed in specially labeled containers for removal and must not be mixed with other forms of waste. Infectious waste is often incinerated, or sterilized with steam under pressure in an autoclave. Medical premises may also need to dispose of a variety of hazardous chemicals which require special treatment, including radioactive materials.

Industrial hazardous waste

The management of industrial hazardous waste is complicated by the diversity of the waste. Most industrial hazardous waste is generated in the chemical processing, metallurgy and textile industries. But in Central Asia the largest amount of industrial hazardous waste by volume or by geographic spread is mining waste. A growing proportion of hazardous waste comes from the cyanide used in gold processing. Cyanide loses some of its toxicity when tailings are stored and it is exposed to environmental factors and treated with chlorine dioxide, but a tailings failure or a transportation accident may result in cyanide and other chemicals being released.

Other hazardous waste results from the by-products of industrial processes, for example arsenic, lead, chromium and mercury, all of which may end up in tailings piles. There are no quick solutions to these contaminant issues, and unlike cyanide, these substances remain hazardous and mobile in the environment, but are less toxic when mixed with other substances. The hope is that hazardous waste will be properly managed, and the challenge to management is to develop an effective enforcement regime.



Source: compilation of data from the Basel Convention, OECD Environmental data, EuroStat, EEA, UNECE environmental indicators, state of the environment reports

* data covers Kazakhstan, Kyrgyzstan and Uzbekistan

Chemicals in Central Asia

Chemicals in Central Asia

The chemical industry worldwide has grown rapidly and significantly in recent decades. Much of the growth, particularly in the last 10 years, has been driven by developing countries and transition economies such as those in Central Asia. The exact number of chemicals on the market is not known, but under the pre-registration requirement of the European Union chemicals regulation more than 140 000 substances are being listed.

The release of chemicals into the environment is a global problem. Agricultural fertilizers and pesticides leaching into water, dyes from the textile industry and heavy metal pollution from mining and smelting are just some of the factors contributing to this problem. All of these sectors are important to the countries of Central Asia. Environmental releases of chemicals affect the general public, and particularly those who live or work near the sources of pollution. But consumers in Central Asia are also exposed to chemical releases in a subtler way – through toys and food, for example.

Kyrgyzstan is the main entry point into Central Asia for imported toys, over 500 tonnes of which enter the country annually. Many toys lack health certificates, and sometimes emit toxic odors and degrade quickly. This trade continues even though there is no verification of the materials used in producing the toys, and NGOs and residents are seeking government intervention to control the situation. Kyrgyz authorities are reviewing the situation, and are expected to endorse special regulations in the near future.

The chemical contamination of foodstuffs is another widely discussed issue in the media and among the public. Some food products have high concentrations of chemicals from fertilizers containing potassium and phosphorus, or from pesticides applied on agricultural land in the past. Preservatives and other additives, especially in milk and flour, are an additional concern. Both toys and food represent well-known health hazards, although they are not necessarily the most hazardous items people are exposed to. The lesser-known risks come from the misapplication of chemicals, pesticides, heavy metals and ozone-depleting substances.

Endocrine-disrupting substances warrant a special note. These substances – including PCBs and other POPs, and lead, mercury, cadmium and arsenic – alter the hormonal system in humans and animals. The adverse effects include reproductive problems such as infertility, cancers and malformations, some of which may be transmitted to further generations.

The Globally Harmonized System of Classification and Labeling of Chemicals (GHS) is an internationally agreed tool for chemical hazard communication, incorporating harmonized chemical hazard classification criteria and provisions for standardized labels and safety data sheets. It was developed in follow-up to the 1992 Rio Summit and was adopted in 2002 by the United Nations Economic and Social Council (ECOSOC) Subcommittee of Experts on the GHS (SCEGHS). The World Summit on Sustainable Development (WSSD) endorsed a global GHS implementation target of 2008. The United Nations Institute for Training and Research (UNITAR) and the International Labor Organization (ILO) were nominated as focal points for assisting countries in building their capacity to implement the GHS. It is an important new tool that countries can use as a basis for establishing comprehensive national chemical safety programs.

The Globally Harmonized System of Classification and Labeling of Chemicals

Acute toxicity (severe)

Acute toxicity (harmful)
Skin/eye irritation
Hazardous to the ozone layer

Flammables
Self-reactives
Emits flammable gas

Carcinogenicity
Reproductive toxicity
Aspiration hazard

Aquatic toxicity

Corrosive to metals
Skin corrosion
Serious eye damage

Pesticides and other agricultural chemicals

Many pesticides and other widely used agricultural chemicals (including insecticides, herbicides, fungicides and synthetic fertilizers) are designed to be toxic to their target species. One group of insecticides widely used to kill pests was derived from twentieth century military nerve gases. They can also be dangerous to other species – including humans – if they are not used according to the manufacturer's instructions. These may be printed on the chemical containers, so are liable to be unintelligible to speakers of other languages or the illiterate. Farmers and other residents widely exposed to pesticides may suffer from nausea, diarrhea, insomnia, skin rashes, hand tremors, excessive salivation, staggering, narrowed pupils, irregular heartbeat and convulsions.

Although agricultural chemicals are normally tested for safety before they are introduced, there has been hardly any testing of the chemicals' effects in combination – and there are thousands of them on the market, with new ones being added every year. They therefore constitute a huge and unmonitored experiment with human health and ecosystems. Relevant key international conventions include the International Code of Conduct on the Distribution and Use of Pesticides, and the Stockholm Convention on Persistent Organic Pollutants.

Pesticides were widely used in Central Asia in the Soviet years, especially on cotton crops. Their legacy persists, not only in soil and water – including the devastation of the region around the Aral Sea – but in the hundreds of dumping grounds and storage sites that still disfigure many communities. Some were built near airfields used for agriculture, and on state and collective farms.

Obsolete pesticides in Central Asia

Minimum and maximum estimates in tonnes

Map produced by ZOÏ Environment Network, November 2012
Source: IHPA (→www.ihpa.info); National state of the environment reports; Stockholm Convention national implementation plans

Polychlorinated biphenyls (PCBs)

Widely used as insulating and coolant fluids in electrical equipment, including transformers, capacitors and motors, and for other industrial purposes, PCBs (polychlorinated biphenyls) are toxic and persistent organic pollutants that can remain in the environment for many years and accumulate in animals and along the food chain. They are thought also to be carcinogenic. The 2001 Stockholm Convention on Persistent Organic Pollutants banned their production. The use of PCBs is also banned in many countries, although some argue that they can be safely used in closed systems with no opportunity of escape to the environment.

PCBs can damage the liver, the endocrine, reproductive, immune and nervous systems, and can cause other health effects in animals. Humans are thought to be at similar risk.

The continued use of PCBs in capacitors and transformers is a key issue in Central Asia. Until 1989 a capacitor plant in Ust-Kamenogorsk in the east of Kazakhstan used PCBs in manufacturing electric equipment and contaminated a large part of the Ablakteka district. The PCB-containing equipment is currently being replaced.

PCB containing capacitors in Central Asia

Stock of PCB capacitors

Map produced by ZOÏ Environment Network, November 2012
Source: National state of the environment reports; Stockholm Convention national implementation plans

Cow at a pesticide dump, Vakhsh, Tajikistan

Corroded pesticide barrels, Kanibadam, Tajikistan

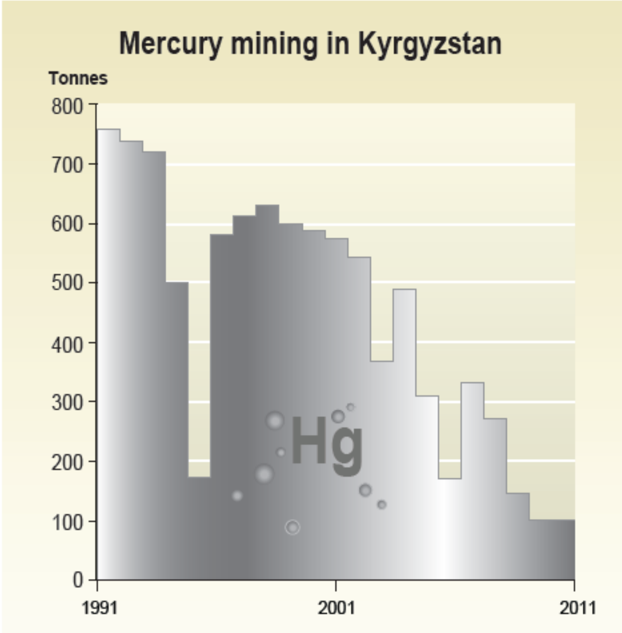
Mercury

Mercury and mercury-containing material in the mining and chemical industries are of particular concern to Central Asian states. On the global scale, natural sources such as volcanoes account for about half of all atmospheric mercury emissions. Of the other half, coal-fired power stations are a principal emitter.

Mercury itself is toxic, capable in certain forms of damaging neurological development and affecting internal organs, with pregnant women, children and infants at greatest risk. Mercury can spread widely through air and water and is ingested by fish and other aquatic life, where it becomes concentrated as it moves up the food chain.

Priorities for regulating mercury include mining and supply, trade, uses (much of it is used in small-scale artisanal gold mining), emissions and releases, storage and contaminated sites. All of these are familiar issues for Central Asia: Kyrgyzstan is home to the world's last known mine still exporting mercury, for instance, and several parts of Kazakhstan were contaminated with mercury used in chlor-alkali production, although the practice has now been phased out. Serious mercury contamination in the Kazakh towns of Pavlodar and Temirtau is being cleaned up.

Mercury is still widely used in thermometers and other scientific instruments both in Central Asia and worldwide. Its use as a dental amalgam, although now largely ended, has still left many people with mercury in their teeth. Two applications are still increasing – gaseous mercury in fluorescent energy-efficient lamps and liquid mercury in artisanal gold mining. But despite this, mercury's use is being reduced globally as its toxicity is recognized and substitutes become available.



Source: Kyrgyz State Agency on Geology and Mineral Resources; USGS Minerals Yearbook on Kyrgyzstan

Lead

Lead used in construction, batteries, solders, alloys and for many other purposes can be poisonous to humans and animals. It accumulates in soft tissues and bones and can damage the blood, the nervous system and the brain. Lead was once added to petrol to improve a vehicle’s performance and protect its engine, but now has been largely phased out to protect the environment and the health of those forced to inhale it in traffic fumes, particularly children. Kazakhstan's industrial sector – in particular lead and zinc smelting – is one of the major contributors of lead emissions released into the environment in Central Asia.

In the Soviet era, the levels of lead pollution at Shymkent in Kazakhstan were notorious, and despite thorough research on the site, little was done to remediate it. In 2011, the authorities acknowledged the problem, and committed themselves to taking remedial measures. All the Central Asia countries have banned the use of leaded gasoline in the past decade. Global efforts to phase out the use of lead in paint, or to reduce its use significantly, are underway.

Asbestos

Asbestos, a group of six naturally occurring minerals, became popular among manufacturers and builders in the late nineteenth century as a sound absorber and fire retardant. But inhalation of asbestos fibres over a period can cause serious illnesses, including cancer, mesothelioma and asbestosis. The European Union has banned all use of asbestos and extraction, manufacture and processing of asbestos products. Kazakhstan is the world’s fourth largest producer of asbestos, accounting (in 2009) for just over 10 per cent of global output. In the Soviet era, Kazakhstan produced half a million tonnes of asbestos annually, and over the past few years has averaged 220 000 tonnes per year. Some asbestos is still used in domestic manufacturing, but most is exported.

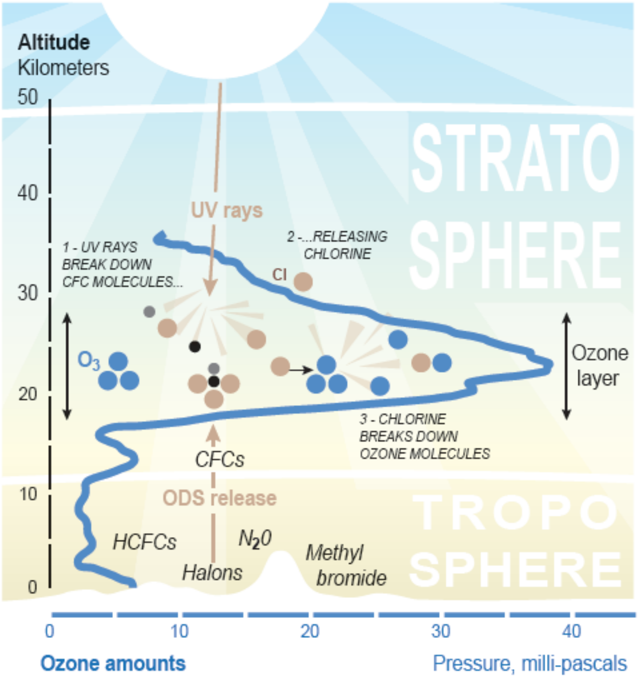
Both asbestos itself and its waste forms – which may be liable to release fibers – are hazardous to human health and the environment. Kyrgyzstan has a large plant producing roofing materials, pipes and other building products, and is a significant asbestos consumer (5 000-10 000 tonnes per year). Asbestos and asbestos-containing products are important trade products for both countries, and because it is affordable and reliable, asbestos is used without restriction in buildings across Central Asia. The use of asbestos is a sensitive issue, and none of the countries in the region is considering banning asbestos production or use on the basis of environmental concerns.

Ozone-depleting substances

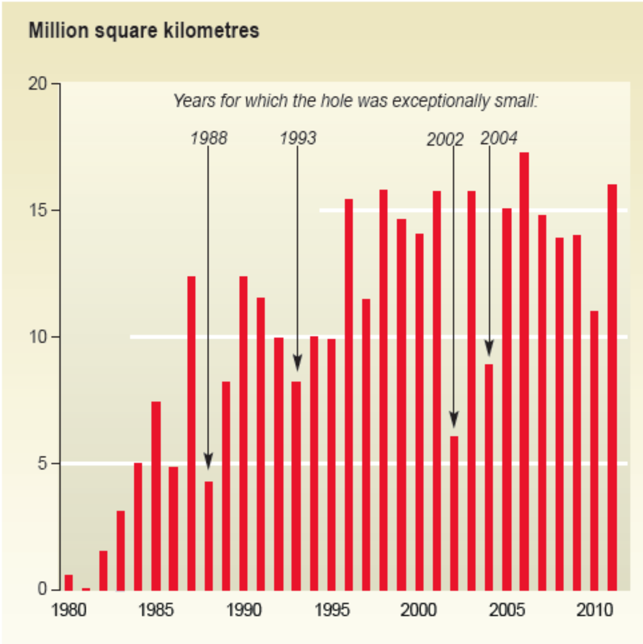
The Earth's ozone layer protects all life on the planet against the harmful effects of ultraviolet radiation from the sun (for humans the main risks are skin cancer, immune system damage and cataracts). In the 1970s and 1980s scientists discovered that chemicals in common use were depleting the ozone layer. The chemicals were chiefly chlorofluorocarbons and related gases, methyl bromide and halons. These were used in refrigeration and aerosol cans, air conditioning, fumigation, in fire extinguishers, as solvents and for a few other purposes. In 1979, when scientists were just coming to understand that the ozone layer could be depleted, the area of the ozone hole over Antarctica was 1 million square kilometers. By 1987, when the Montreal Protocol on Substances that Deplete the Ozone Layer was opened for signature, the area had increased to 22 million square kilometers.

The Montreal Protocol came into force in 1989, and was designed to virtually eliminate production and consumption of ozone-depleting substances (ODSs). It has achieved considerable success (the former United Nations Secretary-General Kofi Annan is quoted as calling it "perhaps the single most successful international agreement to date"), and there are hopes that the ozone layer will perhaps have returned to normal by around 2060-2075. However, there is a problem. Some of the replacement chemicals developed as substitutes for ODSs – hydrofluorocarbons (HFCs) and hydrochlorofluorocarbons (HCFCs) – contribute significantly to greenhouse gas emissions, and therefore promise to relieve one global problem by worsening another.

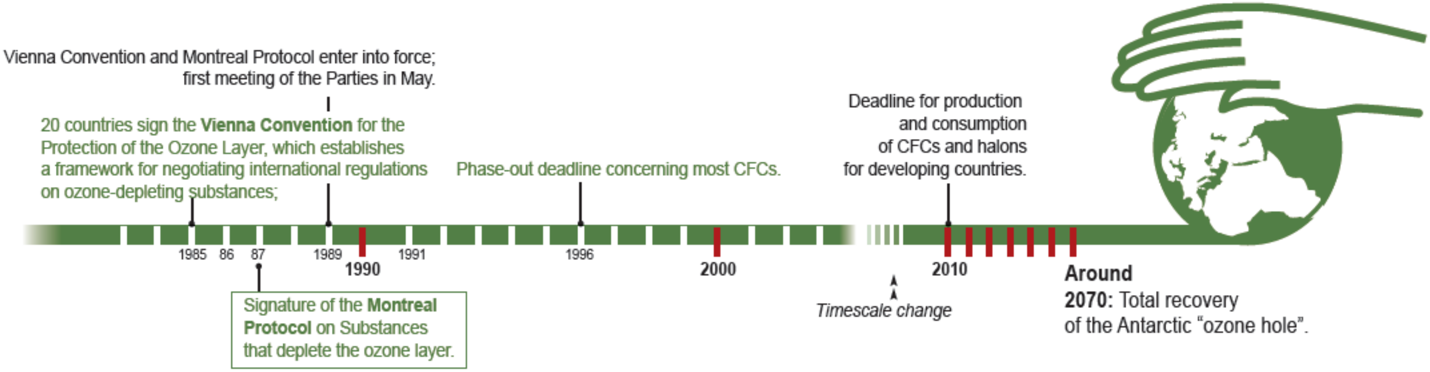
Chemical ozone destruction process in the stratosphere



Yearly averages of the ozone hole size (August to November mean area size for each year)

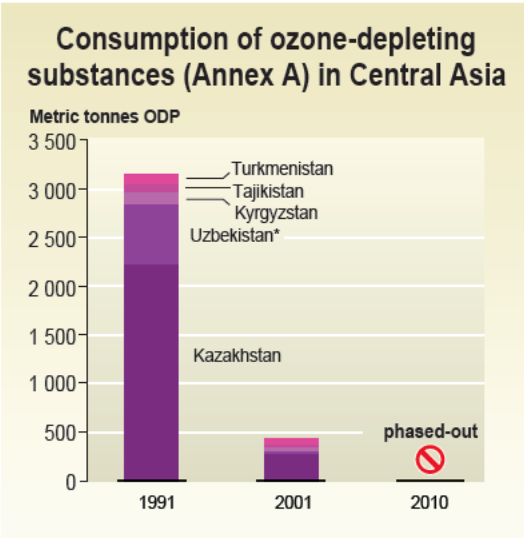


Source: US National Oceanic and Atmospheric Administration (NOAA), 2012.

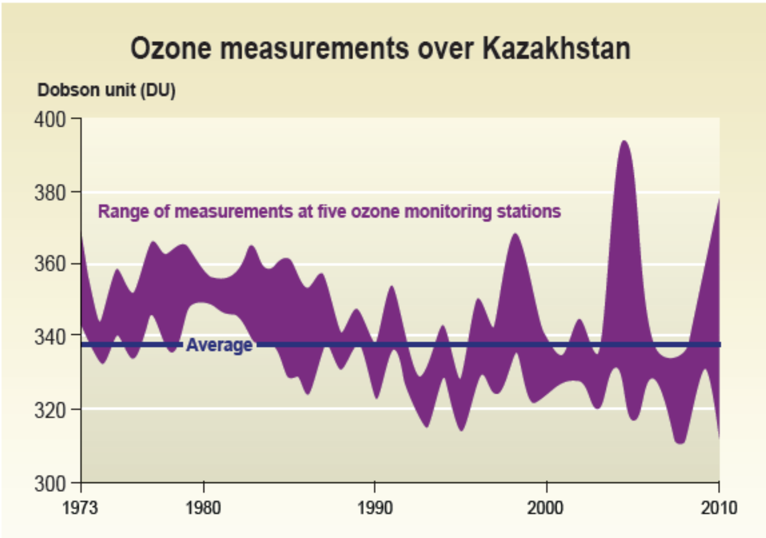


Source: Vital Ozone Graphics III (2012).

Kazakhstan maintains a network of monitoring stations that observe the ozone layer. The observations show that the ozone layer conditions over Central Asia worsened from the 1970s to the 2000s, but this negative trend is likely to stabilize and the situation is expected to improve sometime in the future. Another positive signal is that all Central Asian countries stopped consumption of ozone-depleting substances listed in group "A", thereby contributing to the recovery of the Earth's ozone layer.



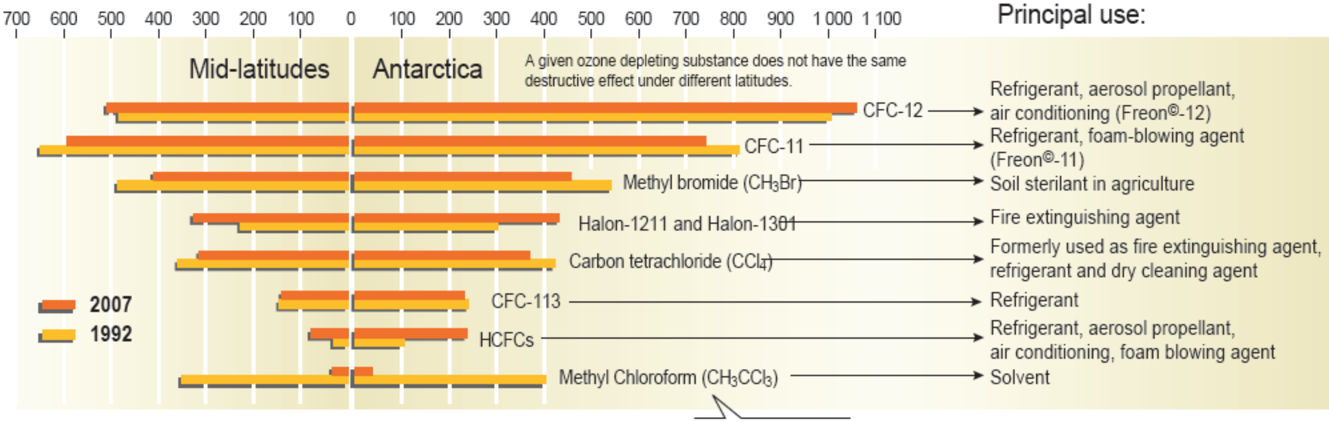
Source: UNEP Ozone Secretariat (http://ozone.unep.org) *data for Uzbekistan for 1993



Source: Kazakhstan Ministry of Environmental Protection

Destructive potential of ozone depleting substances

Effective Equivalent Chlorine [1] in parts per trillion



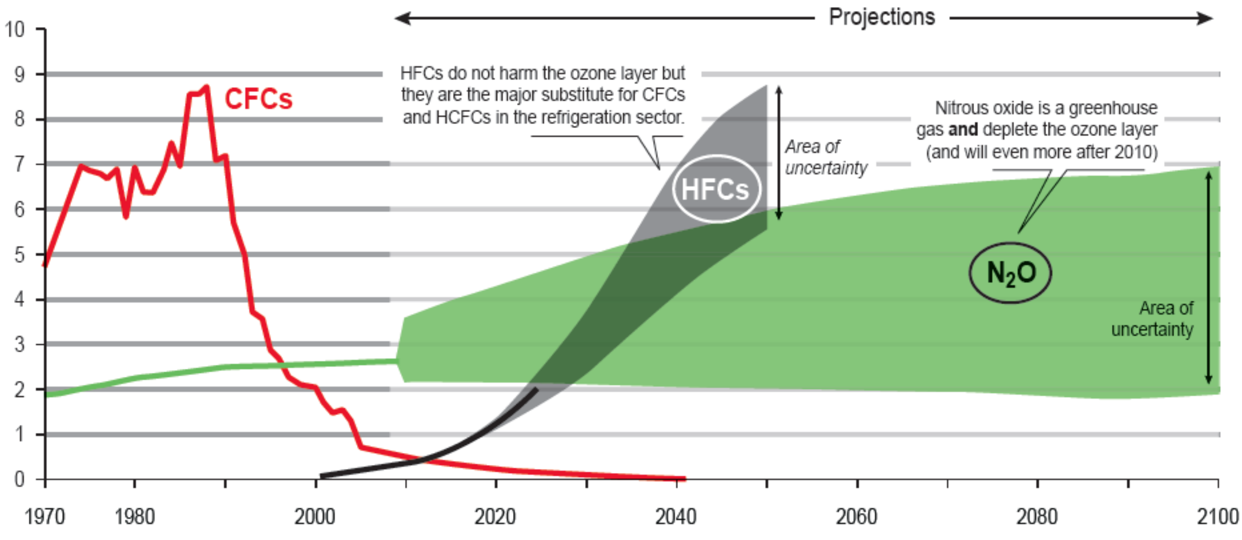
1. Chlorine and bromine are the molecules responsible for ozone depletion. "Effective chlorine" is a way to measure the destructive potential of all ODS gases emitted in the stratosphere.

Source: Stephen A. Montzka, David J. Hofmann, The NOAA Ozone Depleting Gas Index: Guiding Recovery of the Ozone Layer, 2008. (www.esrl.noaa.gov/gmd/odgi)

HFC and N2O: two climate enemies related to the ozone layer

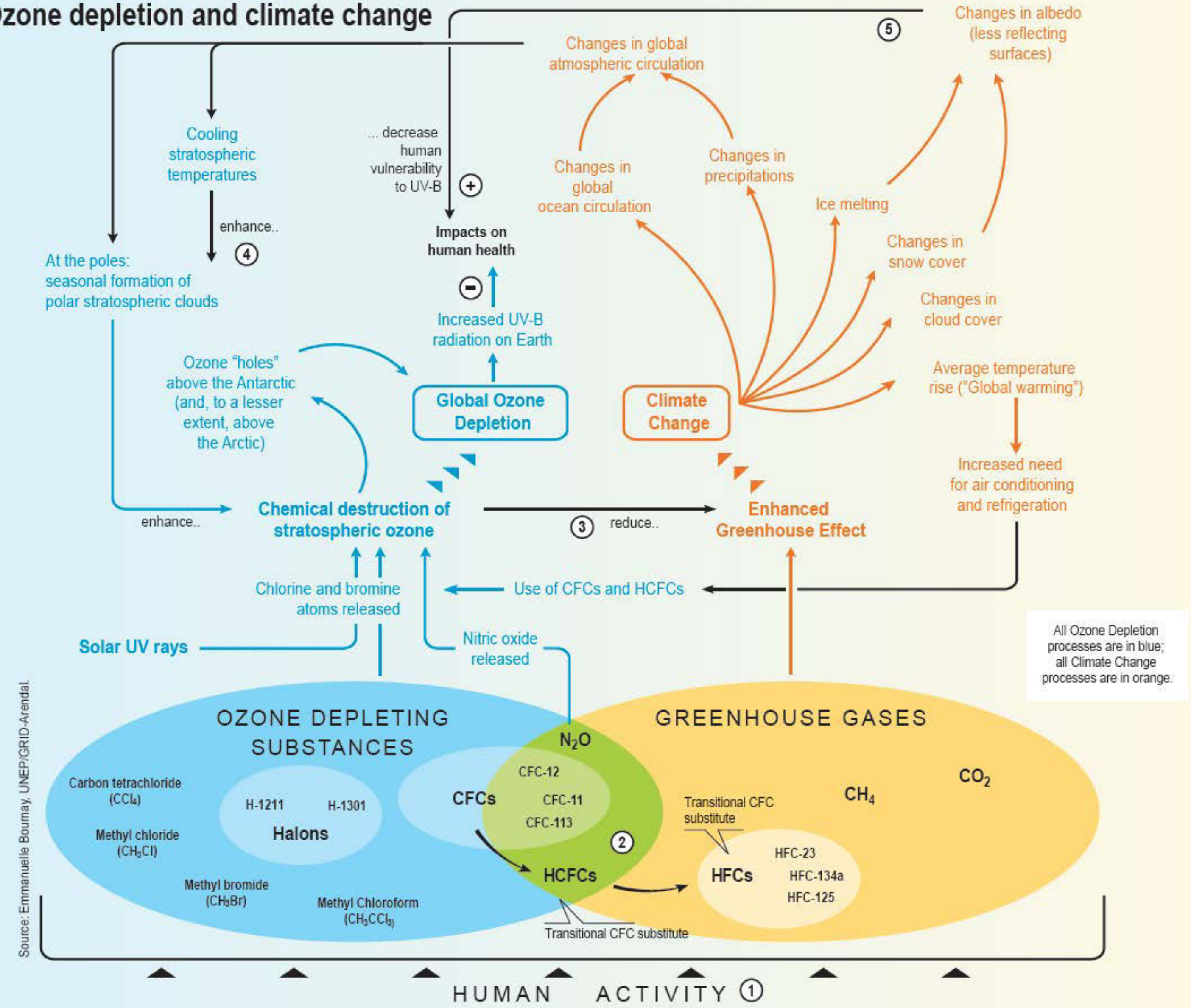
Selected greenhouse gases emissions

Thousand million tonnes of CO_2-equivalent



Source: A. R. Ravishankara, John S. Daniel, Robert W. Portmann, *Nitrous oxide (N_2O): The Dominant Ozone-Depleting Substance Emitted in the 21st Century*, Science, August 2009.

Ozone depletion and climate change



Ozone depletion and climate change are two distinct problems but as they both modify global Earth cycles, they cannot be totally separated. There are still many uncertainties concerning the relations between the two processes. Several links have been identified, in particular:

1. Both processes are primarily due to human-induced emissions.
2. Many ozone depleting substances are also greenhouse gases, notably CFCs and HCFCs. HFCs, promoted to substitute CFCs, are sometimes stronger greenhouse gases than the CFCs they are replacing. This fact is taken into account in the negociations and decisions in both the Montreal and the Kyoto Protocol.
3. Ozone itself is a greenhouse gas. Therefore, its destruction in the stratosphere indirectly helps to cool the climate, but only to a small extent.
4. The global change in atmospheric circulation could be the cause of the recently observed cooling of stratospheric temperature. These low temperatures drive the formation of polar stratospheric clouds above the poles in the winter, greatly enhancing chemical ozone destruction and the formation of the "hole".
5. Human vulnerability to UV-B radiation is related in part to the albedo.The global warming context reduces white surfaces that are more likely to harm us.

Synergies and hotspots

Chemicals, even hazardous ones, are not the real problem: they are the stuff of life itself. The problem is learning to treat them with respect, both when they are useful and when they become waste. The Bhopal tragedy in India in 1984, one of the world's worst industrial accidents, involved the leak from a pesticide plant of methyl isocyanate gas and other chemicals. The Madhya Pradesh government says nearly 3 800 people were killed, while other estimates put the number at around 16 000. More than 550 000 people were injured. This horrific incident did not involve waste, but chemicals in productive use.

Any industrial process that uses potentially hazardous chemicals, and any product that contains them, is capable of causing damage and injury if something goes wrong. The risk is greater when the chemicals have served their purpose and are classified as waste, partly because of the human tendency to assume that when something is out of sight it is also out of mind: once it has been thrown away, so we assume, it can do no further harm. This was part of the thinking behind the practice (followed in Western Europe till late in the twentieth century) of dumping not only sewage sludge but nuclear waste at sea. Once the waste had vanished beneath the waves, it was assumed, the hazard would be diluted and dispersed, to become harmless. But now we know how toxins can bioaccumulate and can travel up the food chain, how apparently innocuous pieces of plastic can kill marine life in places like the North Pacific Gyre or mercury released on any continent may eventually affect fauna and people in the Arctic. We have learned that, when it comes to throwing waste away, sometimes there is no such place as away. Waste sometimes comes back to haunt those who fail to treat it in a sound manner.

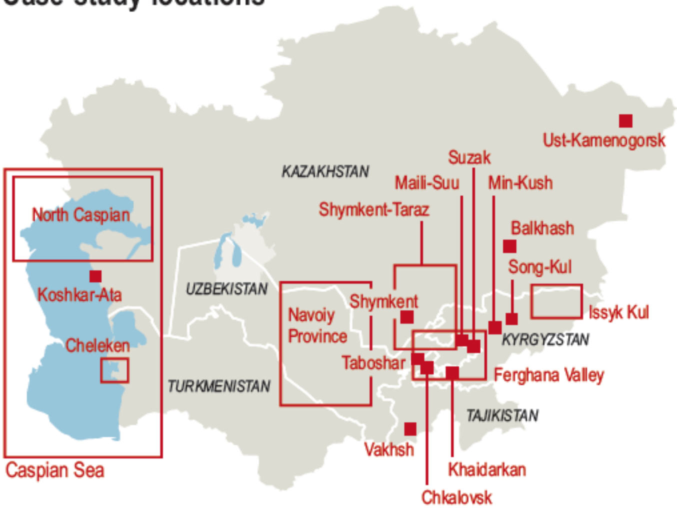
Obviously those who work with hazardous chemicals need proper protection against any ill effects. But they do not always get it, as the fate of many users of agricultural chemicals shows. Nor is the safety of those living near the source of the chemicals guaranteed. Many of those killed or injured in the Bhopal incident were not workers at the plant but inhabitants of the shantytowns that surround it. A fire at a chemical factory in the Swiss city of Basel in 1986 severely polluted the river Rhine with mercury, pesticides and other agricultural chemicals, with the pollution spreading downstream to the Dutch North Sea coast in the space of ten days. Chemicals do not respect political borders. And because waste can be carried on winds and currents, it can contaminate areas apparently at a safe distance from its source. People who graze their animals close to tailings and industrial waste near the Khaidarkan mercury mine in Kyrgyzstan, obsolete pesticide dumps in Tajikistan or PCB-contaminated sites in Kazakhstan, for example, may unwittingly be exposing them to a risk of poisoning.

The health and safety of the people who dismantle and dispose of waste also need constant protection. They range from the “liquidators” who run huge risks to bring nuclear or industrial accidents under control, to the workers in South-East Asia who take apart old ships almost with their bare hands, to the families who recover valuable materials from household and electronic waste in many developing countries. We need to dismantle redundant equipment and restore normal life after an accident, but human lives should not be jeopardized in the process.

Because hazardous waste can affect soil and water, it is not only people and domestic animals that are potentially at risk, but the vegetation on which they depend, the ecosystems in which they live and the other species that share them. There is a limited solution to this: remediation of polluted soils, groundwater, sediments and surface water. But remediation is often expensive, can be technically challenging, leaves the recovered waste still needing disposal, and is by its nature applicable only in relatively small and clearly defined areas. With existing technology it is often practically impossible to clean up all the waste that has been released, leaving waste prevention and minimization as the only realistic options.

The following short case studies demonstrate the breadth and depth of the waste and chemical issues facing the countries of Central Asia. Some hotspots are subject to multiple pressures, and show the effects of synergy; others are the result of one primary issue. The cases come from all across the region, span the years from the Soviet era to the present and consider all manner of waste and chemical contamination – municipal solid waste to radioactivity to mercury and other heavy metals.

Case-study locations



Waste and chemical issues in Issyk Kul lake region

Hazardous waste and substances

- Industrial waste and chemical issues raising public concern
- Poorly maintained radioactive waste, historical pollution
- Dumps of obsolete pesticides recognized as hotspots
- PCB-contaminated sites

Other waste and litter

- Poorly managed waste collection or landfill practices
- High concentration of illegal fishing nets and plastic pollution of lake ecosystem
- Glacier

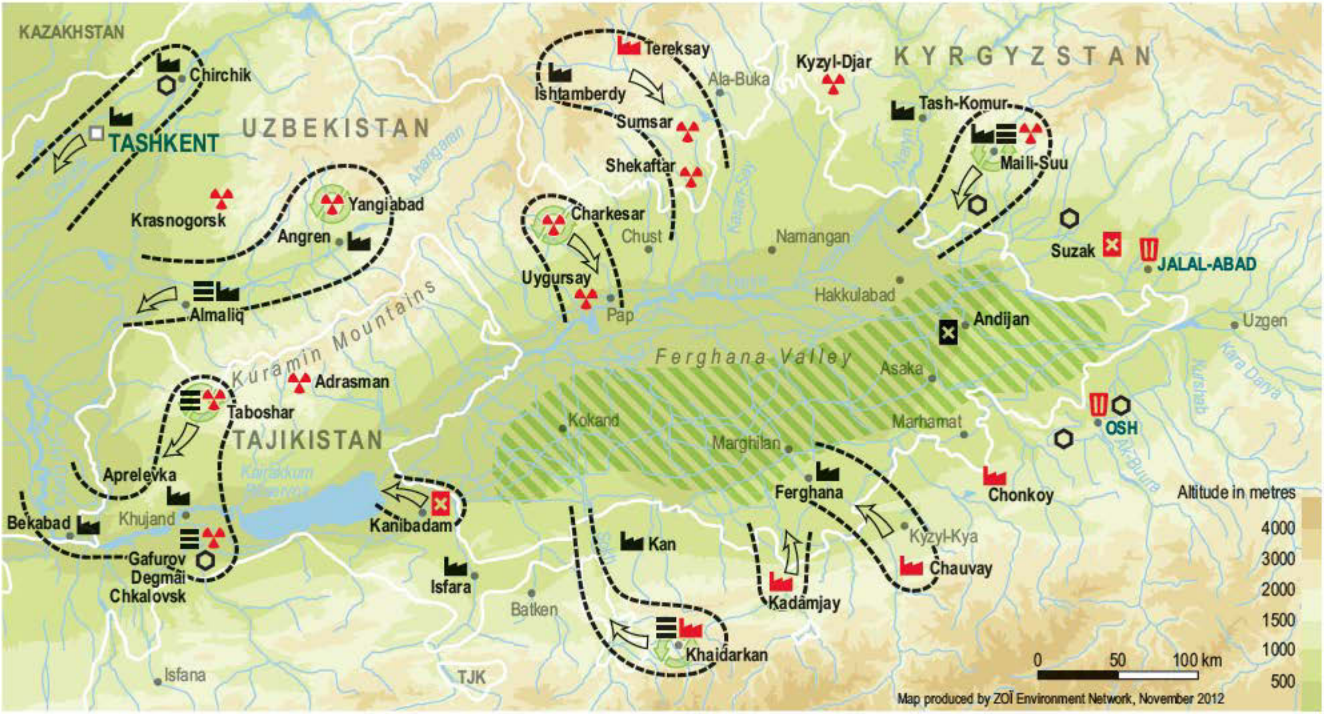
Hidden risk of radioactive contamination (Issyk-Kul Lake in background), Kadjysay, Kyrgyzstan

The Lake Issyk-Kul region qualifies as a priority site for three reasons – its biodiversity, its importance as a tourist destination and its complicated waste and chemical issues. Kadji-Say tailings contaminated with radioactive materials are close to the lake. An echo of a Soviet era spill of tailings material at Aktuz and the current appalling conditions of tailings at Aktuz and Orlovka are additional concerns. Some containment measures are in place, but experts propose further steps, and warn that the contamination of the lake or rivers will spoil the region's image.

In 1998, a transport accident resulted in a cyanide spill into the Barskoon River, which drains into the lake. Safety has improved since then, but the amount of hazardous waste is growing. Climate change complicates the picture at high elevation mines, which need to take special measures on waste storage and industrial safety with regard to melting glaciers and permafrost.

In addition, wastewater and communal waste around Lake Issyk-Kul have become problematic. The wastewater system is insufficient, and no effective system exists for the disposal and management of seasonal waste from tourists. After each tourist season at Lake Issyk-Kul, volunteers collect the waste along the shores. Prior to independence, agricultural runoff was high with the lake receiving high levels of chemical fertilizers. Since independence, the application of fewer chemicals has resulted in less pollution. Illegal fishing not only contributes to the depletion of fish stocks, but thousands of nets are lost each year and may remain in the water for decades causing damage to the ecosystem.

Cross-border risks posed by waste and chemical pollution in the Ferghana Valley area



Sites with significant amounts of industrial waste and chemicals

- Poorly maintained radioactive waste, historical pollution
- Notorious historical pollution from industrial development
- Other industrial waste and chemical issues raising public concern
- Major source of hazardous industrial waste

Pollution pathways

- Local and transboundary risks of soil, air and water contamination
- Spills and reported industrial accidents
- Fragmented soil pollution from industry and agriculture

Sites with significant amounts of persistent organic pollutants

- Major stores and dumps of obsolete pesticides recognized as hotspots
- Other disposal sites for agricultural chemicals
- PCB-contaminated sites

Municipal waste

- Poorly managed waste collection or landfill practices

- Ongoing and planned clean-up actions or waste reduction initiatives

Radioactive waste, Taboshar, Tajikistan

With the highest population density in Central Asia outside the cities, the Ferghana Valley is also home to the highest concentration of industrial sites. The veil of secrecy in the Soviet era, when industrial hazardous waste was not a subject of public knowledge and when waste from one country was sometimes stored in another country, produced a neutral attitude towards waste among the local population. Industrial development of mineral resources in the mountains around the Ferghana Valley during the twentieth century generated around 100 million tonnes of waste rock and a nearly equal amount of tailings from uranium mining; at least 20 million tonnes of waste from mercury mining and smelting; and a significant amount of industrial waste from antimony, copper, gold and iron smelting and processing. Poorly maintained agricultural chemicals waste sites at Suzak, Kyrgyzstan and Kanibadam in Tajikistan present additional health and environment risks. Industrial waste sites that require priority attention and cross-border cooperation include those at Mayli-Suu, Shekaftar, Khaidarkan, Kadamjay and Chauvay in Kyrgyzstan, Taboshar and Chkalovsk in Tajikistan and Charkesar in Uzbekistan. In the event of a major release, the countries need an early warning system to alert each other and minimize or prevent cross-border contamination.

Northern Caspian industrial infrastructure and waste

Important biodiversity areas

- Wetlands, river deltas and sturgeon spawning grounds
- Protected areas

Energy production and distribution

- Oil and gas fields
- Major oil and gas producing areas
- Processing plants and stations
- Oil tanks
- Oil and gas pipelines

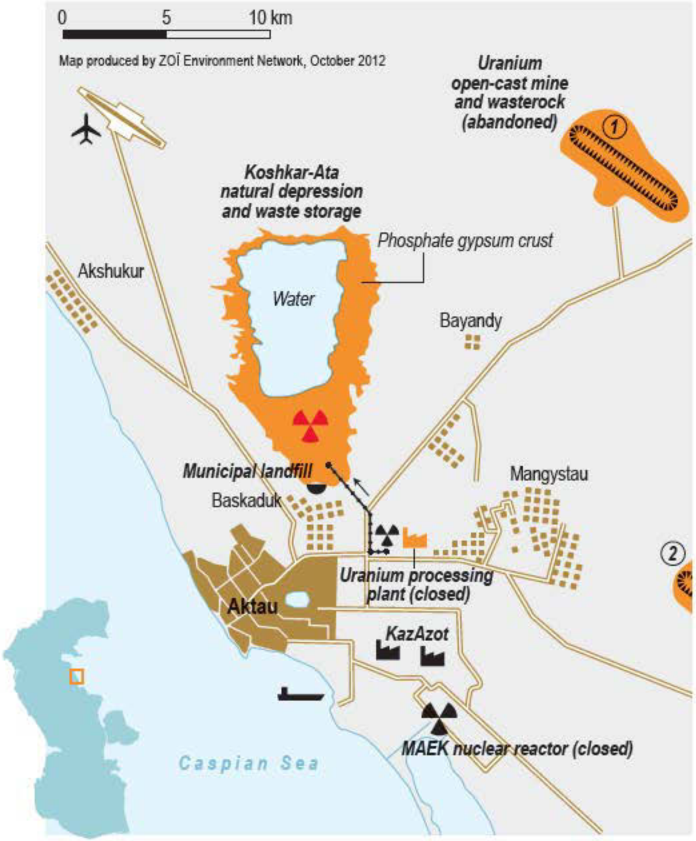
Environmental concerns

- Abandoned and flooded oil wells
- Major waste sites
- Historical pollution due to oil spills

Source: Environment and Security Assessment in the Eastern Caspian Region 2008; data updated in 2012

By international standards, the North Caspian oil reserves are very large. The Tengiz oil field, discovered in 1979 on the Kazakhstan shore of the Caspian Sea, has been in operation since 1993. The even larger offshore Kashagan field, also in Kazakhstan, was discovered in 2000, and is scheduled to start operations in 2013. In both cases, the shallow northern Caspian Sea (3-5 m in depth) and its sensitive ecosystem together with unpredictable weather and a changing climate may complicate oil production. At 14 per cent, the sulfur content of the oil is high. The separation of the sulfur from the oil has produced large sulfur stockpiles. As an offshore facility, Kashagan is subject to storms and ice events. The technology in place is modern, and there have been no accidents so far. This level of safety needs to be maintained.

The environmental conditions in the area are compromised by abandoned and flooded oil fields. While clean-up is clearly in the interests of the state, private companies may also get involved. Annual die-offs of Caspian seals are attributable to pollution, diseases and reduced immunity, and further measures need to be taken in this regard. In addition, shipwrecks near Bautino – a base for future offshore operations – present a safety issue, and some of the wrecks may release hazardous substances into the sea. The Tukhlaya Balka wastewater pond, which serves Atyrau, is vulnerable to a possible rise in sea level.



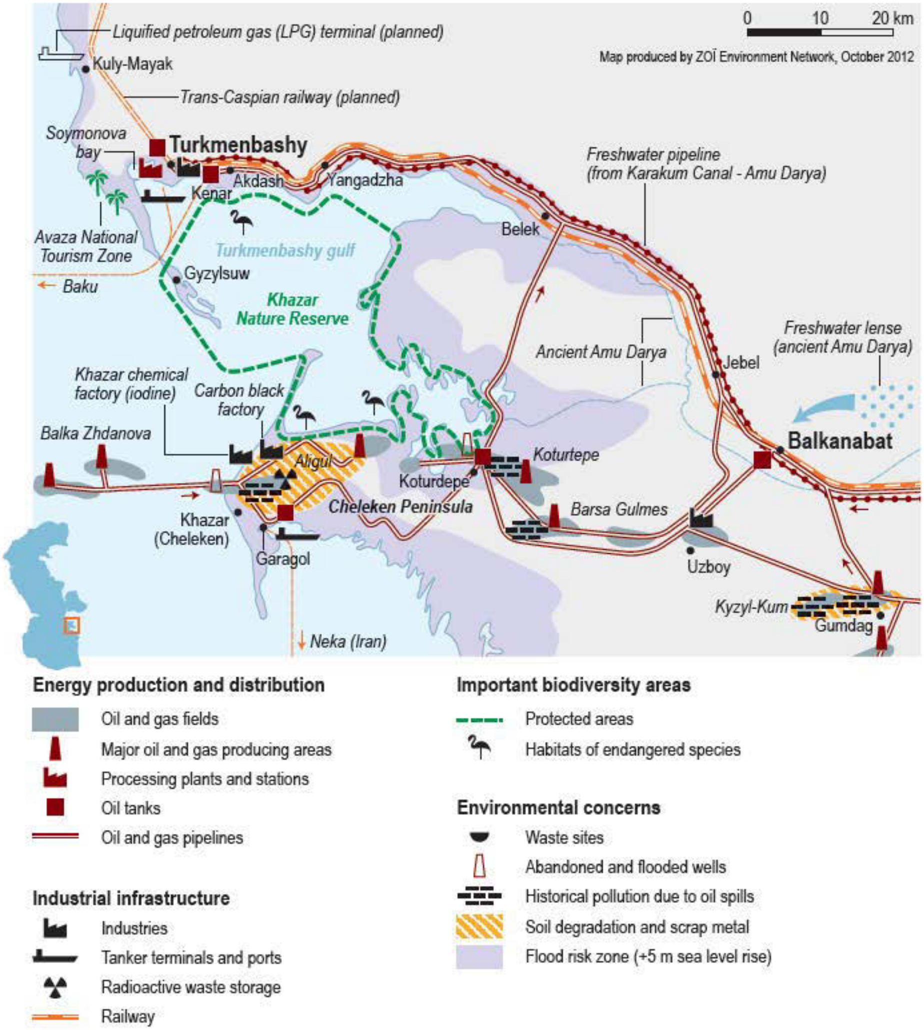
Aktau nuclear complex

Source: Environment and Security Assessment in the Eastern Caspian Region 2008; data updated in 2012

For years, mining and industrial operations near the city of Aktau, Kazakhstan, used Koshkar-Ata – a natural depression – as a waste storage facility. With some 120 million tonnes of tailings and wastewater, Koshkar-Ata is now the largest tailings site in Central Asia. The waste had been stored under water to prevent the release of radiation and to inhibit wind erosion and dust formation, but when the industries stopped producing, the site was left to dry out, and radioactive releases occurred. When initial remediation of high priority sites began in 2008-2010, some waste material was relocated and covered with plastic, clay, cement or soil.

At the MAEK nuclear power station, operations have been suspended, and the waste is being removed. The site is under consideration for a new nuclear power station to become operational in 2018-2020. The design is underway, and the capacity is expected to be small by international standards.

In Kazakhstan, uranium mining is booming and the country is now a globally significant producer. All of this mining is in situ leaching that produces minimal waste, and the outcomes of the Koshkar-Ata case will not be repeated with this new production.



Source: Environment and Security Assessment in the Eastern Caspian Region 2008; data updated in 2012

Industrial facilities in the towns of Khazar and Balkanabat on the Cheklen Peninsula in Turkmenistan have produced bromine and iodine since the 1940s. With a production capacity of 250 tonnes per year, the industrial operations, which involve activated carbon, have generated a significant amount of radioactive waste – in excess of 21 000 tonnes. Historically, this waste was placed close to the Caspian Sea, and industrial wastewater was discharged directly into the sea. The state chemical company of Turkmenistan, recognizing the seriousness of the problem, moved most of the waste into a secure waste storage site in the middle of the peninsula in 2009-2010. An oil refinery in Saymonov bay at Turkmenbashy (formerly Krasnovodsk) started operation in the late 1940s, and discharged wastewater with little or no treatment for decades. The results of recent efforts at wastewater treatment and of placing a physical barrier to the sea to reduce pollution are not yet known. In any case, the pollution accumulated over the years remains an issue.

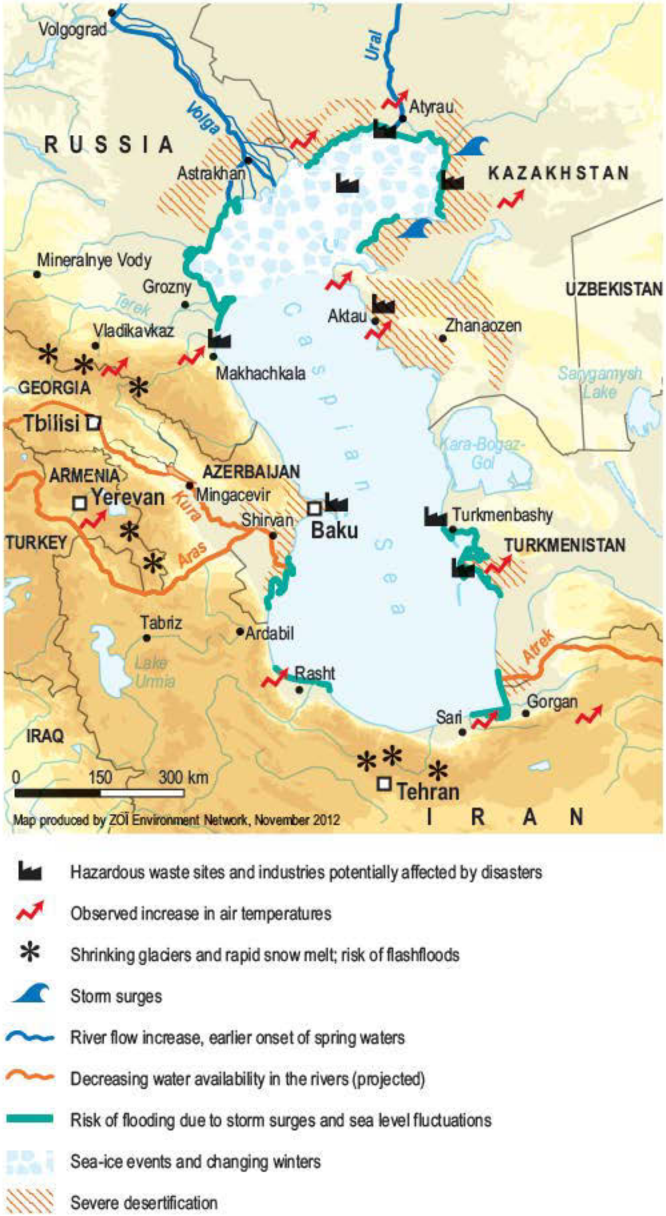
Industrial facility and waste, Cheleken, Turkmenistan

Caspian Sea: pollution of sediments

Source: Interpretation of Caspian Sea Sediment Data, Caspian Environment Programme, 2002, 2007, 2009

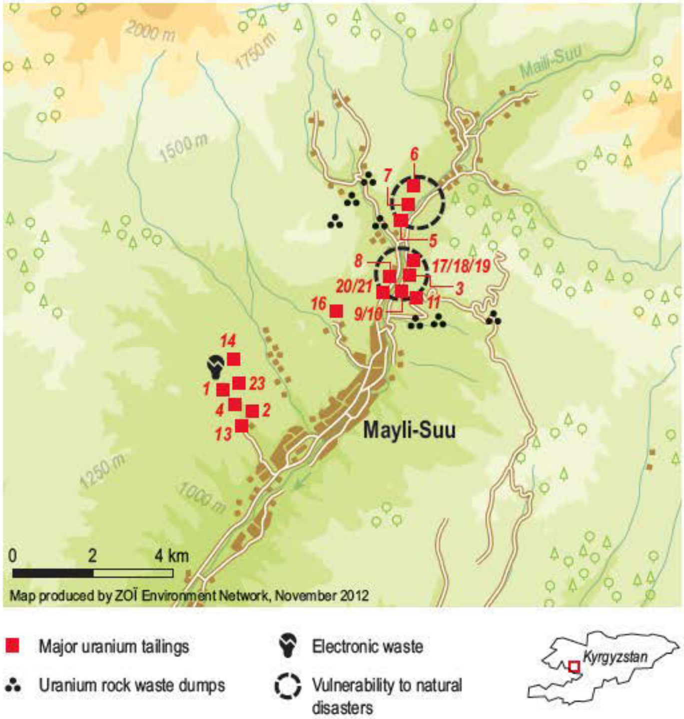
Over the past decade, the Caspian Environment Program has conducted several surveys of the Caspian Sea sediments, and found excessive concentrations of POPs, heavy metals and organic pollutants such as oil in the western and southern reaches of the sea. Most of this pollution accumulated over several decades. Now, with industry growing in the eastern (Central Asian) part of the Caspian, the concentrations of pollutants may be growing as well. Both the chemical and petrochemical industries operate near the sea, and small spills have occurred during oil exploration and transport.

Caspian Sea: climate change, disasters, desertification



The extensive Caspian Sea region faces the challenges of climate change, natural disasters and desertification. To each of these challenges, the mismanagement of resources adds to the region's vulnerability. The potential sea level rise associated with climate change may swamp the existing oil wells and waste infrastructure, and release pollutants into the environment. Storm surges and heavy winds threaten traffic safety. Severe weather events, which may intensify as a result of climate change, may become even more dangerous to onshore infrastructure and transport. And industrial development is intensifying desertification as expansion changes the arid local landscape.

Mayli-Suu uranium tailings, Kyrgyzstan

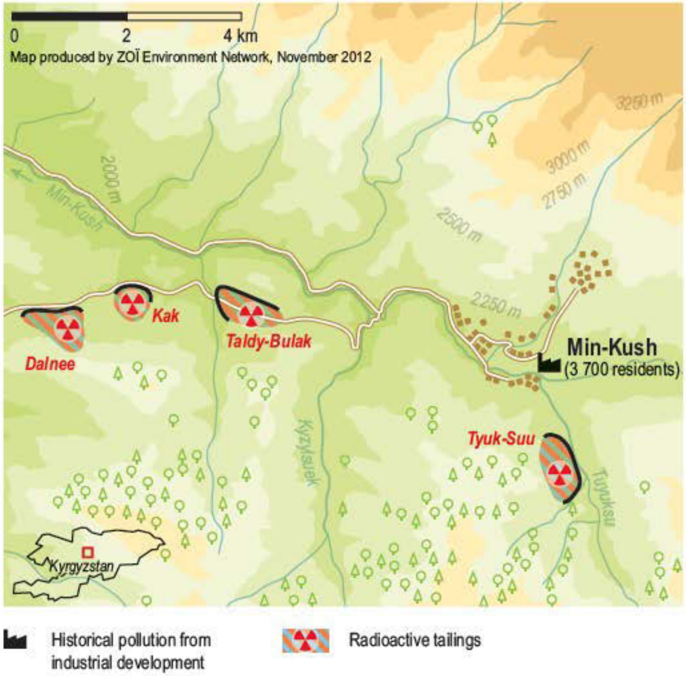


Located on the edge of the Ferghana Valley in Kyrgyzstan, the Mayli-Suu mine started uranium production in the World War II years. With modest reserves, the facility eventually shifted from mining to processing, and imported ore from other Central Asian countries and the Socialist bloc. As the amount of radioactive waste grew over time, planners decided to distribute it over more than 20 tailings and in several waste rock dumps scattered across seven kilometers in the valley. The only safety measures were a fence and warning signs posted after closure, and the covering of waste piles with earth. As these meager defenses collapsed over time, local knowledge of the contamination was lost, and the local population became more exposed to risk.

The area, which is near the borders with other states, is prone to natural disasters – torrential rains, flash floods and earthquakes that trigger landslides and the destruction of tailings dams. The situation offers little time for warnings, and onsite safety systems are important. In April 1958, a natural disaster washed away a tailings dam with 100 000 cubic meters of uranium waste.

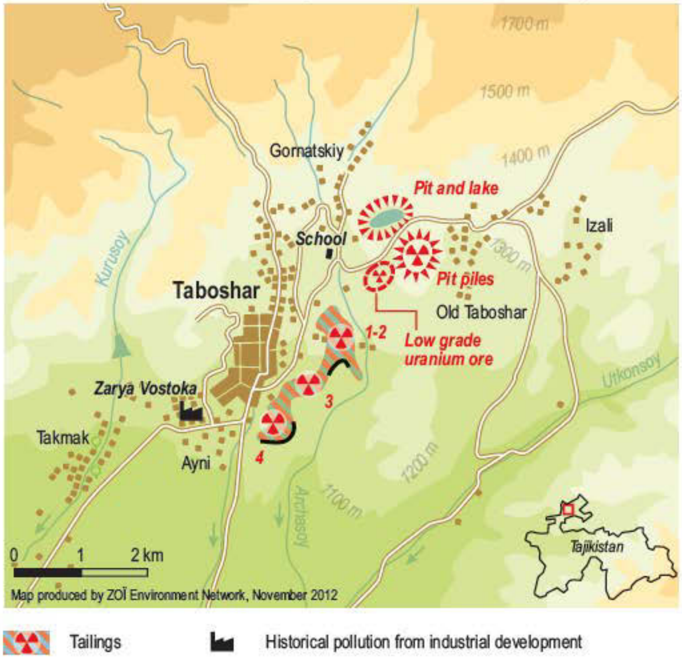
The total volume of waste in Mayli-Suu tailings is estimated at 2 million cubic meters. To complicate matters, a nearby light bulb production factory dumped its electrical waste next to the uranium waste for many years, and made no provisions for safety. Since 2005, the local population has discovered that they can recover nickel and other valuable materials from the waste. Some have been killed by collapses in the dump, while others were exposed to the combined risk of industrial electric waste and uranium. The health impacts of Mayli-Suu waste are evident in the high rate of cancers and abnormal births.

Min-Kush uranium tailings, Kyrgyzstan



The Min-Kush uranium mine and processing facility, located in the center of Kyrgyzstan, has four radioactive waste sites recognized by risk assessments as needing priority attention. The tailings, which are near the headwaters of the river, are in appalling condition and represent a significant risk to downstream areas. The people who continue to reside in this former mining town will continue to be affected even though there is little industrial activity now. Landslides could affect both a former uranium processing facility on the edge of town and one of the tailing sites. For the last 10-20 years, the people of Min-Kush have used tailings and other waste materials such as contaminated scrap metal and sand to construct or insulate houses and other buildings. A lack of knowledge – and an absence of Geiger counters – has led to a situation where many people are now affected. Remediation necessarily means phasing out the use of contaminated buildings, and may entail the relocation of people.

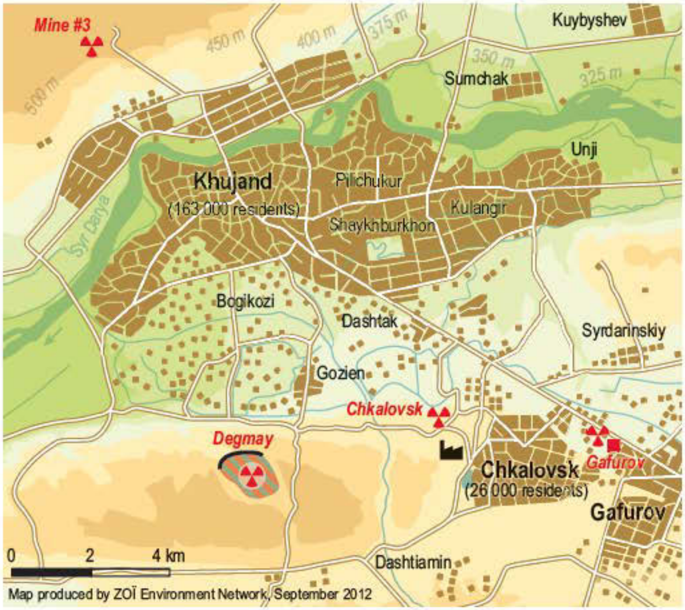
Taboshar uranium tailings and other waste, Tajikistan



Uranium production at the Taboshar open pit mine in Tajikistan started in 1942 and continued to the 1970s, and later converted to underground in-situ leaching. Taboshar has 7 million cubic meters of tailings spread over 65 ha (an area equivalent to 100 football fields) and over 34 million cubic meters of waste rock. Because of its large amount of waste, its proximity to a populated area and the potential for natural disasters, the site has been selected as a hotspot with high priority for remediation.

At the beginning of operations, a small village existed near the site, and over the life of the mine grew into a small town of 11 000 people. As with the Kyrgyz sites, industrial failures and spills occurred, and when that knowledge was lost to the local population, they planted gardens on or nearby the tailings sites and used tailings materials for other purposes. Now the local drinking water is contaminated, and locals continue to graze their animals and plant their gardens in proximity to the contamination.

Chkalovsk, Gafurov and Degmay uranium tailings, Tajikistan



Tailings

Historical pollution from industrial development

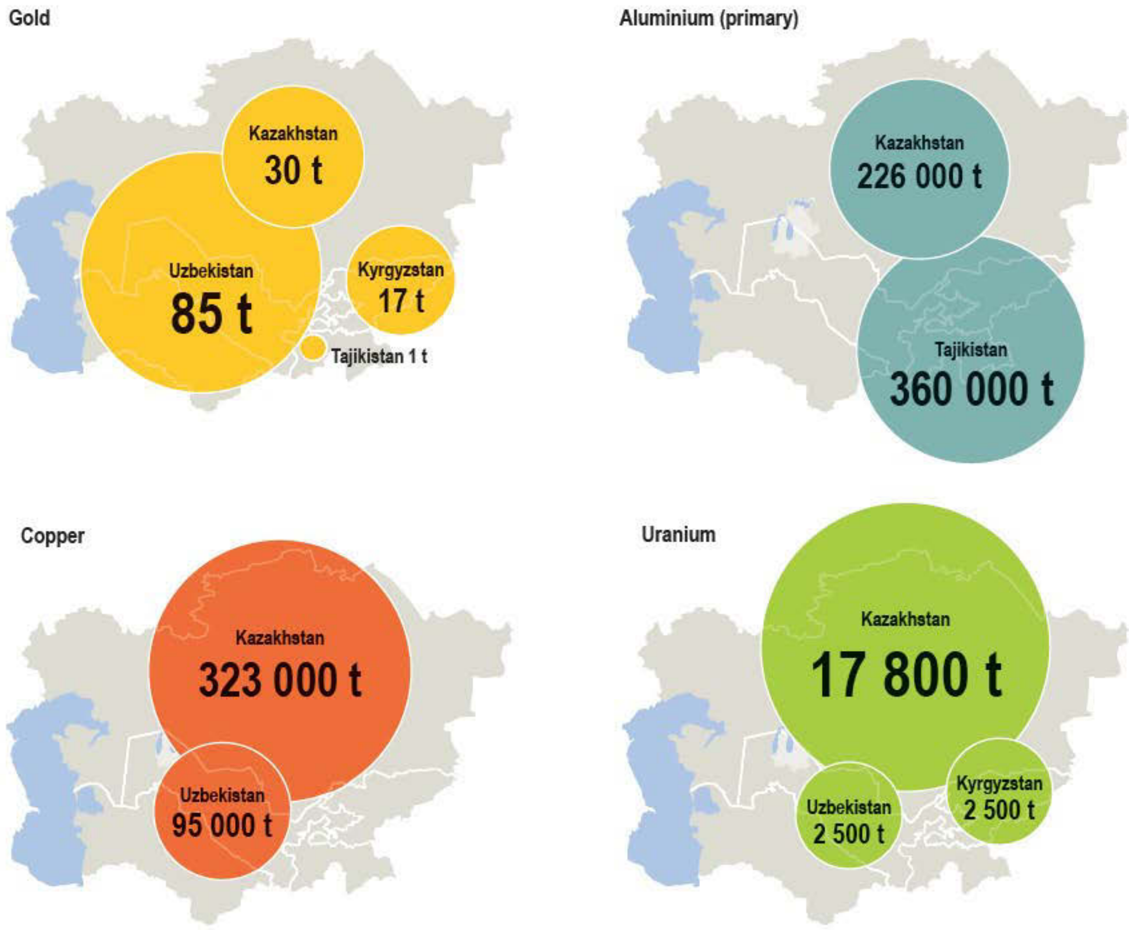
Chkalovsk is Tajikistan's former hub for uranium ore processing. Larger in scale than Mayli-Suu and Taboshar and with more sophisticated and more highly enriched uranium products, Chkalovsk took ore from throughout Central Asia. One result of this is the largest amount of waste (55 million tonnes in 10 tailings) in Tajikistan. Processing began right after World War II and continued until 1998. In the early years the rush to produce enriched uranium led to the storage of uranium waste in the middle of the city of Gafurov near Chkalovsk. The area is now covered, fenced and monitored, but is still radioactive, and in need of improved containment. A larger, more permanent Degmai tailing site was later established 5-7 kilometers outside the city, and the waste material was covered with water. After independence, production stopped, and the uranium tailings dried out, creating substantial risk. Radioactive material, particularly radium and radon, is escaping, and safety measures are inadequate.

Industrial waste in Navoiy Province

Located in the center of Uzbekistan, Navoiy Province is home to most of the country's gold and uranium mines and to most of the waste from mining and processing – 30-35 million tonnes of hazardous waste annually, approximately 90 per cent of the total hazardous waste produced in the country. The Uchquduq uranium mine, located in the middle of the Kyzylkum desert, has several tailings, leaching ponds and numerous waste-rock dumps. This bulk waste represents less of a problem, but large stocks of waste from open pit mining are still present. Fortunately, most of the waste is in desert areas far from population centers, and is therefore a low priority for remediation.

Most of the waste in Navoiy Province is concentrated in three areas – in tailings from a metallurgical processing plant in Navoiy city (60 million tonnes of waste), at the Muruntau gold mine nearby Zarafshan city (90 million tonnes of waste) and at the Uchquduq uranium mine (1 500 ha of open-air uranium leaching ponds and polluted soils). Some areas with high radioactivity have already been remediated, and the work is continuing.

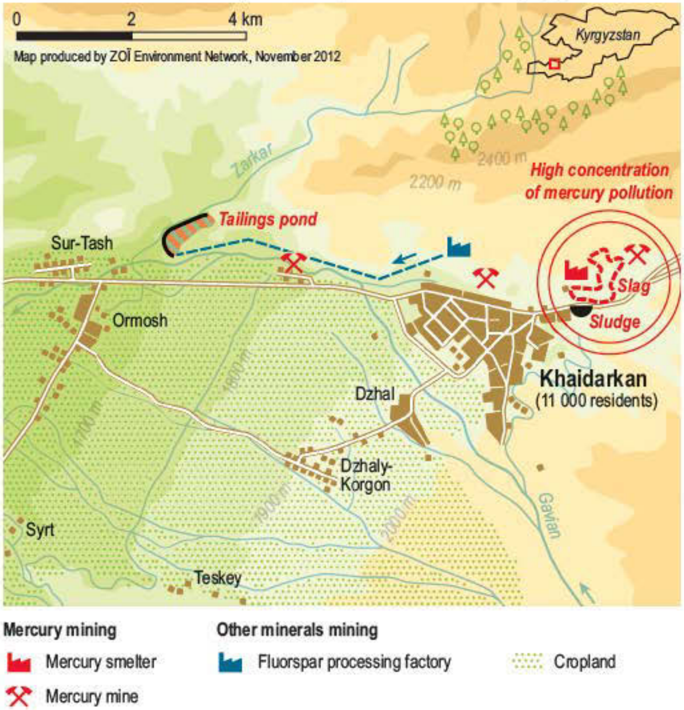
Production of selected mineral commodities in Central Asia



Map produced by ZOÏ Environment Network, July 2012
Source: United States Geological Survey Minerals Information (→ http://minerals.usgs.gov/minerals/pubs/country/europe.html), Data reported for 2009-2010

The mining boom in Central Asia is affecting not only Uzbekistan and Kazakhstan – the traditional leaders in the region – but also Kyrgyzstan and Tajikistan. As the boom spreads, the mining operations are also spreading from remote desert areas to the more sensitive mountain ecosystems where glaciers are present. Modern environmental standards are more stringent than previous standards, and the countries of the region need to follow current best practices for responsible mining – managing waste properly and mining for closure.

Khaidarkan mercury mining and waste, Kyrgyzstan



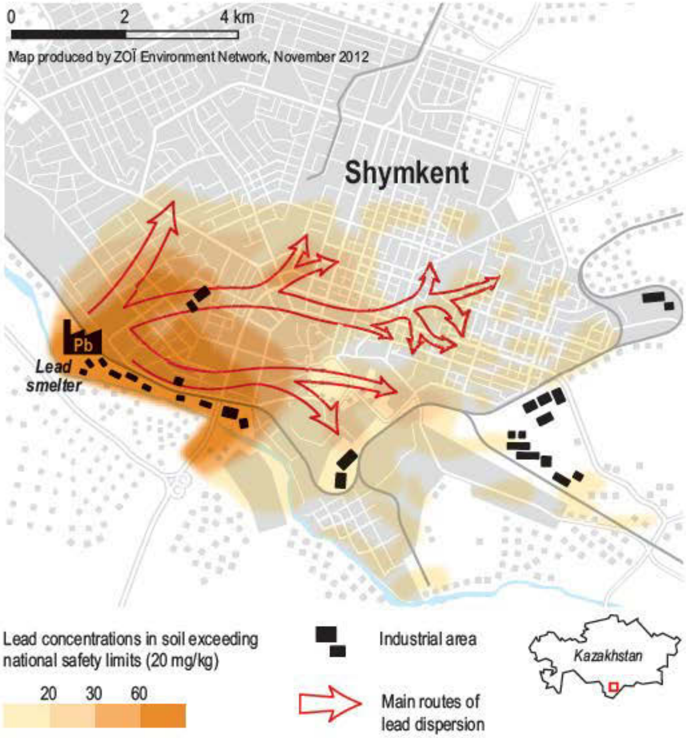
Opened during World War II, the Khaidarkan mine first produced mercury for use by the military. Eventually, Khaidarkan grew to encompass the mines at Chauvay and Ulug-too, and is still an active mercury mine. The mine operators made no provision for backfilling the waste either into the open pits or into the underground spaces later excavated, and as a result, the amount of industrial hazardous waste (more than 20 million tonnes of slag) was the highest in Kyrgyzstan until surpassed by the Kumtor gold mine operations. Bulk waste stored in a seismically active area represents a physical hazard in the case of a sudden release. Part of the Khaidarkan area is contaminated with mercury sludge at much higher concentrations than background levels.

The waste is not confined within the industrial facility, but is stored on the outskirts of town where the local people raise cattle and children play. The environment and health risks have been initially assessed, and important next steps include a more detailed investigation of the contaminated hotspots, addressing those risks through monitoring, land use revision and remediation. Mercury prices, mining policy choices in Kyrgyzstan and the forthcoming global mercury treaty will determine how long and to what extent the active state-owned Khaidarkan mine will continue to operate. But even after the last cinnabar ore has been brought to the surface, pollution will continue in the absence of remediation.

Mercury mining waste, Khaidarkan, Kyrgyzstan

Shymkent and Taraz phosphorous waste

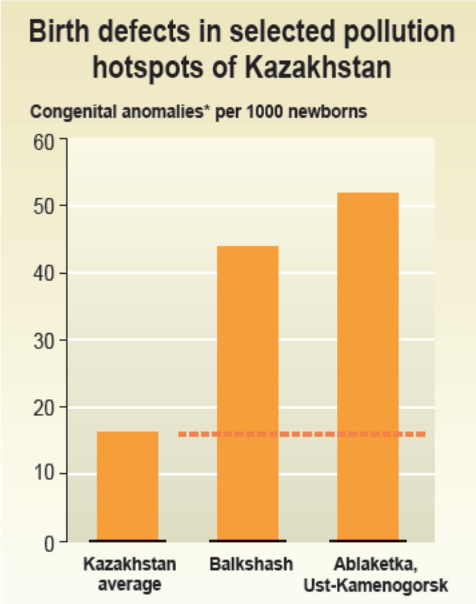
Lead pollution of Shymkent city, Kazakhstan



Source: M. Ishankulov, 1987; Kazakhstan Ministry of Environmental Protection 2010

Former phosphorous plants in two cities – Taraz and Shymkent – in the southern part of Kazakhstan produced significant amounts of waste with high phosphorous content. Now abandoned, these waste and tailings sites represent serious fire and toxic hazards. Located on the edges of the cities, these sites each hold about 500 000 tonnes of waste, and threaten a combined urban population of almost 1 million people. Phosphorous waste is prone to self-ignition, and produces a toxic cloud when it burns. One fire has already broken out, but the local fire brigade quickly extinguished it. The high inflammability of the waste, combined with the absence of safety measures, makes for a significant threat.

Years of emissions from a nearby lead smelter have resulted in lead concentrations many times the national limits in soils in areas near Shymkent. The contamination is spread across an area of some 50 square kilometers and most of the lead is bioavailable and can therefore be absorbed by animals and people. More than 50 schools and kindergartens are located in areas with high lead concentrations in the soil, and as many as half of the Shymkent schoolchildren are estimated to have blood lead levels in excess of the limits recommended by the World Health Organization. Soviet research found that the residential areas around the smelter had higher rates of diabetes and infant mortality.



Source: Kazakhstan First National Report for the Stockholm Convention (2010)

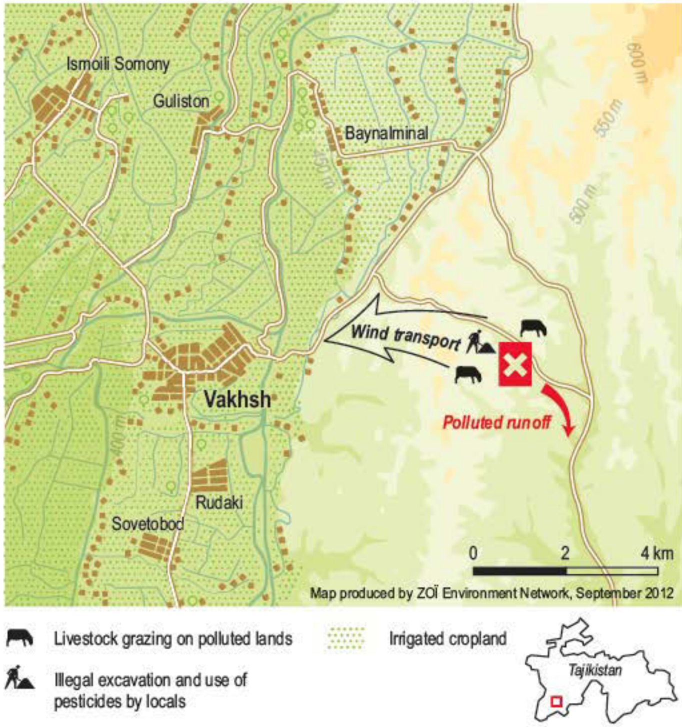
* Average for 1999-2003 (5 years) based on data provided by local hospitals

Balkshash and Ust-Kamenogorsk

The Darial-U station near Lake Balkshash in Kazakhstan was a restricted military site in the Soviet period, and abandoned after independence. A recent inventory found 15 000 capacitors leaking PCBs. In Ust-Kamenogorsk a capacitor plant used some 26 000 tonnes of oils containing PCBs from the time it opened in 1968 until 1989. Hundreds of tonnes of PCB waste were released into industry waste ponds over this period. Although the plant has not used PCBs since then, and the plant is no longer in operation, the levels of contamination are high. Of particular concern is a PCB-containing waste pond in proximity to the Irtysh River and the Ablaketka residential district near the former plant. Altogether the PCB contamination in Kazakhstan – an estimated 2 million tonnes of soil and 250 000 tonnes of PCB-containing waste – is probably the highest in Central Asia. Among the populations exposed at these sites, the rates of abnormal births and other health effects associated with PCBs are three times higher than the Kazakhstan average, and studies confirm the link to PCB exposure.

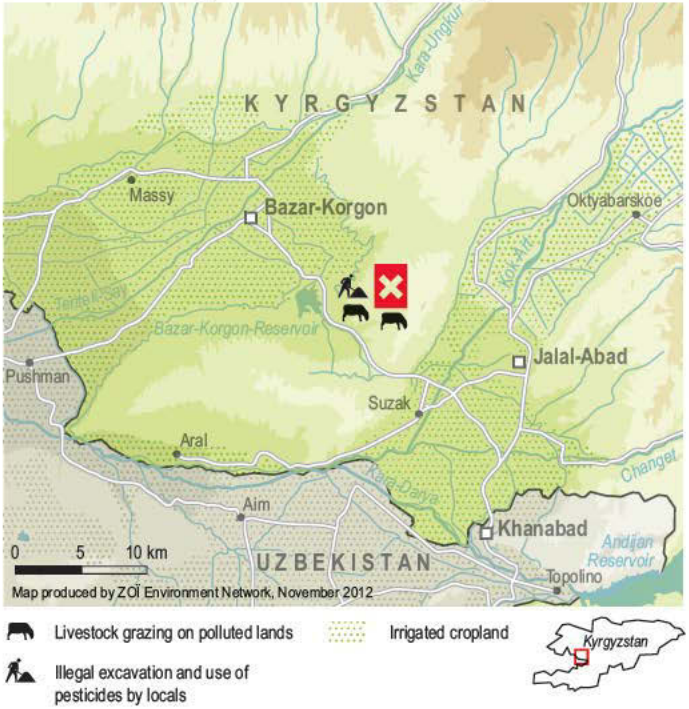
Initial collection and disposal efforts removed many of the leaking capacitors from Darial-U, and the Kazakh government has committed to further, countrywide clean-up, but at least 5 000 capacitors remain at Darial-U. The country had numerous military and electrical stations that may have the same PCB issues, and a more detailed inventory is needed to develop a plan for destroying the PCB-containing waste.

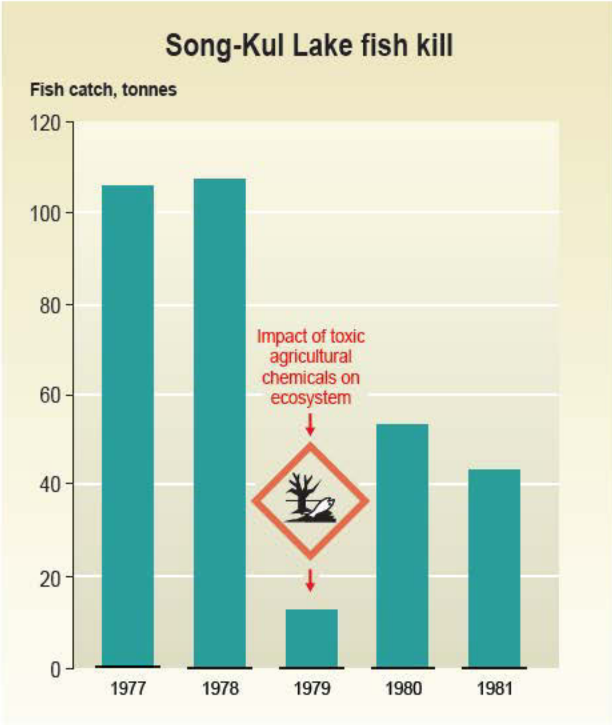
Vakhsh obsolete pesticides dump, Tajikistan



During the Soviet era, the agrochemical dumps at Vakhsh and Kanibadam in Tajikistan received waste from local agriculture and from Kyrgyzstan and Uzbekistan, and are now two of the largest obsolete pesticide waste sites in Central Asia. Vakhsh, located in southern Tajikistan, has some 7 000 tonnes of waste, while Kanibadam, in the northern part of the country, has 3 000 tonnes, including more than 500 tonnes of dichlorodiphenyltrichloroethane (DDT). Located within five kilometers of settlements, both dumps were poorly planned. The original simple fences are long gone, and the sites are now accessible to people and animals. When the prices for agricultural chemicals increased in 2001, the local population began illegal excavations in the dumps to retrieve obsolete and prohibited pesticides for repackaging and sale. The degraded conditions of the dumps and the illegal trade have increased the spread of pollution. Policy-makers and donors have recognized the seriousness of the situation, and have supported research to find ways to resolve the problems. The next steps entail containment and the destruction of the obsolete and prohibited pesticides.

Suzak obsolete pesticides dump, Kyrgyzstan





Source: V. Pevnev. Fish of Kyrgyzstan, 1990; M. Vundcettel, 1994; Kyrgyz National Chemical Profile 2008

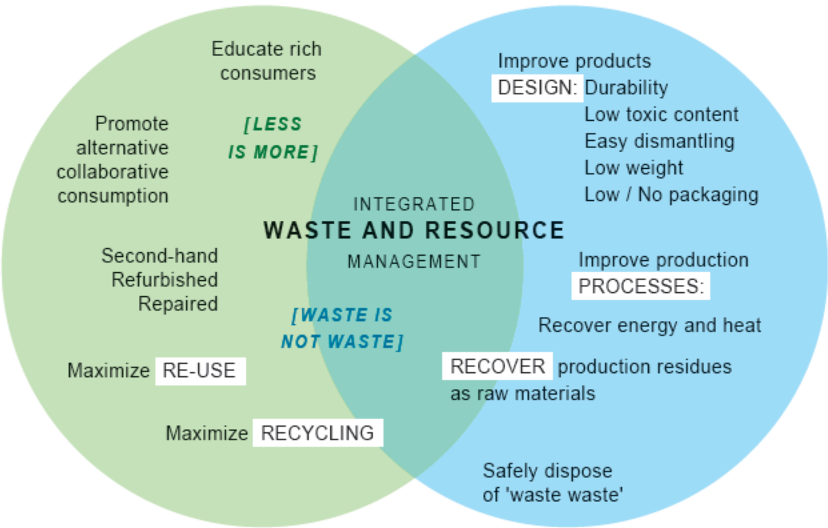
The Suzak pesticide dump is located about 10 kilometers from the city of Jalalabad in the western part of Kyrgyzstan. The largest pesticide waste site in Kyrgyzstan, the Suzak dump has approximately 1 500 tonnes of chemicals on hand. As at the Vakhsh and Kanibadam dumps, the local population excavate obsolete pesticides, and cattle graze the area. Direct exposures and the consumption of contaminated meat from agricultural animals that grazed here led to cases of toxic poisoning in 2004, with some cases resulting in death.

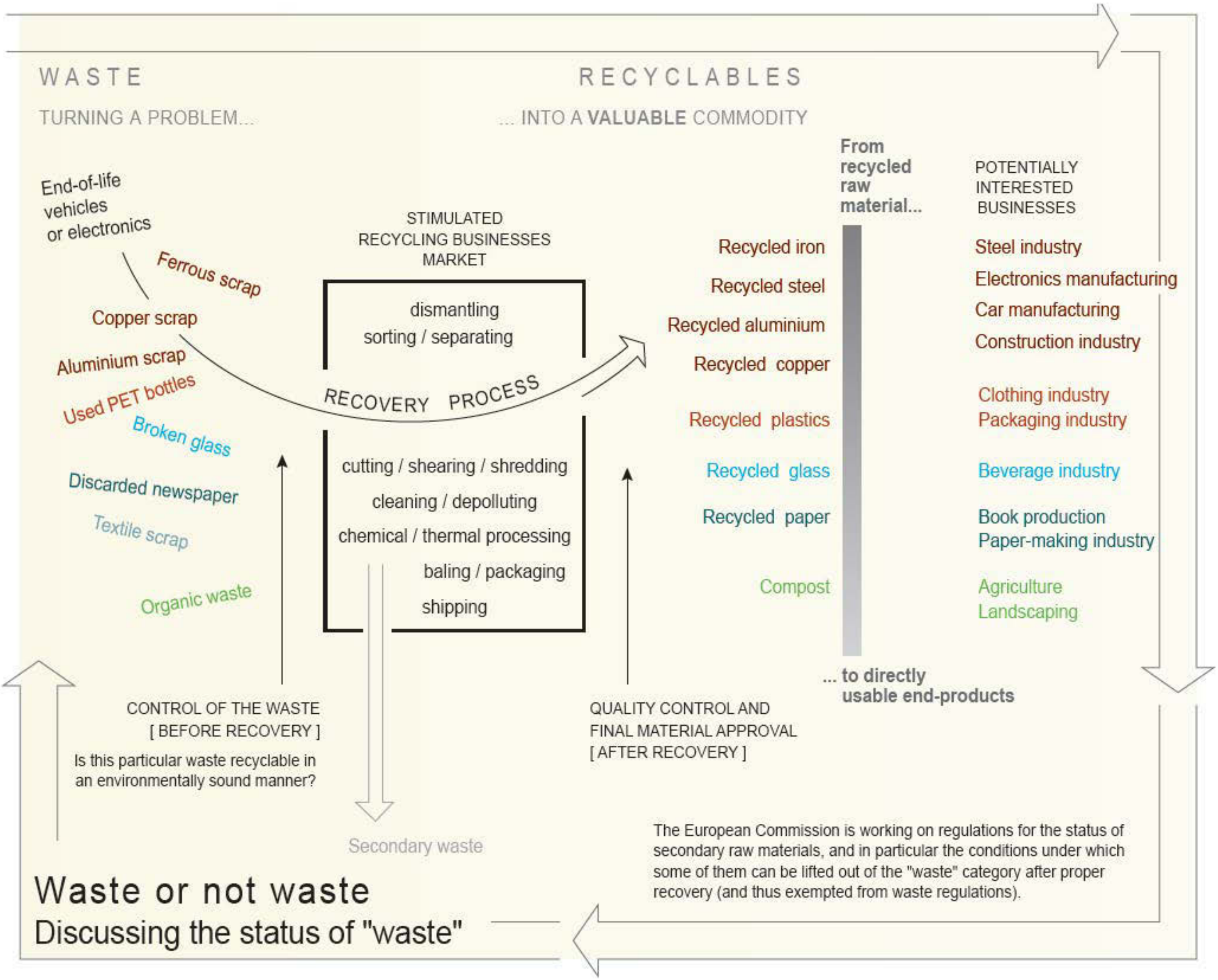
The impacts of pesticides and other agricultural chemicals are evident in the well-known case of Lake Song-Kul in Kyrgyzstan. Excessive amounts of agricultural chemicals applied on the surrounding pastures washed into the lake in 1979, killing most of the fish. Fish stocks have slowly recovered, but have not reached their former level.

Sound management practices

There is a simple way to manage waste, summarized in the familiar mantra Reduce, Reuse, Recycle. But it is not in fact quite as simple as it seems. Obstacles to waste minimization include planned obsolescence and consumer behavior. Technology and fashion can both increase the pressure to upgrade a product, and so can a company's need to survive economically (take, for example, mobile telephones). In a system that relies on increasing production for success, limited product life is vital. Ironically, production methods that save resources, energy and time also lead to more waste generation. But when new products offer genuine improvements, the environment may benefit. Environmental regulations on product efficiency and quality should therefore also consider the products' end of life. Governments play a key role in waste management by providing incentives to both industry and consumers to reduce waste, and through measures to discourage its generation.

Waste provides a living, if a meager one, for an estimated 15 million people worldwide who might otherwise have no income. It is also a lucrative part of international trade, worth an estimated US$ 10 billion annually. Both ends of this waste market perform two functions: they dispose of what the world no longer wants, and they recover what it badly needs (for example, scrap metal such as copper and aluminum, and gold, silver and other precious metals). Even with the growth of the world population and its economy, waste generation can be reduced, if its value is increased. Sharing goods and buying a function or service rather than a product are examples of ways to uncouple economic growth from waste production, and to make the resulting waste more valuable. Consumers and producers will need to accept their share of responsibility, and governments and business should set an example in their own operations to set minimum environmental standards.





The European Commission is working on regulations for the status of secondary raw materials, and in particular the conditions under which some of them can be lifted out of the "waste" category after proper recovery (and thus exempted from waste regulations).

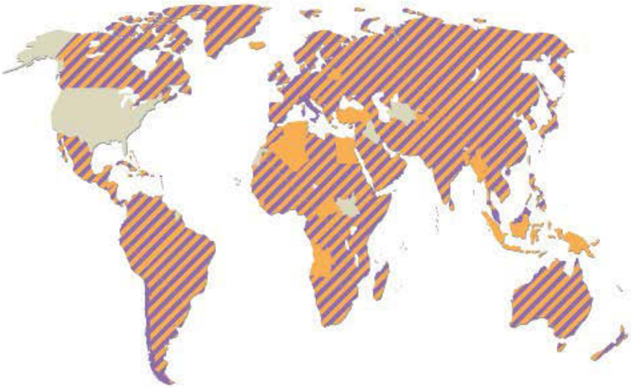
Waste or not waste

Discussing the status of "waste"

Basel Convention [1989]
on the Control of Transboundary Movements of Hazardous Wastes and their Disposal

- 180 Parties
- 75 Parties having ratified both the Convention and the BAN amendment [1994] [1]

1 - Ban on the export from OECD to non-OECD countries of hazardous wastes intended for final disposal [1994], recovery or recycling [1997].



Rotterdam Convention [1998]
on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade

- 150 Parties

Stockholm Convention [2001]
on Persistent Organic Pollutants

- 179 Parties

- Parties having ratified both Rotterdam and Stockholm Conventions

On 16th September 2009, the Vienna Convention and the Montreal Protocol became the first treaties in the history of the United Nations to achieve universal ratification.

Vienna Convention [1988]
for the Protection of the Ozone Layer

- 197 Parties

Montreal protocol [1989]
on Substances that Deplete the Ozone Layer

- 197 Parties

Apart from its main goal, the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (adopted in 1989, entered into force in 1992) has three additional objectives: to minimize hazardous waste generation (both in quantity and danger); to treat and dispose of hazardous and other wastes as close as possible to their source of generation in an environmentally sound manner; and to reduce transboundary movements of hazardous and other wastes to the lowest level consistent with their environmentally sound management. It has 180 parties, of which 75 have ratified both the Convention and the BAN Amendment, which covers the export from OECD to non-OECD countries of hazardous wastes intended for final disposal, recovery or recycling.

BASEL CONVENTION

The Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade (adopted in 1998, entered into force in 2004) has 150 parties and focuses on facilitating information exchange about hazardous chemicals by providing for a national decision-making process on their import and export and by disseminating these decisions to parties.

ROTTERDAM CONVENTION

The Stockholm Convention on Persistent Organic Pollutants (adopted in 2001, entered into force in 2004) lists 22 chemicals for which consumption, production and use, import and export, disposal and/or environmental release should be reduced, prohibited and/or eliminated. Persistent organic pollutants are chemicals that persist in the environment, bioaccumulate through the food web, and pose a risk of causing adverse effects to human health and the environment. Some can be transported long distances by wind and water. The Stockholm Convention has 179 parties.

STOCKHOLM CONVENTION

The Montreal Protocol on Substances that Deplete the Ozone Layer (a protocol to the Vienna Convention for the Protection of the Ozone Layer) is designed to protect the Earth's protective layer of ozone by phasing out the production and consumption of substances believed to be responsible for ozone depletion. The treaty was agreed in 1987 and entered into force on 1 January 1989, and has undergone seven revisions. On the twenty-fifth anniversary of the signing of the treaty in 2012, scientists believe that compliance with the treaty has likely stabilized the ozone layer and that the potentially catastrophic growth of the ozone hole has stopped. They expect the ozone layer to recover by the second half of the twenty-first century – several decades later than originally hoped – provided the treaty provisions are met.

MONTREAL PROTOCOL 25 1987-2012

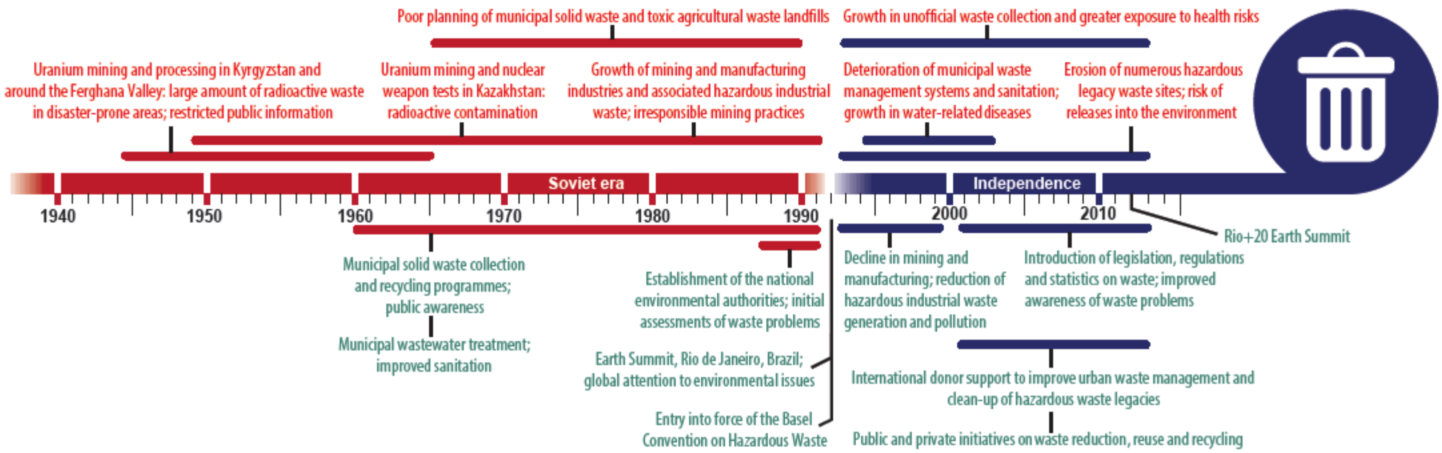
The Strategic Approach to International Chemicals Management (SAICM) was developed by the International Conference on Chemicals Management (ICCM) – a multi-stakeholder and multi-sectoral preparatory committee – and was adopted on 6 February 2006 in Dubai, United Arab Emirates. It is a policy framework to help achieve the goal agreed at the 2002 Johannesburg World Summit on Sustainable Development of ensuring that, by the year 2020, chemicals are produced and used in ways that minimize significant adverse impacts on the environment and human health.

saicm

Central Asia's waste management timeline

The agricultural and industrial expansion in Central Asia 30-50 years ago concentrated on economic and social advancement with little regard to the environment, and once this approach was established, the competition to produce more at any environmental cost continued. This approach generated vast amounts of waste, a significant amount of it contaminated by hazardous chemicals such as DDT and PCBs, and some of it radioactive. On the positive side, a smaller population and different consumption patterns produced less municipal waste, and educational standards and public awareness were high. Waste management systems in urban areas provided for the collection and recycling of paper, glass, textiles and metals, and even for composting.

The advent of independence in Central Asia 20 years ago coincided with the Earth Summit on environment and development in Rio de Janeiro, Brazil, and the attendant awakening with regard to environmental issues such as the treatment of waste and chemicals. In step with the global environmental and national political trends, the countries of Central Asia established new ministries, institutional policies and systems to deal with waste, and joined the new international waste conventions. Initially, the lack of financial resources and different economic priorities led to the postponement of waste-related activities, but after a transition period, the countries acquired more resources. Conditions at legacy sites deteriorated over time, and natural disasters have affected some legacy sites. The countries were able to manage industrial and municipal waste, but unfortunately, wastewater treatment and the separation and recycling of municipal waste lost ground for lack of subsidies and incentives.

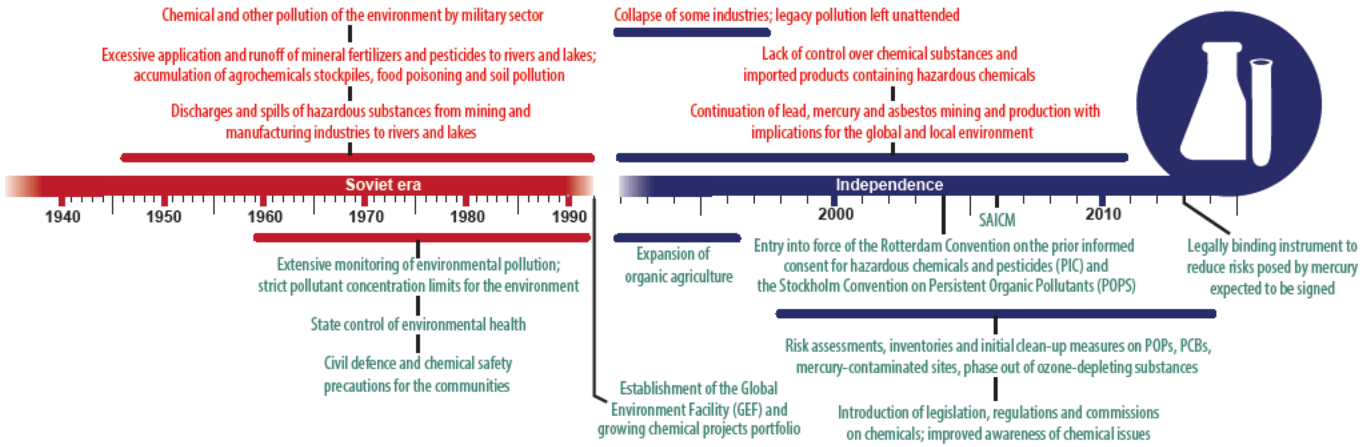


Central Asia's chemicals management timeline

The excessive pesticide applications used in the drive for greater agricultural production 30-50 years ago left many rural areas in Central Asia polluted. Numerous agricultural airfields served as bases for the storage, mixing and distribution of agricultural chemicals, and as repositories of obsolete chemicals. The mercury and lead pollution resulting from industrial practices was not recognized as a problem, and producers and users made no efforts to contain these substances. The persistent organic pollutants from agriculture and the heavy metals from industry accumulated over time, and were released into the environment. Highly restricted military activities also used hazardous chemicals without recognizing the potential dangers at the time, and the military became one of the problem sectors for pollution in Central Asia.

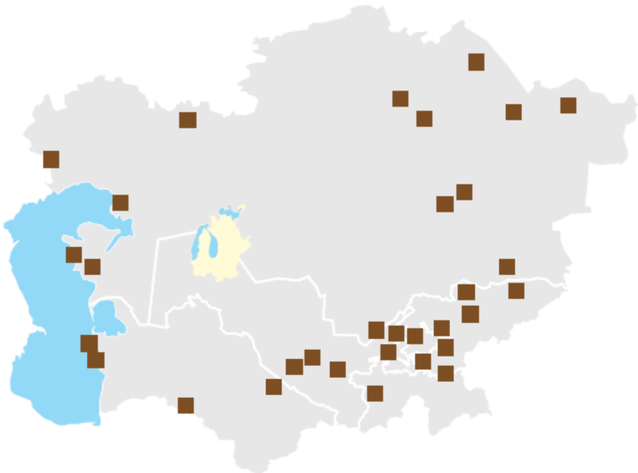
On the positive side, strict and well-established procedures for worker safety in industrial facilities remain in force up to the present. Adherence to these procedures minimizes accidents. Public awareness campaigns have extended the safety precautions into the community, and the populations located near hazardous sites are generally versed in the civil defense measures to take in case of releases.

Over the last 20 years some polluting activities – such as mercury and lead smelting – have continued. In addition, the region opened up to numerous new chemical suppliers – China, the West and Russia. As the region received different chemicals from various sources, the control of chemicals became more difficult. Monitoring declined, and other control capacities diminished. The countries have, however, adopted international conventions and the Strategic Approach to International Chemicals Management (SAICM) principles. Initiatives by the countries of Central Asia include keeping inventories of persistent organic pollutants and developing action plans on ozone-depleting substances. The countries are also establishing chemical commissions to coordinate oversight activities, are bringing more attention to border control and customs to control the entry of chemicals, and are adopting the international system of chemical labeling.



Success stories

Selected governmental, public and donor-funded initiatives on sound waste and chemical management



Central Asia provides many examples of the ways in which both small and large businesses are tackling the problems of waste and hazardous substances. The choice of the cases highlighted here is based on the media and public attention devoted to these issues.

WASTE

Customs

Customs officers play an increasingly important role in the regulation of chemicals, in particular in the detection and prevention of the illegal import or export of hazardous substances, and in the statistical accounting of chemicals crossing frontiers. International organizations have provided training for customs officers in Central Asia on ozone-depleting substances, cross-border movements and the illegal trafficking of hazardous waste and other key topics. The World Customs Organization is one body working to tackle the problem: it has developed a strategy designed to offer a more focused and well-resourced approach to capacity-building in the customs administrations of developing and least-developed countries.

Information on pollution release and transfer

Some regional initiatives related to international practices but specific to Central Asia are underway. The countries in the region are participating in international meetings and preparing to undertake the Pollution Release and Transfer Protocol (PRTP) used in Europe and the West to track emissions and discharges. This protocol, when fully implemented, will provide an overview of Central Asian emissions at both the country and regional levels, and will be available to the public. The use of pollution release and transfer registers (PRTRs) is good practice, but not yet legally binding in the region. In addition, a regional environmental action plan includes waste as an area that needs action, but because of the complexity and scale of the problem, this area is one of the least advanced. The Caspian Sea Environmental Convention has provisions on the sources of environmental pollution and protocols for responding to oil spills, and the Central Asia Framework Convention on Environmental Protection and Sustainable Development envisages actions on waste, air and water pollution, and making information public available.

Remediation of historic oil pollution

Chronic environmental neglect by the former (mainly Soviet-era) oil extraction industry in the Caspian Sea region of western Kazakhstan caused many emergency spills and regular leaks that polluted huge, thinly populated areas. But in the last five to seven years the Kazakh authorities, working with the private sector, have undertaken a major effort to remediate this historical pollution. In Atyrau province, for instance, more than 500 ha of polluted land (an area equivalent to 800 football fields) have been cleaned up with biological and earth engineering methods. Around Uzen in Mangystau province more than 4.5 million tonnes of crude oil was spilled because of broken-down pipelines and outdated drilling methods. One particular "oil lake" containing 600 000 tonnes of crude has been virtually eliminated.

Reduction of sulfur piles at Tengiz

North Caspian oil contains high levels of hydrogen sulfide (about 14 per cent). This sulfur must be separated from the crude oil after extraction and before it enters the pipeline network. While sulfur does not create a major environmental problem, rapidly growing mountains of sulfur stock at Tengiz have raised concerns among local people, environmental experts and NGOs. To address the problem the oil company has increased sulfur sales to both the domestic market (mainly for sulfuric acid production used in uranium in situ leaching) and to the international market. Kazakhstan has become one of the world's leading suppliers of sulfur, and in 2008-2009 Tengiz sold 5 million tonnes of its stock (although about 7 million tonnes still remain on site).

Minimization and reuse of industrial waste

Historical pollution from zinc and lead extraction and smelting in Kazakhstan has created significant environmental challenges. Ust-Kamenogorsk – a highly industrialized city in eastern Kazakhstan – was notorious for the high levels of air, water and soil pollution and unsatisfactory hazardous waste storage by numerous local industries. The leading Kazakh producer of zinc (and a significant producer of lead and gold) introduced new technology and higher production standards, and improved social and environmental responsibility. This led to a significant reduction in overall pollution, improvements in the condition of old tailings, the construction of new and better tailings, the reuse of industrial waste around Ust-Kamenogorsk and Ridder and the backfilling of some abandoned mines. Atmospheric lead emissions have fallen from almost 100 tonnes in the late 1990s to less than 15 tonnes in 2011. The proposed solutions for disposal of highly toxic arsenic-containing hazardous industrial waste, however, caused controversy and public alarm. The commission – consisting of local and central authorities, industry and the local public – is now reviewing a range of alternatives. Many other industries across Central Asia have embarked on waste reduction and recycling initiatives, including aluminum production in Tajikistan, gold mining in Uzbekistan and the textile industry in the region.

Nuclear clean-up at Semipalatinsk

A former nuclear Semipalatinsk test site closed on 29 August 1991 – a date later declared by the United Nations General Assembly as International Day against Nuclear Tests. The site has been extensively studied, the infrastructure for nuclear tests dismantled and radioactive material removed or sealed, while social and medical support has been provided to the local population. Competent authorities have recently prepared a state program to rehabilitate the Semipalatinsk area and expect that up to 95 per cent of the lands could be returned to productive agricultural use by the end of this decade. Kazakhstan's relative wealth has allowed it to fund most of its uranium clean-up from its own budget.

Risk reduction from uranium tailings at Mayli-Suu

The Central Asian governments have identified Mayli-Suu as a regionally significant hotspot, and international players such as the Blacksmith Institute, the International Atomic Energy Agency, and the World Bank have recognized this site for priority remediation. A centralized water intake upstream from the contamination is the only reliable source for safe drinking water, but given the multiple challenges, the results of remediation efforts so far are encouraging. Significant research has been done here, and work continues on the risk reduction measures still necessary to resolve all the outstanding safety issues.

The extensive uranium tailings at Mayli-Suu present both local risks and a potential cross-border threat, particularly to Uzbekistan. The Kyrgyz authorities, supported by donors including the World Bank, the Global Environment Facility and the European Union, have embarked on an ambitious project to improve preparedness for natural disasters and to mitigate the serious risks posed by radioactive waste. Research and feasibility studies conducted in the late 1990s and early 2000s resulted in a number of tangible measures on landslide and flood risk monitoring, tailings dam reinforcement and relocation to safer sites of tailings material at risk from natural disasters. The cost of these activities is high: more than US$ 7 million in donor funds, with substantial co-funding by Kyrgyzstan. But the stakes for the environment and human health are also very high. There are strong expectations of good results.

Assessment of abandoned waste legacy risks, public awareness and risk reduction measures

The cost of remediating former mining, industrial and agricultural waste sites can be prohibitive, and the number of sites is daunting. Kyrgyzstan and Tajikistan, being poorer than their neighbours, tend to relay on donor funding, so assessing priority sites and solutions is very important. Numerous donors are offering help, ranging from the International Atomic Energy Agency, the North Atlantic Treaty Organization through the World Bank, United Nations agencies and the Organization for Security and Co-operation in Europe to governments and universities. They have contributed to studies and better understanding of the environment and health risks associated with the legacy of mining waste, abandoned industrial sites using hazardous substances or generating radioactive waste and dumps of obsolete agricultural chemicals, since information was for many years limited or missing entirely. Now many of these legacy sites have been initially assessed, priorities are set and public awareness is being improved. In some places warning signs, fences or protective coverings were reinstalled. The next step is to identify funds and to design ways to prevent the further spread of pollution in the long run or at least to contain and properly remediate it.

One remarkable example of the follow-up to research efforts and technical cooperation is the EurAsEC member states' cross-border program on remediation of territories affected by the uranium mining and processing. This program, supported by a budget of US$ 36 million (1 billion Russian rubles), was approved in April 2012 by the heads of the governments of Russia, Kazakhstan, Belarus, Kyrgyzstan and Tajikistan and will target three pilot sites: Min-Kush and Kadji-Say in Kyrgyzstan, and Taboshar in Tajikistan. The program will improve conditions and safety of uranium mining waste, tackle radioactive contamination hotspots and contribute to a better quality of life for the local population. Experience and technologies from Russia and Kazakhstan will be applied in the upcoming project.

Health-care waste management in Kazakhstan

Kazakhstan's main chemical-related challenges are soil contamination, groundwater pollution, obsolete pesticides, buried hazardous waste, workplace hazards and, crucially, air pollution. Kazakhstan has more than 1 000 hospitals, 2 000 dispensaries and 9 000 pharmacies and facilities that generate medical waste. It produces, at a very conservative estimate, about 12 000 tonnes of this waste annually – about 32 tonnes per day. As a party to the Stockholm Convention on POPs, Kazakhstan is giving priority to action in the health-care sector, as medical waste incinerators can release high levels of unintentional POPs (u-POPs), such as dioxins and furans. Kazakhstan doctors and citizens still relay extensively on mercury-containing measuring devices such as thermometers and blood pressure meters and the medical sector is also responsible for releases of mercury contained in medical equipment. A United Nations Development Program (UNDP)-GEF project will help it to reduce releases of u-POPs and other globally harmful pollutants, including mercury, by demonstrating sound health-care waste management, and will help Kazakhstan to implement its obligations under the Convention.

Tire recycling

With a rapidly growing number of road vehicles, Kazakhstan is currently the only Central Asian state with growing capacities and incentives for tire recycling and recovery. From summer 2013, car owners will be required by law to dispose of used tires at recycling centers and pay for them to be processed. Other countries in the region could learn from Kazakhstan's experience so far. In 2009 it commissioned its first tire recycling plant, where a private company produces clean rubber granules and a fine powder for use in road construction. The long roads and great temperature differences between winter and summer pose a special challenge for road builders in Kazakhstan, and the fine powder produced by the plant can be added to the bitumen and substantially increases the quality and lifetime of the asphalt. The plant, in Astana, processes around 11 000 used heavy goods vehicle and car tires annually, using German technology.

Improved waste management in Uzbek cities

Central Asia's largest city, Tashkent (population 2.5 million), is continuously improving its municipal waste collection and disposal system and has introduced the sorting and recycling of waste, leaving less for disposal, although waste tariffs and costs remain an open issue. Supported by a US$ 100 million loan from the Asian Development Bank, the new regulations (introduced in August 2012) require household waste to be sorted into five types (plastic, paper, food waste, e-waste and other waste). Containers for the different types will soon be installed across Tashkent.

An earlier US$ 50 million loan from the European Bank for Reconstruction and Development and the World Bank has already helped Tashkent to bring its municipal solid waste management system to the new standards and practices. The project tackled severe environmental problems and public health hazards, in particular the threat of contamination of the city's groundwater reserves from the old urban waste dump. It also helped to strengthen municipal waste collection services and create opportunities for private waste processing schemes.

Smaller but equally famous cities in Uzbekistan – Bukhara and Samarkand – are also improving their wastewater systems and solid municipal waste collection and disposal schemes.

Improved waste management in Ashgabat

Ashgabat, the capital and largest city of Turkmenistan, is known as a white city with a clean image. The city has a recently completed waste processing plant, a new landfill and waste management plant at Ruhabat and a wastewater treatment plant. As the capital city, Ashgabat hopes to demonstrate how to manage waste so that other cities will follow its example.

Improved waste management in Kazakh cities

The largest city in Kazakhstan, Almaty, inaugurated the country's first waste processing plant (built with an investment of US$ 35 million) in December 2007, but its experience has been mixed. The plant's initial performance was good, but the withdrawal of municipal subsidies affected waste processing, which now remains frozen. Lack of separate waste collection in Almaty and other Kazakh cities as well as insufficient financial incentives complicate municipal waste management initiatives.

A new waste management project covers several Kazakh cities and also includes waste incineration. In September 2012, a new waste processing plant was launched in Astana, and another plant in Shymkent is scheduled to be completed soon. These plants will extract recyclable materials such as plastic, glass and metals for further use in manufacturing materials and goods. Lessons learned from the Almaty experience could be instructive for the new plants. The European Bank for Reconstruction and Development (EBRD) is about to finance a series of municipal waste management projects in Kazakhstan including waste-to-energy incinerators and improved wastewater treatment initiatives. The first city covered by the project will be Aktau on the Caspian Sea.

Improved waste management in Tajik cities

Dushanbe, the capital of Tajikistan, is embarking on an improved municipal waste management project, financed by a loan of up to US$ 4 million from the European Bank for Reconstruction and Development. A similar project in the second largest city of Tajikistan, Khujand, will start in 2013. The projects aim to help the two major cities of Tajikistan to rehabilitate an existing landfill site and collection points, and to supply new landfill equipment and collection vehicles, containers and equipment. Other objectives include helping to reorganize and improve solid waste collection and disposal in the cities. The projects promise substantial environmental, health and safety benefits to Dushanbe and Khujand and neighboring communities by providing an adequate and affordable municipal waste management system. But rehabilitating the existing landfill may uncover environmental issues resulting from its current and past use, and an environmental audit will be needed to identify any risks and liabilities such as soil, groundwater and surface water contamination. Feasibility studies for other key Tajik cities such as Regar (Tursun-Zade) and Kurgon-Teppa will help to assess and improve local municipal waste management systems.

Improved waste management in Kyrgyz cities

Of the Kyrgyz cities, Bishkek generates the most municipal waste, and receives the most attention from the authorities. Although practical progress is slow, the EBRD is conducting a feasibility study for an effective waste management system for the city. This study may lead to more specific investments from donors. The overriding question is whether to build an incinerator or to increase landfill capacity, possibly through a waste processing plant or an engineered landfill. The city of Osh is studying the potential for the capture of methane emissions, and has proposed a better waste management scheme within the city. Some donors have provided trucks and the installation of waste bins in a pilot project. The cities of Osh, Jalalabad, Talas and Karakol are also improving wastewater treatment systems with international support.

Ala Archa National Park and Issyk-Kul Lake in Kyrgyzstan

Both Ala Archa National Park and Lake Issyk-Kul are popular local tourist destinations. Ala Archa National Park, close to Bishkek, attracts more than 30 000 tourists each summer (1 000-2 000 every weekend), including skiers and climbers. The visitors generate around 20 tonnes of garbage each weekend, and according to the park management, 80 per cent of these visitors have no environmental awareness. The area around Lake Issyk-Kul, contains significant archaeological remains and globally important levels of biodiversity. It hosts more than 1 million local visitors and 50 000 foreign tourists annually, mainly in the summer. As a consequence of the lack of infrastructure for waste disposal, and because there is no information available about what to do with the waste, these visitors leave a large amount of litter, both on the lakeshore and in the water. Volunteers (especially young people) work together every year to help collect the tourists' waste.

Lenin Peak in Kyrgyzstan and the Fann Mountains in Tajikistan

Both Lenin Peak and the Fann Mountains are popular destinations for professional climbers, mountaineers and adventure-seekers. Kyrgyzstan's Lenin Peak is considered one of the easiest 7 000 m peaks in the world to climb and it has far more ascents than any other mountain of 7 000 m or higher, with hundreds of climbers reaching the summit annually. In 2009 local NGOs and tourist operators organized clean-ups at several base camps around Lenin Peak, collecting and removing more than 2.5 tonnes of garbage from areas at 4 500-5 000 m altitude and another four tonnes further down the mountain. Similar clean-up campaigns have been arranged in Tajikistan's Fann Mountains, which are not quite as high, although several are more than 5 000 m.

Clean cities action

Even before the Soviet era, Central Asian urban communities undertook voluntary public urban clean-ups that included keeping streets and canals clean and removing waste. Under Soviet rule "subbotniks" (literally, Saturday work) were regular city clean-up exercises involving work by citizens. This practice continues, with the participation of a broad cross-section of the public, from students to senior officials. It includes the cleaning of streets, backyards, public spaces, ditches, parks, water bodies, rivers and reservoirs. It also embraces the improvement of city amenities and the entire townscape. In spring 2012 the Kyrgyz Government launched and financially supported a model program, entitled “We live here”.

Recent municipal waste management initiatives in Central Asia have faced a common and serious problem – the lack of public awareness and education (to develop behavior and regular habits) about the need to separate waste and dispose of it properly. Limited knowledge of the waste regulations in effect among both officials and citizens, and low charges for waste disposal, are also issues. The future success of municipal waste management initiatives will depend not only on waste collection and disposal systems and suitable technology, but also on education, economic incentives and law enforcement.

Waste collection at Issyk Kul Lake shores



Waste art

Tourism waste collection, Lenin Peak, Kyrgyzstan

Youth awareness campaign

Recycling of paper, glass and plastics

After food waste, paper is the second largest constituent of urban municipal waste in most Central Asian cities, through the proportion of plastics is growing fast. State-run wastepaper and glass collection incentives and capacities were well developed during the Soviet era, but since independence they have either disappeared or shrunk. Private and municipal incentives in recent years in Uzbekistan's and Kazakhstan's large cities have promoted growth in the number of paper collection points and in paper recycling capacity. Paper recycling enterprises based in Almaty and Tashkent produce schoolbooks, paper, cardboard, paper packaging and other goods, using more than 50 000 tonnes of recycled paper annually. Glass and plastics in solid municipal waste are mainly collected by waste pickers at in-city waste collection points or landfills. The likely exposure of these informal workers to environmental and health risks calls for action.

Public awareness in Uzbekistan

In the Soviet era, information about the risks associated with industrial and chemical wastes and the chemical industry was not publicly available. Recent Uzbek environmental policy provides for the disclosure of such information and for access by the media to sites that use or produce chemicals and generate industrial waste. Environmental authorities organize and support media tours at these facilities, and reporting by environmental journalists has led to better dissemination of information to the public. Motivated by media exposure, the industry has improved its performance.

Traditional and novel approaches to waste minimization and reuse

Traditionally, residents of Central Asia have reused material from obsolete or dismantled buildings for new construction, and waste from agriculture (chiefly cotton residues) for heating and energy. Many rural areas compost large amounts of waste and manage manure on a large scale. While these traditional practices help to reduce waste generation on the one hand, the exposure to asbestos waste or dioxins released as a result of agricultural biomass burning may lead to exposure to health risks. The nomadic communities of Central Asia are also highly efficient in their management of waste, using animal waste for fertilizer, and making felt products – everything from yurts to slippers – from wool. Recently, Central Asian designers have showcased products such as fashion bags made from reused textiles.

Youth initiatives

In Kyrgyzstan, a university initiative, "Move Green", brings university students into schools to teach younger students about waste separation and recycling. Already active in 20 schools and still expanding, this initiative raises awareness about waste, installs waste bins for recycling paper and plastics in schools and creates competitions where students are rewarded and the proceeds of recycling support the students and their schools.

A foundation that promotes youth initiatives in Kyrgyzstan involves thousands of people in efforts to educate youth about waste and to motivate them to act responsibly. The activities include music festivals, games, competitions and photo contests. One recent project collected textile waste, which was then sent to orphanages where the children designed and made handbags and dresses using the recycled textile waste, and sold the products.

CHEMICALS

Global and local action on hazardous substances

The United Nations Environment Program Governing Council agreed in 2009 to prepare a global treaty on mercury to protect human health and the environment. It will be called the Minamata Convention, recalling the thousands of people poisoned by mercury released into Minamata Bay in Japan. A negotiating committee has developed a comprehensive approach, which will include provisions to reduce the supply, use and emissions of mercury as well as waste management, while taking account of the circumstances of individual countries. Negotiations concluded in 2013.

In national initiatives, the Central Asian countries have developed strategies to respond to the global conventions and initiatives on waste and chemicals. All of the countries have recently developed waste and chemicals management programs, and in the countries with sufficient financing, many actions are already underway. In anticipation of the Mercury Convention, some countries are preparing national inventories and action plans and are about to improve their existing regulations on mercury. The countries are developing national chemical profiles to identify producers, users and regulators, and to identify any gaps that may exist. They also participate in SAICM.

Environmental monitoring

Monitoring the circulation of hazardous substances in the environment is a challenge: some substances are toxic and mobile at very low concentrations (mercury), and for others (dioxins) no monitoring capability is available in Central Asia. Tracing pollutants far away from pollution sources helps us to understand their global and regional movements and to establish baselines for comparison. Significant monitoring sites with long-term records include those at the Repetek nature reserve in the Karakum desert in Turkmenistan; the Chatkal nature reserve in the Tien Shan Mountains of Uzbekistan; the Abramov Glacier in Kyrgyzstan on the border with Tajikistan; and at Lake Borovoe in northern Kazakhstan.

Asbestos

Residents and businesses in Central Asia continue to make wide use of asbestos-containing roofing sheets, pipes and other construction materials because they are affordable, durable and versatile. Governments and local and international NGOs such as "Women in Europe for a Common Future" and the Kyrgyz NGO "Biom" are well aware of the health risks of asbestos. They work with the public to encourage people to take precautions in handling and disposing of material containing asbestos and to choose environmentally safer but still affordable replacements.

Mercury clean-up in Kazakhstan

The city of Pavlodar in northern Kazakhstan is affected by mercury pollution from an abandoned chlor-alkali plant. The historical production of chlorine there used a mercury-based technology that left about 900 tonnes of mercury in the soil. A decontamination project funded by the Kazakh government (US$ 16 million) helped to reduce the acute health and environment risks. Elsewhere in Kazakhstan the World Bank is supporting a Kazakh government project to decontaminate a site on the outskirts of the city of Temirtau. From 1950 to 1997 pollution leached from a carbide factory that produced synthetic rubber, using mercury as a catalyst. The factory's wastewater treatment plant was not designed to remove mercury, and as a result more than 1 500 tonnes of the heavy metal were discharged into the Nura River and the surrounding industrial area. The overall cost of the project is about US$ 100 million. Finally, a GEF project, in keeping with the global trend, is likely to support Kazakhstan's first national mercury inventory – in lamps, medical devices and other products.

Reducing global and local environmental risks from primary mercury mining in Khaidarkan

A GEF project is seeking ways to help the community around Khaidarkan in southern Kyrgyzstan to prepare for phase-out of its mercury mine. The project promotes alternatives in order to reduce socio-economic dependence on mercury mining. It also monitors and researches mercury contamination hotspots, designing preventative and remedial measures, raising public awareness and providing small grants to local communities to help the transition. Another donor (Norway) is financing pollution containment and capacity-building measures. The project has goals that are both local (fewer environment and health impacts, reduced dependency on mercury mining as a source of income) and global (fewer atmospheric emissions and less primary mercury production).

Inventories and action plans on POPs and PCBs

The United Nations Environment Program (UNEP) and United Nations Development Program (UNDP) GEF projects on inventories of persistent organic pollutants help Central Asian countries to compile initial inventories of these pollutants. The projects also help governments to understand the current state of the problem, to identify gaps and to prioritize sites for remediation. Persistent organic pollutants share key characteristics: they resist degradation in air, water, and sediments; they accumulate in living tissues at concentrations higher than those in the surrounding environment; and they can travel great distances from the source of release through air, water, and migratory animals. National implementation plans prepared by Central Asian countries under the Stockholm Convention are available at http://www.pops.int/documents/implementation/nips/.

Action on PCBs

The Global Environment Facility supports several PCB projects in Central Asia. One in Kyrgyzstan seeks to help the country establish an adequate legal structure and to create awareness about the risks of PCBs and their impacts on the environment and on the health of workers and the public. The project also aims to ensure the safe handling of PCB stockpiles and contaminated equipment, and to help develop options for the management of PCB-containing or contaminated equipment and oils. Another, in Kazakhstan, is implementing a comprehensive management plan, with the overall objective of significantly cutting emissions of PCBs and reducing their impact on health and the environment through developing sound management across the country. The project seeks to ensure that there is a modern, fully enforceable PCB regulatory system in place. It includes strengthening administrative functions, capacity-building for sound management, dismantling 850 tonnes of PCB transformers and disposing of them, and regionally organized secure storage and disposal of PCB capacitors.

Sustainable alternatives to DDT in malaria control

The Global Environment Facility is supporting a US$ 3.2 million project to find sustainable substitutes for DDT in malaria control in Kyrgyzstan and Tajikistan (it is also supporting similar projects in many other malaria-prone countries). Through an approach called integrated vector management (IVM), the project aims by the time it ends in 2014 to ensure that no DDT is used in vector management and that there is no risk of reverting to its use. This should be achieved through consolidation of the IVM approach and the selected safeguarding of currently unmanaged DDT stockpiles.

Ozone-depleting substances

In all Central Asian countries that have ratified the Montreal Protocol on phasing out ozone-depleting substances, the use of the most damaging ozone-depleting substances (ODSs) has been stopped, while some countries have increased their use of alternatives. The Global Environment Facility is supporting work in several states, often with beneficial results. In Tajikistan, for instance, all the project objectives (ODS phase-out; availability of ODS-free technology and products; introduction of ODS containment practices; raised awareness; strengthened institutional capacity; established country commitments) were successfully met. But a consultants' report on the project concluded that illegal trade threatened to undermine gains in ODS reduction in non-European Union countries with economies in transition, and that halon recovery and banking had been neglected there.

Kumys

For centuries people in Central Asia, particularly in Kyrgyzstan, have been drinking kumys and ayran – fermented milk products – as a way to maintain good health and a clean body. Now, studies by scientists and doctors confirm that this traditional folk remedy does indeed have beneficial health effects. The studies show that "kumys therapy" helps restore the good health of agricultural or industry workers exposed to hazardous substances by flushing certain chemicals from their bodies. This confirmation of the health benefits of kumys demonstrates the potential for folk medicine to take its place alongside modern science.

Initiatives on mainstreaming sound management of chemicals and waste into development

In an important step towards reducing mercury in the environment, the United Nations Environment Program (UNEP) is working with global partners across a number of themes – artisanal and small-scale gold mining; coal combustion; chlor-alkali; products; air transport research; waste management; supply and storage. The participation of Central Asian organizations and individuals in these partnerships is a recent development and a welcome trend.

The United Nations Development Program is collaborating with UNEP on a series of regional workshops for industry, non-governmental organizations and government. The aim of this initiative is to discuss the benefits of integrating chemical concerns into policies. The initiative emphasizes the economic benefits of integration – for example, how using fewer pesticides reduces costly damage to human health and the environment.

Other initiatives include the establishment of an information exchange network at the international level, with a global chemical outlook produced by UNEP in 2011 to help countries understand regional and global trends in chemical management, information and networking; and a solid waste management approach that integrates waste streams so that they can be managed as one stream. Central Asia is not yet included in the integrated waste management initiative, but the countries of the region are good candidates.

Swiss supported activities

Swiss cooperation with Central Asia aims to help the region in sustainable development and in the transition from authoritarian rule and central planning to pluralism and a market economy. Its projects in Central Asia are focused on five main domains: public institutions and services; basic infrastructure (water and energy); private sector development; water management and disaster risk reduction; and healthcare reform. Switzerland has also supported various activities related to waste and chemicals, ranging from assistance in policy development, holding workshops and providing training on innovative concepts to practical measures in environmental and health risk reduction. These include the rehabilitation of wastewater treatment systems and the better handling of hazardous medical waste.

Switzerland has supported the implementation in Central Asia of the Strategic Approach to International Chemicals Management – a global policy framework to foster the sound management of chemicals and to promote chemical safety around the world. It has worked with governments to develop national chemical profiles, and has supported policy reforms in Kyrgyzstan and Tajikistan. Switzerland provided funding to the United Nations Institute for Training and Research (UNITAR) to help develop a strategy for mobilizing resources for chemical and waste management, for addressing the challenges posed by nanomaterials and nanotechnology and for developing national profiles.

Furthermore, the Federal Office for the Environment coordinated with UNITAR, UNEP and Zoï to support the development of studies and the formulation of an action plan on primary mercury mining in Kyrgyzstan. This work has provided a base on which to build further work (and to develop a UNEP-GEF project there).

Switzerland works with the Red Cross and ToxCare on the safe disposal of medical waste in Kyrgyzstan. The project's overall goal is “to better prevent and decrease the numbers of hospital-acquired infections amongst patients in rural areas of Kyrgyzstan”. As a result of the project, all targeted facilities have functioning healthcare waste management systems, and the control of hospital-acquired infections in 10 maternity units in two districts has been improved. Additionally, the ToxCare project has facilitated workshops and trainings on hazardous waste management and the "Cleaner Production" concept that minimizes waste generation and increases product quality and cost-efficiency.

Swiss support is helping to finance the rehabilitation of wastewater systems in the Kyrgyz cities of Osh and Jalalabad. The project aims to ensure a reliable and sustainable water supply and sewage services by improving the effectiveness and efficiency of the cities' water companies. The strengthening of institutions includes project implementation support, financial and organizational support and engineering services, and a corporate development and stakeholder participation program. The investment component of the project will provide necessary resources and expertise for rehabilitating the water supply network and for selected wastewater improvement measures.

Recommendations

Both the number of chemicals in use and the amount of chemicals used are increasing in Central Asia, and perceptions of appropriate chemical applications in agriculture are changing. Waste legacies are an ongoing issue, and the international movement of waste is a growing concern. National and local authorities, the private sector and individual citizens and public organizations all have responsibilities and the potential to promote effective strategies for managing waste and chemicals in the region.

National authorities

The national authorities in the countries of Central Asian have opportunities to influence the development of policies and plans regarding waste and chemical management on a number of fronts. These opportunities include:

- Improving existing laws and regulations on waste and chemicals management in order to make them more efficient and workable

- Establishing chemical safety (or management) commissions where they do not exist, and applying best environmental practice trends in national strategies on chemicals and waste management

- Developing more coherent strategies for the environmentally sound management of waste, taking into account all waste streams in a comprehensive approach

- Applying consistent methods of data collection and the use of common units across all relevant agencies

- Establishing inventories of the import and export of chemical substances and waste where they do not exist, and making the information collected accessible to the extent allowed by law

- Creating industry incentives for environmentally sound recycling and reuse of waste

- Identifying resources (funds, know-how) to apply to the problems associated with contaminated sites from mining and agriculture

Local authorities

Municipalities have limited financial resources and technical knowledge, but as landowners they have responsibility for contaminated sites. Despite these limitations, local authorities have the potential to help improve waste and chemicals management policy and practices in the following ways:

- Advocating, in cooperation with the national authorities, the improvement of landfills, support on contaminated sites, funding for recycling and clean cities initiatives and more effective tariff policy

- Raising public awareness about risks of local hazardous waste and chemical sites, including the dangers of uncontrolled access and exposure to them

- Promoting the environmental image of their communities and taking advantage of market incentives for locally made green products such as those made with recycled materials or produced with fewer chemicals

The private sector

As a major producer of waste, and as a major consumer and producer of chemicals, the private sector has the ability to innovate and promote technology for waste and chemicals management, and share its experiences and knowledge with national and local authorities. Private sector potential to improve waste and chemicals management involves:

- Introducing environmental management systems to reveal the use of resources, calculate environmental footprints and monitor progress
- Supporting local municipalities in specific clean-up projects and cooperating with local citizens to improve their area
- Developing and exploiting markets for waste – environmentally sound recycling and reuse
- Improving industrial and chemical safety, particularly for emergency scenarios, by adopting best environmental practices

Individual citizens and public organizations

Individuals and civic organizations are important stakeholders, who often drive initiatives that can influence policy at all levels and whose goodwill is crucial to achieving local and national waste goals. In addition, consumer behaviour influences the marketplace, and may determine the level of chemical use in important ways. The opportunities for public organizations to make a difference include:

- Disseminating information on the dangers of hazardous waste and chemicals to farmers, children and others
- Promoting waste clean-up initiatives and sound chemical management to help raise public awareness and to encourage better environmental practices

Acronyms and Abbreviations

CFC Chlorofluorocarbon

DDT Dichlorodiphenyltrichloroethane

GEF Global Environment Facility

HCFC Hydrochlorofluorocarbon

HFC Hydrofluorocarbon

IVM Integrated vector management

NGO Nongovernmental organisation

ODS Ozone-depleting substance

PCB Polychlorinated biphenyl

POP Persistent organic pollutant

PRTP Pollution Release and Transfer Protocol

PRTR Pollution release and transfer register

SAICM Strategic Approach to International Chemicals Management

UNDP United Nations Development Program

UNEP United Nations Environment Program

UNITAR United Nations Institute for Training and Research

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Handwoven rug made from used plastic bags, T. Novikova

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